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MANUEL GONZALO

**A LONG-TERM NARRATIVE ON INDIA FROM LATIN AMERICA:
PERIPHERIZATION, NATIONAL SYSTEM OF INNOVATION AND
AUTONOMOUS EXPENDITURES**

RIO DE JANEIRO

2018

Manuel Gonzalo

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Tese de Doutorado submetida ao Instituto de Economia da
Universidade Federal do Rio de Janeiro como requisito
parcial para a obtenção do título de Doutor em Economia.

Orientador: Prof. Dr. José Eduardo Cassiolato

Co-Orientador: Prof. Dr. Eduardo Crespo

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As opiniões expressas neste trabalho são de exclusiva responsabilidade do autor.

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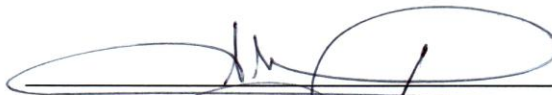
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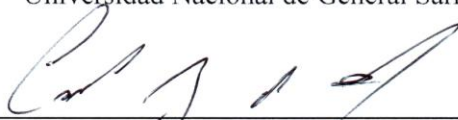
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Manuel Gonzalo, Buenos Aires, Diciembre de 2018.

“Todo povo tem na sua evolução, vista à distância, um certo “sentido”. Este se percebe não nos pormenores de sua história, mas no conjunto dos fatos e acontecimentos essenciais que a constituem num largo período de tempo. Quem observa aquele conjunto, desbastando-o do cipoal de incidentes secundários que o acompanham sempre e o fazem muitas vezes confuso e incompreensível, não deixará de perceber que ele se forma de uma linha mestra e ininterrupta de acontecimentos que se sucedem em ordem rigorosa, e dirigida sempre numa determinada orientação. É isso que se deve, antes de mais nada, procurar quando se aborda a análise da história de um povo, seja alias qual for o momento ou o aspecto dela que interessa, porque todos os momentos e aspectos não são senão partes, por si só incompletas, de um todo que deve ser sempre o objetivo último do historiador, por mais particularista que seja. Tal indagação é tanto mais importante e essencial que é por ela que se define, tanto no tempo como no espaço, a individualidade da parcela de humanidade que interessa ao pesquisador: povo, país, nação, sociedade, seja qual for a designação apropriada no caso. É somente aí que ele encontrará aquela unidade que lhe permite destacar uma tal parcela humana para estudá-la à parte.”

Caio Prado (1942, p. 15)

ABSTRACT

GONZALO, M. A long-term narrative on India from Latin America: Peripherization, national system of innovation and autonomous expenditures. Rio de Janeiro: Instituto de Economia/Universidade Federal do Rio de Janeiro, 2018. Tese de Doutorado.

The main objective of this PhD thesis is to present a long-term narrative of the Indian path of development, informed by a Latin American framework, paying main attention to the (geo)political, technological, financial and institutional aspects related to the specific geographical and demographical features of the Indian subcontinent. Two main historical movements are considered. First, the reconfiguration of the Indian subcontinent from a trade and manufacturing Indian Ocean center to a periphery of the British Empire; then, the re-emergence of India since her independence in 1947 until nowadays. The first period is conceptualized as a process of “peripherization” because, even broader than a deindustrialization process, it implied the urban, institutional, logistic, and external insertion resetting of the Indian subcontinent. In the second period, the post-colonial emergence, configuration, and role of the Indian National System of Innovation (NSI) and the post-1990s growth drivers and periodization are discussed. With respect to the Indian NSI, the relevance of State-owned enterprises, massive public programs and explicit and implicit science and technology policies such as the national missions is pointed out. With respect to the post-1990s growth, without ignoring the role of exports; private consumption led by upper class/casts urban groups, credit boom, public and private investment related to urbanization and energy and government transferences are identified as the main drivers. The external sector is analyzed in the context of the Indian post-cold war approximation to the Occidental world given China’s expansion. Remittances, service exports, and capital flows from the US are highlighted instead of an abstract idea of liberalization. All in all, structural heterogeneity is still there, even increased. The principal contributions of the thesis are: a) to present a long term narrative of the Indian NSI informed by a Latin American framework, b) to discuss the Indian development path integrating the work of several Indian scholars, building an initial dialogue on development and innovation with the Latin American literature, and c) to systematize a dense amount of literature and data on the Indian economic and social structure.

Key words: Indian; long-term; development; peripherization; national system of innovation; autonomous expenditures; growth; structural heterogeneity.

RESUMO

GONZALO, M. Uma narrativa de longo prazo sobre a Índia desde América Latina: periferização, sistema nacional de inovação e gastos autônomos. Rio de Janeiro: Instituto de Economia/Universidade Federal do Rio de Janeiro, 2018. Tese de Doutorado.

O objetivo principal desta tese é apresentar uma narrativa de longo prazo sobre o desenvolvimento da Índia, informado por uma abordagem Latino-americana, prestando especial atenção para aspectos (geo)políticos, tecnológicos, financeiros e institucionais relativos as especificidades demográficas e geográficas do subcontinente indiano. Consideram-se dois movimentos históricos principais. Primeiro, a reconfiguração do subcontinente indiano, de centro comercial e manufatureiro do Oceano Índico a periferia do Império Britânico; em segundo termo, a re-ascensão da Índia desde sua independência em 1947 até nossos dias. O primeiro período é analisado como um processo de “periferização” porque, maior ainda que um processo de desindustrialização, implicou a reconfiguração urbana, institucional, logística e da inserção externa do subcontinente indiano. No segundo período, a ascensão, configuração e papel do Sistema Nacional de Inovação (SNI) e dos motores e periodização do crescimento indiano posterior aos 1990s são discutidos. No que diz respeito ao SNI, destaca-se o papel das empresas públicas, os massivos programas públicos e as políticas explícitas e implícitas em ciência e tecnologia tais como as missões tecnológicas. Em relação ao crescimento pos-1990, sem diminuir o papel das exportações; o consumo privado liderado pelas classes e castas altas urbanas, o boom do crédito, o investimento público e privado ligado à urbanização e energia e as transferências governamentais são realçados. O setor externo é analisado a partir da aproximação indiana ao mundo ocidental a partir da expansão da China. As remessas, exportações de serviços, e fluxos de capitais desde os Estados Unidos são destacados ao invés de uma idéia abstrata de liberalização. Contudo, a heterogeneidade estrutural esta ainda aí, inclusive ampliada. As principais contribuições da tese são: a) apresentar uma narrativa de longo prazo do SNI da Índia baseada numa abordagem latino-americana, b) discutir o desenvolvimento indiano a partir das aportações de autores indianos dando um primeiro passo no dialogo sobre desenvolvimento e inovação com a literatura latino-americana, e c) sistematizar uma quantidade substantiva de literatura e dados sobre a estrutura econômica e social da Índia.

Palavras chave: Índia; longo prazo; desenvolvimento; periferização; sistema nacional de inovação; gastos autônomos; crescimento, heterogeneidade estrutural.

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INTRODUCTION

The Indian long-term path of development from a Latin American PPGE-IE PhD candidate. This thesis is the result of my intense fifty month experience as a student of the PPGE-IE PhD program at the Universidade Federal de Rio de Janeiro (UFRJ), Rio de Janeiro, Brazil. Mainly, the program curricula included nine face-to-face courses and this research. In this sense, the subject of this thesis, which means, the Indian economic development analyzed in a long-term perspective, initially emerged from a RedeSist¹ (Rede de Pesquisa em Arranjos e Sistemas Produtivos e Inovativos Locais) research project oriented towards the study of BRICS National Systems of Innovation (NSI). Sincerely, I knew almost nothing about the Indian economy at that moment, but India appeared as an interesting and challenging research object. Thus, since the first year of my PhD I started reading some referenced authors, articles and books discussing mainly on the Indian NSI.

A first essay on the Indian NSI was written as a final work for Prof. Cassiolato's courses on NSI and industrial and innovation policies. From this essay it was quite clear for me that to explain the Indian NSI emergence and evolution it would be necessary, at least, to give account of the Indian colonization process and the conditions of emergence of the Indian State. Then, I attended Prof. Fiori's course on international political economy, Prof. Medeiros' course on states and markets and Prof. Prado's course on comparative development. These courses, my first readings of Braudel, Polanyi, Jared Diamond and Caio Prado and some discussions with Prof. Crespo pushed me to broaden the scope of the research to a long-term perspective of India's development path. A long-term historical approach would give the research a more accurate understanding of the India NSI, avoiding some research object delimitations that, as an initial researcher on India, could affect my research results. The NSI as a conceptual focusing device, according to Cassiolato and Lastres (2017, 2005) understand that innovation (and development), as a multiple determined processes, is systemic, contextual and accumulative. A historical approach, as initially stated by Freeman (1995), totally fit with the NSI research agenda.

¹ For a deepening on the RedeSist research agenda see www.redesist.ie.ufrj.br.

The reasons to conduct a PhD thesis on India's long-term development from Latin America could be obvious, mainly because there are almost no systematic research efforts, in order to understand the Indian development path, at least among South American economic scholars. However, in terms of the research object by itself, we can say, between many other things, that since the beginning of the XXI century India has been growing at accelerated and impressive high growth rates. India is China's neighbor, being in the most dynamic area of the contemporary capitalism. India is experiencing a slow but constant urbanization process with a total population of around 1.3 billion. India has a main place at the Indian Ocean, a central geopolitical and geoeconomical area for the US, China and the Middle East countries. But, mainly, India has a civilizational history.

Although not so discussed among the Occidental scholars, from the expansion of the Islamic world since the middle seventh century, the Indian Ocean was the most important crossroads of trade and wealth in the world (Chaudhury, 1985; Marks, 2006). Four different civilizations, the Indo-Arabian, the Hindu, the Indonesian, and the Chinese cohabited the trade-ports of the Indian Ocean (Chaudhury, 1985; Subrahmanyam, 1990). The Indian Ocean waters were quite open to trade and market forms, channeling Indian textiles all around the world. At the beginning of the XVIII century, Indian textiles clothed tens of millions of Indians, Southeast Asians, the fashionable men and women of Europe, American slaves and peons, Africans and others throughout the Middle East (Riello and Roy, 2009). As shown in Nayyar (2013), based on figures of Maddison, in 1700 India represented 24,5% of the world GDP and according to Bairoch (1982) in 1750 India's manufactures represented 24,5% of the total world manufactured production. As highlighted by Vries (2016, p. 10):

“When it comes to manufacturing, early modern India... in several respects was a more likely candidate than early modern China to be the first or in any case an early industrializing country. In Great Britain's industrialization cotton played a central role: India's cotton production was second to none in sophistication until far into the eighteenth century.”

However, in 1913, the Indian participation in the world's GDP went to 7.5% and her share in the worldwide manufactures dropped to 1.4% (Nayyar, 2013, Bairoch, 1982; Clingingsmith and Williamson, 2008). During this period two main historical processes occurred in relation to this research: the Industrial Revolution and the British colonization of the Indian subcontinent. The causes of the Industrial Revolution will not

be discussed here; this effort clearly exceeds the scope of this research. But in the first two chapters of this thesis I will analyse the relationship between the Indian subcontinent and its people, the Indian Ocean and the European people, mainly the British. I will build a narrative of the Indian pre-independence times, the period that appears in the global history literature as the one of the “great divergence”, showing how the Indian subcontinent was transformed from an Indian Ocean manufacture and trade center into a peripheral space of the British Crown. I will try to show that this process of "peripherization" is a broader process that the one worked by most of the literature as the “Indian deindustrialization”. The “peripherization” meant, by price and non-price mechanisms, the urban, institutional, logistic and external insertion resetting of the Indian subcontinent.

Then, the post-independence times are presented by most of the occidental media reports and by some respectable scholars, both Indians and occidental, as a case of a necessary transition from a State-led, “socialist” regime to a market economy in which liberalization and market development have been the main growth drivers (Bhagwati and Panagariya, 2013; Bhandari and Goswani, 2000; Delong, 2003; Rodrik and Subramanian, 2008; 2005). In the last two chapters of this thesis I will state some nuance with this spread view. The post-colonial emergence, configuration and role of the Indian NSI and the post-1990s growth drivers and periodization are going to be analysed. With respect to the Indian NSI development since independence, the relevance of State-owned enterprises, the explicit and implicit science and technology policies and the massive public investment, programs and national technology missions in several areas are going to be pointed out. Thus, I will argue that the Indian State, analysed here through the conceptual focusing device of the Indian NSI, although affected by the neoliberal times, still preserves several features generally associated in the development literature with a Developmental or Entrepreneurial State.

With respect to the post-1990s growth, without ignoring the exports contribution; private consumption led by upper class/casts urban groups, credit boom, public and private investment related to urbanization and energy and government transferences will be identified as main drivers. Then, instead of an abstract idea of liberalization, the external sector will be analyzed in the context of the Indian post-cold war approximation to the Occidental world given China’s expansion as a global superpower. The role of remittances, service exports and capital flows from the US,

close related to the Indian Americans and the Indian Diaspora, are going to be highlighted as responsible for pushing the Indian external restriction, consequently allowing growth acceleration.

However, we will make a brief snapshot on some economic and social indicators in order to show that despite growth and wage increases, Indian structural heterogeneity is still there. Even more, asymmetries have increased in the XXI century. Despite being impressionistic, we would not be so wrong if we say that India is today one of the most heterogeneous societies of the world. In this sense, still in India, neither State, neither market; neither class neither caste relations; have given answers to a country of 1.3 billion people that is going to turn the most populated country in the world in the next years.

That said, I have to be clearer with respect to my research aim. The main objective of this PhD thesis is to present a long-term narrative on the Indian development path, informed by a Latin American framework, paying main attention to (geo)political, technological, financial and institutional aspects related to the specific geographical and demographical features of the Indian subcontinent. This Latin American conceptual framework is mainly worked at the PPGE PhD program. Particularly, it is clearly present in the RedeSist research agenda and in the Political Economy research group theoretical background. In concrete, I will be backed by some main categories introduced by the Latin American Structuralism and Latin American School on Science, Technology and Society; the neo-Schumpeterian conceptual device of the National Systems of Innovation (NSI), understood in the broad sense; and the Keynesian-Kaleckian-Sraffian principle of effective demand, focusing on the autonomous expenditures as the main drivers of GDP growth in the long-run.

About the methodology and the Latin American approach. In methodological terms, as said, among the international literature, I have been inspired (only inspired) in the long-term approach used in Braudel (1949)'s *Mediterranean*, Polanyi (1944)'s *Great Transformation* and Jared Diamond (1997)'s *Guns, Germs and Steel*. In the Indian context, this type of approaches can be found in the classic works of Panikkar (1953) on Asia and the Western dominance, Chaudhury's (1985) one on the Indian Ocean and in the more recent global history contributions of Nayyar (2013) and Roy (2012a). In Latin America, my main influencing long-term narratives are the ones of the

Brazilian scholars Caio Prado (1942) and Furtado (1959, 1969) and the Argentineans Ferrer (1963) and Schvarzer (1996).

Particularly with respect to the exposition of the information and the building of the narrative, I have intensively used maps, quotations of other authors and some pictures. Maps have been necessary because of the relevance given to geography in the understanding of the Indian development and to locate the reader in the Indian subcontinent². The use of quotations as an intertext narrative has helped me to present some ideas in the referenced authors' own words, a thing that I considered important to highlight the Indian scholars work and also because many of their words are much clearer than my own ones. Pictures are used to illustrate some particular moments or periods, pass some visual contextualization and give a rest to the reader.

With respect to the research on India, in methodological terms, I have mainly based on: a) an extensive literature (secondary sources) review, b) the use of primary sources mainly from different Indian and international organisms official documents, publications and statistics and c) a fieldwork of over three months in India, interviewing different key informants, professors and scholars. During the Indian fieldwork I have mainly been based at the Center for Development Studies (CDS), Thiruvananthapuram, Kerala under the orientation of Prof. K J Joseph³. I have also spent ten days at the Indira Gandhi Institute of Development Research (IGIDR), Bombay, with permanent dialogue and discussions with Prof. Nagaraj on different aspects of the Indian economic structure and development path; at the Indian Institute of Science (IIS), Bangalore, under the supervision of Prof. Bala Subrahmanya, where I could make several interviews to IT entrepreneurs and policy makers, and at the Indian Institute of Technology (IIT), Delhi, where I interviewed Prof. D. Abrol and Prof. J. J. Thomas. I would like to thank them all as well as the Indian PhD and Master students that I met at the different Indian university campuses.

In the meanwhile of this research, there have been some publications and congresses that have helped to improve my work. Articles about the Indian NSI were presented in co-authored with Prof. Cassiolato at: Globelics Conference 2015, La

² The maps have been carefully elaborated and visually homogenized by Rosaura Flynn. I would like to thank her for her excellent job. All errors are my fault.

³ The talks with Professors Sunil Mani and Beena Pulikottile Louis from CDS were also really useful.

Habana; the IE-UFRJ Posgraduate Students Seminar 2015, Rio de Janeiro; the XX Encontro Nacional de Economia Política (XX ENEP, 2015), Foz de Iguazú; the VI Congress of the Asociación de Economía para el Desarrollo de la Argentina (AEDA, 2015) and as IE-UFRJ Working Paper (Gonzalo and Cassiolato, 2015), as a BRICS Policy Center Policy Brief (Gonzalo and Cassiolato, 2016) and in Revista Márgenes de Economía Política, UNGS (Gonzalo and Cassiolato, 2017). Then, a paper about the Indian “great divergence” was presented with Prof. Crespo at the II Congreso de Economía Política Internacional, UNM, Buenos Aires, 2016 and one about the Indian ICT entrepreneurial ecosystem and the early financing industry development with Prof. Kantis at Globelics 2017. Finally, I have presented a paper about the relationship between the Indian subcontinent and the Indian Ocean in long-term perspective at the I Encontro de Economia Política Internacional (I ENEPI), UFRJ, 2016.

With respect to the Latin American approach, next, I will explain the three main conceptual blocks that are more or less explicitly or implicitly used in this research. The intellectual activity cannot be divided into closed regions, existing influences and theoretical diffusion between scholars and traditions from different parts of the world. However, at the same time, the theoretical framework that I will introduce next is mainly based on Latin American scholar’s interpretations of some worldwide spread categories or on their own contributions. I will not make an extensive development of each category because most of them are highly discussed in different works, but I will briefly explain the main concepts and quote some main references.

A) Latin American Structuralism and Latin American School on Science, Technology and Society: As most of the Latin American scholars that have a minimum interest in the critical thinking, I am influenced by the ECLAC work and the Latin American School on Science, Technology and Society. In particular, there are some main categories and authors that clearly back my research:

- Prebisch’s Center - Periphery conceptual scheme: it is accepted in the international literature that Prebisch’s works between 1949 and 1951, *El desarrollo económico de la América Latina y algunos de sus principales problemas* (1949), *Estudio económico de América Latina* (1950) and *Problemas teóricos y prácticos del crecimiento económico* (1951) are the main contribution of a Latin American scholar to the political economy thinking. In particular, the center - periphery conceptual scheme

is at the core of Prebisch's understanding and vision (Rodríguez, 2006; Sztulwark, 2003; Bielschowsky, 1998; Perez Candeltey and Vernengo, 2016, between many others)

According to Prebisch, the constitution of the center is a movement that begins in England with the industrial revolution, spreads all around Europe, deepens in the US and then reaches Japan. In parallel to the consolidation of these industrial centers, different countries, colonies and territories inserts into the system as a vast and heterogeneous group of regions, called periphery. The periphery conforms a system in which the structural characteristics, the functions of the components and the relations between them are subordinated to the center's needs⁴. This subordination has different forms and channels but the main one is the slow and unequal diffusion of technical progress, which mainly reaches periphery's primary sectors oriented to produce food and primary goods to answer the center's needs. The reduce diffusion of the technical progress into the peripheries originates a dual economic structure. The primary sector is inserted in the global economy, producing at the "best-practice", and then there is a low-productivity subsistent agriculture oriented to the local population needs⁵. This dual productive structure clearly contrasts with the mostly homogenized one of the industrialized centers.

The "dual" character of the periphery reinforces the unequal absorption of technical progress resulting in a lower growth of the medium labor productivity and in the middle income of the periphery⁶. In Prebisch, the different salary path between center and periphery is the main cause behind the deterioration in the terms of trade, both by the stronger bargain power of the unions at the center and by the superabundance of labor in the periphery. Clearly, the center - periphery scheme has been a main antecedent to the different types of, mostly Marxists, dependentist, unbalanced and unequal exchange theories, being a direct hit to the international trade theory based on the principle of comparative advantages. But most important to our

⁴ It is important to highlight here that center and periphery and development and underdevelopment are part of the same system that is interconnected. It means, in some sense, the existence of a center implies the existence of a periphery and the development implies underdevelopment.

⁵ It is relevant to point out that the industrial development is seen in Prebisch's scheme, in line with, for instance, Kaldor, as the main way of technological diffusion.

⁶ In this conceptual sequence, we can say that Prebisch is working with Say's law, a conceptual idea that is not in line with this research conceptual framework. For a discussion on the Say's law influence on the development economics framework see Serrano (2016).

ends, Prebisch conception emphasized on the relevance of the productive structure and its insertion into the global capitalism. This is a main guide to my work.

- Pintos` contribution on structural heterogeneity: departing from the dual model developed by Prebisch, Pinto works around the concept of structural heterogeneity (Pinto, 1970). The broad idea of structural heterogeneity refers to the co-existence of productive forms and social relations that belong to different periods and modes of development in a particular region, but that coexist within the limits of a State (Pinto and Di Filippo, 1982). The structural heterogeneity is expressed both in the production forms and in the social relations inherited from the colonial times, including the successive transformations pushed by the different “technological paradigms”. Three main dimensions could be highlighted about the structural heterogeneity: the productive one, the social relations one and the political one.

Compared with Prebisch` s pioneer dual model, Pinto` s structural heterogeneity gives a more accurate account of the Latin American industrialization process. Thus, despite the “homogenization” intention that conceptually backed the industrialization efforts, through the developing of the modern sector, Pinto states that the results has been the coexistence of different “sectors” in the same national economy with different productivity level, scarce connections between them and geographically fragmented. It means, despite the intentions of generating an endogenous dynamic, the industrialization process contributed to generate an “internal periphery” in the urban centers (Pinto, 1972). Since then, the structural heterogeneity category has been widely used to characterize the Latin American productive and social structures⁷.

- Herrera` s work on explicit and implicit scientific policies and the relevance of the national project: the work of Herrera as a main exponent of the Latin American School on Science, Technology and Society, mainly in Herrera (1973) *Los determinantes sociales de la política científica en América Latina. Política científica explícita y política científica implícita* is pioneer in discussing the articulation between the scientific and R&D efforts of the Latin American countries and the needs of their productive structures and societies. Herrera clearly point out that, more than how much

⁷ For a deeper understanding on Pinto` s contribution, most of the author` s works are available at ECLAC web page. You can also see Sztulwark (2003), Rodríguez (2006) and Mancini and Lavarello (2013) between many others.

to invest in R&D, a main problem has been the orientation and indigenization of the R&D efforts, their connection with the concrete problems of the Latin American societies and the interactions between the Latin American STI institutions. This is a clear antecedent to the neo-schumpeterian conceptualizations of systems of innovation, criticizing the lineal model of innovation (Cassolato and Lastres, 2005).

In particular, Herrera introduced three useful categories for our ends. The “explicit scientific policy” that is the official policy which is expressed in the laws, regulations and statutes of the government offices, ministries and the planning documents, commonly known as the official scientific policy of a country. However, the “implicit policy” is the one that determines the role and relevance of science in a society. It is much more difficult to perceive and understand it because it has no formal document or structure, but it reveals the effective demand for science and technology of the “national project” in force in a society. The “national project” is defined as the set of objectives and the model of country aspired by the social sectors that have, directly or indirectly, the economic and political control of the society. This implies the concrete existence of a elite with sufficient power to articulate and implement their concrete objectives.

These three concepts, mainly the articulation, contradictions and alignments between the explicit and implicit scientific policy are of main usefulness to analyze the State intervention in the STI field and will be clearly present in this research⁸.

B) The role of the State from a broad National System of Innovation (NSI) perspective: The importance of the State intervention both for economic growth and for the building of technological, institutional, innovative and entrepreneurial capabilities is a fact of modern capitalism (Medeiros, 2013, 2003; Fiori, 2007, 1999; Serrano, 2016, 1995; Serrano and Freitas, 2017; Cassiolato et al, 2013; Scerri y Lastres, 2013; Gadelha, 2003; Crespo, 2016; between many others). In the international literature, the relevance of the State has been mainly worked in the research line related to the Developmental

⁸ For more discussions on Herrera and the Latin American School on Science, Technology and Society (composed by scholars such as Jorge Sábato and Oscar Vasavksy, from Argentina, José Leite Lopes, from Brasil, Miguel Wionczek, from Mexico, Francisco Sagasti, from Peru, Máximo Halty Carrere, from Uruguay and Marcel Roche, from Venezuela) see Herrera (2015), Kreimer et al (2004) and Vidal and Marí (2002) between many others.

or, more recently, the Entrepreneurial State (Mazzucato, 2013; Skocpol, 1985; Wade, 1990; Amsdem, 2001; Reinert, 1999; Chang, 2005; etc.). For the Indian context, the discussion about the goals and limitations of the so called Developmental State is given in a political economy frameworks in the works of Kohli (2007a, 2007b, 2004), Chibber (2003) and Bagchi (2003).

However, some of these approaches suffer from the so called “methodological nationalism”⁹ in trying to explaining the Developmental State goals and deficits, mainly by domestic factors, or by dividing the analyses between internal and external causes. In line with Mann (1986, 1993, 2012a, 2012b), I understand that society is a complex emergent of different but interconnected networks of economic, political, military and ideological power. Although the State is the main national epicenter of political power, the structuring and functioning of the other networks is governed by broader global, regional and local trends and social dynamics. Thus, there is neither a lineal not a unique relationship to explain why and how the State acts in-between these networks of power. In order to deal with this fact, a broad National System of Innovation (NSI) framework is adopted in this research, considering that it is both an useful and flexible 'conceptual focusing device' to understand the Indian development trajectory, mediated by the different networks, forces and actors that shape and influenced the State intervention mainly in the STI area¹⁰ (Cassiolato and Gonzalo, 2015).

As detailed in Shariff’s (2006) review on its history and development, the NSI conceptual approach is mainly rooted on two lines of economic thinking: the works of Serra and List on the relevance of domestic market and local knowledge and in Schumpeter’s emphases on innovation and economic change as a main force for the capitalist dynamic. But the NSI concept formally emerged in the 1980s OECD’s expert group on Science, Technology and Competitiveness, mainly pushed by Lundvall, Freeman and Chesnais. In this context, Freeman (1982)’s work on *Technological Infrastructure and International Competitiveness* reintroduced List (1941)’s ideas

⁹ For a discussion on the interpretative problems of the methodological nationalism see Gore (1996), Medeiros (2010, 2011) and Crespo and Muñiz (2017).

¹⁰ In Chapter 1, I will use the concept of ecosystem, to characterize the Indian Ocean in terms of climate and geography, agriculture, trade, technology and the different actor’s relations before the British penetration in the Indian subcontinent. Diamond (1997) and Marks (2007) used this type of approach. A brief analysis using the ‘ecosystem’ conceptual tool for the case of the Amazonian rubber cycle can be found in Gonzalo (2016a).

supporting a history and context specific approach to the competitiveness discussion and stressing on the 'non-price factors' of trade dynamic (Lundvall, 2015). All in all, determining the NSI theoretical origins is to some extent a 'chicken-or-egg exercise': in Lundvall (1985) work on the Danish user-producer relations and interactions, he used the concept of 'innovation systems' and in Freeman (1987) on Japan's institutional and policy set up to support competitiveness, he used the NSI expression. After Freeman's (1987) work, the NSI approach received quite attention, mainly because both academics and policy-makers were trying to understand the extraordinary Japanese competitive performance. The subsequent publications of Lundvall (1992) and Nelson (1993) composed the initial works on NSI¹¹.

Since the 1990s the NSI framework has boomed in terms of citations (Jurowetzki et al, 2015). Scholars from engineering, economics, sociology and different multilateral agencies adopted different versions and definitions on NSI as a conceptual/policy-making tool. In their review on the different definitions of NSI, Lundvall et al (2009, p. 6) explicitly avoid the methodological nationalism, emphasizing on the systemic understanding of a NSI, defining it as:

“...an open, evolving and complex system that encompasses relationships within and between organizations, institutions and socio-economic structures which determine the rate and direction of innovation and competence-building emanating from processes of science-based and experienced-based learning.”

Two main perspectives on NSI have been adopted since then: the narrow and the broad one (Lundvall et al, 2009; Cassiolato and Lastres, 2005). The narrow one, mainly assimilates innovation to science and technology, analyzing the relationships between the Science and Technology actors and institutions with a special emphasis on R&D (Niosi et al, 1993). The broad perspective, adopted in this research, clearly departs from the lineal model of innovation understanding innovation as a systemic, contextual and accumulative process. Thus, it gives much more space to different dimensions that affect innovation such as geopolitics, social institutions, macroeconomic performance, financial systems, demand, infrastructure, market conditions, etc. Furthermore, the broad definition allows us to have in mind the direct and indirect impacts of the NSI on

¹¹ For further discussion on the evolution of the NSI approach see Lundvall (1992, 2015), Freeman (1995) and the already quoted Shariff (2006).

the public and private autonomous expenditure, on the external restriction and on the change in the productive profile. In this line, Cassiolato (2008, p. 10) made a main contribution pushing a broad NSI understanding stating that:

“The broad perspective includes different, connecting subsystems that are influenced by various contexts: geopolitical, cultural, social, political, economic, local and so on. First there is a production and innovation sub-system which contemplates the structure of economic activities, their sectoral distribution, degree of informality and spatial and size distribution, the level and quality of employment, the type and quality of innovative effort. Second there is a sub-system of capacity-building, research & technological services which considers education (basic, technical, undergraduate and postgraduate), R&D, training and capacity-building, S&T information, metrology, consulting, intellectual property. Third, there is a policy, representation and financing sub-system which takes into account explicit policies (S&T&I, industrial, sectoral) and implicit policies (macroeconomic, investment, trade, etc.), regulation (sectoral, foreign trade, intellectual property, environment, innovation), promotion, financing and representation. Finally, there is the role of demand, which most of the times is surprisingly absent most analyses of innovation systems. This dimension includes pattern of income distribution, structure of consumption, social organization and social demand (basic infra-structure, health, education).”

At the same time, the developing countries context demands an even broader NSI approach¹². For instance, in some countries, the institutional setting is incomplete, the education system has several problems, the infrastructure development is weak, the interactions between the different actors are scarce, the R&D expenditure is not the main way to innovation, etc. Regarding this, Cassiolato (2008, p. 4) stressed the need to adopt a broader view on NSI for analyzing developing countries, taking into account:

“...the role of firms, education and research organizations, government (as a whole and not only in terms of science and technology policies), financing organizations, and other actors and elements that influence the acquisition, use and diffusion of innovations. Also important are specific conditions such as natural resource endowments, historical patterns of development (including, for example colonial heritage), culture and geo-political structures.”

This research will try to contribute in order to consolidate and expand the broad understanding of the NSI conceptual device.

¹² Different scholars have been working and adapting the NSI approach for the developing countries challenges, mainly around the Globelics community. Only to point out some of them, in the Latin American context, we can highlight the work of the Lalic community, with salient scholars such as Cassiolato, Lastres, Arocena, Sutz, Yoguel, Dutrenit, etc. In the Asian context, the works around Indialics and Cicalics are also important, with Joseph, Abrol, Liu and Lee as some main scholars.

C) From the Keynesian-Kaleckian principle of effective demand to the Sraffian supermultiplier autonomous expenditures: A main conceptual block of the PPGE PhD courses on growth theory (Prof. Freitas) and macroeconomic (Prof. Serrano) is the principle of effective demand. As known, the principle of effective demand was popularly introduced by Keynes (1936) and, in an even more explicit and clear way, by Kalecki (1933, 1968, 1971). In general terms, effective demand theories state that demand determines output and capacity, adjusting through the operation of some kind of accelerator or/and multiplier mechanisms (Lavoie, 1992; Serrano, 1995; 2016; Serrano and Freitas, 2017; Possas, 1987; Crespo, 2016). However, there are different interpretations, versions and understandings on the principle of effective demand. In the Kaleckian version, in the long-run, investment generates saving through variations in the level of GDP. The main nexus between investment and demand are the variations in the degree of capacity utilization or the creation of new capacity¹³.

I have familiarized with the Kaleckian version of the effective demand as a key principle to understand growth in capitalist economies since my experience at PPGE-IE¹⁴. So I mainly have a “Brazilian version” of it. In this sense, a main contribution of Maria da Conceição Tavares to the Latin American political economy thinking was the introduction of the Kaleckian framework into the Brazilian analysis, institutionally based at UNICAMP (Serra and Tavares, 1970; Tavares, 1976, 1978; between others). In their controversy with Furtado (1966), Serra and Tavares (1970), from a kaleckian effective demand perspective, show that investment in the Brazilian miracle of the 1960s and 1970s would be accelerated by the “autonomous expenditures” of the upper classes (and, we could add, by State direct expenditure and transferences). The political arrangement articulated behind the Brazilian miracle included the transnational enterprises and the financial capital, the Brazilian upper bourgeoisie and the State (Rodríguez, 2006). Then, even with an increasingly unequal income distribution and a decreasing multiplier, growth still boomed¹⁵.

¹³ By these mechanisms wages are a parameter, they are induced but they are not an adjustment variable, as in Cambridge versions of effective demand (Serrano, 2016).

¹⁴ It is interesting to point out that a main difference between the Brazilian and the Argentinean economic courses and economist formation is the Kaleckian framework diffusion between the Brazilian ones and the practically absence of it in the Argentinean ones.

¹⁵ The same as India in the XXI century.

That said, it is useful to clearly define autonomous expenditure, a main concept for Serrano's (1995, p. 15) "sraffian supermultiplier"¹⁶:

"The types of expenditure that should be considered autonomous according to our criterion include: the consumption of capitalists; the discretionary consumption of richer workers that have some accumulated wealth and access to credit; residential 'investment' by households; firm's discretionary expenditures (that are sometimes classified as 'investment' and sometimes as 'intermediate consumption' in official statistics) that do not include the purchase of produced means of production such as consultancy services, research & development, publicity, executive jets, etc....; government expenditures (both consumption and investment); and total exports..."

There are two main "Brazilian versions" of effective demand that have influenced this research: the UNICAMP's one, in which investment is at least partially autonomous and Serrano (1995)'s version, fully stylized in Serrano and Freitas (2017), in which investment is totally induced by the autonomous expenditures. With respect to the UNICAMP version, after Tavares, I understand that the works of Prof. Possas, particularly in Possas and Baltar (1983) regarding the formalization and integration between trend and cycle in a Kaleckian model and in Possas (1987) trying to integrate into the macro Keynesian-Kaleckian framework some micro-schumpeterian elements such as market structures, the type of competition and the firms behaviors as main sources of "autonomous investments" are a substantial contribution. However, in Possas (1987) the final output was a theoretical division between the cycle, which would be governed by the effective demand principle, and the trend, which would be governed by the structural change efforts. Although much broader and micro-founded than most of the Kaleckian models, Possas (1987) do not "resolved" the paradox of investment, it means, its double character. In fact, in Possas (1987) there would not be a problem with the double character of investment because there is not any trend towards the production prices equilibrium, no "gravitation force".

Since the 1990s, the UNICAMP's authors mainly focus in the financial and technological aspects of the Brazilian capitalism as the main limits to autonomous investment. The absence of long-term financing, the high interest rate or the particularly high Brazilian entrepreneurs's liquidity preferences are pointed out as the main problems to increase autonomous investment (Tavares, 1999; Cardoso de Mello and

¹⁶ In fact, as explain in Serrano (1995) the term "supermultiplier" was introduced by Hicks (1950).

Novais, 1998; between many others). However, Serrano (1995) explains that although all these issues are relevant, affecting who is going to invest, in which sectors and with which techniques, they did not fully explain the long-term aggregate investment behavior¹⁷. If in the long-term investment is autonomous, and we accept that commodities are exchanged by their production costs, there would be neither adjustments nor reactions to the mismatches between capacity and effective demand. Entrepreneurs can be Schumpeterian, they can replace each other through innovation, but the aggregate investment has to adjust to demand in the long-run, implying a trend to a normal degree of capacity utilization for the whole economy (Cesaratto et al, 2013; Ciccone, 1995).

In Serrano's (1995) version of effective demand, investment is completely induced by autonomous expenditures, which are the main long-term growth driver¹⁸. In the international literature, the recent works of Deleidi and Mazzucato (2017), from a neo-schumpeterian perspective, and of Nah and Lavoie (2016), from a neo-kaleckian one, tend to converge to the same conceptual line. Then, to determine the level and dynamic of the autonomous expenditures turns to be the main issue for understanding long-term growth. However, it is almost impossible to develop any "endogenous" general theory to explain this, as states in Serrano (1995, p. 42):

"The levels and growth rates of the autonomous expenditures depend crucially on factors as diverse as: the nature of the financial system and the conditions of consumer credit, the pace of technological change and the process of competition with regard to product innovation and product differentiation strategies of the firms, the relation between managers and owners, Government expenditure (and taxation) policy and, in the case of the open economy, the international competitiveness of the domestic firms (and the country's exchange rate policy). The virtual impossibility of deriving formally a general 'endogenous' trend for the autonomous components of demand seems to have led the vast majority of multiplier-accelerator theorists to ignore the role of this component of aggregate demand in the explanation of the long-run trends of capital accumulation."

In this research, I will make an effort in order to build a narrative paying main attention on some of these autonomous expenditure drivers. To adopt an historical and

¹⁷ This does not mean that these issues are not relevant and do not affect the productive structure of the economy, but that they do not determine aggregate investment.

¹⁸ The details of the Sraffian supermultiplier stylized model can be seen in Serrano and Freitas (2017). Here we will only say that the output will be determined by the variations of the autonomous expenditures, mediated by the given technical-capital-to-capacity-output ratio, the normal degree of capacity utilization, the rate of depreciation and the aggregate marginal propensity to save of a country

broad understanding of the Indian development path is useful in order to consider the different geopolitical/military, demographical, technological, financial and institutional aspects which determine the Indian “autonomous” expenditures¹⁹.

Finally, both in conceptual and in methodological terms, it is of main importance to state that I am going to present a historical reading backed by these three main conceptual blocks but respecting and trying to catch the relevant historical processes with their own conceptual implications, not forcing them into my Latin American conceptual background. Besides, as we are dealing with a long-term narrative, each chapter will give a different emphasis, a particular discussion and its own reflections at the end of it. Chapter 1 reflects the Indian Ocean relations before the British penetration into the Indian subcontinent in order to contextualize and give a real dimension of the relevance of the Indian subcontinent as the center of gravitation of the Indian Ocean ecosystem. Chapter 2 discusses the process of peripherization of the Indian subcontinent in relation to the British Empire mainly since the battle of Plassey in 1757 to the First World War. Prebisch’s center - periphery scheme is conceptually backing this chapter. Chapter 3 mainly refers to the emergence and configuration of the Indian NSI since the pre independence times to the 1989. The emergence of an idea of national project, the implicit and explicit policies and the relations of structural heterogeneity in the Indian society are clearly present in this chapter. Finally, in Chapter 4 I mainly work on the Indian growth drivers since the 1990s, paying special attention to the sources of autonomous expenditures and giving account of the deepening of the structural

¹⁹ In relation to Serrano’s general scheme I have to state some personal nuances that do not invalidate the general conceptual agreements. First, in the induced-investment models, technical change is mainly associated to embodied technology, mainly related to improvements in the design or quality of new capital goods or intermediate inputs and R&D efforts. However, although “modernization”, mainly in the developing countries, and R&D, mainly in the developed countries, are principal elements of the innovation process, they are only a part (Cassiolato and Lastres, 2005). The whole idea of a NSI refers to different relations and interactions needed to make innovation emerge, clearly affecting the technical-capital-to-capacity-output ratio. These relations and institutional arrangements should not be underestimated behind the formal consistency of the induced-investment models and deserve much more research in order to conciliate demand-led theories with the neo-schumpeterian understanding of technical change. Second, the induced investment scheme tends to underestimate the relevance and frequency in which innovation and technical change affects the technical coefficients of an economy. We can say that these coefficients are stable in the short run, that they change only incrementally or that they are only affected by main technological paradigms changes, but this is a discussion that needs much more efforts. And third, the autonomous-expenditure-led growth models need to be mediated with the external restriction to growth. In this issue, the Latin American structuralism and the neo-schumpeterian authors have made significant contributions.

heterogeneity and the NSI policymaking and actors during the so called “neoliberal” times. In the final comments I will explicitly re-discuss the Latin American framework given the Indian development experience.

Hope you enjoy the (long) reading...

CHAPTER 1 - THE INDIAN SUBCONTINENT AS THE CENTER OF THE INDIAN OCEAN ECOSYSTEM

“Mathematicians have divided chronological events into four categories: the stationary, the long-term, the cyclical, and the random. For the countries of the Indian Ocean, the stationary component of time is seen in the unchanging nature of the sea, its area and its depth, salinity and temperature, all of which contributed to the quality of marine life and man’s capacity to take a harvest from the sea. ”

Chaudhury (1985, p. 21)

“...the discovery of America and that of a passage to the East Indies by the Cape of Good Hope, are the two greatest and most important events recorded in the history of mankind.”

Adam Smith, quoted by Findlay and O’Rourke (2007, p. 143)

“India as a land of Desire formed an essential element in general history. From the most ancient times downwards, all nations have directed their wishes and longings to gaining access to the treasures of this land of marvels, the most costly which the earth presents, treasures of nature -pearls, diamonds, perfumes, rose essences, lions, elephants, etc. - as also treasures of wisdom. The way by which these treasures have passed to the West has at all times been a matter of world-historical importance bound up with the fate of nations. ”

Hegel, quoted by Panikkar (1953, p. 21).

“One of the central arguments of this study has been that such specific developments in the triangular nexus between state, producing economy and external commerce are intimately related, on the one hand, to an internal and autochthonous groundswell, and, on the other, to opportunities provided by the very process of interaction with other economies. ”

Subrahmanyam (1990, p. 370).

The main objective of this chapter is to give a big picture of the dynamic of the Indian Ocean economic, productive and regional relations mainly with the Indian subcontinent before the British initial penetration at Plassey in 1757. I will try to reflect that among the dense social, commercial and productive relationships developed around the Indian Ocean, which are going to be called in this chapter as the “Indian Ocean ecosystem”, the Indian subcontinent was a main trade and proto-manufacturing center. The main authors used to build this interpretation are Panikkar (1953), Chaudhury (1985), Subrahmanyam (1990), Prakash (2008) and Roy (2012a).

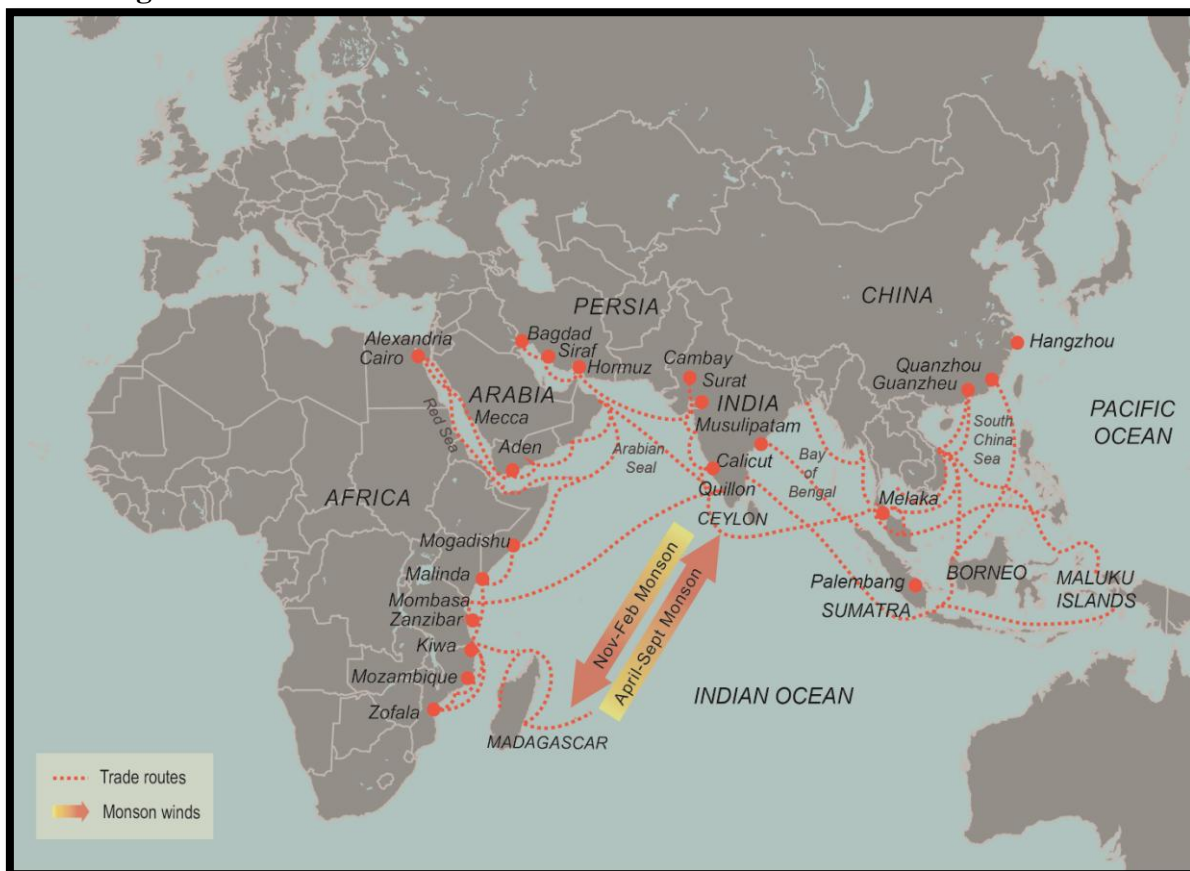
1.1.The Indian Ocean 'from the rise of Islam' to Da Gama (VII century-1498)²⁰

The emergence of the T'ang dynasty in China in 618 and Muhammad's journey to Mecca in 622 were the starting years of an increasing flux of trade that joined together the different cultures, productive systems and ideas of the two geographical divisions of the Indian Ocean, the western and the eastern, that met at the volcanic mountains of Java²¹. In this section, I will give a big picture of the dynamics of the Indian Ocean ecosystem 'from the rise of Islam', to the arrival of Vasco Da Gama at Calicut, in 1498.

²⁰ This section is mainly based on the masterpiece of Professor Chaudhury (1985) "Trade and civilization in the Indian Ocean: An economic history from the rise of Islam to 1750". Chaudhury's book is some kind of Indian version of Braudel's (1949) Mediterranean and, more important, it is an obliged reference to the study the Indian Ocean civilizations.

²¹ To see the characteristics of the volcano's areas of Hava see Herzog's (2016) "Into the Inferno".

Figure 1 - Indian Ocean trade routes and Monsoon winds. 650-1498.



Source: elaborated by Rosaura Flynn.

Monsoons, trade-ports and Emporia trade. The influence of climate synchronized the agricultural and productive dynamic of the Indian subcontinent. The monsoons²² winds, originated from the Ecuador and carrying rain clouds into the Himalayan barrier, functioned as a cyclical component of time, aligning the dynamic of the ecosystem to a single variable: the supply of water to sustain agriculture. The food habits and demand for commodities arising from the pattern of agriculture gave rise to the contours of both trade and social relations. In food terms, Asia was divided into two main blocs: the wheat and the rice. The amount of rainfall of the monsoons determined

²² The monsoon, as a seasonal wind, reverses direction twice a year. The Indian subcontinent heats up since June, creating a low-pressure system that draws cool moist air from the southwest. This produces a wind that blows through the summer months and brings the rains to sustain India's agriculture. In the autumn, the cycle reverses. This allowed merchants from the west to make a round-trip journey to India within a single year. The same cycle occurred from the Bay of Bengal to India's east to the islands of Southeast Asia.

the geographical limits between wheat and rice growing. Rice was a valuable trading commodity because it could be kept for several years, improving in taste, indeed. On the contrary, wheat was susceptible to insect attacks and was seldom transported by sea for any long distance. Famines, as a demographic phenomenon, clothed related to water availability and trade exchange, were also dependent on the 'good' or 'bad' winds of the monsoons.

The sailing season was fixed by the timing of the monsoons too. The monsoon winds reduced travel times producing favorable wind currents. At the same time, storms at sea had critical effects for the population: if the Red Sea fleet of the Surat merchants failed to arrive, the financial and liquidity crisis pulled down for all the community. Two geographical factors affect the patterns of navigation: the Indian Ocean is composed by six separates seas, each of them with each own timetable for correct departures and arrivals and linked to a regional economy and the seasonal pattern of the wind-system determined the time-profile of the trip and the rain precipitations. The distance time was fixed, although they depended on the weather conditions. Each sea had its own particularities and it particular expert sailors. For instance, the Red Sea and the Persian Gulf, by the unusual shape, presented their own particular problems to navigation, with their specific community of sailors. To sail in the southern Indian Ocean out of season represented extreme danger from storms and hurricanes. Mathematical methods of calculating latitudes and stellar altitudes were used, as long as different theoretical knowledge related to the water and tides.

Although there were ports in the Indian Ocean which possessed open seafronts, most of them were located at some distance from the open sea, near the mouths of a river. This was because they were better defended against wind, waves, and pirates. The main rivers of the Indian Ocean are the Euphrates-Tigris, the Indus, the Ganges, the Chao, the Mekong, the Hsi Kiang and the Yangtze Kiang. As the movement of goods by land, whether by pack animals or in wheeled vehicles, was complicated, the rivers were used to bridge the distance between seaports and landlocked cities, as highways. When navigation of the deltas and the upper reaches of the rivers became precarious or old, new and better-suited ports and towns emerged. Few port-towns produced exports goods in quantity, so most of them had to be brought from a distance to the places of shipment. Every major sea-port including Hormuz, Aden, Cambay, Surat, and Malacca

got crowded of sailors, pilots and captains offering their services when the shipping season approached.

Emporia cities arose to handle the trade (Chaudhury, 1985; Subrahmanyam, 1990). The Indian Ocean and the Mediterranean sea was held together by the urban connection between Malacca, Calicut, Cambay, Anden, Cairo, Alexandria and Venice. The flow of goods and men on east-west axis was not possible without the story of these cities. The functional role of caravan cities such as Aleppo and Baghdad was not dissimilar. Malacca was a strategic strait, where the monsoon winds shifted. It linked the eastern and middle circuits been a convenient place for traders to wait for the next journey. The economic and strategic importance of Malacca was not lost on either the Chinese in the early 1400s or, a century later, the Portuguese.

The medieval trade of Asia was founded on four great products: silk, porcelain, sandalwood and black pepper. They were exchanged for incense, horses, ivory, cotton textiles, and metal goods. Spices, silks, cotton textiles, porcelain and glass, jewelry and finely cut precious stones, all of them reflected the strengths of social conventions in regional markets. The Middle East was a large area of consumption which imported from other parts of Asia food, aromatics, medicinal plants and manufactured goods. Slavery trade was a profitable business too. It was carried on by the Arabs, Persians, and some Indians. The slave trade was primarily composed of young girls who were used for domestic work and harems. Men were also enslaved for hard labor.

For the Indian subcontinent, Subrahmanyam (1990) groups three main types of trade: coastal, overland and oversea²³. The coastal trade went from Bengal in the east to Konkan and Gujarat in the west. It was conducted by smaller ships aligned with the Monsoons winds and the agriculture surplus. This was a more stable trade that allowed regions that were not self-sufficient in foodgrains to support a growing population. Overland trade was mainly determined by the regional distribution of areas of production and consumption of particular goods. The overland trade could be divided, on one hand, on trade using the inland waterways and, on the other hand, the trade on pack bullocks and other means of land-bound packers. River trade was limited for the

²³ Despite this complex network of trading posts, there is not a register of the total amount of trade in the pre-modern Indian Ocean world. Family business and community groups did have their own registration of business and commerce, but there was not a central and unified registration.

most part in southern India comparable in dimensions to the great Gangetic or Indus systems in the north. According to Raychaudhury (2008), this overland trade was quite dependent on the Mughal pax, particularly in the north of India.

Overseas trade until the Portuguese has different spots. For instance, in the South of India, as detailed in Subrahmanyam (1990), in the coast of Malabar, the main ports were Calicut, Kollam (Quilon) and Cannanore. Trade was oriented in two main directions: to the Red Sea, the Persian Gulf and the ports of Gujarat on the one hand, and to Melaka and the eastern Bay of Bengal on the other. Commerce with Africa was also made from Calicut. In the Coromandel coast, the main high-sea trade was concentrated in the port of Pulicat. Pulicat's high-sea links extended in two directions: to southern Burma and to Melaka and the south-east. Besides, from other minor intermediate ports of the Coromandel coast, textiles trade was made with Sri Lanka, Bengal, and South Asia.

However, to think that coastal and overland trades were secondary to the overseas trade would be a distorted picture as different overlaps and connections existed between these three routes of commerce. For instance, the growth of overseas trade of one port contributed to the growth of its population and this would, in turn, cause a growth in its participation in the coastal trade. Besides, merchants participated both in overseas and coast trade, connecting both flux.

Cosmopolitan Empires, shipbuilding and gunpowder. Apart from the emergence of Surat, in the early seventh century, and Masulipatnam, in Coromandel, none of the ports of the Indian Ocean had closed links to an Inland Empire. As highlighted by Roy (2012a) whereas the littoral was the center of commercial activity, most settlements, especially the larger ones, were formed inland. Land tax pulled the capital to the interior, but commerce pulled the trading center to the coast. For instance, the Samudri king ruled a small state from Calicut, Cambay had its own king, and the small ports along the Konkan coast were ruled by chieftains. As a consequence, the 'commercial' operators in these ports, needed to adapt to pan-regional economic or political tendencies rather than try to control and shape these forces.

The Arab geographers knew since the tenth century that they were between two, if not three, worlds. The land of Islam was contoured by the Sea of China, on one side, and by the Sea of Rome, on the other. In fact, the Indian Ocean was an area of social and cultural diversity rooted in four different communities: the Indo-Arabic, the Hindu,

the Indonesian, and the Chinese. Chaudhury (1985) affirms that sea trade, supplemented by the Central Asian caravan routes, created a sense of unity. Ethiopians traded gold and ivory, Malays pepper and nutmeg, Yemensis frankincense and myrrh. Along with this string of emporia, merchants spoke a Babel of different languages as part of the long process that brought goods from one extremity of the Indian Ocean to the other. The idea of a common geographical space defined by the exchange of ideas and material objects was quite strong, not only in the minds of merchants but also in those of political rulers and ordinary people.

Distinct communities of merchant-mariners operated the ships and formed the main component of the Indian port towns. In Cambay, they were the Gujarati Muslims; in Malabar, the Mapilla Muslims; in Coromandel, the Chulia merchants and the Telugu Chettis, and in eastern India, the Oriyas and Bengalis. Some of these were mainly merchants, others mainly ship-owners and merchants. Mercantile enterprise was linked to a local shipbuilding tradition. Among them, the Gujarati experienced a significant expansion in the scale of their business in the fifteenth century because of the cessation of direct Arab-China trade. They took advantage of the business opportunity, set in Malacca and Aden, and built close ties between West Asia and Cambay.

The Indian Ocean had some periods of community predominance (Marks, 2007). From 650 to 1000, the period of 'the rise of Islam' (Chaudhury, 1985), Arab traders and mariners carried goods and ideas all the way from the Islamic Near East to Southeast Asia and China. They spread their language and the Islamic religion throughout the region, from East Africa to Indonesia. For instance, in the ninth century, thousands of Arabs, Persians, and Jews took residence in the south China city of Guangzhou and an Islamic mosque was built there. Muslim traders were well received at the port of Canton and they were allowed to conduct their commercial and communal affairs through the traditional Islamic institutions.

A second period began around 1000 until 1500, when the Chinese merchants saw the profits to be made in the trade and, with or without the support of their government, sailed into the Indian Ocean to compete with the Arabs. Since then, Arab traders were still important, but they were not the only ones playing in the waters of the Indian Ocean. In the western zone, Arab traders were most active, although Indian merchants also participated in that trade. The central circuit from Ceylon to the Bay of Bengal and to Southeast Asia was dominated by Indian merchants, although the Arabs

and other Muslims were very active there too. At the same time, the Hindu merchants were not a homogenous group. For instance, the Jain traders of Gujarat, with ascetical values, could not eat, drink or marry with the Chettiars of the Coromandel coast. Finally, at the east, the Chinese dominated the South China Sea circuit from China to Indonesia and the Strait of Malacca.

With respect to the Islam hegemony, Subrahmanyam (2012, p. 31) suggests that at the ports and trade connections, the level of cosmopolitanism of this whole period was really impressive:

“It has at times been assumed that the commercial expansion of these centuries was part of a phase of “Arab dominance” of Indian Ocean trade. But this is surely too simplistic, for other Asian merchant groups participated in this trade on a large scale as well. These included Gujarati... and Bohras, Tamil, and Telugu Chettis, Mappila and Maraikkayar Muslims from southern India, Chinese from Fujian and other provinces of the southeast in the Celestial Empire, and the Iranian tujjar...”.

The shipbuilding was not homogeneous. Each community had its own style and technologies, in close relation with the particular seas and geography where they were located. The Chinese boats, with the flat bottom and the shadow draught of the typical junk, were ideal craft for sailing in shoal and estuarial waters, but in open sea, the junk was in danger. The Indo Arab ship, with its keeled hull and the big lateen sail, gave the sailors a degree of control which was lacking in the Chinese junk. The Arabs sailors had experienced in the Mediterranean Sea. The Indonesian, meanwhile, had their own shipbuilding style, with great reputation. And the African also built their own traditional boats, the 'dhows'. Overall, a large ship was integrated by twelve categories of the crew. The most important were the 'nakhuda', owner of the ship and who defined the itinerary, the 'mu'allim' or captain, that was in charge of the ship and then, between others, the chief of sailors, the store-keeper, the gunners, the purser and the common seamen.

Trade was conducted largely without resort to force of arms. African dhows, Chinese junks and Indian and Arab merchant ships all sailed without naval convoys from their native lands. However, the strength and efficiency of the navies of the Indian Ocean varied (Lewis, 1973). For instance, Arabs developed capabilities in the Mediterranean Sea and had a period of sea-war strength during the tenth and eleventh century (Lewis and Runyan, 1985). China's junks were strong. The Indonesian possessed fast-moving war vessels and their reputation as sea-fighters was well known. On the contrary, the Indian subcontinent remained rather vulnerable to enemy attacks

(Chaudhury, 1985). Besides, according to Chaudhury (1985), Asian trade-ports were not always capable to defend their merchants against pirates. None of the great ports of trade, Aden, Hormuz, Calicut or Malacca, were walled or fortified.

Margariti (2008), based on some anthropological evidence, sustains that there were pirates groups operating in the Persian Gulf and the Red Sea. In fact, it was not that the local players did not know about violence at the sea, Gujarat pirates and Malaysian sea fighters were described as active members of this ecosystem. However, the point here is that before the arrival of the Portuguese there had been no organized attempt by any political power to control the sea routes and the long-distance trade of Asia. The Indian Ocean and its different seas were not dominated by any Empire and there were no systematic efforts from the inland powers to control the sea. Chinese Empire, although its junks were as large and powerful as sixteenth-century European shipping, were occupied in maintaining their political and economic power in terra firma and never considered overseas colonial ventures of seaborne trade. At the same time, Indian lack of interest in sea-power remains enigmatic. The large territorial kingdoms of India, with their cities far from the sea, showed no interest in maritime mastery. In this line, Marks (2007) sustains that from 650 to 1500, trade in the Indian Ocean seemed to have been self-regulating. In the Indian Ocean trading emporium, there was some kind of law of reciprocity. Rulers and princess refrained from interfering in the commercial affairs of merchants from abroad and they guaranteed good behavior.

With respect to financing, Chaudhury (1985) affirms that this is one of the more unknown issues of the period. Bills of exchange were quite developed to finance the commerce from one port to another. Merchants have a big role in financing long trips. There existed a fine line between family, private and commercial property. Family wealth was one of the main forms of private capital accumulation, although merchants also channel some noblemen wealth into the trade business. Anyway, there was nothing similar to stock options or State financing commerce in a systematic way.

“India” clothing the Indian Ocean ecosystem²⁴ According to Subrahmanyam (1990) the Indian subcontinent population around 1600 was little more than 100 million people. This means almost one-fifth of the world population and one-third of the Asian population of the time. Indian textiles not only clothed 100 million Indian people, they were perhaps the most global among the various goods entering long-distance trade between 1500 and 1800. In 1500 cotton textiles were the centre of the manufacturing life of the Indian subcontinent and the foundation of a wide-ranging trade that spread from India via land and sea.

Different types of textiles, mainly cotton textiles, were traded by Indian merchants in exchange for a variety of commodities, mainly spices, foodstuff, and luxuries. Quality was judged by the fineness of the yarn, the number of threads to the inch and by the less palpable criteria of artistic excellence. South India had quite developed cotton regions, a major concentration of producers was located in Coromandel plain and others smaller were the interior regions such as Coimbatore, Mysore and Andhra (Subrahmanyam, 1990). There was some kind of symbiotic relationship between the dominance of the coast in textile production, and the production of cotton in the dry interior. In the coast, Surat (Gujarat) provided high-grade silk and mixed fabrics, Coromandel (Madras) was traditionally the leading producer of inexpensive cotton textiles, and, later, Bengal specialized in luxury cotton, silk, and mixed fabrics. It was a regional specialization with a well-articulated system of exchange with the Indian Ocean.

According to Raychaudhury (1982), others towns like Patna, Benares, Lahore, Multan, Allahabad and other particular regions were reputed for particular varieties. Export came mainly from four regions: the Indus Plain including Punjab and Sind, Gujarat and the west coast, the Coromandel Coast, both south and north and Bengal. In addition to fabric and items of dress, the range of products included sailcloth, cotton carpets, bed-covers, pillowcases, handkerchiefs, mattresses, embroidered quilts, bed-hangings, tents, etc. Cotton yarn production was an independent manufacturing activity and a second occupation in weavers' families. Yarn was produced by a subsistence-

²⁴ This expression is taken from the title of the book of Riello and Roy (2009).

oriented system in peasant households. Broach, Balasore, and Kasimbazar are mentioned as major sources of yarn supply.

As detailed in the book of Riello and Roy (2009), textiles were regularly sold in Bandar Addas by Indian merchants. Then, they moved by land and sea to Persia, Baghdad, and Basra, where they changed hands and reached Constantinople via Syria. The caravan trade carried Indian textiles to Ethiopia, especially cheap striped textiles, along with silver and gold, and embroidered luxury cloth as gifts. East Africa exchanged primary products for Asian manufactured goods, cottons, other fine textiles, Islamic earthenware, glass and Chinese porcelain. Considerable quantities of Asian textiles also arrived in Congo as luxury cloths. In Africa, Indian cloth functioned as currency. Southeast Asia was another key market. In this case, Gujarati merchants dominated the trade with Melaka from the port of Cambay.

The Indian Ocean was a huge, sophisticated and articulated market for Indian textiles. Indeed, when European people arrived at the Indian Ocean, they got marvel with the Indian textiles. As quoted in Riello and Roy (2009, p. 1), John Huyghen van Linschoten noted in his *Voyage to the East Indies* (1598):

“...great traffique into Bengala, Pegu, Sian, and Malacca, and also to India... there is excellent faire linnen of Cotton made in Negapatan, Saint Thomas, and Masulepatan, of all colours, and woven with divers sorts of loome workes and figures, verie fine and cunningly wrought, which is much worne in India, and better esteemed then silke, for that is higher prised than silke, because of the finenes and cunning workmanship.”

It was a proto-industrial production. Cotton was spun and woven in artisan homes with material financed by merchants who then collected the thread and cloth for dyeing and printing before being brought to market to sell. To meet both domestic and foreign demand for their cotton textiles Indians developed a whole manufacturing system, from growing the cotton to finishing it. Prakash (2009) pointed out that the three key elements in this system were the weavers' need of finance, their limited access to the market and the need to avoid the risks associated to the forecast behavior of the demand. This contract system was a variant of the standard European putting-out system. However, unlike in the European case, the Indian weaver bought his own raw material and exercised formal control over his output. Of course, the merchant who had given the advance had first claim on the output, and debt obligations often rendered the artisans subject to coercive control by the merchants.

The unquestioned domination of Indian textiles in the Indian Ocean trade should be understood in terms of the subcontinent's capacity to put on the market a wide range of goods at highly competitive prices. According to Machado (2009), the "competitive advantages" of the Indian textiles were based on the development of multiple shafts and peddles which allowed weavers to couple with the availability of relative inexpensive dyes such as indigo and skilled and cheap labor engaged in all the stages of the textile production, from cotton growing to spinning, printing and weaving, etc. This resulted in an extremely efficient, sophisticated and competitive industry with which no other region could compete in terms of price and quality until the development of machine production in Europe. On this respect, Baber (1996, p. 62) states:

"Indian dyeing techniques and procedures for rendering them permanent, together with the preparation of a very wide range of vegetable dyes relied on quite sophisticated methods, which continued to be superior to other techniques until the invention and manufacture of artificial dyes in Germany. Depending on specific regional conditions, a number of innovations, such as the harnessing of water power for operating the cotton gin and the use of crank handles attached to the spinning wheels, were introduced."

Figure 2 - Gujarat made bedcover. 18th century. Cotton with silk.



Source: MET Museum

1.2.The Europeans at the Indian Ocean: creatures from a different ecosystem (1498-1757)

In this section, I will deal with the arrival of the Portuguese and, later, the Dutch and the English companies to the Indian Ocean.

Genesis of the all-sea route to India. With the emergence of the Italian city-states and the commercial rivalry between Genoa and Venice, the Christian Mediterranean resulted in a space of open naval conflicts. The Venetian encounters with the Muslim fleets fused together the interests of the merchants and the state. This Italian path was reproduced later in Seville, Lisbon, Amsterdam, and London. The “gunpowder trade” was transplanted in the Indian Ocean by the beginning of the sixteenth century (Chaudhury, 1985).

The Portuguese²⁵ venture into the Indian Ocean had at the same time religious and mercantilist motivations. According to Prakash (2008) the Cape of Good Hope route implied the overcoming of the transport-technology barrier to the growth of Euro-Asian trade. The volume of trade was no longer limited by the capacity constraint imposed by the availability of pack animals and riverboats in the Middle East. For around a century, until the challenged of the monopoly given by the Pope by the Dutch and the English in the 1590s, the only merchant group engaged in trade between Europe and Asia along the all-water route was the Portuguese.

European and, more specifically, Mediterranean shipbuilding enjoyed some crucial improvements during XV century. As explained in Findlay and O'Rourke (2007) a first determinant innovation was the adoption of the Arab triangular fore-and-aft lateen sail. It was much more flexible with respect to the direction of the wind than the old Roman square-rigged sails. A second major influence came from northwestern Europe, whose cogs had retained the square rig but improved on its design relative to the Roman original. These ships were reintroduced to the Mediterranean after the Crusades, becoming the standard form of transport for large cargoes.

Vasco da Gama's road to India had a laborious effort that included centuries of naval expertise and capabilities, strong financing, and the political decision-making. Portugal took advantage of the accumulation of knowledge that came from the competition between Genoa and Venice, during the thirteenth and fourteenth centuries, for the hegemony of trade in the Mediterranean. Sagres became in what we would call today an "R&D lab", bringing together mathematicians, cartographers, Moorish prisoners who had different knowledge of the Indic and African seas, and so on. This was later institutionalized as the Naval Academy of Sagres, which provided cutting-edge naval knowledge for Portuguese sailors. Henry "The Navigator" was the man who led this enterprise. Henry figure synthesized the religious and mercantilist spirit of the adventure: in his 'private' sphere, he was a trader in sugar and slaves and a patron of corsair ventures, in the 'public' affair, he was Master of the Order of Christ and creator

²⁵ It is relevant to point out that Portuguese were not the first European people in reaching the Indian subcontinent, the ancient Greeks and Romans were the first. They have even found Roman coins in West Bengal, up the Hooghly River near present-day Kolkata (Kaplan, 2010b). For a quick analysis of the Portuguese experience in relation to the type of relations that characterized the emergence of an interstate and capitalist system see Fiori (2014).

of the Portuguese Crown patronage of missions (Subrahmanyam, 2012; Panikkar, 1953).

The financing was not a minor factor for the sustainability of the conquest. The resources of the Order of Christ, inheriting the Order of the Knights Templar, were used mainly to finance the marine explorations. Besides, the princess of Antwerp also put recourse to the Indian enterprise. As explained by (Panikkar 1953, p. 35):

“Armada followed armada in unending succession under trained captains and the Portuguese chiefs in the Indian waters knew that men and ships were on the way bringing succour to them. Even in the most difficult circumstances, they could, therefore, hold out with the firm conviction that help was not far away... the Portuguese Government had the financial backing of the great merchant princes of Antwerp who, realizing the revolutionary change in trade that the Portuguese discoveries involved, had hastened to annex the benefits. The Weslers, for example, had invested in the Portuguese voyages of 1505, and the Lisbon Government had found it necessary as early as 1503 to open a depot for spices in Antwerp. To this system of continuous reinforcements... must be attributed the success that attended the navies of Portugal on the Eastern seas.”

Da Gama's sailed to India also implied a sailing challenge. What he did, according to Kaplan (2010a), was to reacquaint Europeans with the monsoon wind system that allowed him to go to India. In doing so, Arab navigators in what is today Kenya helped him to do that. Calicut, located at the south of the Indian Subcontinent, at the contemporary Indian state of Kerala, was ideally situated to take advantage of the monsoon winds from the Red Sea to the Indian coast and back to the Arabian shores. This had both implications in terms of agriculture and sailing: Calicut was one of the Indian main producers of tropical spices and it was in a mainstream road of the Indian Ocean sea-trade.

The sea gunpowder was one of the main novelties of the Portuguese ships at the Arabian Sea. To Panikkar (1953), the arrival of the San Gabriel vessel in the Indian Ocean introduced a revolutionary factor: the ship carrying cannon. The armament of the Portuguese ships was totally unexpected and new in the Indian seas and gave an immediate and decisive advantage to the Portuguese. The only non-European Power which had developed gunnery on the sea was the Ottoman Empire, and when the Portuguese arrived at Calicut the Turks had no navy in the Indian Ocean. At this point, most of the authors, such as Chaudhury (1985), Panikkar (1953), Findlay and O'Rourke (2007) agree. The Portuguese cannon was a distinctive competitive advantage for the

initial Portuguese presence at the trade-ports. For instance, the Malaysian struggle with the Portuguese are remembered as great sea confrontations. Scenes in the Indian Ocean related in "The voyage of François Pyrard of Laval to the East Indies, the Maldives, the Moluccas and Brazil" quoted by Subrahmanyam (1990, p. 259) had this epic tenure:

“The War between them is very cruel and merciless, for the Malabars are so courageous that they never surrender, and prefer death. I have seen them, when in battle with the Portuguese, on perceiving that they were the weaker side and could not avoid being taken, all come to one side of their galliot, and go down with their booty, galliot and all, and sometimes even wait till some Portuguese had boarded their vessel, so that they should perish with them. ”

In relation to the land, Findlay and O'Rourke (2007) state that in the Indian subcontinent, it was a period of political transition. The dominant state had been the Turkic slave dynasties of the Delhi Sultanate, but this had decayed and been replaced by the weaker Afghan dynasty of the Lodis in the middle of the fifteenth century (after defeated by Babur, the founder of the Mughal dynasty in 1526). Central and South India were under dispute between the powerful Hindu kingdom of Vijayanagar and the Muslim sultanate of Bahmani.

The Muslim quasi-monopoly over the spice trade and the influence that they had over Calicut's Zamorin was not expected by da Gama in his first trip of 1489. After a formal exchange of compliments, da Gama returned back. The second expedition was of much more scale: thirty-three ships, 1.500 men and a powerful armada commanded by Pedro Cabral. This expedition was the first violent act of the Portuguese in the Indian Ocean. For our ends, we can add that a series of naval confrontations took place in the ports of South India between 1489 and 1510; this tension also involved the Sultan of Cairo and the Sultan of Gujarat, who had commercial interests in the area. Although the Portuguese superiority in terms of gunpowder, Calicut's Zamorin in joint military efforts with the Sultan of Egypt and other local power prevented the Portuguese conquest over Calicut. However, the Portuguese enjoyed a monopoly in the sea trade route between Europe and the Indian Ocean that lasted for almost a century, from 1489 to 1600, when Northern European companies were created.

Figure 3 - Vasco da Gama in front of the Zamorim of Calicut - Jose Veloso Salgado's (1898).



Source: <http://historicalalleys.blogspot.com.br/2010/12/many-faces-of-zamorin.html>

A Goa centered network. According to Subrahmanyam and Thomaz (1991) the 'Portuguese India' was not a geographically well-defined space but a complex maritime network of territories, establishments, goods, persons and administrative interests in Asia and East Africa. It was centered in Goa, but with port presence in Calicut, Ceylon (Sri Lanka), Malacca, Macao and, even, Nagasaki. In the initial period, this network was built by the military power, but then, it was mainly developed by negotiation and balancing of power with different local merchants and powers. With respect to the Portuguese territorial presence and the local connections, Panikkar (1953, p. 39) says:

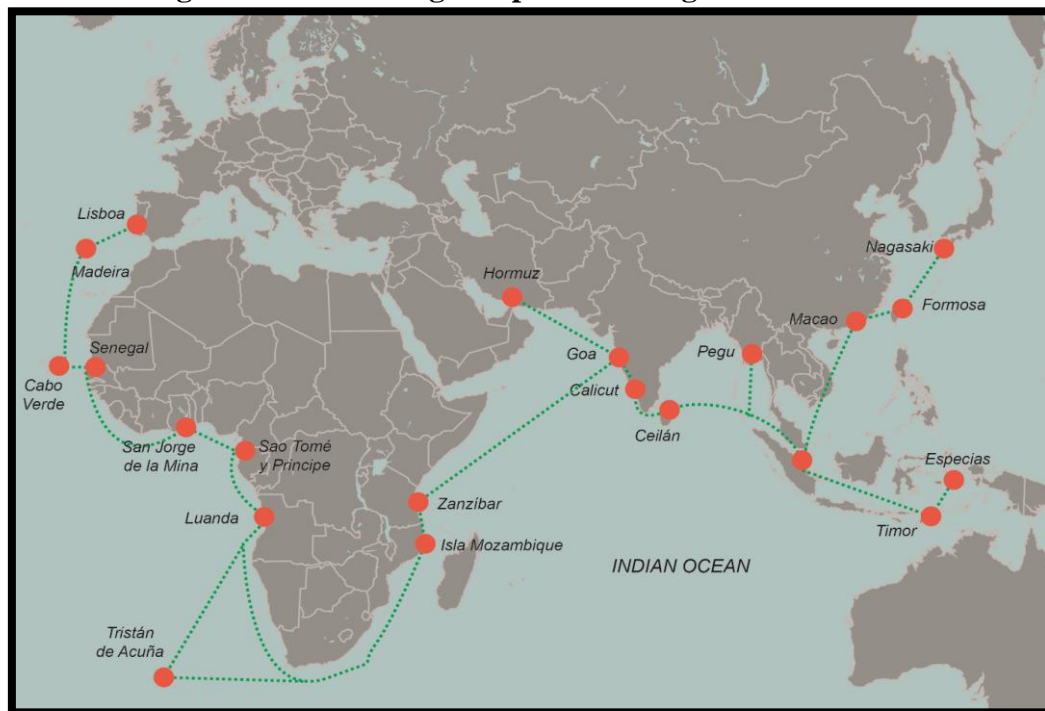
“Goa was no doubt occupied and converted into a great base, but this was with the help of Tulaji, the Hindu chief of the area, who joined with the Portuguese in order to weaken the Adil Shahi Sultan's authority in the neighborhood... Goa was at an extremity of Adil Shai's extensive dominions and its conquest and fortification by the Portuguese were matters of great importance to the Hindu Empire of Vijayanagar in its campaigns against Islam. The Vijayanagar Emperors were quick to realize that Goa provided them an outlet to the sea, through which they could get not only arms and equipment, but the horses which they needed so much for their cavalry. Actually, therefore, the conquest of Goa was not the establishment of the Portuguese as a land power in India, but the creation of a suitable place for naval operations in the Indian Ocean. ”

As said, the Portuguese network did not end in India. Albuquerque, perhaps the main captain in Portuguese naval history in the Indian Ocean, managed to temporarily conquer with Chinese support the port of Malacca, which was controlled by the Sultans of Malaya. After Malacca, the Portuguese reached Japan, where they founded Nagasaki in 1571. Nagasaki would have given the possibility of controlling the flow of commerce with the Pacific Ocean, but it never occurred. As it stands out by Panikkar (1953, p. 41):

“With the conquest of Malacca, Albuquerque completed the structure of European maritime Empire in Asia. He had set out to build up a commercial Empire based on an unchallengeable position in the Indian Ocean. The major ports on the coast of Africa were already under Portuguese domination, but before his time there was in India only a small foothold in Cochin, and no strong points anywhere from which Portuguese naval authority could be enforced. By the annexation of Socotra, by political influence at Ormuz and by holding Malacca he established a system of control which remained unshaken as long as Portuguese naval power remained powerful enough in Europe. ”

As can be seen in the next map, a Portuguese proto "string of pearls" was built in the Indian Ocean. At the same time, the Portuguese tried to maintain the Indian route in secret, in 1504 a decree forbid the insertion of any details about the route after the Congo in any map.

Figure 4 - The Portuguese proto "String of Pearls". 1580.



Source: elaborated by Rosaura Flynn.

All in all, it is relevant to point out that the Indian subcontinent as a whole was never under a real threat of Portuguese territorial dominance²⁶. As highlighted by Prakash (2008), no strong Asian power of the time, whether in India, the Middle East, or China, considered the Portuguese to be a serious threat to the existing balance of power. No Asian ruler saw the need to construct a navy such as the Japanese built after Commodore Perry's visit to Japan in 1853. In fact, to Panikkar (1953) the big achievement of the Portuguese during the first period of their supremacy was to restrict the Arabian traders to participate in the spices trade.

The Portuguese control over their maritime-port network had some nuances. With respect to the general framework of the Asian trade, for Chaudhury (2008), the aspirations and the activities of the *Estado da Índia* represented an institutional innovation: a complete state monopoly of an important commercial product was not unknown, but it was a rare phenomenon. For Indian merchants and political ruler, it was a relatively novel experience to encounter an imperial scheme that was being directed from a centre of power which was situated many thousands of miles overseas, in another continent. Pepper and spices were the main commodities on which the Portuguese founded their imperial ambitions.

With respect to trade, the main item was the spices, mainly pepper, though some other goods were also procured. The procurement of pepper in India was organized by the Portuguese while the sales in Europe were through contract sales based until the middle of the century at Antwerp and thereafter at Lisbon. According to Prakash (2008), partly because of the absence of a strong mercantile tradition among the Portuguese, comparable in any sense to that of the northwestern Europeans, and partly because the Crown had provided the main finance and the infrastructural support to the efforts, the overseas enterprise in Asia was dominated from the very beginning by the Portuguese Crown.

The cargoes sent from Lisbon to Asia exchange for pepper included precious metals, non-precious metals such as copper, lead, tin, quicksilver and mercury, and other goods such as coral, wines, olive oil, etc. However, metals dominated the exports, and copper was the most important. According to Chaudhury, it was not until the third

²⁶ For a detailed view of the genesis and functioning of the *Estado da Índia* see Subrahmanyam (2012).

decade of the XVI century that silver from the mines of Mexico and Peru began to reach the Iberian Peninsula in large quantities and re-export to the Indian Ocean. Indian textiles were used primarily to buy Indonesian spices and drugs and the Chinese porcelain and silk. Slave trade was also used into intra-Ocean transactions²⁷.

For Prakash (2008), the attempt at monopolizing the spice trade was unambiguous. It called for a total exclusion of Asian shipping from the Persian Gulf and the Red Sea and the regulation of the rest of the Asian trade. The 'institutional platform' used to implement this policy was the cartaz, that all Asian ships were obliged to carry on. The document obliged the Asian ship to call at a Portuguese-controlled port and, following the establishment of the Portuguese customs houses there, to pay customs duties. Enemies of the Portuguese and banned goods such as spices were not to be carried. There is some evidence that an equivalent of the cartaz existed in the Asian seas before the arrival of the Portuguese, but the scale on which this restrictive measure was used by the Portuguese was unprecedented. This 'institutional platform' represented a constraint on the freedom of navigation on the seas.

The Portuguese were able to enforce such requirement only in the first years, essentially because of the near absence of effective naval gun-power capabilities on the Indian and most other Asian port cities of the time. However, after some decades, the Portuguese capabilities of 'enforcement' of the all sea route were discussed. For Prakash (2008), the Estado da Índia lacked the resources in men and ships to sustain an effective blockade of the Red Sea for a century. The only area in which the Portuguese were reasonably successful was in preventing ships from Malabar from going to the Red Sea, but shipping from Kanara (Karnataka) and the Bay of Bengal continued to carry Indian pepper to the Red Sea from the late 1530s onward, mainly through the agency of the Gujarati sailors and traders. For Chaudhury (2008), the cartaz system was partially ineffective through corruption and administrative laxity. There were agency problems.

At the same time, a variety of interest groups were involved in the Portuguese network (Prakash, 2008). In Lisbon, in addition to the Crown, syndicates of merchants,

²⁷ It is important to have in mind that Portuguese were sugar producers in America, so they were mainly involved in slave trade. According to Findlay and O'Rourke (2007) over 5 million slaves were traded by Portuguese between 1519 and 1867 as part of the transatlantic commerce. For the same period, the British transatlantic slave-trade registered 3 million people, the French 1.5 million, and Dutch and SpANSIh half a million each.

financiers, and bankers of various European nationalities were an essential constituent of the operation and one main link with the European ecosystem. These syndicates played an important role in the procurement and the transportation of the return cargo from Asia. Within Asia, the Portuguese presence had different faces. In first place was the official presence in the form of the Estado da Índia, which was supposed to take care of the commercial interests of the Crown. But the employees of the Estado from the Viceroy down simultaneously engaged extensively in trade on their private account under a variety of arrangements. Finally, private Portuguese traders, the Casado traders, operated either under the protection of the Estado da Índia or outside of it.

The Portuguese also have different phases of interaction and articulation with regional players in order to control trade. For instance, Subrahmanyam (1990, p. 258) relates:

“...the Portuguese rapidly entered into conflictual relations with the Samudri Raja and the Pardesi merchants of Calicut, and encouraged Cochin to develop itself as a rival to Calicut. In the early phase, the Portuguese even used as agents in the procurement of commodities for the cargoes of Europe-bound carracks Mappila merchants such as Cherian and Mamali Marakkar”. Once again, conflict and partnerships with local networks. ”

Gujarat, Bengal, Masulipatnam and many other ports of the Indian Ocean were not under the control of the Portuguese Goa centered network. As explained by Subrahmanyam (1990), at the second half of the sixteenth century, there were different political disputes at South India, mainly between the Bahmani kingdom's successor, the Golconda Sultanate, the Gajapati and the Empire of Vijayanagar. In short, these disputes resulted in the decline of Pulicat as a high-sea port, the rise of Masulipatnam, which reached its climax in the 1600s. In fact, the regulations governing the Goa customs house made mention of textiles from Masulipatnam and the duties to be charged on them. Furthermore, the growth of the Bay of Bengal as a trading system which involved different ports was another trend that was outside the sphere of control of the Portuguese. Persian merchants were dominant in the Bengal coast and in its surrounding ports; both the South Indian fragmentation of power and the emergence of Bengal as a central process to understand port settlement of the Northern European companies during the sixteenth century.

From the Iberian people to the North Europe people. As explained by Panikkar (1953), the growth of Protestantism in Europe indirectly impacted in the Indian Ocean ecosystem. For the Protestant nations, the Papal grant of a monopoly to Portugal had no

validation. But, mainly, what was changing since the end of the XVII century was the balance of power in Europe. Elizabeth, from England, was challenging the Phillip II's monopoly in the Spanish Main. In parallel, the centre of spice had been shifting from Lisbon to the ports of Netherland at the end of the sixteenth century. The demand for spices was greater in the northern regions of Europe and the trade was also being controlled by the northern traders.

According to Chaudhury (1978) the commercial and financial supremacy of Amsterdam during this period was beyond anyone's doubt. To Findlay and O'Rourke (2007) the Dutch emerged by 1650 as the leaders in global commerce on virtually all of the seas and oceans in the world. The foundation of Dutch commercial prosperity rested on a world-wide carrying trade and a massive concentration of marketing and stapling functions in Amsterdam. The biggest profits were made by the Dutch from their ability to import and redistribute a wide variety of goods throughout the markets of Europe and Asia. Much of the Mediterranean and the Baltic trade was carried in Dutch shipping. Besides, the Dutch were the masters of the European bullion trade. The bankers of Amsterdam could issue bills of exchange on Cadiz and Lisbon, in quantities which the London of William III found hard to rival (De Vries, 1973).

At the end of the XVI century, when Portugal became a territory of the Hamburgs, the Dutch directly challenged them in Europe. Thus, in 1592, the leading Dutch merchants decided to establish a company for trading with India. The first Dutch fleet was in 1595. Of the 259 men who left, only 80 returned, but it was a success in commercial terms. The United East India Company (Dutch Verenigde Oostindische Compagnie, VOC) was formally created in 1602. It had not only the monopoly of trade, but wide sovereign powers to sign alliances, conquer territories, build forts, etc. According to Israel (1989), Dutch shipping consisted of large armed vessels of 500-1,000 tons, they established as a formidable power. As pointed out by Roy (2012b), the contest for control of trade in the Atlantic and in Indonesia between the Dutch and the Spanish was fierce and only occasionally contained by diplomatic efforts.

However, the deconstruction of the Portuguese network in the Indian Ocean was a warfare process and not a punctual event. As related by Panikkar (1953), a first deal was signed between the Dutch and the Zamorin and Emperor of Malabar, one of the main enemies of the Portuguese. The Dutch first attempt to displace them was done in the islands of Indonesia, where Portuguese were not so well established. A major

victory was achieved in the Battle of Swally, in 1612, but the Dutch establishment in Indonesia was fully achieved in 1619, when they conquest and occupy Jakarta. Then, in 1641, the Dutch conquest Malacca²⁸ and, in 1654, they occupied the port of Ceylon. After Ceylon, the Portuguese network downfall was rapid. Cochin was occupied in 1660 and other small trading ports fell one by one to the Dutch.

On 31st December 1600, the English East India Company (BEIC) received from Queen Elizabeth the royal charter giving it the monopoly to trade in the East and it was permitted to carry bullion out of England to finance its trade. Spices were a main good both for flavor food and for spiced drinks. In 1599 the Dutch rose the price of pepper from 3 to 8 pounds and the British merchants decided to enter the Eastern trade. The first vessel reached Sumatra in 1602, but there was no demand for the British products. So, the Company's agents thought that they could finance the pepper imports through Asian intra-trade: they reported that there was a great demand for Indian textiles in Bantam and Moluccas. They could so finance the pepper imports with these 'carry-trade' profits. No doubts, Dutch consolidated power in Indonesia was the main factor that led the English to concentrate on the Indian coasts. The first British trading post was established in Surat, in 1612. However, the civil war in England stressed the Company situation. As a consequence, during the first half of the seventeenth century, the East India Company only embarked on a diplomatic policy of extending their trading post among India. They settled in Masulipatam in 1641 and they obtained the right of the Empire of Vijayanagar to build a fort at Madras in the same year.

England emerged from the Civil war with a strong navy and an aggressive middle class that was willing to challenge the Dutch commercial hegemony. According to Findlay and O'Rourke (2007) it was the newly enhanced power of Parliament acting as the collective interest of the national mercantile class, rather than the 'grace and favor' of a monarch, that was being responsible for the British mercantilist policies. For Panikkar (1953) and Bandyopadhyay (2004), it was the Restoration that gave a great impulse to the BEIC. Either way, the situation of the company business got better consideration in England.

²⁸ In 1642, the Dutch also drove the Portuguese out of the Gold Coast in Africa, the main source of Portuguese slave trade. At the same time, this opened this rich slaving area to other Europeans, mainly the Dutch and the English.

In the Indian Ocean, the BEIC moved the headquarter from Surat, where they were supervised by South Indian rulers, to Bombay, which Charles II received from the Portuguese crown in 1661 as dowry for his bride and was handed over to the BEIC in 1668 for an annual tent of 10 pounds²⁹ (Bandyopadhyay, 2004). A better defence system could be built in Bombay. Sir Josiah Child³⁰ came to lead the BEIC with a forward policy. Indeed, he 'declared war' on the Mogul Empire. As a consequence, the BEIC establishments in Bengal were occupied and mostly destroyed. The Company was forced to behave no more shameful in the future. However, after this event, thanks to the indulgence of Emperor Aurangzeb, the BEIC was allowed to fortify in a fishing village in Calcutta (1690). The Company did not attempt any other forcible interventions until the 1750s, long after Aurangzeb death in 1707.

In Europe, the first Anglo-Dutch war in 1642 launched a mercantilist war competition that included the second and the third Anglo-Dutch war and went until the Napoleonic war started in 1803. In the Indian Ocean, in order to keep up with the other European Powers, Henri IV, from France, also founded a French East Indian Company in 1601. Despite several voyages were made, it was not until Colbert that the company received a push. Colbert original idea was to establish a French authority in Ceylon. A fleet was sent in 1670, although the Dutch prevented the French settlement and the main French achievement was the foundation of Pondicherry, at the south-east coast of the Indian subcontinent.

With respect to the territorial big picture of the Indian Ocean at the end of the XVII century, Panikkar (1953, p. 51) says:

“...the power of the Portuguese had been eliminated effectively from the Indian Ocean and from the Pacific, though their establishments at Goa, Macao, and Timor were left undisturbed. The Dutch controlled the coastal tracts of Ceylon and had a few trading establishments on peninsular India, of which die most important were Cochin and Negapatam. They occupied Malacca and controlled the trade of Malaya. In Indonesia, they had built up an Empire based on commercial monopoly and with China and Japan, they carried on a profitable trade. The British, excluded from the Indonesian islands, had concentrated on India where they had built up an extensive trading organization. Last, of all, the French had entered the Orient and staked their claims at Pondicherry.”

²⁹ In fact, Bombay had been given to Charles II through the Treaty of Whitehall, that involved a mutual defense pact between Portuguese and the British Crown against the aggression of the Dutch.

³⁰ Child was a relevant figure not only because of his personality, he also wrote a mercantilist classic, the "New Discourses of Trade".

With respect to the period that was starting, Findlay and O'Rourke (2007, p. 228) state:

“...most of the rivalries of the age of mercantilism were about which national company could gain control of a given market or trading areas, such as the spice trade of Southeast Asia, or entry and exit into the Baltic. The aim was to exert monopoly control over a given trade, thus gaining monopoly profits, which in turn would increase the state's financial ability to successfully wage war, thus enhancing its mercantilist trade objectives. Such logic was hardly new, since as we have seen many previous states, including Srivijaya, Mamluk and Ottoman Egypt, Venice, and the Estado da India had more or less successfully attempted to pursue similar policies. Given this "zero-sum" focus on the international division of monopoly rents, classical arguments regarding the gains from trade to all parties under peaceful conditions of perfect competition did not apply. ”

According to Roy (2012b, p. 121), the BEIC appearance altered some kind of balance of power in the Indian Ocean ecosystem:

“Although technically a joint-stock firm, the company did not represent a unitary command-and-control structure. Its overseas trading enterprise was possible because of the peculiar nature of the principal-agent relations that it entailed, combining modern joint-stock operation with a pre-modern form of partnership between risk-taking peripatetic sailors and soldiers and risk-averse sedentary town merchants. These two classes of people did share a common interest in the profits of Asian trade, but they were not friends otherwise. A decisive change of balance in the partnership could see the sailors-cum-soldiers try to establish a sphere of the political authority thereby defying the wishes of their principals, the capitalists. Colonization was an outcome of the unstable partnership that formed the basis of these enterprises.”

With respect to the intracompany competition at the Indian Ocean Subrahmanyam (1990, p. 282):

“The use of violence was an intrinsic part of the market strategy of the Dutch Company from as early as 1615 or 1620... but that process of expanding into markets was often at the cost of other European rivals. Moreover, the barriers to entry by which these partial or complete monopolies operated, once created, were backed by live ammunition. ”

For now, what will be said about the North European companies is that they were a typical creature of the European ecosystem, particularly in geopolitical terms, of a period of emergence of the Northern powers. Although they were private companies, 'the first joint-options companies in the world', they competed in both military and diplomatic terms backed by their States navies and financed by other European powers to control the lucrative trade networks which connected Europe with the Indian Ocean.

However, different principal-agency and Imperial competition relations mediated in the 'objective function' of the companies, both at the European and Indian Ocean ecosystems.

Bombay, Madras, and Calcutta: the 'gates' of India. As highlighted by Roy (2012a), Subrahmanyam (1990), still in the sixteenth and early seventeenth century, the Indo-European trade was closely dependent on Asian traders. They controlled many aspects of Indo-European business except for the final sale and shipment by sea. They functioned not only as agents for the Europeans inside India but also as main actors in overland trade. All forms of caravan trade and river-borne trade were dominated by the Indians. Prakash (2008) also pointed out that the Europeans had no option but to operate within the given organizational structure, including accommodation by bankers and money changers, partnerships with local merchants and the services of artisans, etc. Indeed, although the Portuguese 'hegemony' over the pepper trade during the sixteenth century, the Indian maritime trading communities were still really involved in the coastal trade. For instance, the local communities of Gujarat (Muslims), Malabar and Coromandel had their own boats and capital.

However, as pointed out by Dasgupta (2008) Indian maritime trade experienced a rearrangement during the seventeenth century. With the emergence of the English and Dutch companies, the western Asia trade was re-emphasized at the expense of the south-east, which had marked Indian trade in the previous century. In this moving, the final breakdown of Portuguese restrictions liberated maritime trade in the Indian Ocean. This, plus the growing demand in Europe, caused a period of prosperity in the local merchant communities. According to Findlay and O'Rourke (2007), at the first half of the seventeenth century, the BEIC used its naval forces to serve as escorts for Indian ships carrying valuable cargoes to the Red Sea, the Persian Gulf and pilgrims to Mecca. These services and the diplomacy applied by the ambassador to the Court of the Mughal Sir Thomas Roe put the Company in the good books of the emperor Jehangir, and led to the granting of several commercial privileges. Carrying-trade and naval protection were the main initial business of the BEIC.

Different processes of knowledge exchange and diffusion occurred during this period. Roy (2012a) stresses that during the seventeenth-century Indian practices were behind the European ones in sailing: instruments such as the telescope and compass were unknown to Indian sailors. The Indian ships were the heaviest and they were

constructed with little iron, which made them unsuitable for long voyages. According to Prakash (1990), in the period between 1620 and 1670, the ships increasingly exhibited 'European' traits such as multiple decks, heavier armament, etc. In Qaisar's (1982) work on the Indian response to the European techniques, he explains that the European caulking techniques were rejected because the local techniques for treating hulls were cheaper and just as effective. In the case of the telescope, which was widely used by the Europeans sailors, there is no evidence for its use by Indians either for navigational or astronomical observations during the seventeenth century. However, different European method and techniques such as the iron nailing were quickly adopted by the Indian people, as states by Qaisar (1982):

“It is remarkable that the Indians lost no time in adopting the new technique. They sensed the danger and readily adopted the alien technique of iron nailing. It was no accident, then, that an Arab merchant in 1507 built a galleon in the Portuguese style in Gujarat. When Goa was conquered by Albuquerque in 1509, a good deal of pitch, oakum, cordage, and nails were discovered in storehouses. Even earlier (1501), Cabral was given to understand that the ships on the south-west coast were made with the iron nails. Varthema, writing about Calicut in the first decade of the sixteenth century, observed the use of ‘an immense quantity of iron nails’ in Indian ships.”

In fact, during the seventeenth century, the Dutch and the English East India companies, as well as private English traders, became important buyers of ships constructed at Narsapur Peta and other Indian shipbuilding centers such as Hugli in Bengal³¹. Many of these ships were built on the basis of European designs and in some cases under European supervision. The Dutch Company and the English private traders used these ships for intra-Asian trade and found their performance extremely satisfactory.

At the second half of the seventeenth century, the BEIC finally established at the three port-cities that would configure its future penetration into the Indian subcontinent and, in some way, re-localized the trade dynamic of the subcontinent (Panikkar, 1953, Roy, 2012a). Although the acquisition of Madras (1640), Bombay (1661) and Calcutta (1690) came to the English separately, it included a process of threats or warfare with local states. In geographical terms, neither Madras nor Bombay was situated on a river-

³¹ See more on technology transfer, indigenization and knowledge flows in Qaisar (1982), Baber (1996) and Subrahmanyam (1988), among others.

borne. And although Calcutta was situated on a river, the main business did not come from it. In fact, in geographical terms, these ports looked to the ocean. According to Roy (2012a), each of these territories emerged not only as a little colony with its own laws and administration but also as a commercial center, a port and a destination for migrant Indian artisans and merchants. Each one started small, with a little European population and a port without a harbor. The fort and its walls enclosed the factory and the European population; the villages formed a kind of suburb from which supplies of goods and workers came into the fort town. But they grew rapidly: Madras reached a population of over 300,000 by 1700, while Calcutta and Bombay had 100,000 and 70,000 respectively by the middle of the eighteenth century (Roy, 2012a). The three Presidency cities started to configure the new identity of the company in India. Gradually, in Bombay, Calcutta, and Madras, the English were becoming landlords.

This geographical change was highlighted, in institutional terms, by Roy (2012a, p. 121):

“Another sphere in which the Europeans made a significant change, urbanization, again invites us to the institutional and knowledge outcomes of the contact. Trade historians see the emergence and meteoric rise of Bombay, Madras, and Calcutta merely a diversion of trade from the established centers such as Surat, Masulipatnam, or Hooghly. In fact, these three cities represented a different business culture in coastal India. For one thing, Madras and Bombay broke the geographically conditioned dependence of port cities on internal navigation and Mughal roads. Even more than Surat, these were ocean-bound ports. For another, Surat and Masulipatnam were cities that did not belong to merchants; in those cities, the merchants did not make laws, in Bombay they did. The three cities were, institutionally speaking, worlds apart from the Indian littoral spaces. ”

“India” clothing Europe. In parallel with the displacement of the principal sea-ports, a second main change occurred during the seventeenth century with the Euro-Asian trade: Indian textiles boomed in Europe. In short, the European nations arrived in Asian waters in search of spices, but with the total exclusion of the British from Indonesia and the growth of trade with the ports of China, the interest for the BEIC shifted to textiles, calico, muslin, silks, etc. The strict prohibition on importing French linens and silk into Britain at the end of the seventeenth century was a main first push for Indian cotton textiles. According to Riello and Roy (2009) and Baber (1992) Indian cotton textiles helped to create a new middle-class and bourgeois notion of fashion in

Europe. They became popular because of their cheapness, colorfulness, durability and their washable quality³². They mainly compete and replace wool clothing. For Chaudhury (2008), the imported textiles could be classified under five groups: plain white cotton, plain dyed cotton, striped and check cotton, chintz and embroidered cloth, and silk piece-goods, including fabrics containing a mix of cotton and silk yarn. As showed before, India's textiles had been traded beyond its shores long before the European arrival, but the volume of transactions taking place from the sixteenth century appears of a wholly different order. To Findlay and O'Rourke (2007), in 1750, textiles were between 60% and 80% of the BEIC imports to England.

It is important to have in mind that the Indian trading posts were not 'demand' posts for the British goods. It was the New World that was fueling Asian trade, strengthening the European consumer boom (Roy, 2012a). Virginia tobacco in the middle of the seventeenth century and Caribbean sugar in the eighteenth century were the most important American goods. Indian textiles were used as means of payment in Africa for slaves, in turn, feeding into production for export to the Americas. For a brief period in the seventeenth century, Persian horses went to India to balance the trade. But it was silver from the Americas that greatly contributed to the making of Asian trade. The Spanish conquest had made silver cheaper in Europe than Asia. These events, together with the almost inexhaustible demand for silver of India, made it possible to continue the purchases of Asian goods until the mid-eighteenth century.

However, the lack of demand for Western goods gradually turned during the seventeenth century in a serious complaint in England and in France. Although the growth of wealth helped to maintain the demand, the East India trade was looked with disapproval and was subjected to strong criticism. As said by Panikkar (1953) the popularity of Indian textiles became a great political issue. In 1677 the British Parliament prohibited all but woolen goods for winter use. The Navigation Acts, which restricted the use of foreign ships for trade between every country except England, and the Calico Acts, which gradually banned the import of textiles into England should be understood as an emergent of this protectionist displeasure and the beginning of a period of protection to English national industries, mainly first wood and then cotton

³² See Beckert (2014) for an in-depth global analysis of the cotton industry and Lemire (2009) and Berg (2009) for an analysis of the European consumers and of cotton as a fashion and luxury good.

textiles. But this process of British 'import substitution' would reach its climax long after Plassey's battle, in 1757, the first British victory on Indian territory and the beginning of the peripheralization of the Indian subcontinent.

Figure 5 - Britannia receiving the riches of the East Indies - Michael Rysbrack (1730)



Source: The British Library.

1.3. Discussing the Indian Ocean ecosystem before Plassey (1757).

This section will be closed with a few reflections on the Indian Ocean ecosystem during the period under study. I will start with first confirming what I understand of the Indian Ocean, in fact, as it really was before the European people. Although with regional heterogeneities, it functioned as a dense and connected network of trade ports and emporia cities. The Indian subcontinent was the main manufacturing center of the Indian ecosystem with Indian textiles dressing more than 100 million Indians, being traded in the different coasts of the Indian Ocean and reaching both Europe and China by the combined sea-land route.

Islam and the Chinese, mainly, used violence and expanded territorially inland, but they were highly open to merchants, trade, and religions at the Indian Ocean coast. Hindu, Indonesian, Persian, Armenian, Arabs, Jews, South Indian Princess and Kingdoms and African people also participated in this 'fair play' ecosystem. Trade and markets were quite extended, either inland, as port-trade and as overseas trade. Trade compensated regional heterogeneities. There was quite a developed mathematical, geographical, sailing and shipbuilding technical knowledge. Knowledge flowed but it also had excluding mechanisms, mainly related to community and family membership. Different entrepreneurial communities were there. There were also pirates and sea fighters, although there wasn't any developed systemic and State-backed protection against them. The inland surplus was regulated by the Monsoon winds and rains, which fed more than 100 million people. In fact, it is not wrong to say that the monsoon was the main climate, economic and demographic systemic factor that regulated this ecosystem.

Thinking in the novelties of the Portuguese arrival, I will highlight some elements were absent in the Indian ecosystem. First, as said, it seems clear that there was nothing as a State looking after the violence at the sea. There was neither a national State trying to monopolize the Indian Ocean ecosystem nor any systemic dynamic of 'preparing for sea-war'. The inland powers were mainly land-oriented Empires. As a consequence, this lack of naval warlike impetus had some institutional and knowledge implications. Mainly, the fields of knowledge development were different. The Europeans included knowledge and systemic efforts on developing larger and stronger ships and sea gunpowder. At this point, I totally agree with Panikkar (1953) when he

says that Da Gama's arrival implied the initiation of the dominance of maritime European power over the land masses of Asia.

Second, although the existence of bills of exchange and some other credit mechanisms mainly developed intra-communities and between merchants and some segments of the Indian Subcontinent 'nobility', the development of public and private financing mechanisms was quite minor than in the European ecosystem. In Europe, both the Crowns and the merchant had developed different instruments for financing the overseas expansion. The Dutch were perhaps the most advanced in the development of these types of instruments, but the relevance of funding can be found both in the Portuguese and in the other European companies. The stock option and monopoly structure of the Northern companies also contributed in achieving a larger scale of operations and allowed to invest more recourse in military capabilities and trading infrastructure. The relationship between the BEIC and the Crown, the Parliament and the Bank of England in terms of funding was also a relevant and distinctive aspect.

Third, in more cultural and impressionistic terms, we would also say that in the Indian Ocean ecosystem described, there was not any strong 'national feeling'. Of course, there were different regional and religious communities but at the Indian Ocean, it was a community feeling of belonging that prevailed. This close relation between Nation and the protectionist policies and framework seems to be quite European in nature, or, even better, exotic to the pre-modern Indian Ocean ecosystem.

Specifically, in the case of the Portuguese, the naval gunpowder and the financial support of the Crown and different European groups was central to understand the process of reaching "India" and the initial port settlement. Then, the Portuguese developed a logistic network centered in Goa mainly oriented to monopolize pepper trade. It is interesting to point out that although private merchants and other types of naval entrepreneurs were part of the long-term project, the Portuguese one was a formal Crown-led enterprise. The institutional instrument used by the Portuguese to the pepper-monopolization was the cartaz. This, depending of course on the enforcement capabilities based on the ports control and naval gunpowder, was an important institutional innovation in the Indian Ocean. However, the Portuguese network that extended mainly during the sixteenth century controlled neither all goods nor all the extension of the Indian Ocean ecosystem. Different local and regional communities widely participated in the Indian Ocean trade.

If the Portuguese initiated the systematic military all-sea trade route with Europe, the Northern companies deepened the Atlantic connection with much more naval and gunpowder strength. But mainly, they articulated Indian textiles, the European demand and the bullion that came from Americas. Of course, the European demand was a welcome factor for some local player of the Indian ecosystem, such as the merchants and the port rulers. It would not be wrong to say that from the end seventeenth century and during the eighteenth century, the Indian textile exports reached a momentum of high climax, enjoying both the Indian Ocean and the transoceanic demand.

It is also important to highlight the relevance of trade triangulations for the European people. As the Indian Subcontinent was not a source of effective demand for many European goods, the Europeans companies 'sold' their carrying/custody services and obtained a rent from their military-logistic monopolies to finance the imports to Europe. It is true that bullion flew to the Indian Ocean in exchange for goods, but trade triangulation would always function as a 'financing' mechanism. In fact, as we will see, this would increase since the British could control Bengal and sell opium to China in the nineteenth century.

The regional and urban dynamic is also an aspect to have in mind. Each port had its own profile of merchants, shipbuilders, and entrepreneurs related to some specific communities, with an arms-length relationship with the inland rulers. In this sense, the Europeans tried both by diplomatic and by violent means³³ to make alliances or partnerships with different port rulers. The emergence or decline of a port-city also implied the emergence or decline of a new set of relations. For instance, in Goa, the Portuguese gradually transformed themselves into rulers. The changes in the trade flux and the port prominence in the coasts of Malabar and Coromandel, in parallel with the emergence of the future Presidencies of Bengal, Madras, and Bombay, contributes to understanding the later British penetration on the Indian subcontinent.

With respect to trade, there are no doubts that during the pre-colonial period, India did quite well in her trade with Europe, exploiting her 'comparative advantage' in

³³ It is interesting to quote the words of Charles Boone (1718) the English Governor of Bombay as a synthesis of the way in which violence, trade, and friendship was developed in the Indian Ocean: "If no naval force no trade, if no fear no friendship" (quoted by Chaudhury, 1982, p. 3).

cotton textiles to generate a permanent trade surplus compensated with both silver inflows and trade triangulation. In fact, it was in 1750 that according to Bairoch (1982) "India" reached a pick of 25% participation in the world manufacturing output (clothing both the Indian Ocean ecosystem people and the European people). In fact, the narrative that I have tried to build reflects an Indian Ocean ecosystem that had its own dynamic of trade and production before the European arrival. The all-sea-route exports, of course, contributed as a source of a new and growing demand, but this demand was added to a structure of relations and production that was quite developed before the European arrival.

In relation to the State expenditure, the Indian Ocean dynamic was different from Europe. In fact, the sole introduction of the State as a consolidated figure is even quite unnatural to the narrative presented. The inland Empires, as we will see, were mainly land fighters and agriculture based. However, we do not see a systemic 'Indian State' expenditure and technological effort on developing violence at the Indian Ocean. And when I say violent at sea, I am not only referring to gunpowder, but also to all the infrastructure related to sailing, control of commerce, standardizations, forts, etc.

To conclude, in this encounter of agents of different ecosystems, market forms and trade were not a main difference. In fact, the Indian Ocean waters looked much more cosmopolit and tolerant than the Mediterranean ones. The more systemic force in the Indian context was the monsoon winds. Instead, the European ecosystem groups were being trained by the systemic forces of war capitalism³⁴ (Beckert, 2014).

³⁴ Sven Beckert refers as "war capitalism" to the institutional innovation of the Europeans States, by which trade, war, plundering, territorial conquests, slavery and technological improvements went hand in hand during the capitalist ascent.

CHAPTER 2 - THE INDIAN SUBCONTINENT PERIPHERIZATION (1757-1914)

"It is a little awkward to use the name India for the entire territory of three independent states. But India in the larger sense, comprising Pakistan, India, and Bangladesh together, is still a valid geographical expression. The region containing the three countries is separated from the land-mass of the rest of Asia by the highest mountain ranges in the world. From the Himalayas, lower ranges run down, on both flanks, west and east, in practically uninterrupted series, down to the sea. The sub-continent enclosed by these ranges and the sea, approximately between latitudes 8° N and 37° N and longitudes 61° E and 97° 30' E, contains two broad physical divisions, the Indo-Gangetic plains and the peninsula."

Habib (1982, p. 1)

"It would have required supernatural vision for an observer in 1750 foretell that in the course of fifty years a European nation would have conquered a third of India and would be preparing to contest with the Marathas for a position of paramountcy over the rest; for after 250 years the position of European nations in India was substantially the same as it had been after Albuquerque in 1515."

Panikkar (1953, p. 71)

"As we examine protracted process in detail, it becomes clear that both pressures from the periphery and impetus from the metropole constantly interacted with each other, and search for revenue, quest for trading privileges and the imperatives of military exigencies all took the driving seat in turn to accelerate the process of territorial conquest and erect in India the most magnificent Empire that Britain ever had."

Bandyopadhyay (2004, p.42)

"Whatever the relative magnitude of European commerce in India, it was undoubtedly a factor, though not the only factor - in the changing direction and composition of India's foreign trade. A major feature of the changes in the map of India's foreign trade in the first half of the eighteenth century was the decline of Gujarat and the corresponding increase in the importance of Bengal."

Raychaudhuri (1983, p.25)

"It is tempting to give the different railway patterns shorthand labels, such as "advanced" for the rail networks and "colonial" or "underdeveloped" for short lines running inland from a harbor. To do so, however, would be doubly misleading, for colonialism took many forms, and the relationships between railways and the rest of the society are exceedingly complex. India, which emerged from colonial rule with a "developed" rail network and an "underdeveloped" economy, is a case in point."

Headrick (1988, p. 51)

In this section, I will mainly work on the Indian subcontinent path since the British 'victory' in Plassey in 1757 until the First World War. This period will be characterized as a process of peripherization of the Indian subcontinent by the British rule. Some main authors in which I have history-backed my understanding are Bandyopadhyay (2004), Habib (1995a, 1995b, 1982), Metcalf and Metcalf (2013), Roy (2012a), Rothermund (1988) and Raychaudhuri and Habib (2004).

2.1. The Indian Subcontinent geography and demography around 1600

The Indian subcontinent is contemporarily defined as a 4,4 km² triangle that is suspended off the landmass of Central Asia. Geologically, the Indian subcontinent rifted from Gondwana and merged with the Eurasian plate around 55 million years ago. Bounded on the north by the Himalayas, the land is accessible from that direction only through a number of north-west facing passes. The Arabian Sea forms the western boundary and the Bay of Bengal the eastern one.

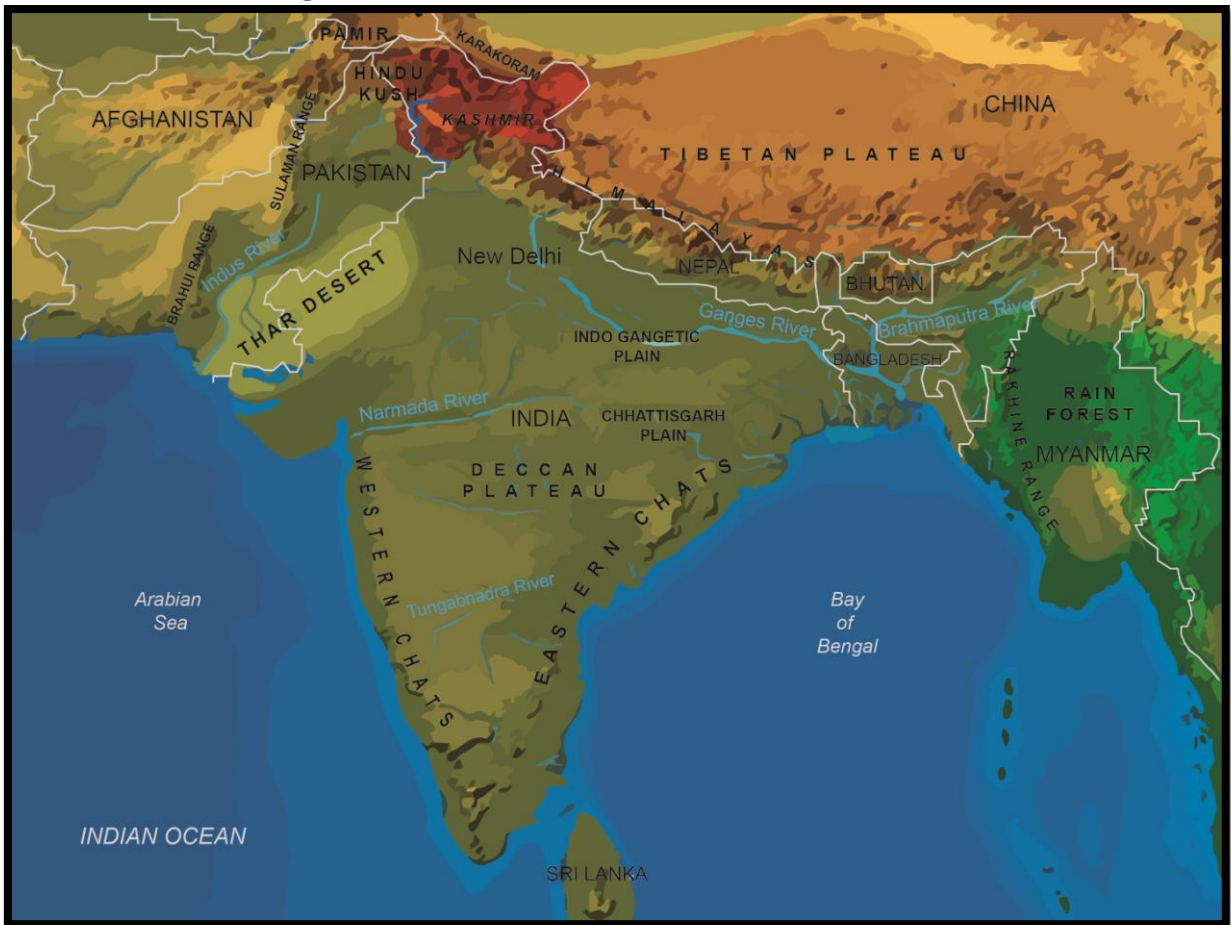
The subcontinent can be roughly divided into three geographic areas. The northern region extends from the northwest lands watered by the Indus River to the northeastern region watered by the Ganges River. The third main river of the northern area is the Brahmaputra. The Himalayas are the source of all three. Rajasthan and the Punjab hills are in this northern region too. The central area is called the Deccan and includes hill and forest zones as well as the arid Deccan plateau. The southern region is separated from the rest of the land by the Nilgiri Hills. The climate is mainly tropical with rainfall for much of the subcontinent dependent on the monsoon winds. The plains of the northern regions are fed by mountain snows, being less dependent on the Monsoon winds than the peninsular India in the south. Along the human history, the North Indian rivers have been ones of the main 'feeders' of the world. Most of the Indian subcontinent population has lived in the north area, both because of the river irrigation and the river trade.

South India is defined by Stein (1982) as this portion of the peninsula that goes to the south of an imaginary line from about 13° North, on the Malabar Coast of the Arabian Sea, to about latitude 18° North on the Coromandel Coast of the Bay of Bengal. The major early civilization elements were defined in the Tamil plain. From the fifth century, a civilization developed in the Tamil plain profoundly influenced people over a great portion of the southern peninsula by people migration on the plain, as the peasant agrarian system expanded

during the Chola period. From an early time, the sea offered the south Indians opportunities for both trade and piracy. The existence of trade ports on the coast as well as in the interior certainly constituted points of a vast commercial network reaching ultimately to China. According to Stein (1982, p. 19), the European peninsular penetration at South India was low until the eighteenth century:

“From the early sixteenth century, when the Portuguese assumed control over the Indian Ocean trade network from their headquarters in Goa, through the seventeenth century ascendancy of the Dutch on the Coromandel Coast and in Indonesia, and through the Anglo-French rivalry of the mid-eighteenth century, European trade was centered upon, and its impact restricted to, the coastal borders of the peninsula... Once their trade stations had been extended into small territories in the eighteenth century, and they were able to mount landed power, the sea became an important way of extending European authority... the sea provided the British with flexibility and mobility which could not be matched by any other power in India. It was as an adjunct to military strength based upon the land that the sea began, once again to have an impact upon events in south India by the eighteenth century. ”

Figure 6 - The Indian Subcontinent in South Asia



Source: elaborated by Rosaura Flynn based on Stratfor.

With respect to the population, as discussed in Habib (1982), Moreland's estimation of around 100 million people living in the Indian subcontinent around 1600, although different methodological discussions, is widely accepted. Others' works also discussed in Habib (1982) suggest that there were 140 million people. Only 15% of this population was urban population. More than two third of them lived in the northern area, near the Indus and the Ganges rivers. In fact, the Mughal Empire was mainly located in this area.

2.2. The Mughal Empire: main features and downfall^{35 36}

The British penetration in the Indian subcontinent cannot be understood properly without contextualizing as a process that occurred after the Mughal Empire downfall. Mughal Empire was founded in 1526 by Zahiruddin Babur³⁷ and reached its climax with Emperor Akbar in the second half of the sixteenth century. The last great ruler was Aurangzeb, who governed from 1658 to 1707. In general terms, the Empire was based on military strength, sedentary agriculture and geographical integration (Metcalf and Metcalf, 2013). Richards (1993) defined the Mughals as a 'war-State'. The centralized administrative system headed by the Emperor was mainly based on its military power. Below the Emperor, the other most important element in the structure of power was the military aristocracy. Akbar called the military aristocracy as mansabdari, each of them had a dual numerical rank: his personal numerical rank and the number of horsemen he had to maintain. According to Bandyopadhyay (2004) in the middle of the seventeenth century, from about 8,000 mansabdari, 445 controlled 60% of the revenue income of the Empire. This wealth concentration in the hand of a group of mansabdaris would later cause strong competition between this military aristocracy.

The effectiveness and sustainability of the relationship with the Emperor depended on the personal qualities of him but, mainly, by the constant expansion of resources, which explains the permanent drive towards the territorial conquest of Mughal India. The military aristocracy was divided into various ethno-religious groups: Turkish (called Turanis), Persian speaking groups from Iran, Afghanistan and Iraq (called Iranis), the Indian Muslims and the Hindus (mainly the Rajputs and Marathas). The Mughal military strength was based on the use of horsemen, an Arab-root warfare technology, but also in the use of gunpowder and infantry (Rothermund, 1988). As observed by Metcalf and Metcalf (2013), the Empires of this period such as the Mongol, the Qing or the Ottoman, were called "gunpowder Empires".

³⁵ This section is mainly based on Bandyopadhyay (2004), Raychaudhuri (1982) and Metcalf and Metcalf (2013). For a deeper understanding of the Mughal period see Habib (1963, 1995), Raychaudhuri and Habib (1982) and Richards (1993).

³⁶ I will briefly analyze the Mughal Empire characteristics because it was the more extended Empire in the Indian subcontinent from the sixteenth century to the eighteenth century. However, it is important to have in mind that in central India, Maharashtra, and the Deccan and in South India, the Vijayanagara authority were important regional powers during this period

³⁷ Babur was descendant from Timur, from the father family and from the Mongol Genghis Khan from his maternal family.

The army was a crucial element both in institutional terms and as the consumer of a wide range of commodities including military hardware as cannon and matchlocks. According to Habib (1995a), the most complete figures about Mughal's army are available for 1647, and they show that there were 7,000 cavalymen and bearers in the emperor's own establishment, 185,000 horsemen, and 40,000 infantry, consisting of matchlockmen, gunners, cannoniers, etc. Cavalry accounted for the larger portion of military expenditure. The horsemen were paid well above the subsistence level. The import of horses for the army from Persia and central Asia were paid for with exports, mainly textiles. Besides, next to the expenditure on the armed forces, the main charge on the ruling elite's income was the maintenance of a truly fabulous lifestyle. According to Raychaudhuri (1982) the nobles' taste for the products of high skills and qualities encouraged the tendency to specialization which was a characteristic feature of India's manufactures.

The unbalanced of power with the Europeans at the sea is marked by Raychaudhuri (1982, p. 191) when he refers to the river's navigation:

“The acceptance of the principle that Indian traders sailing on Asian waters must carry passports from the Europeans - first incorporated in treaties with the Portuguese - formalized the Mughals' naval inferiority. In so far as the European factories - until they developed into fortified settlements - were at the mercy of the Mughal, there was a balance of threats. Only rarely did the tussle with the over-mighty foreigners develop into a hot war: the most noted instance is the war with the English in Bengal (1686—90). ”

Roy (2012a) also pointed out that Islam supplied a cooperative principle among communities that colonized open land on the frontiers, cleared forest and supplied soldiers to the State. For him, particularly in north India, Islam was a religion of the land rather than of the roads. The need to expand territorially was mainly based on the need to add new land to tax and finance military expenditure. As showed in the classic work of Habib (1963), *The agrarian system of Mughal India*, the Mughal land-revenue system rested on the compromise that the peasant was left with a provision for his subsistence while the surplus was extracted by the Empire in the form of land revenue. They were the peasants the ones who sustained the whole Mogul 'war-State'. As said by Rothermund (1988, p. 7):

"...as far as external relations were concerned, the Mughals were practically liberal free traders, but in internal affairs they unwittingly followed the doctrine of the physiocrats, who believed that there should be no other tax than the tax on agriculture... ”

But as pointed out by Bandyopadhyay (2004), an Empire imposed from above and its increasing economic pressures was perhaps never fully accepted by the rural society. Peasant

unrest was a recurrent theme in the history of the Mughal power, but fear to the Mughal army prevented the problem most of the times. As highlighted by Raychaudhuri (1982), not all that was extracted from the peasants was drained away from the countryside. If the revenue collected was between a third and a half of the agricultural produce, the net portion which was taken away has been estimated at a quarter to a third. The difference remained in the hands of the zamindars, usurers, headmen and agricultural castes with superior rights in land. The local landlords or zamindars had a key role. They were the ones who mediated in the relation between the military aristocracy and the peasants. However, there was a big heterogeneity between the zamindars. Some of them, for instance, the Rajputs, had considerable political influence and power in the Mogul Empire. At the same time, the alignment of the zamindars with the Mogul was partial. Although Akbar had tried to gain the zamindars as collaborators, after the end of Aurangzeb period in 1707, the zamindars began to flounder in closed relation with the increasing pressure over the land-revenue.

As they were invaders, the Mughals were quite open both in religious and ethnic terms. The unifying ideology was the loyalty to the Emperor. Although the Mughal had a Persian liturgy, they did not try to impose a Muslim sectarian identity. In fact, there was not any forced conversion to Islam. Akbar was quite open with respect to his court, including Brahmans, yogis, Jains, Jesuits, Muslims, etc. As highlighted by Metcalf and Metcalf (2013), the cultural life of the Mughal had a period of effervescence in a general context of pluralism inside the Empire. The Mughal painting and architecture, Persian rooted but transformed by the Indian context and knowledge are a main reference of the Mughal period. Different health care systems such as Ayurveda, with Sanskrit origins, and the Arab Yunani Tibb cohabited and reinforced each other. As says by Raychaudhuri (1982, p.181):

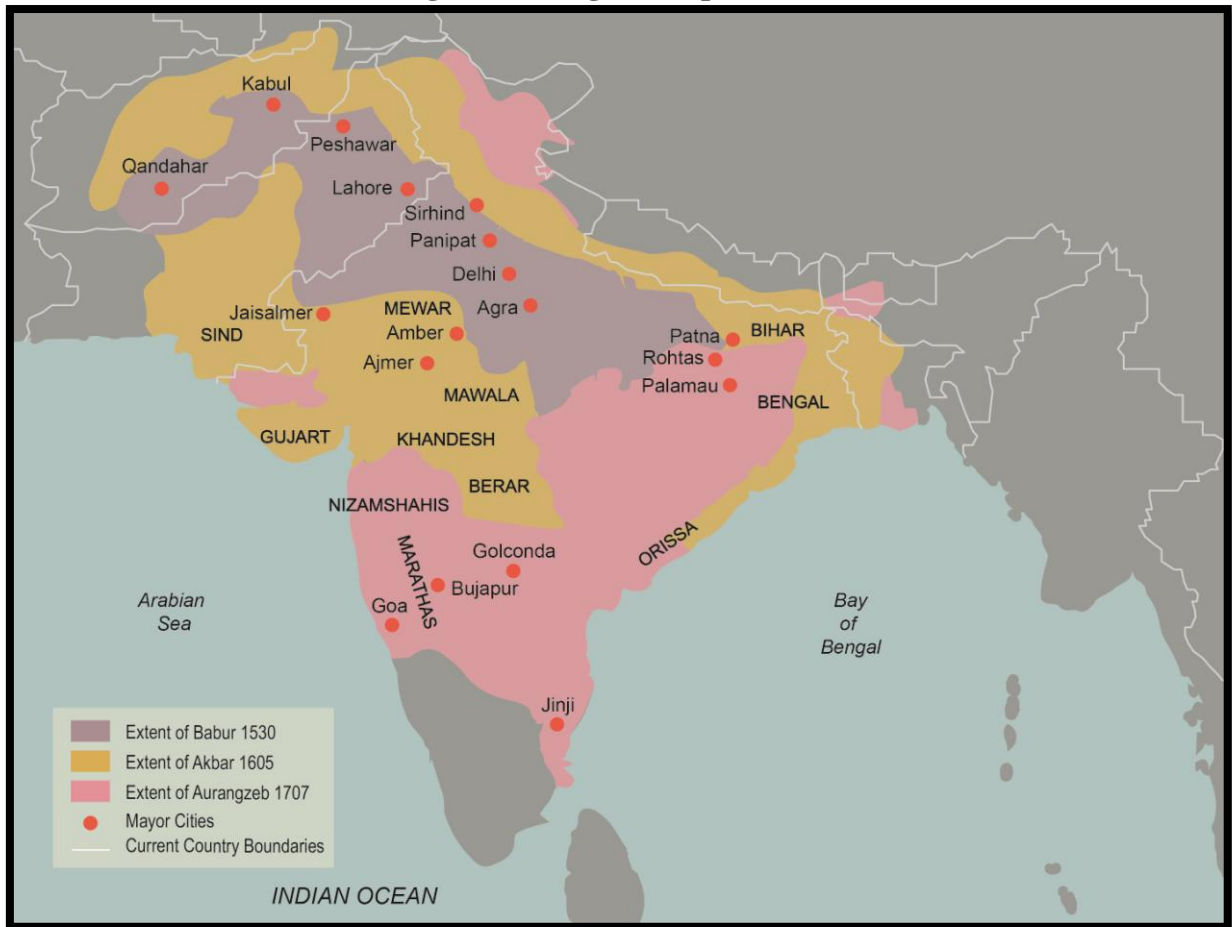
“Poets, scholars, artists, musicians, calligraphists, physicians and the like were all beneficiaries of imperial or aristocratic munificence. Together, they constituted a fair proportion of the middle class... the peasant's surplus was very usefully at work here, helping to create and continue significant cultural forms, the rich tapestry of Indo-Mughal civilization.”

With respect to the use and diffusion of technology, Raychaudhuri (1982) is really critical, pointing out that the extreme simplicity of instruments and a general indifference to labour-saving devices were one of the most characteristic features of manufacturing techniques during the Mughal period. He highlights that they did not know the use of coal, had no proper cast-iron, were unfamiliar with the techniques of deep mining and their

chemical industry was primitive. Besides, he adds that there was no inclination to replace copylist by printing press and the shortcomings in fuel resources, metallurgy and chemical industries blocked any prospect of wide-ranging technological development. According to him, it seems that despite the internal cultural life of the Mughal Empire, the overall picture related to technology was not one of any distant announcement of an industrial revolution. In this respect, Habib (1995a) is less critical, although he highlighted the lack of development of mining engineering as a critical factor for energy and industrial development. The delay in introducing and diffusing metal, particularly iron, to replace other materials was also an important element. In general terms, the labor-based techniques seem to prevail to more complex technologies. However, this does not imply a lower specialization, because artisans were quite specialized.

The maximum expansion of the Mughal Empire was reached in 1707 with Aurangzeb. Aurangzeb is considered a more conservative Emperor particularly in religious terms. He changed Mughals' tradition of religious tolerance, established by Akbar, to a more intolerant policy. Furthermore, he initiated expansionist campaigns in western India against the two autonomous states of Bijapur and Golconda and against the Marathas at the south. Instead of allowing the Deccan sultanates to remain as buffer states against the threat of the Marathas, Aurangzeb chose to take them over and confront the Marathas directly. This geopolitical error can be traced to his fanatical Sunni orthodoxy, which could not tolerate the Shia faith of the Deccan rulers.

Figure 7 - Mughal Empire 1530 - 1707

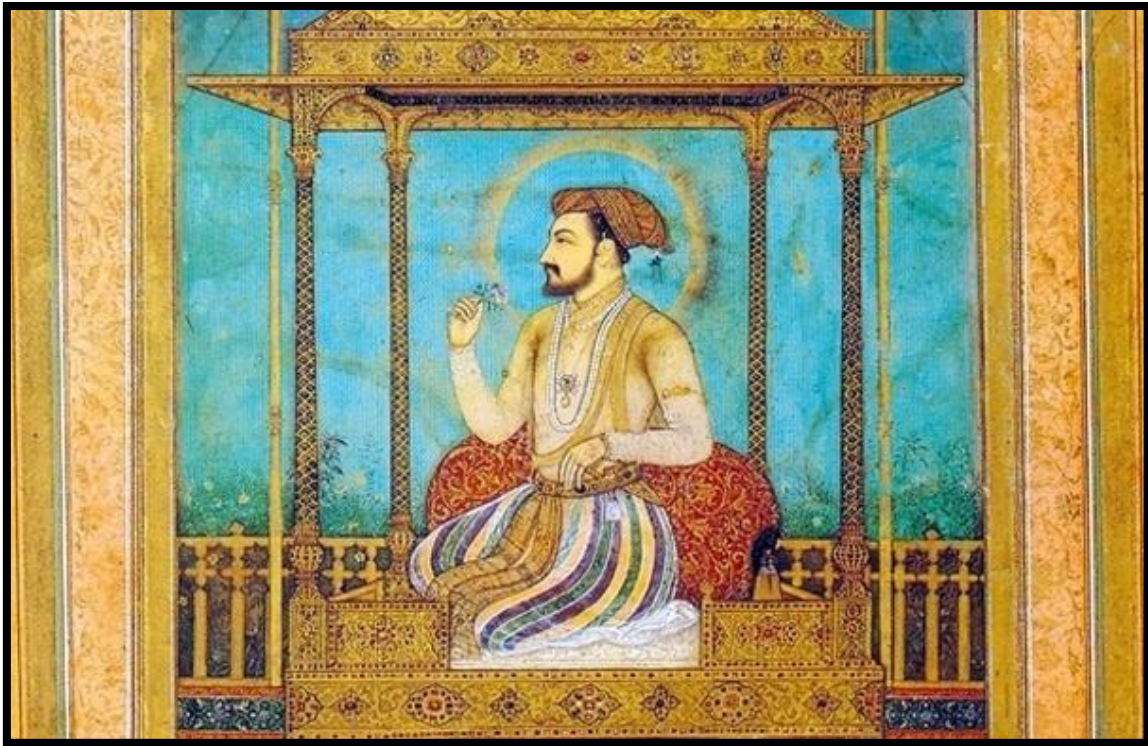


Source: elaborated by Rosaura Flynn based on mapsofindia.

Any attempt to understand the British penetration in the Indian subcontinent should be understood in the context of the Mughal downfall. As stated by Dalrymple (2015):

“The rapid rise of the East India Company was made possible by the catastrophically rapid decline of the Mughals during the 18th century. As late as 1739, when Clive was only 14 years old, the Mughals still ruled a vast Empire that stretched from Kabul to Madras. But in that year, the Persian adventurer Nadir Shah descended the Khyber Pass with 150,000 of his cavalry and defeated a Mughal army... Three months later, Nadir Shah returned to Persia carrying the pick of the treasures the Mughal Empire had amassed in its 200 years of conquest: a caravan of riches that included Shah Jahan’s magnificent peacock throne, the Koh-i-Noor, the largest diamond in the world, as well as its “sister”, the Darya Nur, and “700 elephants, 4,000 camels and 12,000 horses carrying wagons all laden with gold, silver and precious stones”, worth an estimated £87.5m in the currency of the time...”

Figure 8 - Shah Jahan with Peacock Throne and Koh-i-Noor



Source: <http://i.indiaopines.com/author/akanksha-pattanaik/>

The causes of the Mughal decline are still discussed. Some scholars such as Clingingsmith and Williamson (2008) suggest that the Persian victory happened in a context in which the Mughals suffered from an agricultural crisis, caused by climatic adversity, related to the 'bad' Monsoons. The raising on the crops and rice prices contributed to the Mughal collapse. Others focus directly on the figure of Aurangzeb and his expansionist policy. We understand, in line with Metcalf and Metcalf (2013), Raychaudhury (1982) and others that the 'Imperial overstretch', as called by Findlay and O'Rourke (2007), is closely related to the dynamic of power and wealth accumulation of the Mughal Empire. A limitation in the resources, caused by a long military opposition or territorial overexpansion, perhaps aggravated by a drought, could explain the collapse. The increasing warfare expenditure of the second half of the seventeenth century resulted in the fragmentation of the Mughal control power over the different local leaders, regions, and states.

Metcalf and Metcalf (2013) identified three fracture lines during the Mughal fragmentation: the zamindars, the peripheral Princess, and the state governors. The zamindars, as said, were landlords and also acted as local rulers. They had increased their power during the seventeenth century and many of them had entered into the Mughal ruling scheme. However, after Aurangzeb's death, all over the north and central India, different zamindars

upraised as a constant challenge to the Mughal rule. The Princesses were being accepted by the Mughal as part of their networks of alliances. The Rajputs can be considered one of these groups. They also upraised in the eighteenth century. Finally, the governors were nominated by the emperor as local administrators and they gained quite an autonomy. As independent rulers, they started to decline sending revenues to Delhi. Raychaudhury (1983, p. 3), referring to the Mughals fragmentation, says:

“By the middle years of the eighteenth century the Empire lay in ruins, its once vast possessions reduced to 'roughly a rectangular wedge of territory about 250 miles from north to south and 100 miles broad'. The imperial governors did not formally deny their allegiance to Delhi, but one after another they had asserted their autonomy: the Nizam-ul-Mulk in the Deccan in 1724..., the eastern provinces of Bengal, Bihar, and Orissa in about 1740; Gujarat and Sind in 1750, Oudh in 1754. Independent Pathan dynasties ruled in Farrukhabad and Rohilkhand within striking distance of the capital. The Rajput alliance destroyed by Aurangzeb's wars was never completely restored. In the far south, the former Hindu kingdom of Mysore was to grow powerful under the adventurer Haidar Ali. The southernmost parts were divided up into a number of small principalities. ”

It is in this context of fragmentation that occurred, during the first half of the eighteenth century, different uprisings all around India and the emergence of new and not-so-new local power. For instance, in Hyderabad, there was the Nizan emergence in 1723 that defeated Mubariz Khan, the local Mughal administrator. The re-emergence of Marathas, in the central part of the subcontinent, the Sikhs at Punjab, Jats and Afghan kingdoms at the north, and the Mysore and Tipu Sultan at the South were part of this fragmentation process.

2.3. From Plassey (1757) to the end of the BEIC Monopoly (1813): the BEIC territorial penetration, military fiscalism, and textile exports

Plassey, the local opportunity in a broad mission of conquest. The drivers of the expansion of the BEIC into the Indian subcontinent are still discussed. Some authors such as Marshall (1968) stressed that the growth of a territorial Empire in India was neither planned nor directed from Britain, but it was the initiative of the company officials operating in India. However, as suggested by Bandyopadhyay (2004), Hejeebu (2015) and many others, a more accurate picture can be obtained if we understand the BEIC penetration as process drove both by factors at the level of Indian Ocean ecosystem and also at Europe. In this way, the BEIC officials responded to the specific Indian Ocean 'opportunities' although in a general

framework of expansion that was stimulated from Britain, even with internal political conflicts and subject to the specific political situations.

In Europe, the course of the eighteenth century changed the political conditions and pushed Portugal and Holland to back seats: only France and England remained in the contest at the Indic (Panikkar, 1953). According to Findlay and O'Rourke (2007) over the course of the long eighteenth century, defined as the period from 1689 to 1815, no fewer than 64 years out of a total of 126 involved war between Britain and France. Although much of the fighting was on the European mainland, the wars were worldwide in scope and extent, including North America, the West Indies, and the Indian subcontinent. In Britain, military spending as a percentage of total expenditure averaged about 70% in the nine and seven year wars with the French. As a percentage of national income, it rose from 9% in 1710 to 14% in 1760 (Findlay and O'Rourke, 2007).

In the Indian subcontinent, after reorganization in the 1720s, the French Company developed Pondicherry at the south-east. The trade with India flourished between 1728 and 1740: the volume of trade increased from £89,000 to £880,000. However, this was still only half the British figure (Findlay and O'Rourke, 2007). Paradoxically, the French were the last European company in arriving at the Indian subcontinent, but they were the first in conceiving the project of territorial penetration. It was Joseph Francois Dupleix, the leader of the French company, who analyzed that in the middle of the eighteenth century the Indian Subcontinent was vulnerable to be taken over by any leading European power. This would be at the low price of a small but well-trained army of native troops, led by European officers and a few regulars using modern artillery and armaments and supplemented by skillful diplomacy to deepen the local fragmentation.

In this context, as explained by Hejeebu (2015), despite the peace treaty signed by France and England in 1748 they remained in a state of continuous conflict through 1756, when the Seven Years War began. The directors of the Companies knew about the devastation that the Anglo-French war would impose on the Indian trade. With episodic military and naval support from the British Government, the BEIC directors worked to find their settlements abroad while averting a liquidity crisis at home. The Company's response to the Seven Years War would change the whole enterprise dynamic.

As detailed by Bandyopadhyay (2004), Bengal's represented 60% of English imports from Asia in the mid-eighteenth century. As said before, in 1690 Aurangzeb granted the BEIC the right to duty-free trade in Bengal in return for an annual payment of 3,000 rupees. In 1696

the BEIC built a fortification in Calcutta and they were granted with the landowner rights in three villages: Kolkata, Sutanuti, and Gobindapur. However, after the death of Aurangzeb in 1707 the situation became unstable again for the BEIC. Although in 1717 the new Emperor Farruksiyar assured the BEIC duty-free trade and allowed them to rent thirty-eight villages around Calcutta, the new autonomous ruler of Bengal, Murshid Quli Khan, refused to extend the duty-free permission. The conflict between the BEIC and the Bengal Nawab³⁸ was opened.

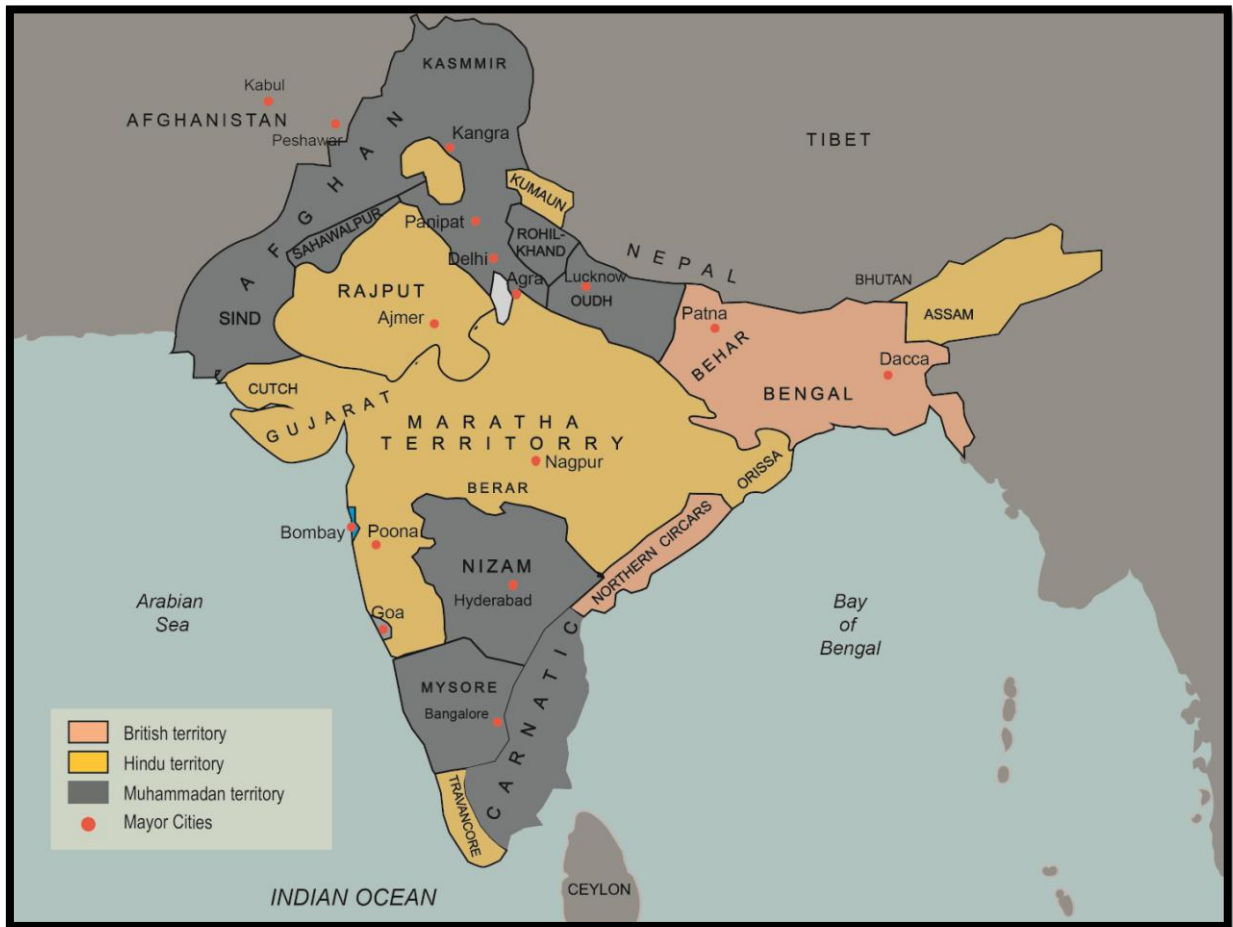
Furthermore, the French victories in South India made the English felt insecure about a possible alliance between them and the Nawab of Bengal. In 1755 the BEIC began renovating its fortification at Calcutta without permission, giving protection to fugitives from the nawab's court too. In 1756 Siraj-ud-daula became nawab, stopped the British duty-free treatment and took over the English factory of Kasimbazar. The crisis made Robert Clive arrived from Madras with a strong military force. According to Bandyopadhyay (2004, p 43):

“...Clive decided on a coup d'état. The confident servants of the Company in Calcutta were not prepared to tolerate a young tyrannical nawab threatening to destroy their trading privileges... There was already a disaffected faction at the nawab's court, consisting of merchants, bankers, financiers and powerful zamindars, like the Jagat Seth brothers... who felt threatened by the assertion of independence by a young nawab enthusiastically trying to reorder the balance of power in his court. There was also a natural communion of interests between the Indian mercantile community and the European traders, as many of the Indian merchants were operating in collaboration with the English Company and private traders...”

Indeed, the battle of Plassey was part of a collision of interests that ended in the conspiracy to replace Siraj with Mir Jafar, his commander in chief. The local partnership was a key element for the British penetration in Bengal. In June 1757 Siraj was defeated by Clive with the largest contingent of the nawab army remaining inactive. The new Nawab of Bengal, Mir Jafar, became a puppet in the hands of the English (Bandyopadhyay, 2004). As stated by Dalrymple (2015), within a few years, 250 company clerks backed by the military force of 20,000 locally recruited Indian soldiers became the effective rulers of Bengal.

³⁸ A Nawab was a native local governor, during the time of the Mughal Empire.

Figure 9 - India, 1765 (post-Plassey)



Raychaudhuri (1983)

Territorial expansion, fiscal militarism, and war at land. After the battle, it came to the 'Plassey plunder' as indemnity payments for the destruction of the properties in Calcutta: the English army and navy received £270,000 for distribution, the BEIC received from Mir Jafar 22,5 million of rupees and Clive himself got £34,567 (Bandyopadhyay, 2004, Chaudhury, 1983). But more important were the changes in the structure of trade and bullion (even more after the assumption of the Dewani of Bengal in 1765 as we will see). Private trade, both from Company's officials and private merchants boomed. Bullion imports from Britain, that used to be between £700 mil and 1 million before 1747, stopped and bullion was exported from Bengal to China and other ports of India to finance British imports. For Chaudhury (1983) the period between 1765 and 1786 was a booming period of private trade by the BEIC servants, which rose the alarm of the British parliament, that gradually started introducing different types of controls to the BEIC officials and servants.

In some decades, the Bengal's export of raw cotton to China would come to be central to the BEIC entire system for remitting money from India to Britain through Canton and its expanding tea trade with London. This solved one of the Company's primary annual objectives that was the regular provision of the substantial liquid funds. Large quantities of tea were exported from Canton to Britain, Europe, and the Atlantic world. Raw cotton and illegal shipments of opium from Bengal would help the BEIC to generate funds in the first half of the nineteenth century. Thus, controlling Bengal trade and trade taxes allowed the BEIC to endogenously finance its military expansion reducing its dependency on British investors and, indirectly, of the Crown³⁹.

In the Indian subcontinent, at the end of the eighteenth century, three main local powers faced the Company: 1) the Maratha Empire covering the west and central parts of India, 2) the Nizam of Hyderabad, whose territories covered the tablelands of the Deccan, and 2) the Tipu Sultan, who ruled over Mysore in the south. The Marathas had established a powerful Empire centrally controlled from Poona. According to Dalrymple (2015), the Marathas constituted the only indigenous dynamic political force in India. However, a new period of furious territorial expansion of the BEIC started since Plassey. It is interesting to highlight that the European had been trading with the Indian Subcontinent through the Atlantic for two centuries and a half, the BEIC for more than one century and a half; however, there was not any territorial penetration during this period, but in half a century they conquered a good portion of the subcontinent. As stressed by Dalrymple (2015), the BEIC:

“...using its rapidly growing security force -its army had grown to 260,000 men by 1803- it swiftly subdued and seized an entire subcontinent. Astonishingly, this took less than half a century. The first serious territorial conquests began in Bengal in 1756; 47 years later, the company's reach extended as far north as the Mughal capital of Delhi, and almost all of India south of that city was by then effectively ruled...”.

³⁹ The relationship between the EIC and the Crown is a subject in itself, although these words of Dalrymple (2015) give a good idea of them: “When it suited, the EIC made much of its legal separation from the government. It argued forcefully, and successfully, that the document signed by Shah Alam – known as the Diwani – was the legal property of the company, not the Crown, even though the government had spent a massive sum on naval and military operations protecting the EIC's Indian acquisitions. But the Members of Parliament (MP) who voted to uphold this legal distinction were not exactly neutral: nearly a quarter of them held company stock, which would have plummeted in value had the Crown taken over. For the same reason, the need to protect the company from foreign competition became a major aim of British foreign policy.”

Lead by Robert Clive, the main battles and expansion agreements with local power were the battle of Buxar (1764), the final victory over the Tipu Sultan (1799), the agreement of de Bassein (1802), by which they take over Pune, and consequently Delhi (1803), and the victory over the Marathas, by which they dominated the center and south India (1817). Buxar was the first strong battle where the British realized that their army, with a unitary European command and discipline and well-paid sepoys⁴⁰ could defeat the Indian forces with relative ease. In Buxar, they defeated the alliance of three local leaders, Mir Kasim, who had fled from Bengal, the Mughal Emperor Shah Alam II and Shuja-ud-daula of Awadh. As a result of BEIC victory, the Treaty of Allahabad was signed, by which the BEIC received the right to collect revenue (dewani) from Bengal, Bihar, and Orissa. In return, the Company would pay an annual tribute of £260,000.

⁴⁰ A sepoy, from sipahi, was an Indian infantryman employed by the armies of the BEIC.

**Figure 10 - Shah 'Alam conveying the grant of the *Dewani* to Lord Clive, August 1765.
Oil painting, Benjamin West, c.1818**



Source: British Museum.

In relation to the territorial expansion, to the South, the Tipu Sultan from Mysore was a main opponent to the BEIC, as stated by Baber (1992, p. 126):

“The armies of Haider Ali and Tipu Sultan represented real and sustained threats to further expansion of the Company's power. These threats came in a series of military encounters between the army of the EIC and those of Haidar Ali and, later, his son and successor Tipu. Haider Ali, the ruler of Mysore, had already attracted the attention of the British due to his stands against them in the 1770s and 1780s in which he had not been subdued. In fact, for a number of years, Haider Ali and Tipu Sultan had posed serious threats for the expansion and consolidation of British colonial rule in India. After failing in their campaign against Haider Ali, the British targeted Tipu, who became the object of military encounters and well-orchestrated ideological and propaganda campaigns in Britain.”

There were four rounds of battle, in 1767-69, 1780-84, 1790-92 and 1799. These wars also involved the Marathas, the biggest power in extension after the Mughal downfall, who fought in some battles for the British and in some for the Tipu Sultan and the French that supported Tipu from Pondicherry. The English finally took Mysore in 1800.

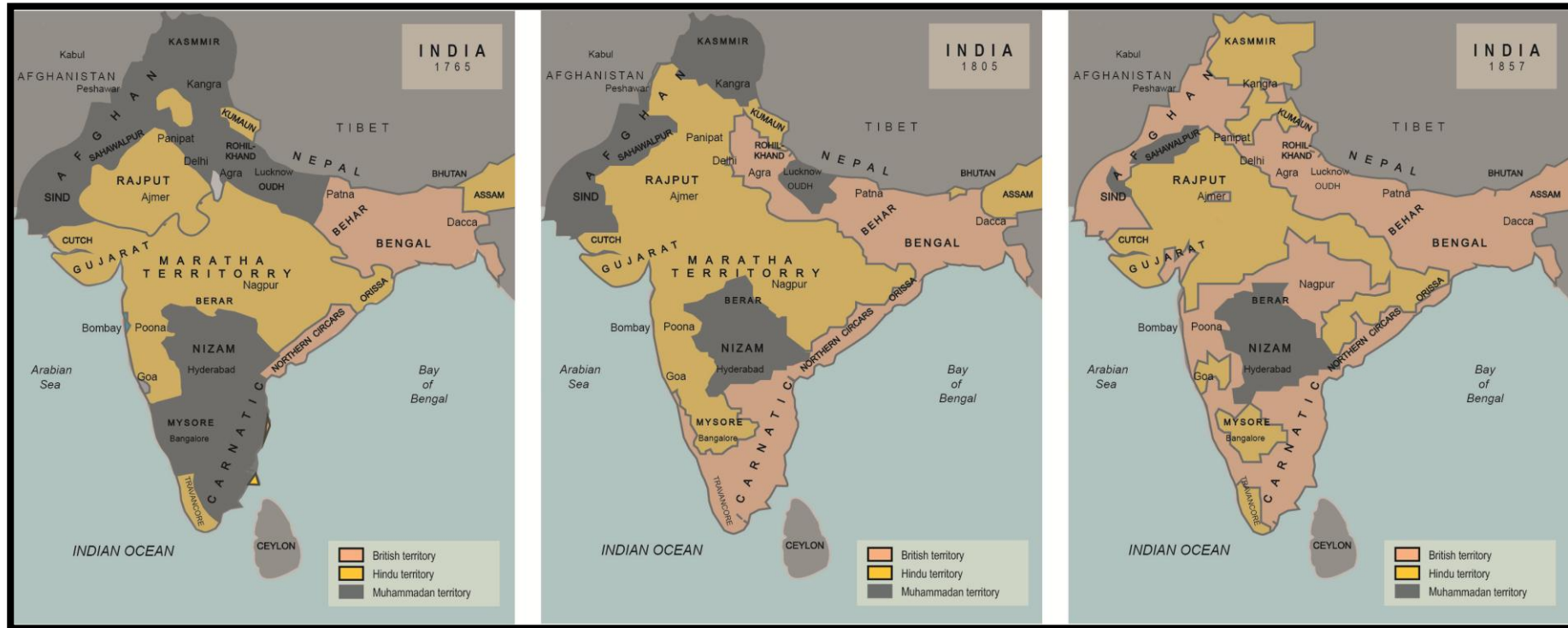
With the Marathas, the BEIC disputed three wars, the third between 1817-1819. They did not completely defeat them but they lost much of their territories, extending the power of the BEIC to the southern territories of Vindhya. The expansion to the North involved disputes who ended with a treaty obtaining Awadh. The other adversary in the North were the Singh from Punjab, the English took advantage of internal divisions and disputes and declared the war in 1845. They signed a humiliating treaty in 1846, resulting in the annexation of Jalan-dhar Doab, Kashmir was given to the Raja Ghulab Sing Dogra of Jammu, an English ally, and Dalip Singh retained his throne, but was to be guided by an English Resident. The final annexation of Punjab was in 1849.

The expansion to the south included the disputes with the French forces. A first Carnatic war occurred in 1740 in Madras, where the English were all with the Nawab, but the end of hostilities in Europe after the treaty of Aix-La-Chappelle left the Indian conflict standby. A second Carnatic war was in 1752, in the context of succession disputes between the local power, the French, and the British supported opposite candidates. Clive won, occupied Arcot, and placed Muhammad Ali in the throne of Carnatic. The third Carnatic war happened in the outbreak of the Seven Years' war. In 1761 Pondicherry capitulated and the last French forts in Carnatic fell in the same year. As said, all these wars include alliances with local powers, such as the Tipu, Mysore or the Carnatic Nawab.

With Bengal conquest, the British had much more financing than the French at the Indian Ocean: Bengal's volume of trade was four times more than Pondicherry's one. In Bengal, the financing came both from trade and from revenue collection. As said by Metcalf and Metcalf (2013), with this broad 'fiscal base' the English could pay for the sepoy army, which was basically a mercenary army. The British expansion could not be understood without this relation between fiscal militarism and the sepoy army. The relationship between Indian and British at the army was around 1 to 10. In a similar vein that in the Mughal Empire, the British fiscal militarism obliged the BEIC to expand for new territories in order to obtain more resources. Since the eighteenth century, it was not only by trade that the BEIC was financed, gradually, land revenue started to be a new source of financing.

Fiscal militarism gave territorial dividends. The military-territorial expansion of the BEIC can be observed in the next maps:

Figure 11 - Expansion of the BEIC in the Indian subcontinent: 1765, 1805, 1857



Source: elaborated by Rosaura Flynn

Of course, the evolution of the Company's army was closely connected with its own development. As explained by Kolff (1990), the tradition of recruiting peasant armies had been developing in north India since the sixteenth century, confirming a "military labor market". From the European powers, the French were the first to recruit sepoys, in 1721. Then, Clive started with this policy in the BEIC. The sepoys were trained and disciplined according to European military standards and commanded by European officers at the battlefield. According to Bandyopadhyay (2004) the sepoys rose from 82,000 in 1794, to 154,000 in 1824, to 214,000 in 1856. In the first period, the recruitment process was focus mainly on upper cast Brahman and Rajput landed peasants from Awadh and Bihar. Then the selection was broader to lower casts. Gurka soldiers were recruited since 1815 from Nepal. The martial tradition and European training made the Gurkhas the most trusted soldiers of the British army.

With respect to the military technology 'at land', as discussed by Hoffman (2015), we could not say that the Indian subcontinent was not accustomed to war. In fact, the downfall of the Mughal Empire gave place to different internal warfare competitions during the eighteenth century. So, what explains the BEIC extraordinary penetration in the Indian subcontinent? According to Qaisar (1982) the Mughals quickly accepted the European pistols and muskets, importing gunsmiths and artillerymen to manufacture their weapons, although Indian gunpower was inferior to the European one and it was increasingly imported. At the same time, Rothermund (1988, p. 17) says:

“...all weapons the company used were well known to Indian rulers... Better organization and discipline were the only secrets of the company's success... The daring cavalry dashed ahead, the artillery was left behind and often fired only some desultory shots in order to show its presence... The straggling infantry, ill-trained and ill-equipped, was often more of a nuisance than of use in the decisive battle. Moreover, Indian rulers and generals were not good at financing wars: they might win a battle, but then proved to be unable to pay their troops... they (the BEIC) did not invest much in cavalry and artillery, but rather relied on a well-trained infantry, which was regularly paid and drilled and could mow down the Indian cavalry by shooting with machine-like precision. The military feudal man on horseback was a valiant fighter, but he was an individualist at heart who looked for his counterpart on the other side with whom he could engage in a duel worthy of a warrior. ”

Although his words are quite impressionistic and could have a 'European bias', he gives some interesting clues about the BEIC superiority: 1) military organization, 2) financing and 3) cavalry versus infantry. Metcalf and Metcalf (2013) also stress the importance of

military organization as the BEIC competitive advantage⁴¹. We can infer that the military training and organization of the BEIC officials, complemented with the numerous and well-paid sepoys, were more effective on the battlefield. With respect to the financing, we have already highlighted that it was crucial at sea war. And most of the authors highlight that it was also important to land. First, as explained, Bengal's fiscal militarism was a key advantage. Then, as explained by Hoffman (2015), the BEIC had much less fix cost than the local powers, and this was an advantage. The BEIC did not have to maintain a court, an Empire or any other bureaucratic structure apart from the sepoy army. This model was very flexible, it enlarged when it had to fight, but it did not create a noble structure, at least in the first period. Furthermore, the financing from Britain also contributed, as said by Dalrymple (2015):

“...perhaps most crucial (reason for the BEIC triumph) was the support that the East India Company enjoyed from the British parliament. The relationship between them grew steadily more symbiotic throughout the 18th century. Returned nabobs like Clive used their wealth to buy both MPs and parliamentary seats – the famous Rotten Boroughs. In turn, parliament backed the company with state power: the ships and soldiers that were needed when the French and British East India Companies trained their guns on each other.”

Dalrymple (2015) also highlighted the importance of the financing of the Bank of England:

“On 15 July 1772, the directors of the East India Company applied to the Bank of England for a loan of £400,000. A fortnight later, they returned, asking for an additional £300,000. The bank raised only £200,000. By August, the directors were whispering to the government that they would actually need an unprecedented sum of a further £1m... the East India Company really was too big to fail. So it was that in 1773, the world's first aggressive multinational corporation was saved by history's first mega-bailout – the first example of a nation-state extracting, as its price for saving a failing corporation, the right to regulate and severely rein it in.”

Third, as we have seen, Mughal's style of war was horsemen-based, a typical style of war for plunder or pillage. But the British war-technology was different, it was based in well trained infantry. It seems that in this clash of styles, the British 'software' succeed. Besides, the system of local alliances designed mainly by Clive also played an important role both for

⁴¹ With respect to the military technology, it is useful to have in mind Hoffman (2015, p. 7) words with respect to the broad understanding of military technology: “The technology here encompasses a lot... because it has to embrace everything that made victory more likely, from weapons to training and administration. Leaving part of the technology out in order to focus on the weapons alone would be a bit like trying to analyze the impact of computers by considering only the hardware and ignoring software and the Internet. As with computers, all the various parts of the gunpowder technology played a role in the European conquest, and they complemented one another and were continuously changing over time”.

the expansion and for the conservation of the territories. According to Metcalf and Metcalf (2013), this network of alliances was developed in Arcot, Awadh, and Haiderabad. The BEIC offered protection for external powers to the different nawabs but they made available their troops to the British. In doing so, both forces reduce fixed cost of war and, for the British, these alliances function as 'buffer States' inside the Indian subcontinent.

Deindustrialization? Deindustrialization is a main issue in the Indian economic history and in the great divergence debate. We will deepen on it in the next section. For now, we would like to present only some partial figures about the Indian external insertion in relation to textiles, in order to show how the situation was at the end of the eighteenth century. According to Chaudhury (1983), between 1780 and 1790, there still existed a sharp trade surplus in favor of India in relation to the commerce with Europe. Exports annual average from India reached £7.331.569 and imports £2.393.610. 27% of the Europe imports from India were directly controlled by the BEIC. But English private traders licensed by BEIC, with around 6%, clandestine trade under the British flag, with 27%, and the other Imperial companies, that totalized 38%, were also quite involved in Europe imports. It is interesting to note that these companies also worked for the BEIC, trading in the rest of Europe as subcontractors and functioning as a way to channel remittance of the BEIC Directors and officials.

Chart 1 - Trade between India and Europe, estimated annual average, 1780-90

	Imports to India		Exports from India	
	(£)	(%)	(£)	(%)
Foreign Companies:				
Dutch, French, Danish, Portuguese	992,64	41.5	2,757,763	37.6
Clandestine trade:				
English trade under foreign flags	615,3	25.7	2,000,000	27.3
English private trade:				
Licensed by the East India Company	439,6	18.4	403,565	5.5
East India Company	346,07	14.4	1,962,095	26.8
Privilege goods shipped on the Company's ships			208,146	2.8
Total	2.393.610	100.0	7,331,569	100.0

Source: Chaudhury (1983)

If we analyze the composition of the exports from Bengal between 1795 and 1805 we can see that piece goods, raw silk, opium, and cotton have a continuous increased. In the case of piece goods, the more 'industrialized', the pick is reached in 1802, doubling the amount of

1795. It is true that these exports, since the second half of the XVIII century, were growingly re-exported to other European countries from Britain (the import substitution process was also having a place in Britain!), however, as states by Chaudhury (1983, p. 806):

“...the far more important characteristic of the half a century following the revolution of 1757 was the fact that Indian trade still continued to flow along the traditional channels and its composition was based on an exchange of fine textiles, foodstuffs, and other raw materials for precious metals and certain manufactured products.”

In relation to the balance of payments, according to Chaudhury (1983), the total export surplus after deductions was of 16,5 million rupees between 1813-4 and 1820-1. Of this sum, 5,7 million rupees were service payments (insurance, freight, etc.) and the remaining 10,7 million rupees can be taken as an average of private remittance of capital from Bengal, exclusive of the BEIC.

We then could conclude that until the beginning of XIX century, India was not only surplus at trade with Europe, what is more, among exports, piece goods were growing. In fact, the BEIC Directors were much more worried in sending remittance to Britain⁴² than in the import substitution process and the industrial interests that were growing in England. The transition from a naval-commercial business model to this military-territorial-commercial power seems to have been pushed by the profit-opportunities with independence from the industrial interests and lobby that was growing in Manchester and Lancaster.

⁴² According to estimations made by Cuenca Esteban (2001) between 1784 and 1792 the BEIC transferred net financial transfers from India to Britain reached a peak of £1,014,000 annually. Indian textiles were an important money-good to repatriate wealth accumulated in India to England.

Chart 2 - Exports from Bengal to Europe between 1795 and 1805. In Rupees.

	Piecegoods	Indigo	Sugar	Raw Silk	Grain	Opium	Cotton	Treasure	Sundry articles	Imports re-exported
1795-6	94,83,284	62,51,424	8,20,186	5,81,183	9,11,365	13,08,360	1,47,211	-	5,49,062	3,98,056
1796-7	74,26,752	32,33,797	11,57,715	3,40,975	8,87,630	13,31,255	1,38,870	-	3,55,018	4,85,185
1797-8	57,48,617	54,59,844	8,46,752	6,12,253	5,57,401	10,77,961	1,07,711	-	3,91,172	2,79,018
1798-9	57,74,057	23,79,629	14,01,646	6,67,300	8,79,713	12,55,579	4,27,053	-	6,37,467	4,52,484
Total 4 years	284,32,710	173,24,694	42,26,299	22,01,711	32,36,109	49,73,155	8,20,845	-	19,32,719	16,14,743
1799-1800	120,01,199	35,53,949	23,89,691	14,33,751	12,49,274	28,80,593	-	-	9,42,599	11,35,383
1800-1	141,67,106	39,88,293	10,00,099	10,51,957	14,21,940	34,52,432	-	-	10,40,059	18,93,006
1801-2	165,91,309	38,48,139	12,01,798	13,65,882	22,59,618	27,51,515	-	2,31,406	11,17,435	19,67,068
1802-3	185,94,676	29,73,754	10,81,544	16,38,467	25,44,676	39,43,951	-	15,67,039	18,79,165	21,52,171
1803-4	161,69,478	44,69,930	10,71,366	19,10,398	32,67,196	41,88,225	23,13,185	2,51,008	9,18,685	11,32,854
Total 5 years	775,23,678	188,34,065	67,44,498	74,00,455	107,42,704	172,17,116	23,13,185	20,49,453	58,97,943	82,80,542
1804-5	110,85,509	64,77,041	18,20,446	33,82,000	28,89,913	64,12,283	19,41,507	1,29,516	-	9,68,497
1805-6	128,49,670	52,21,609	33,24,168	30,86,491	24,60,716	58,66,888	30,44,544	-	-	7,10,405

Source: Chaudhury (2008)

However, according to Bairoch (1982), the Indian subcontinent shared in the world manufacturing output went from 24,5% to 19,7%, between 1750 and 1800. India was starting her relative diminishing in the global manufacture output. A much more broad process, the Industrial Revolution was having a place.

2.4. 1813-1850s: deindustrialization (and de-urbanization)

Structural change. In context of colonies, Roy (2000) defines deindustrialization as the process in which: a) the traditional industries decline in the colonies, b) the decline is initiated by a technological decline in domestic economy, c) it is sustained by colonial policies and d) the development of modern industries do not compensate the fell down of traditional ones. Kaldor (1978) defines deindustrialization as a continuous declining share of a country in the global trade of manufactures, consequently, with deterioration in its balance of trade in manufacturing (Ray, 2016).

There are several methodological, interpretative and empirical debates about Indian deindustrialization⁴³. For Clingingsmith and Williamson (2008), India deindustrialized between 1750 and 1860, with two sub-periods, between 1750 and 1810 and between 1810 and 1860. They sustain that in the first period, the rise in grain prices deteriorate the Indian competitiveness and, in the second period, the effects of the industrial revolution were the main drivers of the deindustrialization process. According to Bairoch (1982) figures, the Indian relative participation in the world manufacturing output went from 24,5% in 1750 to 19,7% in 1800, to 17,6% in 1830 and to 2,8% in 1880. So, the sharper drop in the relative participation was between 1800 and 1880. Also in a more long-term data, Clinginsmith and Williamson (2008) based on Bagchi (1976) show that the population dependent on industry in the Gangetic Bihar, one of the most populated areas of the Indian subcontinent, went from 28,5% or 21,6% in 1809-1813 (depending on the methodology applied) to 8,5% in 1901. Also with Bagchi (1976) figures, it can be seen that if we take together the spinners and the

⁴³ The issue of Indian deindustrialization has his genesis in Marx (1853). As explained in Ray (2016), for Marx, the agriculture of India was dependent on the government works of infrastructure, mainly in irrigation. The export-oriented textiles were the main manufactured products. In such economy, the decline of manufactures would cause a collapse in whole society. It was in this context when Marx saw the British trade policies as the main cause of Indian downfall: 'England began with driving the Indian cottons from the European market, it then introduced twist into Hindostan, and in the end inundated the very mother country of cotton with cottons' (Marx, 1853, quoted in Ray, 2016, p. 54).

weavers participation on the total occupation of the Gangetic Bihar, it went from 12,6% to 1,3% between 1809-1813 and 1901.

Chart 3 - World manufacturing output 1750-1939 (in %).

Year	India	Rest of the		
		China	Periphery	Developed Core
1750	24.5	32.8	15.7	27.0
1800	19.7	33.3	14.7	32.3
1830	17.6	29.8	13.3	39.5
1880	2.8	12.5	5.6	79.1
1913	1.4	3.6	2.5	92.5
1938	2.4	3.1	1.7	92.8

Source: Simmons (1985)

Chart 4 - Population dependent on industry in the Gangetic Bihar (in %)

	1809-1813	1901
Assumption A*	28.5	8.5
Assumption B**	21.6	8.5

Source: Clingingsmith and Williamson (2008) based on Bagchi (1976)

*Each spinner supports only him or herself.

** Each spinner also support another person.

Chart 5 - Population of the Gangetic Bihar dependent on different occupations (in %)

	1809-1813	1901
Spinners	10.3	1.3
Weavers	2.3	
Other Industrial	9.0	7.2
TOTAL	21.6	8.5

Source: Clingingsmith and Williamson (2008) based on Bagchi (1976)

We understand, in line with Kaldor (1979), that we can have a much more accurate picture of the deindustrialization process if we put together the data on industry participation with the data on external trade. Doing so, it seems quite clear that the gross of the Indian deindustrialization process occurred in the first half of the XIX century. In line with the

periodization proposed in Chaudhury (1983), we understand that the end of the BEIC monopoly on Indian trade implicitly symbolized the 'triumph' of the lobby of the British textiles and private merchants and traders, which after a period of internal protection, passed to demand for free trade in the trade with colonies.

If we analyze the Indian trade in Bengal, the main Indian port, as it is shown next, there was a dramatic decrease in the piece goods export participation between 1811-2 and 1814-15 (after the end of the BEIC monopoly): from 33% to 14.3%. What is more, in 1850, the piece goods participation fell to 3.7%: the structural change in the Indian export composition was almost done! In parallel, the raw cotton exports went from over 5% to 20%, from 1811-12 to 1834-35. Sugar and opium participation also gradually grew during this period too. For the whole period, indigo⁴⁴ raw silk, opium⁴⁵ and cotton accounted together for around 60% of the total exports. The rise of the opium trade was mainly directed to China and indigo went to Britain and Europe.

Chart 6 - Indian exports from Bengal by commodity. %. 1811 to 1851

Year	Indigo	Piece goods	Raw			Sugar	Total
			Raw silk	cotton	Opium		
1811-12	18.5	33.0	8.3	4.9	23.8	1.5	90.0
1814-15	20.0	14.3	13.3	8.0	N.A	3.0	58.6
1828-9	27.0	11.0	10.0	15.0	17.0	4.0	84.0
1834-5	15.0	7.0	8.0	21.0	25.0	2.0	78.0
1839-40	26.0	5.0	7.0	20.0	10.0	7.0	75.0
1850-1	10.9	3.8	3.8	19.1	30.1	10.0	77.6

Source: Chaudhury (1983)

If we observe the trade growth of Bengal between 1813 and 1828, the immediate consequence of the end of the BEIC monopoly was a sharp increase. At the same time, we can also see a change in the past period trend, an acceleration of the growth in the imports and a reduction in the export growth rate. Import index grows 77% between 1813 and 1827,

⁴⁴ Indigo's exports growth is mainly explained by the development of the machine textile industry in Britain and Europe and the consequent increasing in the demand for printing cloth.

⁴⁵ Opium was mainly exported from Calcutta and Bombay to Canton (China). The total volume of exports went from around 5,000 chests in 1800 to almost 25,000 in the 1830s.

export index grows only 28%. Bengal's exports reached a peak in 1817-18 and then they started their decline.

Chart 7 - Export & Imports from Bengal. 1813-1827. Million Rupees and Index.

	Exports (million Rs.)			Imports (million Rs.)			Index	
	Merchandise	Treasure	Total	Merchandise	Treasure	Total	Exports	Imports
1813-14	46.4	0.04	46.44	15.8	5.80	21.60	100	100
1814-15	47.3	0.15	47.45	15.6	11.20	26.80	102	99
1815-16	56.4	0.02	56.42	16.5	19.50	36.00	122	104
1816-17	61.2	0.17	61.37	20.6	41.34	61.94	132	130
1817-18	65.1	0.32	65.42	29.7	33.17	62.87	140	188
1818-19	58.3	0.30	58.60	29.7	49.50	79.20	126	188
1819-20	54.3	6.65	60.95	17.5	41.10	58.60	117	111
1820-1	56.8	1.23	58.03	22.5	24.10	46.60	122	142
1821-2	53.6	12.40	66.00	25.9	22.20	48.10	116	163
1822-3	61.9	5.20	67.10	26.9	17.30	44.20	133	170
1823-4	50.5	12.30	62.80	26.2	13.20	39.40	109	166
1824-5	52.6	3.50	56.10	28.7	12.14	40.84	113	182
1825-6	56.6	0.14	56.74	21.5	15.10	36.60	122	136
1826-7	51.2	1.11	52.31	21.8	12.60	34.40	110	138
1827-8	59.5	4.50	64.00	28.0	14.20	42.20	128	177

Source: Chaudhury (1983)

Furthermore, the British cotton textile exports penetration in the Indian market, according to Ellison (1968), gradually increased from 3,9% in 1831-1835 to 58,4% in 1880-81. According to Habib (1988) the exports of cotton goods from the United Kingdom to India increased from 0.8 million yards in 1815 to 45 million yards in 1839. Cotton went from 8 lbs in 1814 to 4.56 million lbs in 1828 and 10.81 million lbs in 1839.

Chart 8 - British cotton textile exports in the Indian market, 1831-35 to 1880-81

	Indian consumption of cotton textiles (m lb)	Share taken by British exports (%)
1831-35	375	3.9
1856-60	455	35.3
1880-81	600	58.4

Source: Ellison (1968)

Now, which were the main causes of this sharp Indian deindustrialization? First, the Indian deindustrialization was part of a much broader and global process that was the British Industrial Revolution. To explain the industrial revolution exceeds our purpose, however, we understand it as a global scale process, which not only includes India (although it was the 'Jewel in the crown'). This process included a mix of transport and energy revolution, exponential increase in the commerce with the colonies, increasing technical change, all that back and stimulated by the evolution of the European War States, mainly materialized in the development of the naval industry. These and other causes produce the British emergence⁴⁶.

That said, with respect to the causes of the Indian deindustrialization, we understand this process as a mix of local and global processes, price and no price mechanisms, technological and institutional drivers and violent and non-violent means. In this sense, trying to find a one-only explanation can lead to never-ending debates. Some liberal authors tend to explain the deindustrialization process as a result of the market forces⁴⁷. For instance, Roy (2002) mainly attributes the deindustrialization process to Britain's productivity gains in textile manufacture and to the world transport revolution. Clingingsmith and Williamson (2008) go in the same line, adding that improves in British productivity, first in cottage production and then in factory goods, led to declining world textile prices, making production in India increasingly uneconomic.

In our view, this 'market forces' are mainly technical achievements of British industry, in a particular geopolitical context. This pushed the introduction of novel sources of energy, with notable improvements in machinery designs, provoking a substantial reduction of unitary

⁴⁶ See Hobsbawm (1999), Findlay and O'Rourke (2007), Freeman and Louça (2002), Allen (2009) among many others.

⁴⁷ Among others, this explanation was sustained by Morris (1963), Rothermund (1988) and more recently by Williamson (2008).

costs of production which were translated to its international terms or trade. As shown in the next chart, the productivity of labor in spinning 80s yarn in England sharply increased in the last three decades of the eighteenth century, going from 2,000 operative hours to process 100lb of cotton to 135 hours.

Chart 9 - Best-practice labour productivity in spinning 80s yarn in England, 1780-1825 (operative hours to process 100 lb of cotton)

Year	Technology	OHP
1780	Crompton's mule	2.000
1790	100 spindle mule	1.000
1795	Power-assisted mule	300
1825	Roberts' automatic mule	135

Source: Broadberry and Gupta (2005)

By this means, England increased its share of the international market, essentially in the market for cotton textiles. The total amount of British cotton goods exports jumped from 1794-1796 to 1804-1806, from 15.6% of total British exports to 42.3% (Findlay and O'Rourke, 2007). In parallel, 'terms of trade' also dropped. According to Clingingsmith and Williamson (2008), between 1801/1810 and 1841/1850, the British terms of trade experienced a drop of 40%!

Indeed, the beginning of the process that ended with the breaking transformations of the British textile industry pushing the industrial revolution should be interpreted rather as an Import Substitution Policy promoted by the local textile manufacturers menaced by import competition than a pure 'market process'. Since the eighteenth century, the Navigation Acts, which restricted the use of foreign ships for trade between every country except England, and the Calico Acts, which gradually taxed or banned the import of textiles from India, should be understood as an emergent of this protectionist displeasure and the beginning of a period of protection to English national industries, mainly textiles. Indian patterns and designs had quickly become fashionable forcing domestic textile producers to react both by lobbying for protection and imitating through printing on wool, linen, and calico. However, no attempt by English producers to imitate Indian labor-intensive production methods were economically viable at British wage rates, as shown in the next chart, the relationship between the weekly earning of cotton operatives between Britain and India, was always superior to 4 to 1 (Broadberry and Gupta, 2005). Energy-intensive techniques were emerging.

Chart 10 - Weekly earnings of cotton operatives in Britain and India, circa 1680- 1820 (s/d)

Year	Lancashire	India	Lancashire as % of India
1680	6s/0d	1s/6d	400
1770	9s/0d	1s/6s	600
1790	13s/3d	2s/0d	663
1820	10s/4d	2s/0d	517

Source: Broadberry and Gupta (2005)

Some Marxian and nationalist authors interpret Indian industrial decline as a consequence of the imperial policies. Between the nationalistic authors, the main expressions are Dutt (1901) and Naoroji (1901). More contemporary, Wallerstein (1986), a neo-Marxist, and Roy (2000), a more liberal scholar, go in this line too. We agree on this. It means, it is a fact that there were non-market forces such as explicit violence and institutional development that express Imperialistic forces. For instance, analyzing the internal causes of the sharp change in the external trade composition, Chaudhury (1983, p. 843) says:

“...the loss of the export market was preceded by a long period of political instability and the attempt by the East India Company to control the activities of weavers, all of which must have contributed to partial dislocation of the industry. However, the first half of the nineteenth century contains many accounts of the severe suffering of unemployed spinners and weavers in Bengal, and there were differences of opinion whether agricultural occupation could provide alternative employment...”. After Plassey, the BEIC merchants gradually imposed their authority to coerce weavers.”

Indeed, both institutional and financing control was also part of this deindustrialization process. In 1765, the Bengal spinners were obliged to sell their goods only to the BEIC. At the same time, the Agency Houses started operating in this period, controlling the financing of the spinners and gradually increasing in the control over the productive process and the commercial flow. Agency Houses were mainly managed by ex-servants of the BEIC. They controlled trade, financing of cotton, indigo, and sugar and the corresponding houses in London collected remittances and supply them with funds. According to Bhagwati and Desai (1970) by 1820s, they also acquired an interest in shipping, extending their commercial interest to Malacca, Java, China, Manila, Mauritius, etc. No doubt, these 'institutional

arrangements' were concrete imperialist institutions that contributed to change the trade pattern.

Tariff policy was another instrument used to promote British manufactured goods. Chaudhury (1983, p. 865) states:

“In Bengal, the rates of duties on exports and imports were fixed at 5 to 10 percent in 1810, and next year the principle of favouring British trade and shipping was introduced by doubling the rates of duty on goods carried by foreign ships. Subsequently, the duty on British imports was reduced to 2.5% percent and metal goods exempted altogether. The decline in the share of continental countries in India's trade after 1814... was almost certainly due to these high preferential duties, and foreign vessels were now excluded from the coastal trade of India through a regulation which stipulated that they should proceed from British Indian ports direct to their own countries. The regulations in force in Bombay and Madras during this period were similar to those in Bengal on the point of giving preference to British goods. ”

The Charter Act of 1813 deprived the BEIC of its monopoly trade between Britain and India, although its monopoly trade with China was left untouched. In 1832 a parliament inquiry was done about the BEIC performance in India. This inquiry gave an account of the English ambient of reform with respect to the BEIC. In 1833 a Charter Act was passed renewing the BEIC role for another 20 years but abolishing the BEIC monopoly of tea trade with China. The BEIC possessions in India were to be held in trust for the British Crown and there was an advance in the institutionalization of India as a formal colony of the Crown. The Charter 1853 renewed the Charter of 1833 but not for twenty years. The BEIC days of territorial expansion over the Indian subcontinent were finishing. After the Indian Mutiny of 1857, which among other things expressed the institutional and functional incapacity of the BEIC to govern a whole subcontinent the BEIC, the British Crown directly assumed the Indian subcontinent rule. The so-called imperialism of free trade was assuming the power (Gallagher and Robinson, 1953).

Figure 12 - Suppression of the Indian Revolt by the English, by Vasily Vereshchagin, 1884⁴⁸



Source: public domain from the internet.

De-urbanization. In parallel to the deindustrialization process, there was a de-urbanization process⁴⁹. Following Habib (1995b) figures, the only Indian eastern city that registered an increased was Calcutta, going from 179,917 in 1821 to 428,328 in 1872. But this increment was more than counterbalanced by the decline registered in the population of almost all major cities: Dacca went from 200,000 in 1800 to 68,595 in 1872, Murshidabad from 165,000 in 1815 to 46,182 and Patna from 312,000 in 1811-12 to 158,900. In the case of Awadh, at the north of the subcontinent, where today is situated Uttar Pradesh, the number of towns of 5,000 people and above was 43 in 1838, but the 1911 census counted no more than 15. The total population of the towns stood at an estimated 374,000 to 385,000 in 1838 and at 186,483 in 1911. It seems clear that urbanization as an indicator of development and capital accumulation was not the case during the Indian nineteenth century.

⁴⁸ This painting was allegedly bought by the British crown and possibly destroyed. It anachronistically depicts the events of 1857, the Indian Mutiny, with soldiers wearing uniforms of the late 19th century.

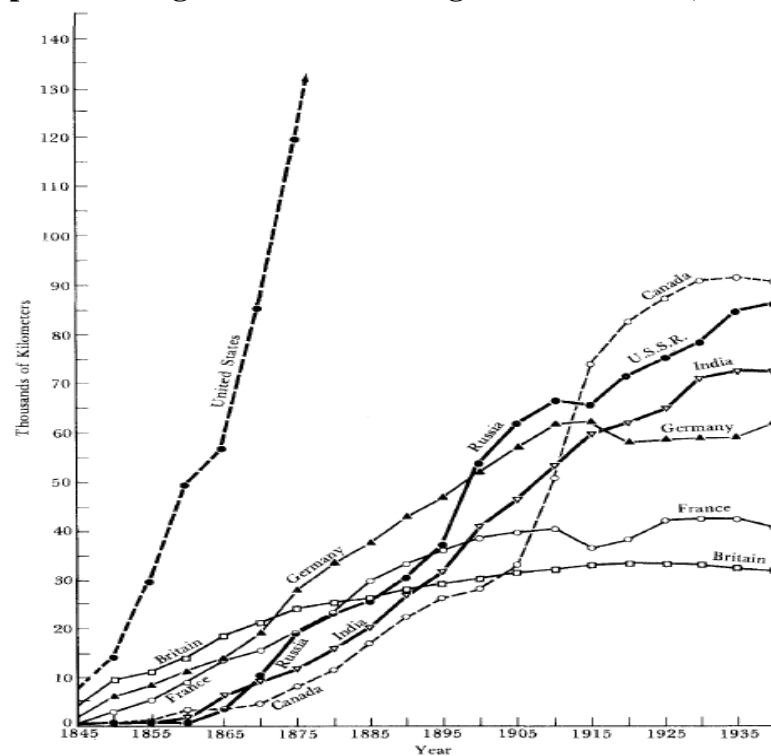
⁴⁹ In a more neutral perspective, Visara and Visara (1983) affirm that the level of urbanization in India has always been very low.

2.5. 1850s-1914: railways, agriculture (and famines) and 'wealth drain'

In this section, I will deal with the three main issues related to the Indian Raj, mainly during the second half of the nineteenth century. During this period the Indian subcontinent was formally assumed as a colony of the British crown. I will mainly focus on three interrelated aspects: the railways' development, the agriculture development and its relationship with famines and the 'wealth drain'. These three interrelated aspects deepened and consolidated the peripherization process that started from Plassey.

Railways. The railway system was largely the main investment (and the main material contribution) made by the British in India. The development started in 1853 and by 1910 it was the fourth-largest railway system in the world (Hurd, 1983). The Indian rail network was the costliest construction project undertaken by any colonial power in any colony. Of the £271 million of British capital exported to India before 1911, around £200 million were invested in railways (Tomlinson, 1979). Given its relevance, there are different works analyzing its development. We will be mainly based on the works that look to understand its functionality to the Raj, the net contribution to the Indian economy and its relation to the peripherization process.

Graphic 1 - Lengths of the seven longest rail networks, 1845-1940



Source: Headrick (1988)

Prior to the railway construction, transportation among the Indian subcontinent was costly and difficult. As said before, the main and cheaper ways of transport were the river shipping mainly concentrated on the Indus and Ganges valleys and the coastal regions (Roy, 2012a; Hurd, 1983). The pressure for the railways' development was installed in Britain by the merchants and industrialists since around the 1840s and, in India, the importance of the railway for military terms was also there.

With respect to the commercial interests, the railways received the support of the cotton manufacturers of Lancashire and Glasgow and their members of Parliament because the cotton industry had been hurt by the American "cotton famine" of 1846. But they were not the only group interested, as stressed by Headrick (1988) there were other influential lobbies such as the London East India houses, the P&O line, the City bankers, the Times, the Economist, railway journals and many hardware manufacturers.

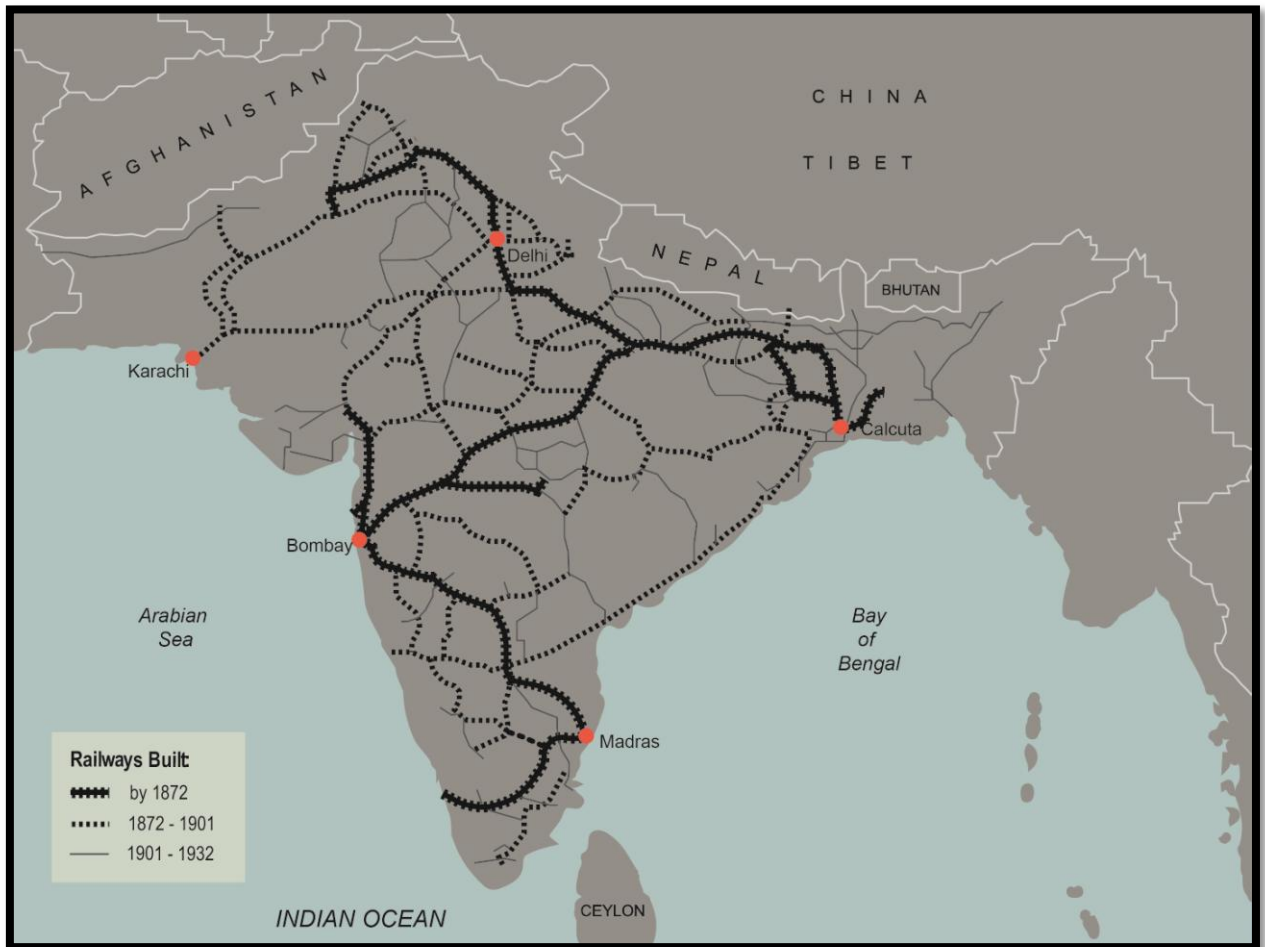
Hurd (1983) highlights that the Raj Viceroy viewed the railways as an instrument for military controlling the population and for defending the frontier. So, different lines and large sums of money were expended to develop lines to strategic points on the frontier. It has to be remembered that the BEIC had tried to invade Afghanistan in 1839 because of the advance of the Russian people in central Asia. In this sense, lines built through cities normally avoided the central business districts and passed through the outskirts in order to be defended from mobs. After the Indian Mutiny of 1857 and with the consolidation of the textile industry in England, the railway construction became an imperial priority.

According to Hurd (1983, p. 739) the construction of rail network lines was quite rapid:

"In 1860 there were 1,349 kilometres, but by 1870 there were 7,678 kilometres, by 1890, 25,495 kilometres, by 1920-1, 56,980 kilometres, and by 1946-7, 65,217 kilometres. The first lines were built inland from the major ports of Bombay (1853), Calcutta (1854), and Madras (1856). By 1867, of India's twenty largest cities (according to the Census of 1872), nineteen were on railway lines, and by 1947 all but a few districts in remote regions were served by railways. The density of rail lines grew from 35 route kilometres per 10,000 square kilometres in 1880 to 159 in 1946-7. Assuming that the sphere of the trading area extended for 32 kilometres on either side of the track, by 1946-7, 78 percent of India's total area fell within the range of the railway system."

As we can see in the map below, the main internal railways' route meant to connect the three Presidency city-ports, Calcutta, Madras and Bombay and to reach Punjab, one of the main agriculture areas and the northern frontiers.

Figure 13 - Major Indian railways lines, 1872-1932



Source: elaborated by Rosaura Flynn based on Headrick (1988)

Until the 1870s, they were private British companies that built the railways. The initial cost was quite expensive, both because of the engineering works related to overcoming rivers and mountains and because of some overprice charged by some companies. They were given a guaranteed 5% dividends, cover by the Indian government (tax to the Indian people, mainly peasants). The companies were given free land with ninety-nine years lease. At any time before that, even a few months before the expiry of the lease, the companies could return the lines to the government and claim full compensation for all the capital. This type of "Private Public Partnerships (PPP)" was described by some authors as an instance of private enterprise at public risk (Bandyopadhyay, 2004)⁵⁰.

⁵⁰ The same argument is used nowadays for instance by Mazzucato (2013) with respect to some infrastructure and high tech product developments.

In 1870 the Indian government began building new lines at a rapid pace too. Despite their lower initial cost, the state lines lost money because the companies had already taken up the most profitable routes between the major cities while the government's lines into frontier areas or into regions of famines. Since the 1880s, most private lines started giving profits over 5%. However, according to Headrick (1988), altogether the government's guarantee payments to the railway companies in their first forty years of operation came to £50 billion.

Railway construction integrated the land and the sea, making possible a reduction in the carriage costs of low-valued high-bulk commodities. Then, steamships connected coastal trade with international trade. The construction planning favored the connection between internal markets and the ports but provided no interconnection between the internal markets cities. The preferential freight charges were less for bulk manufactured goods traveling from the ports to the interior and raw materials from the interior to the ports (Bandyopadhyay, 2004). The total tonnage capacity of ships entering the three major ports of the subcontinent, as said, Bombay, Calcutta, and Madras, was lower than 100.000 in 1800, increased to 1.2 million in 1844 and reached 4.2 million in 1900. The railways were a necessary complement to the agriculture for an external market that was being developed by the Raj. In this sense, Hurd (1983, p. 745) says:

"Much of this increased volume was composed of goods destined for foreign markets or goods being imported into India. The reduction of shipping costs, therefore, must be counted as a major factor in changing India's position in international trade. Railways helped Indian agricultural commodities to become competitive internationally and made possible an enormous expansion in the export of products such as wheat, rice, jute, leather, oilseeds, and cotton. Before railways, only a very small proportion of agricultural output normally was exported, but after railways, substantial amounts of both food and non-food crops began to be shipped overseas as much as 13 percent of the wheat produced and an even greater percentage of non-food crops... Before railways, the sub-continent exported no wheat at all, but by 1886 India was supplying 23 percent of Britain's imports of wheat. In real terms, the value of exports increased 230 percent from 1862..."

The contribution of building national markets in the context of a peripheral insertion in the world market did not imply a direct improvement to the Indian people. The relationship between famines and the railway development is controversial. Some authors sustain that they contributed to the reduction of famines, but many others maintain the contrary. According to Headrick (1988) the Famine Commission recommended in 1880 that 5,000 miles of line were urgently needed and that the Indian railway system should expand to 20,000 miles to achieve the major famine zones. However, the decline in revenues to the Treasury made it impossible for the government to undertake even a minimal program of famine railroads. According to

Sen (1980), railways contributed to famines because they allowed food grains to leave drought-stricken areas during times of famine. According to Sweeney (2011), the protective railways built in the 1880s and the 1890s did not mitigate the effects of the 1896 and 1901 famines.

In terms of local linkages and indigenous technological development, the benefits were even lower. Most of the management, the equipment, and the skilled labour came from Britain. Rails, points, fishplates, machinery, locomotives, even sleepers, were almost all built outside India. Only some technology transfer existed in low tech areas such as plate-laying. The multiplier effects of the railway construction boom benefited Britain directly: at the 1880s, 22% of the British locomotive production went to India. The Raj did little to stimulate the development of heavy industry or management skills within India. For instance, until the 1920s, the mechanical engineers on the Indian railways were all Europeans; Indians were not welcomed into the profession (Headrick, 1988). Railway companies followed policies from which British industry and financial institutions were the primary beneficiaries. Indeed, the Government of India urged companies to 'buy British' (Hurd, 1983).

Although there were not initial local capabilities to develop the whole railway network, Indian people 'catch up' was quick (anyway, there was not State demand until the interwar period). As highlighted by Hurd (1983, p. 749):

"Locomotives are a case in point. Indian railway workshops had proved capable of manufacturing competitively-priced locomotives as early as 1865 when a locomotive was made at the Byculla works in Bombay. Yet, between 1865 and 1941 Indian workshops produced only 700 locomotives, while British firms exported some 12,000 to India. The importance to the British locomotive industry of the Indian market is indicated by the fact that of the total output of a sample of British locomotive firms, fully 22 percent was shipped to India. India's loss from the purchase policies of the railways was not limited to her lack of progress in developing heavy industry. She also failed to reap the benefits of the spread effects to industry which would have occurred. Instead, the spread effects stimulated the British economy."

Between the positive aspects, it has to be pointed out that Indian people did welcome the railways. At the initial phase, the British thought that they were not prepared for them, but they got crowded since the early development. Another consequence of railways was the postal system. Before the mid-nineteenth century, the postal systems run by the individual presidencies and Indian states were expensive and unreliable, and often corrupt. Lord Dalhousie, known as 'the great modernizer', introduced stamps, a uniform rate throughout India and a central administration. In increasing the speed and security of the mails, no reform was as effective as the spread of railways.

With respect to the final assessment about the railways' development, for Roy (2012a), the railway development was positive because it integrated the local inland markets with the world market. According to Headrick (1988, p. 56):

“...India had one of the world's top rail networks, at least from 1890 on. Yet among nations with large rail networks, India remains a special case for two reasons: it was the only colony among sovereign states; and it was the only one of them that failed to industrialize during the railway boom... a different kind of imperialism, one that would have built a railway network beneficial to India rather than to Britain. This is the most difficult of all scenarios to imagine...

In my view, the railways were the most important material contribution of the Raj to the Indian subcontinent: it developed an infrastructure that could not have been developed by indigenous efforts, at least in this proportion and speed. In fact, this contributed to the integration of the Indian Territory. However, even being the bigger contribution, this was designed and used to reinforce the Indian subcontinent insertion as a peripheral space of the British Crown. No major technology transfers, no mayor public purchase oriented to local suppliers, no mayor local linkages were there. If in the first half of the twentieth century India lost her role as a regional center of textile production and exports, the second half consolidated her integration to the world economy as agriculture commodity exporter. The consequences in terms of the welfare of the Indian population were not the main aim of the British. The peripherization process was almost completed, but we still have to understand what happened with agriculture, famines and the wealth drain to have a complete picture of this process.

Export profile, agriculture, irrigation, and famines. The Raj period consolidated the Indian insertion in the world market as an agriculture commodity supplier. The industrial and transport revolution, mainly through the steamship technology, the opening of the Suez Canal in 1869, and the development of the railways in India were a main push to the increased in the flux of trade between the Indian subcontinent and Europe. As pointed out in Findlay and O'Rourke (2007), the opening of the Suez Canal cut the distance between Britain and Bombay from 10,667 miles to 6,224 miles and between Britain and Calcutta from 11,900 miles to 8,083 miles. The steamship technology reduced fuel requirements and it added the possibility to pick up coal at Gibraltar, Malta, Port Said, and Aden.

The reduction in the costs of transport both increased the volume of trade and consolidated the structural change in the Indian exports composition from a textile supplier to an agriculture commodity supplier which began at the first half of the century. According to

the figures of Chaudhury (1983), between 1814 and 1850, four commodities accounted for around 60% of Indian exports: indigo, raw silk, opium, and cotton. However, for the second half of the century, as shown in the next chart, raw cotton, food grains, seeds, raw jute and tea explained around half of the Indian exports. Both for Chaudhury (1983) and Rothermund (1988) there was a diversification in the export profile during this period, however, this diversification was restricted to a general pattern of specialization for India as the raw commodity supplier. To Habib (1995b), this period represented a real shift in Indian agriculture to the production of raw material for England, a shift in relative acreage from food grains to non-food crops and an enlargement within the acreage under food grains of the portion devoted to crops for exports. To Rothermund (1988, p. 39), during this period:

“...the forces of the world market penetrated India, extracted cheap raw materials and made a formative impact on the home market, which grew up under the tutelage of the world market...”

Chart 11 - Exports from India: commodity composition, % of selected items in total export value, 1850-1 to 1935-6

Year	Raw cotton	Cotton Goods	Indigo	Food grains	Raw Jute	Manufactured Jute goods	Hides and skins	Opium	Seeds	Sugar	Tea
1850-1	19.1	3.7	10.9	4.1	1.1	0.9	1.8	30.1	1.9	10.0	0.2
1860-1	22.3	2.4	5.7	10.2	1.2	1.1	2.0	30.9	5.4	3.1	0.5
1870-1	35.2	2.5	5.8	8.1	4.7	0.6	3.7	19.5	6.4	-	2.1
1880-1	17.8	4.2	4.8	17.1	5.2	1.5	5.0	18.2	8.6	-	4.2
1890-1	16.5	9.5	3.1	19.5	7.6	2.5	4.7	9.2	9.3	-	5.5
1900-1	9.4	6.4	2.0	13.1	10.1	7.3	10.7	8.8	8.3	-	9.0
1910-11	17.2	6.0	0.2	18.4	7.4	8.1	6.2	6.1	12.0	-	5.9
1920-1	17.4	7.6	-	10.7	6.8	22.1	3.5	-	7.0	-	5.1
1930-1	21.0	1.6	-	13.5	5.8	14.5	5.3	-	8.1	-	10.7
1935-6	21.0	1.3	-	-	8.5	14.5	-	-	-	-	12.3

Source: Chaudhury (1983)

We can see that raw cotton went from a participation on the Indian exports of 19,1% in 1850-1 to a pick of 35,2% in 1870-1. Food grains went from 4,1% to its pick of 19,5% between 1850-1 and 1890-1. Seeds evolution is similar, from 1,9% to 12% between 1850-1

and 1910-11. The American Civil war in 1860 and the possibility of interruptions to Lancashire's cotton supplies explain the Indian raw cotton impetus during the 1860s. In the case of foodgrains, Burma's rice and the Indian wheat were the main products. The most important market for Indian wheat was Britain, taking almost 20% of its total imports from India at the end of the nineteenth century (Chaudhury, 1983).

As a consequence of the increased in the world trade, food grains demanded containers bags. This explains the growth of raw jute and manufactured jute goods exports. Jute, after cotton, converted in the second main industry of India during this period. Manufactured jute goods reach their climax during the first-world war, because of the increased in the British government orders. With respect to tea development, from the point of view of England, this is the case of import substitution from a non-colonial area such as China to a colonial land such as India. The tea industry was almost entirely developed with British capital and enterprises and it was only marginally integrated with the rest of the India economy (Chaudhury, 1983).

Now I will concentrate on the link between this external insertion, agriculture market development ('commercialization'), irrigation and famines. Agriculture was the main source of revenue both for the Mughals and for the British, being of main relevance to the fiscal needs of the Raj. The land tax extraction during the British period experienced different forms and mechanisms. First, the Permanent Settlement introduced a fixed tax, vested the land ownership right in the zamindars and reduced the peasant status to tenants. The coercion was mainly pushed by the British and the zamindars to the peasants. Then, the British understood that with the Permanent Settlement the zamindars were being more benefited than the Raj, so they implemented the Ryotwari Settlement during the first half of the nineteenth century. Peasants were vested with the property right, but they were also taxed and they had to directly pay to the Raj officials. Finally, the Mahalwari Settlement was introduced, trying to maximize the revenue of each land, by different tax rates, but it functioned only partially because of the difficulties in the implementation.

Doing his assessment on the systems of land revenue, Bandyopadhyay (2004) says that a common feature of the three systems was the over-assessment, as the primary aim of the British was to maximize revenue income. In general terms, the results were mounting debt and dispossession in the case of the peasants and increasing land sales (concentration of the land property) in the case of the zamindars. The levels of coercion, partnerships between the

British and the upper class and casts and peasant resistance differed according to the different regions.

To frame the discussion of the agriculture 'commercialization' we have to mention that agriculture is closely related to irrigation developments⁵¹. But irrigation was not so developed and did not concentrate the same resources as the railways of the Raj. According to Bandyopadhyay (2004), the British works in irrigation were limited, except for the construction of some irrigation canals in the north related to the Indus and the Ganges, mainly directed to the agriculture area of Punjab, and others canal in the Presidency cities of Bombay, Bengal, and Madras. Although between 1900 and 1933 the area under irrigation almost doubled, it was mainly an absolute term improvement: when the British left India in 1947 only a quarter of the total cropped area was under public irrigation. Public irrigation facilities remained inadequate, creating a few areas of relative prosperity and increasing inequality between the different peasants' groups and casts. Habib (1995a) goes in the similar argumentative line. Roy (2012a) goes even further, identifying the lack of investments in irrigation as the main cause of the Indian agriculture low productivity improvements during the Raj. For him, canals were feasible in regions such as the plains of the Ganges or the Indus, where rivers supplied large volumes of water, but they were few in the rivers of the Deccan plateau where water scarcity limited the possibilities of fertilizer application.

The work of Whitcomb (1983) is a bit more positive about the evaluation of the British works on irrigation. However, it also agreed that irrigation was a variable of adjustment depending on the Raj fiscal needs and that it was mainly directed to fuel crop areas for external markets. Irrigation for the famines areas was not a profitable business for the privates and the public works depended on the availability of resources. The famine of 1876-8, which mainly affected Madras and Mysore, demonstrated the need for famine finance to be made a permanent part of government calculations. A Famine Commission was created to study the history of famines and the possibilities of prevention in the 1880s. In 1900 an Irrigation Commission was created to link irrigation to droughts areas. However, as with the famine railway routes, having in mind that during the first world war the British investment inflows to India almost stopped, it is not difficult to infer that both Commissions created in the late Raj and with not many resources and priority, did little for famine preventions.

⁵¹ As we have seen before, the railway network development was another component of the 'technological package' implemented by the British in India.

The Raj period in terms of agriculture was characterized by some authors as a process of ‘commercialization’ of the Indian agriculture (Ghose, 1982; Habib, 1995a, 1995b). It is important to highlight that India’s principal exports, particularly raw cotton, jute, foodgrains, and oilseeds production were in hands of small peasants at the first half of the nineteenth century (Chaudhury, 1983). However, according to Habib (1995a, p. 331):

“While the conditions of the poorer peasantry and rural proletariat become more and more critical, the extending production of commercial crops laid the basis for extensive landlord and rich-peasant agriculture. In 1891 the smaller proprietors cultivated 54% of the cultivated area in the Punjab; in 1900, only 45%... This was the basis of the formal conversion of the zamindar into the modern Indian landlord. The long series of tenancy acts, beginning with the Bengal Rent act of 1859, merely extended recognition to his new position, and to the subsidence of the bulk of the Indian peasantry into mere tenantry-at-will.”

The ‘*commercialization*’ of the agriculture implied the advance in the development of market relations in agriculture production. With the railway development, some irrigation, and the telegraphs, the British connected different crops and seeds areas of the Indian subcontinent to produce for the British needs and supply European countries. The market development in agriculture tended to favor differentiation within the peasantry and capital accumulation and concentration of land in the new landlord class (ex-zamindars). This was considered a sign of progress towards capitalist agriculture. However, the initiatives had severe consequences both in terms of output and for the peasants living conditions.

With respect to the output, according to Tomlinsson (1993), agricultural yields were largely static in colonial India and between 1920 and 1947 the production of food crops lagged behind the rate of population growth. In terms of welfare, the worst consequences materialized mainly in the famines of 1876-8, with 3,5 million death and 36 million affected; 1896-7, with around 5 million death and almost 100 million affected; and 1943, with 1.5 million death mainly in Bengal (Visara and Visara, 1983)⁵². At the end of the second half of the nineteenth century, the Indian subcontinent population was around 250 million people that mainly depend on agriculture to live (Visara and Visara, 1983).

The main problem of the ‘*commercialization*’ process in relation to famines was that the development of crops and seed markets, without any buffer intervention of the State (or any collective institution or mechanisms to back up the market functioning), instead of

⁵² Another huge famine was the one of Bengal in 1770, with around 10 million dead and 30 million affected people.

reducing famines, added a new famine cause. In other words, markets not only did not contribute to reduced famines impact but they also added a new cause for famines⁵³. Market development in Indian agriculture, although generating capital and land accumulation in the new landlord class, reinforced the problems related to famines and did not stimulate investment in technology and irrigation. The main reason is that it is not only the food supply but also its distribution that determines the incidence of famines. Thus, an increase in the international price of the crops or a local shortage of crops, in the connected markets, could end in a general increase in the prices that lead to famine, especially, in a context of debt and low (or even no) income peasants. On the other hand, not all the people starve to death during a famine, in fact, many people were able to make extraordinary economic gains during them.

In Ghose's (1982, p.378) paper, there is a stylized conceptual understanding and some interesting empirical facts about the famines functioning in a non-monetised exchange economy, as one of the Raj periods:

“First, the major famines and scarcities occurred during a period when India was a food-surplus country and was, in fact, exporting large quantities of foodgrains. Exports of foodgrains were taking place even in years when thousands, or perhaps millions, were dying of starvation. At this aggregate level at least, it seems clear that these famines were not precipitated by absolute shortages of food caused by uncontrollable vagaries of nature. In fact, there were never simultaneous crop fails all over India or even in a whole province. Second... India's agrarian economy could be characterized as a non-monetized exchange economy. For a significantly large proportion of the population, food supply depended on "employment entitlements". This fact makes it easy to understand why localized crop failures produced disastrous famines...”

In his review of works on Indian famines, Ghose (1982) characterized the famines between 1860 and 1910 in four aspects: a) none of the famines was caused by an absolute food shortage, b) those who suffered starvation deaths were mainly landless laborers, small artisans and petty traders (and we would add low casts), c) food grains were actually being exported in substantial quantities during famine periods even the worst affected areas (for instance, 1877, 1896-97 and 1899-1900 were years of severe famines, although net exports of food grains continued), and d) crop failures precipitated famines not because they create an

⁵³ I follow here conceptual analysis stated by Sen (1977), developed and stylized in Ghose (1982) and detailed in an impressionistic way in (Davis, 2001). These approaches had an inspiration in Polanyi (1944), in the sense that the development of market without any collective backup and controls can have severe negative impacts on the society as a whole.

absolute shortage of food but because the created a collapse in the income of the lower casts and classes.

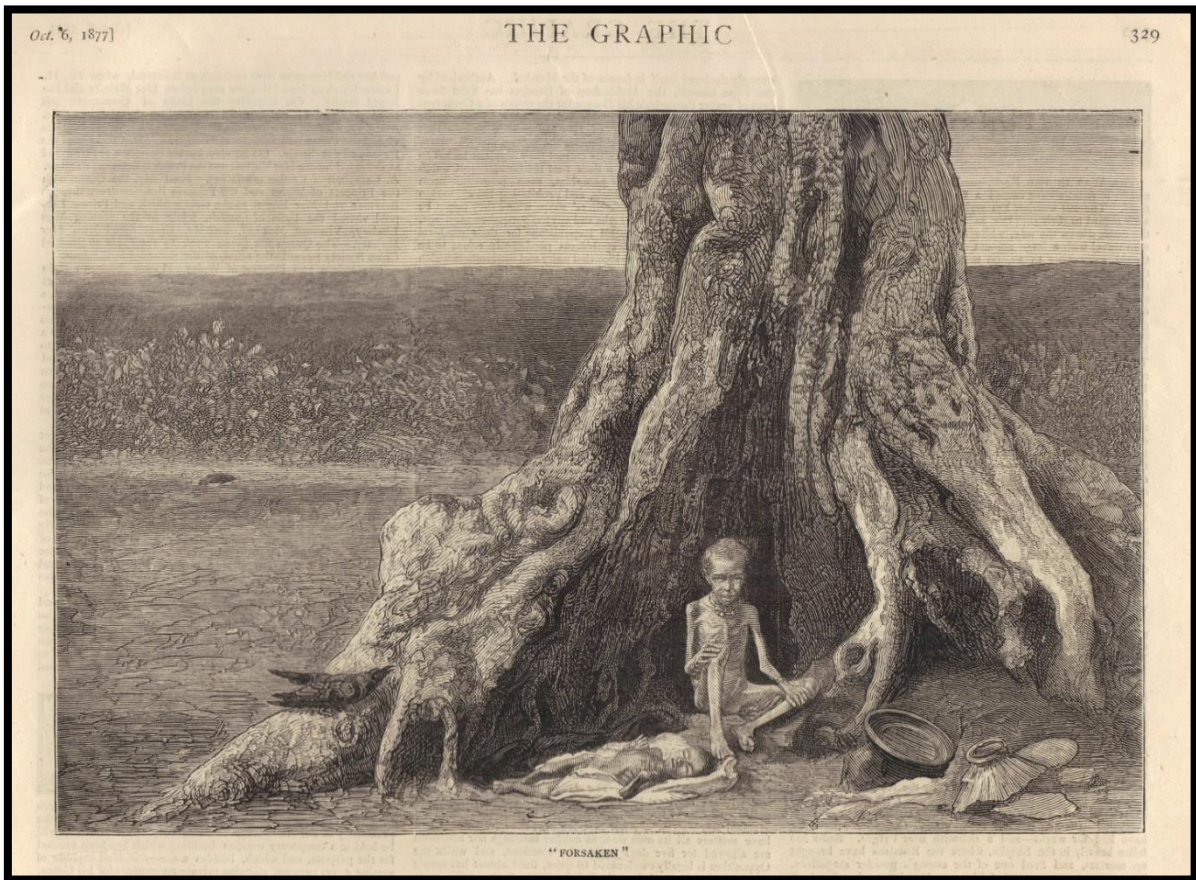
The statement of the Famine Commission (1880, p. 29) quoted by Ghose (1982, p. 380) is really illustrative of this 'new market-path to famines':

“The first effect of a drought is to diminish greatly, and at last to stop, all field labour, and to throw out of employment the great mass of people who live on the wages of such labour. A similar effect is produced next to the artisans, the small shop-keepers, and traders, first in villages and country towns, and later on in the larger towns also, by depriving them of their profits, which are mainly dependent on dealings with the least wealthy classes; and, lastly, all classes become less able to give charitable help to public beggars, and to support their dependents. Much of the agricultural classes as possess a proprietary interest in the land, or a valuable right of occupancy in it, do not as a rule require to be protected against starvation in time of famine unless the calamity is unusually severe and prolonged, as they generally are provided with stocks of food or money, or have credit with moneylenders. But those who, owning only a small plot of land, eke out by its profits their wages as labourers, and rack-rented tenants-at-will living almost from hand-to-mouth, are only a little way removed from the class of field-labourers; they possess no credit, and on them pressure soon begin...”

Besides, it is not necessary to say that the '*commercialization*' process, it means, the market process development, was not a spontaneous process, but it implied day by day coercion over the peasants. It seems accurate to argue that some peasants went to money-crops because they were more profitable and not because of coercion mechanisms, but coercion was oriented to produce land ownership transfers and tax collection over-indebted and starve low class and casts, as detailed by Davis (2001). Some of these situations ended in rebellions, such as the indigo rebellion of 1859-60 and this coercion also function as a push for the emergence of the Indian National movement, but this process this will be discussed in the next chapter.

To sum up, the agriculture development during the second half of the nineteenth century re-structured the Indian agricultural relations and land possession in order to channel part of the Indian agriculture production to foreign markets, stimulating capital and land accumulation in some segments of the new-old landlord class. The adverse consequences were severe for Indian people: the aggregate production of food crops lagged behind population growth; investment in irrigation, both public and private, was insufficient and concentrated at the external-markets-oriented areas; the impact of famines was not reduced, on the contrary, they were amplified.

Figure 14 - Forsaken, The Graphic, October 1877 (Horace Harral)

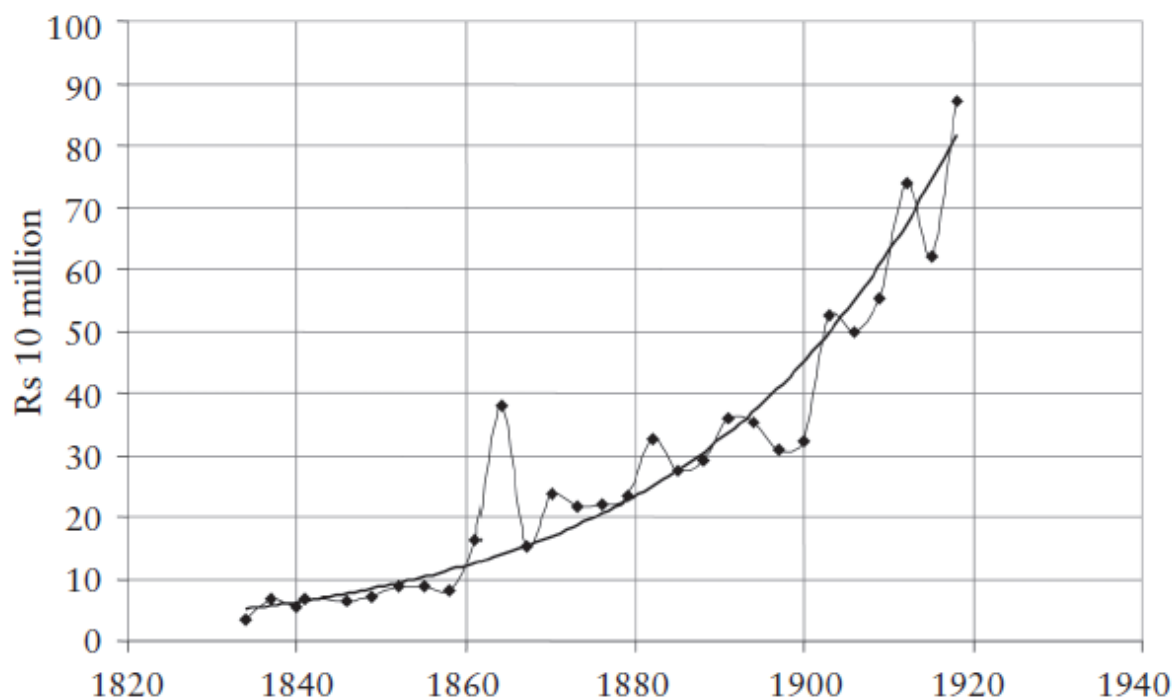


Source: National Portrait Gallery

The 'wealth drain'. The 'drain' theory was mainly introduced and developed by the moderate nationalist intellectual Dadabhai Naoroji, in his 'Poverty and Un-British Rule in India' and it was further developed by the nationalist historian Dutt in 'Economic History of India' and by Digby in "Prosperous' British India'. Conceptually, the 'wealth drain' implied a transfer of commodities from India to England without the former getting back any equivalent economic, commercial or material return (Patnaik, 2017; Chandra, 2016). A chronic excess of exports over imports is on the base of the drain idea⁵⁴. In fact, as pointed out by Patnaik (2017) Indian peasantry and workers produced the second largest merchandise export surplus in the world for at least four decades since the 1890s.

⁵⁴ At the same time, the drain theory was a simple but powerful conceptual instrument for the Indian national leaders to blow on the Raj. Indeed, the 'drain' theory was used to explain most of the Indian problems and backwardness during the British rule, producing some kind of 'overutilization' of the concept.

Graphic 2 - Merchandise exports surplus, India, 1833 to 1919



Source: Patnaik (2017)

Describing the 'drain of wealth' theory, Chaudhury (1983, p.869) says:

“An unusual characteristic of India's foreign trade throughout the period of this survey (1757-1947) was the existence of a large export surplus, which was not offset by either a rise in her foreign-exchange reserves or an increase in overseas lending. In fact, the permanently favourable balance of trade, after including movements of treasure, was accompanied by a net import of capital after 1850. The key to the puzzle lies in the invisible items in her balance of payments and the unilateral transfer of funds that she had to make to Britain as part of the political charges debited to her external account. ”

For Patnaik (2017, p. 278) the concept of drain implies that:

“a substantial part (up to one-third) of the total tax and other revenues raised within the colony was not spent in the normal way within the country, but set aside for sterling expenditure by Britain on its own account abroad. But how did the transformation of rupees in the Indian budget into sterling with Britain take place? By using that part of revenues to reimburse colonized producers of export goods (the very same producers who had paid in the taxes in the first place!), while the financial gold and foreign exchange (forex) earned through their global net commodity exports were appropriated by the metropolis for its own use”.

There are different estimations and calculations of the total amount of the drain. In one hand, Naoroji (1876) estimated them in around 5 and 7 million pounds per year between 1835 and 1859, between 17 and 27 million per year for 1860-1872, and around 35 million in 1905.

More contemporary, Cuenca Esteban (2001) sustains that they were much more limited, affirming that the net financial transfers from India to Britain reached a peak of 1 million pounds per year in 1784-1792 and then declined to over 0,5 million pounds in 1808-1815 and became slightly negative in 1816-1820. Both these numbers are still discussed not only because of the quality of the statistics but because of the way in calculating and defining the 'drain'. For Chaudhuri (1983), for instance, to measure the actual magnitude of the drain, it should be necessary to use a 'value added' concept. It means that the cost of producing the exports must be subtracted from their final sales value. Furthermore, this type of critics and conceptual debates open the door to different streams of 'unequal exchange' perspectives. Here, we will only focus on introducing some elements of the so-called 'drain wealth', mainly related to the Indian balance of payments. Although it is not our intention to enter in some debates that exceed the scope and objective of this essay, we understand that the behavior of the Indian balance of payment is another important aspect to understand the Indian peripherization process. We mainly follow Chaudhuri's (1983) work and figures.

After the Charter Act of 1813, the BEIC was required to pay a nominal payment of 500,000 pounds out of the public revenues raised in India to the stockholders of the BEIC. According to Chaudhuri (1983) these payments varied from 1.5 and 3 million pounds before 1850. During the most part of the nineteenth century, India had negative balances in regard to most other services items and short-term capital movements: 1) payments of government's external obligations, 2) transfer of private savings and 3) profits of European firms and invisible services charges such as freight on shipping, insurance and banking commissions. All these debit items were financed through exports surplus on merchandise account, mainly textiles and raw cotton, and since the 1850s, with the railway development, through capital imports.

The exports to China were the main channel for indirect remittance to Britain. It was Britain's heavy adverse balance of trade with China mainly based on tea that prevented bullion moving from India to England. This pattern was maintained over most of the nineteenth century. In fact, after 1870, the total Indian export surplus jumped to 180 million rupees and it remained at around 200 million rupees in the 1870s and 1880s. The annual home charges also jumped since the 1860s, reaching between 7 to 10 million until the 1870s and rising to over 20 million at the end of the century (Chaudhuri, 1983). The balance of payments in favor of Britain was estimated at 25 million in 1880, covering more than a third of Britain trade deficit with the US and Europe. At the same time, re-exports of tropical

products to Europe was another source of gain for Britain, allowing to purchase strategic materials such as bar-iron, pitch and tar, timber from the other European countries and reducing its trade deficit with them. In this aspect, Patnaik (2017, p. 285) says:

“Compared to the demand for Britain's own goods, the demand for tropical goods by Northern populations was higher and more income-elastic. Re-exports boosted the purchasing power of Britain's domestic exports by as much as 55 percent during the period 1765 to 1821. Four-fifths of goods re-exported by Britain were from tropical regions, and the re-exports went mainly to Continental Europe. Re-exports from the Netherlands actually exceeded exports of its own domestically produced goods in the eighteenth century. The metropolis enjoyed a double benefit – not only did it get prized tropical goods free for its own use, but it got them free to exchange for temperate land products in which it was deficient.”

In 1898-9, according to numbers of Pandit (1937) India had a surplus of 355,5 million rupees on the merchandise account, but her total net deficit on the balance of payments was 396,5 million rupees. Thus, there were around 40 million rupees of foreign borrowing, what we nowadays would call FDI. In the case of service transactions, they reached around 200 million rupees per year, including freight payments, home charges, commission on banking and insurance and net interest payments excluding railways. In fact, according to De Cecco (1975), at the end of the XIX century, this mechanism of payments became a fundamental tool for the maintenance of an international monetary system based in the Pound sterling Gold Standard.

According to Findlay and O'Rourke (2007) at the beginning of the twentieth century, the international trading system was indeed profoundly multilateral, with countries and regions running up surpluses with some partners which they used to pay off deficits elsewhere. In the next graph, it is shown the pattern of settlements between the main players of the world economy in 1910 (excluding China). We can see that India ran trade-surpluses with continental Europe, the United States, Japan in order to send bullion to Britain (or to prevent it to go to Asia).

commissions). The British logistic control of the sea and the development of its financial system explain the main part of the 'drain', configured from the Indian peripheral position in relation to the center. Even more, the home charges were the main visible account of the Indian colonial position.

2.6. Discussing on the Indian Subcontinent peripherization process (1757-1914)

Both the British and the Mughals were 'external' actors that managed to rule over a vast territory of the Indian subcontinent for over two centuries each. In this sense, both the Mughal and the British rule shared some common aspects: a) they based their fiscal revenue on land taxes, b) they had to make alliances (and create divisions) within the different local groups or casts to control the local people, c) these alliances were mainly, but not only, with the zamindars, d) they based their expansion on fiscal militarism, e) the military expenditure was the main pillar to maintain the power. At the same time, despite rebellions such as the Indian Mutiny and many others, for a long time, they managed to maintain and expand their power over the subcontinent. The Indian subcontinent as a territorial that was governed by external actors, although exceeds the objective of this work is an important element of continuity to understand the British penetration and the absence of any "nationalistic" feeling and construction until the emergence of the national movement (as we will see in the next chapter).

For instance, we can infer that for a Hindu Bengal merchant, there was not much difference in being ruled by a Muslim military elite or by a British one. In fact, perhaps they preferred a British ruler that did not get into their religious preferences and even let them expand their business, closely related with the external trade. Of course, both the Mughal and the British control the subcontinent by coercive means, however, the British expansion in a subcontinent of around 250 million people would not have been possible without local alliances. In fact, if we strictly analyze the Battle of Plassey, the first major event for the British penetration, it was a more diplomatic than a military victory. The alliances with the local merchants, zamindars, and financiers, synthesized in the figure of the *Jagat Seth* brothers, were the main factor to explain this first "opportunity" capitalized by the BEIC. After Plassey, fiscal militarism, the financing of war and the soft technology used to do war were principal elements to explain the rapid territorial penetration.

Although it is not so present in the literature, the urban delocalization of the commercial flux, it means, the emergent ports, are principal features of the British penetration. As we have seen, Bombay and Madras were not main ports during the sixteenth century and although Bengal already was an important port, it was not domain by any European power and it was oriented to ocean trade, instead of internal river trade. In fact, the British were excluded from the Indonesian ports by the Dutch, the Malabar Coast was still an area where the Portuguese had influence, mainly around Goa, and at the Coromandel coast, the French were located in Pondicherry. With more or less planning and consciousness, the British developed what would later become known as the Presidency cities as their 'gates' to India. This change in the port relevance could be read as a triumph of the ocean trade flux over the inland powers. The growth of these three cities and the de-urbanization of the inland cities add to this argument.

The relationship between the BEIC and the British Crown is quite discussed in the literature, with different interpretations and perspectives. In particular with relation to the Indian subcontinent penetration, we understand that although it was pushed by the Directors and officials 'thirst for profit', represented in the figure of Clive, it cannot be explained as an individual willing process. The BEIC was quite independent during the Seven Years' war because the Crown was mainly orienting their resources for the war in Europe. However, the BEIC penetration occurred in a general framework of Imperial expansion. One of the more visible aspects where the British Crown support can be perceived was in the financing of the Bank of England to the BEIC. In fact, as said, a good amount of the British congressmen had stock options in the BEIC.

This does not mean that there was a total alignment between the BEIC and the Crown. For instance, during the period that went from Plassey to the beginning of the nineteenth century, the BEIC was not aligned with the textile lobby that was growing in Britain, institutional represented in the different Calico Acts. The BEIC continued importing textiles to Europe because there was demand and it was a good business. In fact, it was in the first half of the nineteenth century that, pushed by the Industrial Revolution, the textile interests triumph and forced the BEIC to operate in line with them. In other words, the BEIC objective function (and its control) was under dispute between the different groups both at Britain and in the Indian subcontinent, but this dispute occurred in a general frame of the market and territorial expansion.

If the second half of the eighteenth century represented the British penetration in the Indian subcontinent, the first half of the nineteenth century was a period of the structural change in the Indian subcontinent export profile and in her productive structure. As we have seen, in around 50 years, the Indian participation in the world manufacturing output went from 20% to 3% and the piece goods exports went from more than 33% of the total exports to 3,7%. Both the effects of the more global process of the Industrial Revolution and the British rule at the Indian Subcontinent are related to this structural change process. The energy and technological shift of the Industrial Revolution, it means, the emergence of a new techno-economic paradigm made the Indian proto-industry to be no more competitive. In parallel, this process was reinforced by institutional, financial and explicit violent mechanisms oriented to 'downgrade' the subcontinent. Between the nonviolent mechanisms, the Navigation Acts, the Calico Acts, the trade tariff, the weaver's obligation to sell to the BEIC and the Agency Houses had the main role.

Despite that both in the historically and in the contemporary great divergence debate the focus has been concentrated over the deindustrialization process, we had tried to show that what happened in the Indian subcontinent was a broader process. This process included, at least, the urban, institucional, logística e da inserção externa. Although the data that we could find is not quite complete, the deurbanization of many cities is the main aspect of the period under analysis. During the second half of the twentieth century, during the Raj, this broader process was completed in different dimensions. First, the railways, as said, the principal material contribution of the British to Indian (and a main antecedent to Public Private Partnerships), implied the development of a whole infrastructure both with military and commercial purpose. They link different areas, mainly crops lands, from the Indian subcontinent to Britain and assured the political control. However, the railways' contribution in terms of famines reduction, autonomous demand for the Indian economy and technological indigenization was scarce. The agriculture development tended to maximize the tax collection, formatted the Indian agriculture profile and developed market relations. The consequences both in terms of output and social welfare were severe. The wealth drain, despite the methodological and statistical discussion, was another aspect of alignment of the Indian subcontinent territory to the British need: it was totally functional to the British trade triangulation and to maintain the Pound sterling Gold Standard.

The triangulation of trade, re-export of tropical goods and the direction of the financial fluxes was another key element to understand the contributions and the role of the Indian

Subcontinent in the British Imperial configuration. The British logistic control and the Indian subcontinent urban reconfiguration were main elements in the triangulation dynamic. Bengal was a much more ocean trade port than an inland port, the exports of indigo, opium, cotton, and rice have to be contextualized in the British triangulation scheme.

To conclude, it would be useful to define in a more specific way what we mean by the Indian peripherization process. Mainly, we understand this process as the development of a set of coercive and non-coercive (price and no-price) relationships between Britain and Indian subcontinent based on: a) the logistics and trade control in hands of British actors, b) the territorial penetration and urban restructuring of the Indian subcontinent, c) the structural change (in the export profile and in the internal sector composition) of the Indian economy, d) the institutional, infrastructural, financial and autonomous State expenditure subordination of the Indian subcontinent to the British needs. This subordination included the railways' development without a 'catch up' process, the deepening in the primarization of the export profile, the formatting of the agriculture production and the development of markets relation in the agriculture and the consolidation of a capital account profile that assured the wealth drain to Britain. This process transformed a subcontinent that was, at least, an Indian Ocean regional center of textile production in an annexed territory of the British crown. In fact, the peripherization process is another way to analyze the process and effects of the British colonization of the Indian subcontinent.

CHAPTER 3 - EMERGENCE, CONFIGURATION AND MAIN CHALLENGES OF THE INDIAN NATIONAL SYSTEM OF INNOVATION DURING THE “PLANNING” PERIOD (1914-1989)

"National or independence movements against colonial powers have taken roots in various other Latin American and African countries. However, the specificity of the Indian case is that intellectual struggle against colonial science policies led to the creation of a local and national basis in science institutions that worked towards the formation of an Indian science community which became an integral part of the political struggle as well... even before independence in 1947, the struggle against colonialism and colonial science led to a number of conceptual frameworks and views as the of science and technology in nation-building, self-reliance in science and technology, and above all, the importance of modern science and technology institutions in the development of a country."

Krishna (2013, p. 142)

"The upshot of the discussion is to suggest the need for a technology policy which is more closely rooted in the socio-economic priorities which are still widely acknowledged as valid. Furthermore, they have to be judged against a long-term perspective... We have also noted the great importance of land-saving innovations for India, given its agroclimatic conditions and deteriorating ecological conditions. These considerations do not preclude the introduction of high technology into Indian industry if this improves the functioning of key infrastructural items such as power, transport, and communications, as any reduction in capital-output ratios in these sectors can lead to substantial saving of capital for the economy as a whole."

Chakravarty (1987, p. 68)

"...we would re-emphasize two things: i) the inefficiencies in planning which we have highlighted in this volume were probably inevitable: there is no escape from 'learning by doing' and it is pertinent to remember that few, if any, critics, and least of all the laissez-faire advocates, grasped the full dimensions of the planning and developmental problems faced by India around 1950; and ii) none of the improvements in the planning of trade, industrialization and related economic policies which we have advocated in this volume are incompatible with the basic objectives of a socialist society which stresses distributive justice, equality and the eradication of material poverty..."

Bhagwati and Desai (1970, p. 500)

"Whether we talk of Keynesian demand management, or of socialist planning, or of social democratic welfare, or of Third World State intervention and planning, the point of reference in every case is the 'national economy'. The basic premise of all these different conceptions of interventionism is that the national economy constitutes the 'control area' of the State, within which, subject to whatever political economy constraints it may face, the State can act in order to achieve objectives more or less in conformity with its intentions. True, the national economy is linked to the larger international economy, but this link, it is supposed, can be adjusted through instruments such as trade policy or exchange rate policy..."

Patnaik (1998, p.184)

Next, there are presented two main sections. The first one tries to reflect on the conditions of emergence of the Indian NSI, mainly working on the Indian colonial context during the first half of the XX century, the last period of the colonial rule, particularly after the First World War. Then, we work on the characterization of the NSI evolution between the independence in 1947 and the external crises of 1989-90, dividing it into three sub-phases: the Nehru's government, between 1947 and 1964, Indira Gandhi first phase, between 1966 and 1977, and the 80s, first lead by Indira Gandhi and then by her son, Rajiv Gandhi. Some of the main references used in this chapter are Joseph et al (2008), Krishna (2013), Rakshit (2009), Bandyopadhyay, (2004), Chakravarty (1987), Chandra et al (2008), Nagaraj (2013a), Patnaik (1998), Bhagwati and Desai (1970), Bardhan (1984), Panagariya (2008), between others.

3.1. Emerging processes during the late colonial time: wars push, national movement and social heterogeneities (1914-1947)

India was one of the poorest territories in the world in the 1940s (Bardhan, 1984; Nagaraj, 2013a; Patnaik, 1998; Joseph et al, 2008; among many others). According to Habib (1982) in 1940 the Indian subcontinent population was around 389 million. Following Kapila (2014, 2003) figures, 85% of the people lived in rural areas; 70% worked in agriculture, mainly subsistence agriculture; illiteracy reach 80%; child mortality was extremely high, life expectancy was of 30 years old and malaria, and the different fevers killed millions of people per year. For Joseph et al (2008) and Kumar (1982) the average growth rate of the economy during the first half of the nineteenth century was lower than 2%, with a growth rate of the GDP per capita lower than 0,5%.

The initiatives linked to scientific development during the colonial period were related to railroads, geology, trigonometry, botanical garden and questionnaires and information processed on jobs linked to the administrative and exploratory functions developed by the British in India. According to Krishna (2013, 1997), there was a center-periphery type of division between Britain and the British Raj, where the role of the Indian establishments was oriented to search and a basic processing of information, with low degrees of self-development. In fact, the first three modern Indian universities, in Calcutta, Bombay, and Madras, the "Presidency cities", all of them created in 1857, had as their main task to train administrative and technical staff for the administration of the colony, offering this way few science courses.

In this section it will be given a brief characterization of the last phase of the colonial rule during the first half of the XX century, mainly the interwar period, highlighting some emergent economic and political processes and actors that configured the gestation of the post-independence Indian NSI, particularly with respect to the political economy framework, the role of the State and the science and technology explicit and implicit policies⁵⁵.

The Wars push. As we have seen, the Indian subcontinent entrepreneurial capabilities were there before the arrival of the British. However, the British rule reset the Indian entrepreneurial structure. Particularly in the second half of the XIX century, with the development of the railways, there was an extended involvement of British capital and enterprises, mainly motorized by the managing agencies. Since the end of the XIX century, the Indian capital was gradually moving into areas not developed by British capital such as sugar, paper, cement, iron, and steel. In fact, the Bengal National Chamber of Commerce was founded in 1887 and the Indian Merchants' Chamber of Bombay in 1907. The Parsis and Marwaris were some of the communities that emerged and consolidated as entrepreneurs around a narrow industrial base (Bhagwati and Desai, 1970).

The First World War, by positioning India as a strategic base for the Allies and limiting trade possibilities, was a main push for a proto import-substitution process that contributed to the development of both the Indian capitalist and the urban working class. With the steel as the main one, a number of industries expanded through the war and beyond, such as cotton textiles; benefited by a reduction in the British imports, jute and coal-mining, directly impacted by the war demands, and other industries such as leather, soap, ship-building, wool, etc. (Bhagwati and Desai, 1970). As highlighted by Bandyopadhyay (2004, p. 358):

“Since the late nineteenth century, the Indian capitalist class, more specifically an industrial bourgeoisie, was gradually becoming more mature and influential in politics. Until the end of World War One... the number of registered industrial enterprises had been steadily rising, while developments in the interwar period further strengthened their position... By 1944, nearly 62% of the larger industrial units employing more than one thousand workers, and 58% of their labour force were controlled by the Indian capital. And in the smaller factories, which constituted

⁵⁵ The debate about 'decolonization' is long, diverse and still open worldwide. In general terms, the broad discussion is oriented to understand the influence of the British rule or the local reaction in the dialectic process that resulted in the independence. This process is characterized by some authors as a hybridization process. A deeper analysis of the historical context of this period can be found in Bandyopadhyay (2004), Prakash (1999), Chandra et al (1987) and Chandra (2008, 2016), Bhagwati and Desai (1970) and Habib (2017) between many others.

95.3% of the industrial sector, the control of the Indian capital, as Aditya Mukherjee has emphasized, was “absolute”...”

For instance, the Tata Iron and Steel Works (TISCO), that later evolved till today becoming one of the main Indian 'national champions' was clearly benefited during the First World War. Doraji Tata came from a Parsi⁵⁶ family of Bombay that had made his fortune as cotton manufacturers. Since the 1880s, without sufficient funding and demand of the government, Tata was trying to develop the steel and iron industry in India. As detailed in the excellent work of Headrick (1988), Doraji Tata made different efforts and articulations in order to develop the steel industry in India: he studied the British, German and American iron and steel industrial development experiences, including different journeys to these countries and the Tata family made different family investments to research an optimal combination of iron, coal, flux, and water in India. But the main TISCO's 'primitive accumulation' as steel producers came with the beginning of the First World War (Headrick, 1988, p. 291):

“For TISCO, World War I was a godsend. India was cut off from Germany and Belgium, and British supplies became scarce. Steel imports fell by 84 percent from 1,040,000 tons in 1913-14 to 165,000 tons in 1917-18. Imports of railway supplies fell by 93 percent. Meanwhile, the demand for steel soared as the war effort put an increasing strain on the railways and the military called for ever more munitions. Its stores' policy in abeyance, the Indian government now purchased all of TISCO's output. As the Indian Industrial Commission of 1916—18 explained: "In consequence of the increased difficulties of obtaining from Europe stores for war and essential purposes, the necessity of stimulating the local manufacture of munitions became a matter of vital importance."

In more general terms, as stressed by Seth (1986), it was the First World War that began to give India the characteristics of a mixed economy. Wartime forced the British to set certain industries under State ownership and protect Indian industries and installed the question of industrialization. Indeed, as pointed out by Prakash (1999, p. 89) the Indian government declared that the question of the expansion and development of Indian manufactures and industries should be taken up in a more comprehensive manner. An Indian Industrial Commission was appointed for this purpose, with ten members, including four Indians, headed by T. H. Holland, who had served as the director of the Geological Survey of

⁵⁶ The Parsis constituted less than 0,03% of the Indian population, but were a dominant business class in Bombay.

India. Although the government did not follow its recommendations, the commission's report situated the state as the main actor in pushing industrialization.

In Britain, the opinions on the relative importance of and control over India began to change with the Great Depression. The British felt that they had little control over the Indian monetary and fiscal policies. Protective tariffs had already been imposed and wartime procurement policies led to an evaporation of India's sterling debt, replaced by Britain's rupee debt to India. India's relevance to imperial defense was also under scrutiny: the Indian army needed modernization and the government of India did not have the budget. In 1939, it was decided that the British government would pay for it, including the cost of the Indian army fighting outside India. As the Second World War broke out, Indian army had to be deployed in the Southeast Asian front and as it became increasingly difficult to transfer cash during wartime: Britain's debt to India boomed. By 1946, Britain owed India more than £1,300 million, almost one-fifth of Britain's GNP (Bandyopadhyay, 2004).

The Second World War put India in a main geopolitical position again. According to Cohen (2001), the British converted India into a major arms producer and a base for military operations to China, Southeast Asia, and the Persian Gulf. They conducted an active diplomacy with the Indian neighbors and accepted significant American military assistance. In a recent interview with Bharat Karnad, researcher of the Centre for Policy Research and a national security expert, he says (Rekhade, 2017):

“During the Second World War, India was called the Arsenal of the East. The entire allied armies' Middle East command under Montgomery and the Southeast Asian command under Mountbatten were provisioned by India. It was not Europe. Europe was fighting its own battle. It didn't have the resources. We were doing it. We made everything from guns to lorries to aircraft. We put together Lancaster bombers in Bangalore.”

The War was initially beneficial to various groups of Indians: it increased the income of industrialists, merchants and rich peasants producing for the market and reduced the pressure of rent. According to Bhagwati and Desai (1970) employment increased by 103% during the war and the industrial production only 20% between 1939 and 1946 due to the inelasticity of supply, given the absence of a machinery and capital goods industry and the import difficulties during the war. However, cement, paper, iron, steel and sugar industries received another main pushed with the war. With respect to the domestic situation, by 1942, the main problem was the scarcity crisis resulting from a shortfall in the supply of rice, with the Bengal famine as the highest point, with more than 1.5 million deaths. While the higher

food prices hit the poor, the rich were hurt by excess profit tax, the forcible collection of war funds and coercive sale of the British. The British power seemed stressed.

Indian National Movement, Congress Party, and Hindu Science. The Indian independence process significantly influenced the NSI conformation and main features. This process cannot be understood without visualizing the central role played by the so-called Indian National Movement, its main political arm, the Indian National Congress Party, founded in 1885 (hereafter, Congress) and the intellectual building of the idea of a Hindu Science. As explained in the works of Chandra et al (1987) and Chandra (2008, 2016) the anti-colonial and nationalistic thinking and movement was a long-term, gradual and heterogeneous process that was getting dense since the second half of the XIX century. In Chandra's (2008, p. 11) words:

“...the Congress was the leader of the popular anti-imperialist movement of the Indian people; and its activities in the main constituted this movement. The task of politicizing, activating and mobilizing the Indian people was accepted by the Congress from the beginning but was basically undertaken after 1918. In the Gandhian era, the national movement derived its entire force from the militancy and self-sacrificing spirit of the masses. Starting out as the activity of the radical nationalist intelligentsia, the national movement later succeeded in mobilizing the youth, the women, the urban petty bourgeoisie, the urban and rural poor, the urban and rural artisans, and large sections of the peasantry and small landlords.”

However, till at the end of the XIX century, the Congress did what Bandyopadhyay (2004) defines as moderate politics, as it was mainly integrated by liberal professionals and upper cast intellectuals, mostly connected with the conservative landlord interests. For instance, between 1892 and 1909, nearly 90% of the delegates who attended the Congress sessions were Hindus, only 6.5% were Muslims, and among the Hindus, nearly 40% were Brahmans and the rest were upper-caste Hindus (Bandyopadhyay, 2004). In this sense, although the evolution of Indian nationalism was not a linear result of western influences, the role of Western education was quite important: designed to colonize the mind of the Indian intelligentsia, the latter selectively appropriated that knowledge to build their critique of colonialism. In fact, there was a mixed behavior in the intelligentsia: absorbing more or less critically the British education and accessing to knowledge possibilities, pointing out some specific issues to the government and demanding for more space in the Raj bureaucratic structure. With respect to the national movement before Gandhi's gravitation in the Indian political scene, Bandyopadhyay (2004, p. 284) comments:

“Nationalist movement in India before the arrival of Mohandas Karamchand Gandhi (soon to be known as Mahatma (great soul) Gandhi) from South Africa in 1915 has been described by Judith Brown (1972) as "politics of studied limitations" and by Ravinder Kumar (1971) as "a movement representing the classes" as opposed to the masses. What these descriptions essentially imply is that nationalist politics until this time was participated only by a limited group of Western-educated professionals, whose new skills had enabled them to take advantage of the opportunities offered by the Raj in the form of administrative positions, seats in the district boards or legislative councils. They belonged mainly to certain specific castes and communities, certain linguistic and economic groups, living primarily in the three presidency towns of Calcutta, Bombay, and Madras.”

The objective of Congress moderates politics was a full political freedom that would come gradually, where India would be given self-governing right as Canada and Australia. However, after a period of illusion on the Enlightenment and modernization possibilities and potentialities of the Raj rule, the upper-caste intellectuals gradually adopted a more critical and demanding attitude towards the British. In intellectual terms, the moderates nationalists fulfill a key intellectual role in developing a political economy critic of the British Raj. As explained in Chandra (2016), the work of Dadabhai Naoroji on 'wealth drain' was a potent conceptual and political approach to criticize what we characterized as the center-periphery relationship between Britain and the Indian subcontinent. The Indian nationalist economists that were part of the moderates, such as Naoroji, Ramanade, and Dutt, were mainly concentrated on the effects that the British rule (it means, imperialism) was causing to India, with poverty as the main point.

Not being anti-capitalists, they discuss the importance of industrialization, the relevance of the State for industrialization and on different critics to the 'export-led' model that the British developed in India. We understand their economic thinking as a critic to imperialism with some similarities to List, related to the importance of State, industrialization and local knowledge for development. According to Chandra (2016, p. 360):

"Economic development... they believed, consisted primarily of rapid and all-out industrial development of the country. The core of economic growth lay not in the development of foreign trade or means of transport, or in the capacity of the government to raise increasing revenues or to produce balanced budgets, but in industrialization. This view led them to give their wholehearted, almost obsessive, devotion to the aim of rapid industrialization."

Referring to the moderates framework, Habib (2017) says:

“The founding fathers of the Indian National Congress... the ‘moderates’, saw the country's future as one of ‘constitutional development’ under the stewardship of England, the development paralleling a reform of the traditional society with its numerous iniquitous customs. They mostly aspired to economic progress on the

lines of modern countries, with Japan increasingly taken as the model. Yet, for the reason that the moderates desired India's industrial development, they rejected free trade, the great shibboleth of a modern political economy, and instead demanded protection. Swadeshi, therefore, came more easily to their lips than Swaraj. They wished Britain to loosen the tentacles of tribute which strangled the domestic market; and one way to do so was to reduce the salary and pension drain to Britain by 'Indianising' the civil services and the army officer corps. One can see now that they looked forward to a future for India as a classical bourgeois country; but there was one mitigating feature: they had a genuine sympathy for the poor, and wished, like Naoroji and Dutt, to protect the small peasant and the factory worker. It was here that the theoretical foundation was laid for the later mobilisation of the ordinary people under Gandhi and the Left."

In parallel, at the end of the XIX century, a more Hindu-rooted stream of thought emerged, in some way dissatisfied with what they considered the western-influenced moderates. According to Habib (2017) the 'orthodox nationalists' had little sympathy for the slow constitutional development articulated by moderate leaders. If the British wished to impose their western ways, opposition to this could be used by the nationalists for the mobilisation of people against alien rule. The idea of Hindu Science, was part of this path of both ideological and scientific research of an Hindu identity, rooted in religion. They mainly looked to connect the different scientific, medical and technical achievements of the Indian people to a Hindu-Vedic past origin, in opposition to the hybrid framework of the moderates. As worked by Prakash (1999) this was important in trying to restore the Indian nation in the image of Hindu science⁵⁷. The artifice of archaic Hindu Science composed an undivided origin and legitimized it in an original unity and purity (Prakash, 1999, p. 99):

"The idea of Hindu science had originated in the Orientalist research of the late eighteenth century. But a century later, the seeds sown by the Orientalists had come to bear different fruits. No longer did it satisfy only the hunger for the knowledge of the East: Hindu science now nourished the idea of a modern Indian nation. Helped by its status as the product of academic research, the notion of Hindu science won influence beyond the circle of religious reformers. References to Hindu medicine, mathematics, astronomy, and chemistry became ubiquitous in the elite culture. Journals and pamphlets returned to the past to search for the scientific contributions of the Hindus, identifying India with Hinduism and seeking Hinduism's transcendent value in its science."

In institutional terms, Krishna (1997) says that along the first half of the twenty century, in line with the growing demands and lobby efforts of the Indian elite, a series of structures in science and technology were created. These were the first efforts to shape a

⁵⁷ In Benedict Anderson (1983) terms, it was significant to think the nation in the myth of origins, building a collective sense of belonging to an immemorial past.

science and technology policy that attended the national needs and were linked with the relationship and partnership between the Indian scientific elite majored in England and the local political elite, including Gandhi, Nehru, Patel and many others. Within the Indian scientific community appeared M. N. Saha, who worked with stellar physics; J. C. Bose, who discovered radio waves propagation in 1905 and C. V. Raman, who discovered the so-called Raman Effect. Most of them were grouped in the Indian Association for the Cultivation of Science in Kolkata and the Indian Institute of Science in Bangalore, where Raman was the first Indian director from 1933 to 1948. In this sense, according to Krishna (2013, p. 141):

"the specificity of the Indian case is that the intellectual struggle against colonial science policies led to the creation of a local and national base in science institutions that worked towards the formation of an Indian science community which became an integral part of the political struggle as well (Krishna, 1997). Thus even before independence in 1947, the struggle against colonialism and colonial science led to a number of conceptual frameworks and views such as the role of science and technology in nation-building, self-reliance in science and technology, and above all, the importance of modern science and technology institutions in the development of the country. All these views and frameworks on science policy for development, which were the result of the pre-independence struggle, came to play a central part in the state policies which made science and technology important factors for development led by Jawaharlal Nehru...".

The National Planning Committee formed in 1939, led by Nehru, already emphasized the importance of indigenous science efforts. As we will deepen in the next section, for Nehru, science would have a main place in answering to the Indian people needs, as can be inferred from his message to the Indian Science Congress in January 1938 (quoted in Prakash, 1999, p.196):

"Though I have long been a slave driven in the chariot of Indian politics, with little leisure for other thoughts, my mind has often wandered to the days when as a student I haunted the laboratories of that home of science, Cambridge. And though the circumstances made me part company with science, my thoughts turned to it with longing. In later years, through devious processes, I arrived again at science, when I realized that science was not only a pleasant diversion and abstraction, but was the very texture of life, without which our modern world would vanish away. Politics led me to economics and this led me inevitably to science and the scientific approach to all our problems and to life itself. It was science alone that could solve these problems of hunger and poverty, of insanitation and illiteracy, of superstition and deadening custom and tradition, of vast resources turning to waste, of a rich country inhabited by starving people."

The end of the First World War marked a turning point in different aspects (Chandra et al 1987). First, the War caused disgusting and disillusion in the Indian people and showed that the expectations of self-governing were too ingenious, positioning the need to deepen the political struggle. Second, Gandhi emerged at the center of the post-war political scene, with

different strategies looking to transform the Congress in a mass movement, including, between others, the Swadeshi, the non-cooperation and the Quit-India non-violent resistant strategies. Third, the Russian Revolution of 1917 had a great impact in the Indian independence aspirations, causing a radicalization of the Congress economic framework, embodied in Nehru's figure, and in the political organization landscape in general, including the foundation of the Communist Party of India (CPI) in 1925 and the Congress Socialist Party (CSP) in 1934. Four, the brief War industrial stimulus affirmed in the Indian intelligentsia and the Indian political economy thinking the need and importance of State intervention and purchase power in order to push the industrialization process.

Figure 16 - Main leaders of Congress Party: Nehru, Gandhi, and Patel.



Source: LIFE Magazine.

Social heterogeneities at Partition. Despite the national movement and the Congress were the mainstream trends of the anti-colonial Hindu-frame reaction, they were not monolithic and they did not integrate all the dissent Indian groups. With respect to the capitalist class ideology and political position, Chandra et al (1987) sustain that the Indian capitalist class developed a long-term contradiction with imperialism, while retaining a relationship of short-term dependence on and accommodation with it. Mukherjee (1986) sustains that capitalists preferred a nationalist movement with acceptable limits, not guided by left-wing radicals and patronized right-wingers. For Bandyopadhyay (2004), the relationship between the Indian capitalists and the Congress remained strategic, issue-based, and pragmatic, coinciding with many aspects of the Congress program. For Chibber (2003) the Indian capitalists were opposed to State intervention in the economy and the Bombay Plan, the main industrialization program developed by the capitalists, was a move that tried to avoid the radicalization of the Quit India movement.

We understand that each of these explanations has some points of true, but the main aspect with respect to the independence movement is that capitalist class did not politically lead neither the national movement, nor the Congress. Gandhi, Nehru and the different Congress political leaders were not immediate representatives of the capitalist class, having quite autonomy in developing a program that, although including some main capitalist interests, such as avoiding a full-communist independence movement, consisted in a broader agenda that included different groups and castes interests, all glued by a growing anti-colonial feeling. It is important to highlight that the Congress, although integrating different working class organizations that were growing mainly in the urban areas, was not an anti-capitalist party, as highlighted by Bandyopadhyay (2004, p. 378):

“Gandhi disapproved this autonomous labour militancy... “We seek not to destroy capital or capitalists” he reasoned, “but to regulate the relationships between capital and labour” (quoted in Ray, 1984, p. 284). The same argument resonated in Jawaharlal Nehru’s statement in 1929... he reminded everybody that Congress was not “a labour organization”, but “a large body comprising all manner of people” (quoted in Chandavarkar, 1994, p. 414). Although the Congress Socialists showed greater sympathy for labour, the compulsion to remain an umbrella organization representing the working classes prevented Congress from integrating the working classes more closely into its movement.”

The main heterogeneity was not related to class categories. Although Gandhi and Nehru militated in favor of a secular and unified independent India in order to include Muslims and other minorities, the Indian subcontinent political, regional, religious, communal and cast heterogeneity was too varied to be contained in the Congress political umbrella. In religious terms, the main minority group that contested the congress authority and

representation were the Muslims. Broadly, Muslims leaders such as Ahmed Khan understood the nation as a federation of communities, with different kinds of political rights. Being an ex-ruling-class, Muslims considered that they should have a special place in the future Indian nation. In this context, Muslims formed the All Indian Muslim League in 1906 with the main base in Bengal in order to politically demand protection and space as a minority group, through the creation of separate electorate. The dispute between Congress and Muslim Leagues had different momentums. Gandhi supported the Khilafat movement to defend the Ottoman Caliphate at the end of the First World War, looking for a Hindu-Muslim unity. However, this union ended with the abolition of the Caliphate and the Hindu-Muslim relationship never reached that climate again. With respect to the dispute about the meaning of the Indian Nation between the Hindu culture and the Muslim separatism, Habib (2017) points out:

“Since the ‘nation’ (the country as a political community) is a product of modern history, it can be argued that national consciousness developed in India only as a consequence of the development of modern means of communication, especially railways, and the creation thereby of a unified market, along with the growth of the press and the spread of modern education. But these very factors heightened the consciousness of other identities as well, such as those of religion, caste, and region. While nationalist historians like Tara Chand and Mohammad Habib laboured to prove that compositeness was the bedrock on which the Indian civilisation had been built, a point stressed too in Jawaharlal Nehru's *The Discovery of India*, others, like R.C. Majumdar and I.H. Qureshi, saw two mutually exclusive streams running in Indian history ever since the appearance of Islam. If Muslim separatism openly espoused the two-nation theory after the Lahore Resolution of the Muslim League (1940), Hindu ‘nationalism’ also implicitly accepted the same theory by virtually excluding Muslims from India's cultural past and from her political future (thus the slogan, ‘Hindi, Hindu, Hindustan’).”

Figure 17 - The Muslim league leaders.



Source: Wikipedia Commons.

The non-Brahman castes and the untouchable groups (the Dalits) also expressed dissent from Congress⁵⁸. For our purpose, I will only highlight that at the beginning of the XX century, there was an emergence of non-Brahman and Dalits political organizations, demanding a better place in the Hindu-Colonial hierarchy. Among many others groups, we can mention the Pulayas of Kerala, the Chamars of Punjab, the Balmikis of Delhi, the Namasudras of Bengal. Ambedkar was the main Dalit leader that had a principal role during this period (including the foundation of the Independent Labour Party in 1936, winning the Bombay elections in 1937) and even after independence, been involved in the writing of the Indian Constitution. The relationship between Ambedkar and Congress, and Gandhi and Nehru, in particular, had different moments of more or less closeness too. But according to Bandyopadhyay (2004, p. 352), the emergence of Dalit movements pointed out the Hindu political preponderance:

“Although many of these movements did not last long, their implications were quite subversive for Hindi society, as not only did they unite Dalits around the message of a commonly shared brotherhood, they also indicated their defiance of the Hindu notions of hierarchy and untouchability. This tendency to repudiate Hindu theology as a disempowering and subordinating ideology for the Dalits came to an explosive high point when in December 1927 Dr. Ambedkar in a public ceremony burnt a copy of Manusmriti, the most authentic discursive text authorizing untouchability. In 1934 he wrote to temple satyagrahis at Nasik about the futility of temple entry or seeking redress for their grievances within a Hindu religious solution. What he suggested instead was a "complete overhauling of Hindu society and Hindu theology", and advised the Dalits to "concentrate their energy and resources on politics and education" (Zelliot, 1992)”

Apart from the Muslims, the Dalits and the non-Brahman movements, the social and religious heterogeneity also included different regional communities with their own features. For instance, Sikhs, mainly in the Punjab area, and Tamils, at the south. Some of these people were politically organized as the Princely States, cohabitating in the British Raj, such as the Princess of Hyderabad, Mysore, and Travancore in the South or the Jammu, Kashmir, and

⁵⁸ It is out of our scope to explain the caste system, a deep analysis can be found in Raheja (1994). But given the relevance that Hinduism and casts still have in India, we will say that in general terms the caste system is a quite unique form of social organization hierarchy based on religion that gives a professional specialization. In historical terms, the main groups have been the Brahmins or priests, the Kshatriyas or Warriors, the Vaishyas or farmers, traders or wealth producers and the Sudras, who served these three others groups. The Dalits or untouchables are a fifth group, even lower in the social hierarchy. Members of each cast have a moral code of conduct (dharma) and their good or bad performance (karma) determined their position in the caste hierarchy in the next life. However, in modern India, these groups are not homogeneous between regions: there are more than 3,000 jatis, or "caste-clusters" (Bandyopadhyay, 2004).

Sikkim in the Himalayas. Different regional tribes, peasants, and women of different castes sub-clusters completed the scenario. In fact, it was the presence of peasants and women that gave particular tenacity to the Civil Disobedience Movement of 1930-34.

With respect to the complex meaning of "the nation" in this context, Bandyopadhyay (2004, p. 190) reflects:

"It is difficult to deny the truth... that here "the "nation" itself is a ground of dispute and debate, a site for competing imaginings of different ideological and political interests". India was a plural society and therefore Indian nationalism was bound to have many voices, as different classes, groups, communities, and regions interpreted their "nation" in various, sometimes even contradictory, ways. Indian had many identities, like class identity, caste identity, religious identity and so on; at different historical conjunctures different identities were articulated and intersected with each other. As the colonial state sought to reinforce and substantialise these fissures, the Indian nationalists tried to publicize an alternative discourse of integration. Jawaharlal Nehru talked about "the old Indian ideal of a synthesis of different elements and their fusion into a common nationality". Such a romantic assumption of fusion was, however, to avoid the hard realities of conflict and contradiction..."

The last colonial "contradiction" emerged during the partition of the subcontinent and ended with the creation of India and Pakistan in 1947. Roughly, the partition implied the division mainly of Punjab, Kashmir, and Bengal, in territories that would be part of Pakistan, a mostly Muslim State, or India, mostly Hindu. The process of division of these territories, with the British army in retreat, led to a spiral of religious violence, among Muslims, Hindus and Sikhs, that involved between 10 and 12 million people trying to cross borders and between 200,000 and 1 million deaths (Chandra et al, 1987; Godbole, 2006; etc.). The emergence of India's SNI occurred in a country with balkanization risks, a dual productive structure and some of the worst socioeconomic indicators in the world.

Figure 18 - The Indian Partition. 1947

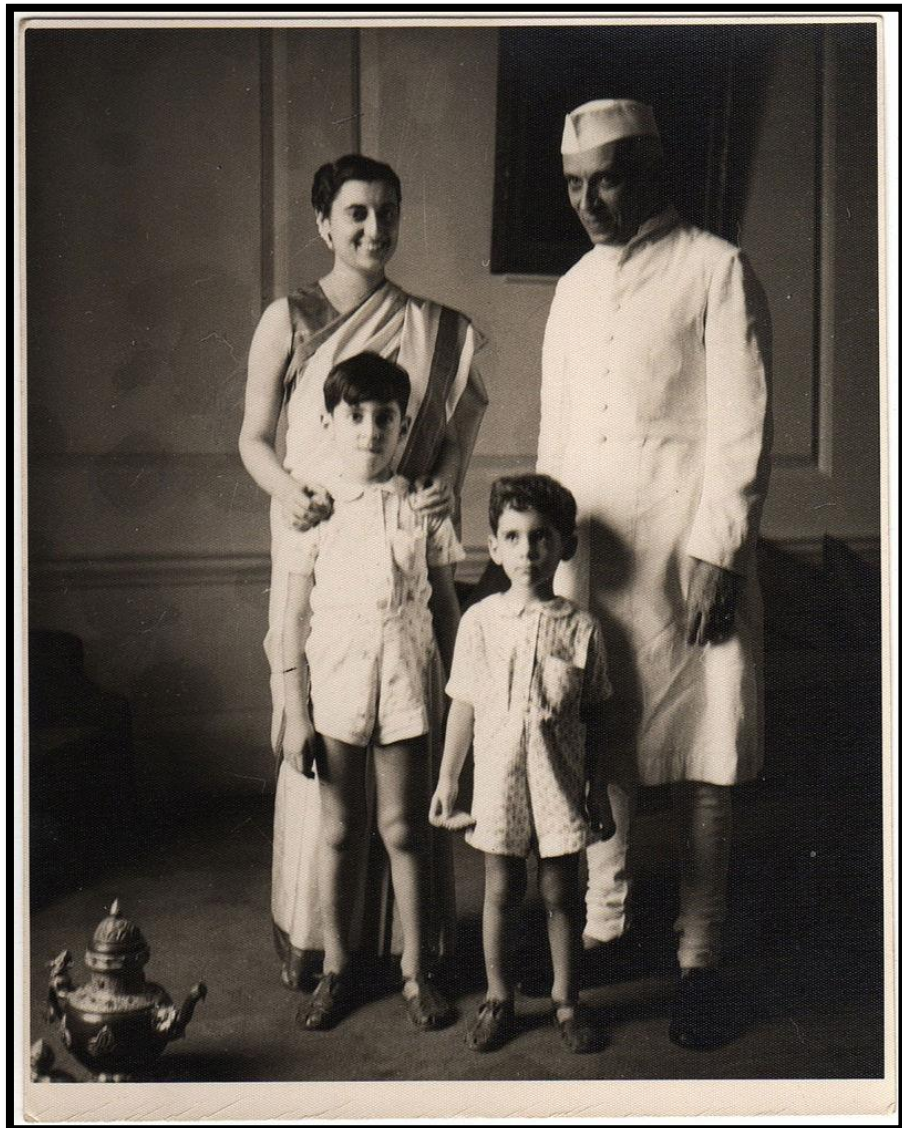


Source: elaborated by Rosaura Flynn based on Pinterest.

3.2. The Indian NSI configuration during planning (1947-1989)

In this section, it is analyzed the period between 1947 and 1989, from the Indian independence to the external crises of 1989-90. We divide it into three sub-periods: the Nehru's government, between 1947 and 1964, the first Indira Gandhi's period, between 1966 and 1977, and the 80s of Indira Gandhi and Rajiv Gandhi.

Figure 19 - Nehru's family: Indira Gandhi, Nehru, Rajiv and Sanjay Gandhi.



Source: Wikipedia Commons.

3.2.1. The Nehruvian path (1947-1964)

Nehru's historical 'Tryst with Destiny' speech of the 15 August 1947 marked the birth of Independent India, full of hopes and imaginations on the future as an independent nation as well as with urgent and concrete doubts on the social, geographical and geopolitical consequences of the Partition process. Habib (2017) describes the Independence Day's atmosphere and the economic consequences of the Partition in a good manner:

“From August 15, 1947, to January 26, 1950 – from the creation of the Dominion of India to the proclamation of the Indian Republic – spanned a very harsh period of two-and-a-half years. The jubilation at independence was tempered, even silenced, by the largest forced migration of the last century involving some 12 million people, and by popular reaction to the brutal massacres that accompanied them – massacres ultimately stayed only by Gandhiji's two fasts at Calcutta and Delhi and his martyrdom (January 30, 1948). The partitioned land, already ravaged by two centuries of colonial exploitation, now had its industrial structure thoroughly disrupted. Raw jute and cotton fields were placed on one side of the border, jute and cotton mills on the other; an extensive market for Indian coal was also lost. The adverse effects on the textile manufacture, the biggest sector in India's modern industry at the time, tended to pull back the general level of India's industrial production. The inherited British-built administrative machinery and the tendency to compromise with the established land-controlling interests led to much peasant dissatisfaction, of which the Telangana rebellion (1947-51) was the most powerful expression”.

It is not difficult to perceive that the main and most immediate political issue in India in 1947 was to maintain the new Indian democracy unified and to begin with the building of a national state that, although with the inevitable inherit of the colonial period, could give an answer to the illusions and claims raised during the colonial rule. Bandyopadhyay (2004) highlights that Jawaharlal Nehru identified two main enemies of the new Indian nation: communalism and poverty, and had two themes of his election campaign: history and stability. With the Congress as the main political inheritor of the legacy of the freedom struggle, it would be the main political party in the post-independent India. Nehru was both an emergent and a key player of the National Movement and the Congress Party and, no doubt, after Gandhi's assassination on 30 January 1948, he would have the main political role in the post-independence Indian political scenario and, particularly, in the building of the initial blocks of the Indian NSI.

Nehru, the Indian scientific elite, institutional building, and non-alignment. Jawaharlal Nehru was the first Indian Prime for 17 years, since 1947 until his death in 1964. Nehru came from a Kashmir Brahman family and he was the son of Motilal Nehru, who was twice timed

President of the Congress Party. He had studied law at Cambridge, combining a liberal and secular approach to politics with a socialist approach to the economy. He admired the URSS and considered that planning and industrialization were the main means to development⁵⁹. Arnold (2013, p. 361) characterizes this period as a phase of 'Nehruvian Science':

"A concept of Nehruvian science (NS) has value only if it adds analytical depth, and not mere descriptive gloss, to the understanding of the history of science in modern India and if it allows the historian to stand outside both the nationalist representation of science and the colonial vision of science that preceded it. There are evident dangers, in focusing exclusively on Jawaharlal Nehru (1889 –1964), of exaggerating the contribution of one individual or of shrinking the temporality of postcolonialism to fit the compass of a single life. Nehru was not a practicing scientist, nor (despite his undergraduate education at Cambridge) did he possess scientific training. And yet he was one of the principal architects of modern India and, through his enduring commitment to science, a leading figure in the formation of India's science policy and practice. His personal engagement with science helps explain how, within the time frame of the late colonial and early postcolonial periods, science received such public validation; but equally it helps us to contest negative representations of science in the non-West as a form of stubborn "localism," as a kind of ethnographic aside to the "real" (i.e., Western) history of science. Nehru was one of the principal authors of postcolonial subjectivity, not least in relation to science."

The post-war Indian science institutions were structured under the leadership of Nehru and his close alliance with the scientific Hindu elite. For instance, S. S. Bhatnagar was in charge of industrial research, Homi Bhabha of atomic energy establishment, P. C. Mahalanobis of the Planning Commission and D. S. Kothari in the defense establishment. Although as highlighted by Bhagwati and Desai (1970) the Hindu elite and upper middle class/casts were already incorporated to the State bureaucratic structure since the colonial period, the expansion of the State role and institutional setting after independence gave a main push to the Hindu-bureaucracy that later consolidated as a key player in the Indian policymaking and political economy, as worked by Bardahn (1984) and Patnaik (1998) between others. Krishna (2013, p.143) details Nehru's articulation with the scientific community and the importance of the State in developing science institutions:

"While Nehru obtained the party's legitimation for assigning an important role of state mediation and governance of science and technology development, the government led by him after 1947 further legitimized the role of the state as it accepted the recommendations of the A. V. Hill Committee Report submitted in 1944. According to this report and the model of science advocated, all science and technology institutions and science agencies including national laboratories were to be placed under the overall control of a government body or ministry. Nehru created the Ministry of Scientific Research and Cultural Affairs in 1948 and took on the

⁵⁹ For a deepen exploration in Nehru's framework and ideas see Nehru (1936, 1946) between many other works on Nehru's figure.

portfolio himself. The building of S&T infrastructure with new universities, science agencies and national laboratories came under the control of this ministry. Towards establishing infrastructure and building institutions in S&T, Nehru deemed it very important to bring scientific elite and science leadership closer to the government. He used his annual full-day attendance at the Indian Science Congress every year after 1947 to strengthen his association with the scientific elite and science community where he issued major science and technology policy statements and intentions of the government. As early as 1948, addressing the annual Indian Science Congress, he called upon scientists by observing that, 'in India, there is a growing realization of this fact that the politician and the scientist should work in close cooperation'."

As emphasized by Rao (2008) and Joseph and Abrol (2009), the period between 1947 and 1964 had an impressive growth of the State's organizational density. Krishna (2013) details the main science agencies created: the Council of Scientific and Industrial Research (CSIR), with a network of 38 national laboratories in physical, biological, mechanical, and chemical sciences, the Department of Atomic Energy (DAE), the Defence Research and Development Organisation (DRDO), the Indian Council of Agriculture Research (ICAR) and the Indian Council of Medical Research (ICMR). With respect to the higher education sector, from 30 universities in the late 1940s, they have found about 95 universities including specialized institutions such as five Indian Institutes of Technology (IITs). According to Patel (1993) this amount of institutions for science and technology was a testimony of the wide scientific and technology infrastructure, having no rival in the third world and even among several developed countries. In the next table, it can be seen the impressive increase in the founding and manpower of the main Indian S&T institutions.

Chart 12 - Growth of Major S&T Institutions in Terms of Funding and Manpower in India

Scientific Agency	R&D Budget (US\$ PPP)			S&T Manpower		
	1958-9	1965-6	% increased	1958-9	1965-6	% increased
DAE	16,3	42,1	258%	1.067	7.441	697%
CSIR	10,7	29,7	278%	3.512	9.515	271%
DRDO	3,1	20,4	658%	1.500	7.003	467%
ICAR	7,8	13,4	172%	1.500	8.400	560%
ICMR	1,07	2,2	206%	1.001	1.585	158%
Subtotal	38,97	107,8	277%	8.580	33.944	396%

Source: own elaboration based on Krishna (2013).

Note: DAE: Department of Atomic Energy; CSIR: Council of Scientific and Industrial Research; DRDO: Defence Research and Development Organisation; ICAR: India Council of Agriculture Research; ICMR: Indian Council of Medical Research; and DoS: Department of Space.

Some main efforts made by the Indian NSI during this period were configured by Nehru's development and foreign affair framework with respect to the Indian geopolitical insertion and context. Both nuclear and space capabilities gave their initial steps in the 50s and early 60s. With respect to nuclear, as detailed by Ogden (2011), in the early Cold War, India remained focused on technological advancement rather than on developing a nuclear arsenal. Nuclear co-operation between India and many other governments such as Canada, the USA, the United Kingdom and France was developed. These cooperative efforts resulted in the building of the APSARA in 1956, the first light water research reactor of its kind in Asia, and in the development of the CIRUS heavy water research reactor, in 1960. Furthermore, in 1962 India began producing her own heavy water and in 1965 plutonium was separated for the first time. In this sense, although Nehru's public anti-military and pro-disarmament discourse and explicit policy, according to Karnad (2017), Nehru's implicit policy had a main role on the initial settings of the Indian nuclear arms power:

“For instance, of the two major things he set in motion, one was the nuclear weapons programme. He had said that India had missed out on the gunpowder revolution and was therefore enslaved. He had said that no matter what happens we were not going to miss out on the nuclear revolution. This is what is so brilliant about his disarmament cry... but this man (Nehru) had vision. He may have talked disarmament, but all the time as the minister for atomic energy, he encouraged, financed and ensured that Homi Bhabha set in motion what he called the Janus-faced nuclear energy programme.

Do you know who Janus is? It's the god in the Greek pantheon with two faces looking in opposite directions. Janus. Civilian-military. Remarkable! When India didn't have money in the 1950s, he took money from the military and the Ministry of Defense, which is why in the 1950s the defence budget went down, just to fund the nuclear programme. He said if you have nuclear weapons, you have security. That was the point he was making. And we had reached our nuclear weapons threshold before China in March of 1964. He died in May 1964.”

Related to space, Reddy (2011) explains that, with international co-operation in the peaceful uses booming on the agenda of the UN and with the NASA making concrete proposals for co-operation in space research in early 1960, the Indian policy-makers began to think about the relevance of space research as it could have applications in agriculture, education, industry and other scientific areas. In 1961 the Department of Atomic Energy (DAE) was created and in 1962 the DAE set up the Indian National Committee for Space Research (INCOSPAR) with the appointment of Sarabhai as chairman. In the second half of the 1960s, the basic infrastructure necessary for a broad-based space programme was put in place under the leadership of Vikram Sarabhai. The specific objectives of the programme were related to the use of orbiting satellites for communications, telecommunications and

television, meteorological observation and forecasting and remote sensing of natural and renewable earth resources.

Wilson (2003) points out that the indigenization of aircraft capabilities was another important effort made by the Indian NSI. According to Karnad (2017):

“The other thing that Nehru did, where arms were concerned, was instead of importing combat aircraft, which is what we have been doing, he imported the best combat aircraft designer in the world at that time in the 1950s. He got Dr. Kurt Tank, who designed the Focke-Wulf warplanes for Nazi Germany. Can you imagine this? He imported the greatest designer of aircraft. He was commissioned to design the aircraft in 1957. By 1961, the first prototype was flying in the Bangalore skies. The first supersonic jet aircraft to be made outside of Europe and the United States in the world flew over Bangalore. In 1961... Dr. Tank had designed the HF-24 Marut. That was the great combat aircraft that flew to Bangalore. It is parked in the HAL (Hindustan Aeronautics Limited) museum. It was then said to be the finest airplane in the world.”

Pant (2011) says that Nehru dominated the Indian foreign and security policy landscape with his non-alignment posture, which was a classic ‘balance of power’ policy in the early cold war, bipolar world. Nehru (1963, p. 455) defined non-alignment as a *"policy of friendship towards all nations, uncompromised by adherence to any military pacts"*. He understood that the newly formed, poor countries of Asia and Africa, had nothing to win in joining the military blocs of the big powers, consequently positioning India as the leader of the newly independent Afro-Asian nations, pushing Pan-Asianism, demanding Dutch withdrawal from Indonesia and supporting freedom struggles in Indochina, Malaysia, and different African countries. However, non-alignment was not a policy of no-relations with the blocs led by the US and the URSS. India remained a member of the Commonwealth, received US economic aid and cultivated a friendly relationship with the Russian. As states by Chandra et al (2008, p. 192), India used cooperation from both sides of the ideological blocks to build military capabilities:

“In the Nehru years alone she bought, for example, for the Airforce, 104 Toofani aircraft from France, 182 Hunters and 80 Canberras from the UK, 110 Mysters from France, 16 AN-12s and 26 Mi-4 helicopters from the Soviet Union and 55 Fairchild Packets from the US. Two hundred and thirty Vampire aircraft were produced under license from the UK in India. For the Navy and Army as well, similar purchases were made. In addition, efforts were made to establish a defense production base and licenses were obtained from various foreign countries to produce the following equipment: Gnat interceptor aircraft from the UK, HS-748 transport aircraft from the U, Allouette Helicopters from France, MiG interceptors from the Soviet Union, L-70 anti-aircraft guns from Sweden, Vijayanta tanks from the UK, Shaktiman trucks from Germany, nissan one-ton trucks and Jonga-jeeps from Japan, Brandt mortars from France, 106 mm recoilless guns from the US, Sterling carbines from the UK, wireless sets from different countries.”

According to figures from Bhagwati and Desai (1970), the US had been the major aid-donor to India during the three first Five Year Plans. Its share on total aid utilization was over 70% in the First Plan, 55% in the Second and 58% in the Third. A major shift in favor of commodity assistance is seen in the Third Plan, reaching almost the half of the US, under the US Agricultural Development and Assistance Act of 1954, the Public Law 480, mainly concentrated on wheat. The World Bank and the International Development Association also played a role, contributing with around 12% of the external aid received. Habib (2017) says that with the US's nuclear power challenged by the USSR, the Chinese Revolution in 1949 and the outbreak of the Korean War in 1950, India began to diverge from her initial US alignment. Beginning with abstentions at the UN, India pursued a policy of non-alignment, which enabled her to act as one of the peace-makers in Korea in 1952-53 and a leader of the Asian-African movement. The freezing in the relationship with the US came particularly after 1954, when the US formed a strategic anti-communist alliance in Pakistan, as states by Scott (2011, p 244).

“Even whilst India resolutely proclaimed the virtues of non-alignment, its adversary Pakistan was quick to align with the USA and its alignment systems, joining CENTO and SEATO on either side of India, as it were. US military supplies to Pakistan in the 1950s may have been seen as strengthening Pakistan as an anti-communist bulwark, but for India, it was an enabling device for Pakistan to try and maintain strategic parity with India. As Nehru put it in 1954, ‘this granting of military aid by the United States to Pakistan creates a grave situation for us in India [...] it adds to our tensions’...”

Although beginning cool, a close friendship was gradually developed with the USSR. Sachdeva (2011) explains that Indo-Soviet relationship was reinforced with Jawaharlal Nehru's visit to the USSR in June 1955 and the Nikita Khrushchev and Nikolai Bulganin visit to India in December 1955. Congress was affirming its planning strategy and a ‘socialistic pattern of society’ and Nehru was playing a leading role in the Bandung Conference. The USSR was using aid, trade, and diplomacy in developing countries to limit Western influence, pushing the Indo-Soviet relations in metallurgy, defense, energy, and trade sectors. From 1955, the URSS gave full support to India on Kashmir at UN and in 1960 India and Russia signed their first agreement for military supply with India receiving aircraft, helicopters and engineering equipment for the Border Road Development Board to construct roads in the areas disputed with China (Chandra et al, 2008). According to Bhagwati and Desai (1970), the Soviet-bloc aid grew from almost 0 in the First Five Year Plan to 6% in the Second and 12%

in the Third, mainly used in the heavy industrial sector, including power, coal, drugs, steel, and oil. A difference between the Soviet-bloc aid and the US-bloc aid was that the Soviet grants went almost exclusively to the public sector, in order to reinforce the planning scheme and the public enterprises' capabilities, in contrast to the mixed nature (private and public) in the use of the Western aid.

With China, India tried to maintain cordial relation, being one of the first nations in recognizing the People's Republic of China in December 1949. But the relationship stressed when India offered asylum to Dalai Lama, with the Chinese seeing it as a strategy to undermine their hold over the Tibet. Nehru, pressured by the opposition and the press and overestimating the strength of the Indian army, made an aggressive move, resulting in a disastrous military engagement with China in October-November of 1962. This resulted in a military humiliation for India, with China easily defeating the ill-equipped Indian army and ending the conflict through a unilateral declaration of the ceasefire (Bandyopadhyay, 2004). This defeat was a military keystone for India's geopolitics and for the defense sector, turning visible the inevitable geopolitical and territorial competition between China and India and resulting in the growing of the public debate around upgrading military capabilities and developing nuclear weapons (Pant, 2011; Chaulia, 2011; Cohen, 2001; etc).

Economic policy and planning⁶⁰. Nehru (1963) argued in an article published in Foreign Affairs that India should achieve socialism "*without adhering to any doctrinaire definition of the word*". This meant planning through the democratic process for land reforms, industrialization, and development of infrastructural facilities such as power plants, transport projects, irrigation, etc. However, although Nehru's thinking had a strong influence, there were different views among the national movement about the policies for development. As explain by Abrol (2014) and Patnaik (1998), there were three main streams of ideas: the 'Nehruvian', the 'Gandhian' and the 'left'. Broadly, the 'Nehruvian' orientation subscribed to a State-led industrialization process, based on large public enterprises and heavy industry, public financed irrigation, etc. The 'Gandhian' framework was mainly based on the decentralization of economic activity and the decision to the local villages, indigenous knowledge development, self-government, peasant promotion, etc. The 'left' orientation was

⁶⁰ The debate on the Indian planning is very rich and diverse. I have mainly consulted some classic texts from different perspectives such as Bhagwati and Desai (1970), Byres (1998), Patnaik (1998), Chaudhuri (1998), Bardhan (1984), Chakravarty (1987), Panagariya (2008), Nagaraj (2013) and Kapila (2003). Deeper and much more detailed discussions could be found in these authors, among others.

based on minimizing the dependence on big business and foreign firms, a mix of large state enterprises with cooperatives, land reform and radical redistribution of the assets, etc.

For Chatterjee (1997), the predominance of Nehru's vision led to the evolution of a developmental state, intervening in the economy, planning and guiding its growth. Nehru viewed planning as a good instrument to resolve conflict in a large and heterogeneous subcontinent (Chakravarty, 1987). However, there was a mix of different policies sustain by the other views, such as the protection to the cottage industry, a Gandhian rooted policy, and a partial land reform, mainly in Calcutta, Kerala and Tamil Nadu, where the Communist Party had a strong influence. In some sense, as explained by Nagaraj (2013a, p. 192), the three approaches cohabited in the broad economic policy framework of the period⁶¹:

“This was a period of state-led import substituting industrializing to acquire quickly domestic capability to produce capital and intermediate goods, following the Mahalanobis model - named after the distinguished statistician who formulated the strategy for the second five-year plan. Assuming limited prospects for export growth to finance import requirement, the 'heavy' industrialization strategy sought to maximize long-term economic growth, though it implied a slower growth of output and employment in the near term. However, to meet the employment goal—the most pressing need in the labor surplus economy—the model advocated fiscal and physical controls to promote cottage industries for the production of consumer goods, a policy that had considerable appeal among the Gandhians. The development strategy was predicated on land reforms and public investment in irrigation and flood control to augment food production and agricultural raw materials for meeting the growing demand from the industrial sector”.

In fact, after independence, there was broad agreement in the need for planning: the question was not to plan or not to plan, but how planning should be implemented (Patnaik, 1998; Chaudhuri, 1998; etc.). In the international scene, the Great Depression eliminated any faith in free-market, Keynesianism argued in favor of State intervention and the Soviet Union was experiencing rates of growth that were unprecedented in human history. Within India, it was understood that *laissez fair* was the modus operandi of economic imperialism. As stressed by Bagchi (1972) India had perhaps been the more 'free trade-free market' regime in the world, ending in underdevelopment, economic domination, and famines. Thus, according to Patnaik (1998, p. 165), during the 60s, there was a common idea among the Left economists and policymakers that capitalist development needs exogenous stimuli to sustain itself:

⁶¹ In fact, as explained by Patnaik (1998) the National Planning Committee set up in 1938 by the National Congress had members of a broad spectrum of well-known Indian capitalists, trade unions, intellectuals, professors, non-Congress Provincial governments, etc.

“Such a stimulus can be provided in the context of an underdeveloped country that has a weak industrial base, not by exports, which are mainly of primary products with low income and price elasticities of demand internationally; nor even by import substitution which, though necessary initially, provides only a transient stimulus, but by state expenditure, which of course has to be directed towards plugging gaps in the production structure, i.e. towards heavy and capital goods production. State capitalism, in other words, is necessary not just for an anti-imperialist economic strategy, but for the development of capitalism in any case. Public investment, since it 'crowds in' rather 'crowds out' private investment, is necessary for sustaining capitalist growth itself...”.

Although the relevance of exogenous stimuli, in his deep and fine discussion on the planning process Chakravarty (1987) highlights that the Indian planners subscribed to a supply-side view of the planning process. The domestic demand as a constraint to the growth process was not a hypothesis. There was an understanding about the main role of public investment. Following Lewis’s opinion, most of the Indian developmental economists agreed that the central issue for development was to understand how a country which saves 5% of its income could pass to 20%. It was viewed as a problem of primary accumulation of capital rather a Keynesian under-employment equilibrium and this should be solved with an accelerated growth strategy. There were three main possibilities to direct public investment: infrastructure, agriculture and industrial development. In some sense, the planners explored the three possibilities.

The Five Year Plans were the main policy-making instrument. As explained by Byres (1998), the process of planning and elaborating the plans, although closed screened by Nehru, was integrated by different researchers, university professors, policymakers, economists, and technicians, resulting in quite rich discussions and arguments around the issue of planning⁶². In concrete, as observed by Chaudhury (1998), the First Five Year Plan (1951-1956) stressed in infrastructure and agriculture, spending around 30% of the public sector outlay in irrigation and power, 27% on transport and communication, 21% in agriculture, land rehabilitation and community developments and only 5% in industry and minerals. Many irrigation projects were developed such as the Bhakra Dam and the Hirakud Dam. The monsoon was good during these years, resulting in high crop yields and increasing external reserves.

⁶² As explained by Chakravarty (1984) almost all major contemporary economists who were interested in problems of development interacted with Indian planners and policymakers in the fifties and sixties, including several Nobel laureates. This resulted in a process of two-way interaction between the Indian policy-makers and the development thinkers.

It was in the Second Five Year Plan (1956-1961), the Mahalanobi's one, that the public expenditure in industry jumped from 4% of the public outlay to 20%, mainly in basic industries such as iron, steel, coal, fertilizers, heavy engineering and heavy electrical equipment⁶³. The Plan assumed stagnant exports and the main trading activity was to import capital goods. According to Seth (1986) systematic model-building for the purpose of developing strategy began with the Second Five-Year Plan. In the first Plan, planners used a two-sector model, but with the availability of inter-industry modeling techniques, they gradually evolved to a multisectoral approach.

As detailed by Panagariya (2008), given a balance of payment stress in 1958 that resulted in the introduction of foreign exchange budgeting, the Third Five Year Plan (1961-1966) re-emphasized in agriculture, particularly wheat production, fertilizers and import substitution. The Third Plan for the first time dedicated a chapter to the problem of regional imbalances, to achieve regional dispersal of industries, the Plan suggested a policy of uniform price for steel at all the railheads in India (Seth, 1986). However, the war with China in 1962 caused a re-distribution of the recourses in order to increment the defense budget. Nehru's death in 1964 and the draught of 1964-1966 also impacted in the implementation of the Third Five Year Plan. As can be seen next, the rates of growth in the Indian manufacturing between 1951/2 and 1969/70 show figures between 17% and 21% for rubber, petroleum and plastic products, non-electrical machinery and electrical machinery for the period between the First and the Second Plan.

Chart 13 - Rates of growth in Indian Manufacturing. 1951-2 to 1969-70

Industry group	1951-2 to 1959-60	1960-1 to 1969-70
Textiles	2,98	0,70
Rubber, petroleum and plastic products	17,54	10,40
Chemical products	7,90	8,39
Basic metal and alloys	6,52	7,01
Non-electrical machinery	21,02	17,00
Electrical machinery	17,64	14,01
Transport equipment	14,83	7,66

Source: own elaboration based on Chandra et al (2008)

Mixed economy: State-owned enterprises, Gandhian and communal entrepreneurs, liberal FDI regime and State financing. According to Kapila (2003) India went from 5 Central

⁶³ According to Chakravarty (1987), the Mahalanobis's model was a variant of the models used in the Soviet planning, particularly the model developed by Feldman in 1928 and popularized by Domar in the mid-fifties.

Government Enterprises in 1951 with a total investment of 290 million rupees to 47 in 1961 with a total investment of 9,5 billion rupees. Although this increase in the number of the State-owned enterprises went in line with the growing role of the public sector during the planning era, the private sector continued operating (and even growing!). As stated in the Industrial Policy Resolution of 1948, the Indian economy was a mixed economy: government provided stimulus, directions and also direct participation in the production, while the market, subject to regulations, also operated in determining supply, demand, and prices.

In this general context, State-owned enterprises, contemporary called Central Public sector enterprises (CPSEs), had the main role. According to Khana (2015) the State-owned enterprises were to make India self-reliant, promote import-substitution, develop the backward regions and prevent concentration of economic power in private monopolies.

Reinforcing the Industrial Policy Resolution of 1948, the Industrial Policy Resolution of 1956 listed almost twenty industries which were of exclusive responsibility of the State: arms and ammunitions, atomic energy, iron and steel, heavy castings and forgings of iron and steel, heavy machinery required for iron and steel production, mining, machine tool manufactures, heavy electrical industries, coal, mineral oils, mining, iron ore and other minerals such as copper, lead and zinc, aircraft, air transport, railway transport, shipbuilding, telephone, telegraph and wireless equipment and generation and distribution of electricity. There were some industries where the State would create new enterprises and the private sector would supplement the State efforts: aluminum and other nonferrous metals not listed before, chemical industry, antibiotics and other essential drugs, fertilizers, synthetic rubber, carbonization of coal, chemical pulp and road and sea transport. The private sector could operate freely in the other sectors and some exceptions were made in the previous ones. The Industries (Development and Regulation) Act of 1951 empowered the State with the Industrial Licensing regime, which was used to stimulate and regulate the private sector participation in the different sectors and regions.

Between 1962 and 1966, Bhagwati and Desai (1970) show that in terms of accumulated investment, these thirteen firms totalized more than 80% of the total investment of the State-owned enterprises: 1) Hindustan Steel, with around 45%! 2) Neyveli Lignite Corporation, 3) Heavy Engineering Corporation, 4) National Coal Development Corporation, 5) Oil and Natural Gas Commission, 6) Fertilizer Corporation of India, 7) Heavy Electrical India, 8) Indian Refineries, 9) Air India, 10) Shipping Corporation of India, 11) Indian Oil Corporation, 12) Bharat Heavy Electricals. In sector wise terms, between 1963 and 1966, steel

concentrated around 43% of the cumulated investment in public sector projects, engineering around 17%, chemicals 10%, petroleum 10% and mining and minerals 8%.

With respect to the private sector, the dominance of the traditional entrepreneurial communities over the Indian manufacturing continued: the Marwari entrepreneurial community, Gujarati industrialist, the ones from Panjab and the Parsis⁶⁴. According to Bandyopadhyay (2004), despite the restrictions, the private sector controlled by family groups was never eliminated and, on the contrary, it flourished. Public investment functioned as a crowding-in mechanism. Continuing with the past trend, formal private investment tended to be concentrated in a narrow segment of firms. The top twenty-eight industrial firms concentrated around 20% of the total industrial applications between 1959 and 1966 and around 60% of the fixed investment of the private sector. Four top houses such as Birlas, J.K., Tata's and Shri Ram concentrated 20% of the private investment (Bhawati and Desai, 1970).

In parallel, the government stimulated the entrance of new professional groups such as engineers and scientists, some kind of entrepreneurial policy, with good results in Gujarat and Punjab. As studied by Tyabji (1989), a Gandhian rooted policy was implemented, mainly consisting in the reservation of the handicraft market, some small-scale final goods productions and some textile production for small enterprises and entrepreneurs, mainly in rural areas, that still operated in a putting-out system. In fact, this type of sectors and the agriculture activities still today employ most of the Indian people.

Bhagwati and Desai (1970) say that although in 1945 the National Planning Committee had elaborated a critical resolution on the role of foreign capital, that went in line with the Indian Nationalism framework, the First Industrial Policy Resolution of 1948 gave space to private foreign investment in specific circumstances. Furthermore, in 1949 Nehru announced a liberal policy towards FDI. Both liberal and Marxist-rooted authors agree in the liberal characterization of the FDI treatment during Nehru's period. Abrol (2013) defines it as a period of cautious welcome and liberal attitude to FDI, with parallel technological capability building in public sector. There were no significant restrictions on remittance of profits and dividends although majority ownership was preferred to be in Indian, mainly public, hands. The two main forms of private foreign operations during this period were the equity investment and the pure technical collaborations. According to Bhagwati and Desai (1970)

⁶⁴ A detailed analysis on the different entrepreneurial communities profiles could be fine in Hazari (1966).

FDI investments were centered around petroleum and manufacturing, metal products, capital goods and chemicals.

Minority foreign equity participation was used in the State-owned enterprise to promote technological transfer. In his detailed analysis on foreign technology transfer to State-owned enterprises Mani (1992, p. 2) stresses that during the three first Five Year Plans, until 1968, equity participation and turnkey contracts with foreign firms were encouraged as a mechanism of technology transfer:

“This was thought to be the best mode of technology transfer as giving a chance to the collaborator in managing the host firm enabled the country to secure technologies for a variety of high technology areas where otherwise it would have been difficult to obtain... the increasing foreign exchange constraint felt especially towards the close of the fifties, also encouraged minority foreign capital participation. In some cases, capitalization of know-how provided the much needed foreign exchange resources for the import of capital goods. To encourage foreign collaborators, the government extended a number of tax concessions to them and streamlined industrial licensing procedure to avoid delays in approval of foreign collaboration. The Indian Investment Centre was established in 1961 to forge a close link between Indian and foreign parties. But this soon led to a flood of collaborations. It is noted by some commentators that this liberal policy... led to the import of inessential and often enough inappropriate technology... Apart from acquiring technology through financial participation, turnkey contracts with foreign firms as a prime contractor was another source. During the period between 1957 to 1967, about 254 such agreements were entered into for plant construction and a large proportion of them was in the public sector.”

Last but not least, as worked by Nayyar (2015) and highlighted by Bhagwati and Desai (1970), the creation of different public development finance institutions had an important role in financing the private sector during this period, constituting the financial arm of the Indian NSI. The main four institutions created were the Industrial Finance Corporation of India (IFCI), the National Industrial Development Corporation (NIDC), the Industrial Credit and Investment Corporation of India (ICICI) and the Refinance Corporation for Industry Private, LTD (RCIP). The IFCI was established in 1948 to provide long-term credit for medium and large industrial enterprises. Its contribution to long-term financing was estimated in a range of 12% of the long-term industrial financing and 5% of the estimated gross fixed investment during 1950-8 (Bhagwati and Desai, 1970). The NIDC started with the Second Five Year Plan mainly for credits to the jute and cotton textile industries for modernization. The ICICI was established in 1955 as a private institution but with funding of the government and the World Bank to promote industries in the private sector assisting them in their foreign exchange needs. It operated in several sectors such as paper, engineering, sugar, plastics, chemicals, automobiles, shipping, etc. The RCIP began in 1958 mainly to

provide refinancing to commercial banks and to medium and large firms for productive purpose. In his evaluation of the performance of these development finance institutions Rosen (1962), quoted by Bhagwati and Desai (1970, p. 79), says:

“...Their financing amounts to 13-20% of the total long-term finance from external sources to privately owned public limited companies in each year and represents about 9% of the gross fixed investment of the organized private industrial sector in the same year (1956, 1957, 1958). It is estimated that the direct assistance of these institutions has made it possible to invest a total amount of funds approximately double the actual institution financing so that the total role of these institutions is closer to one-third of the external long-term finance supplied and 15-20% of the gross fixed investment... These institutions probably do somewhat better than the normal commercial banks in making finance available to rapidly growing industries. All the major recipient industries of special institutional finance were also major industries within the context of the First and Second Five-Year Plans. Thus one can conclude that on the whole, the special financial institutions have made major contributions to industrial finance and what without their assistance the rate of industrial growth would have been lower.”

Population, infrastructure, and agriculture. After Independence, great attention was put on improving health, mainly through the control of many infectious and parasitic diseases and through the diffusion of vaccines. The main results were achieved in the decreased in the death rates in all the country, resulting in a significant increase in the rate of population growth to 2% for the period between 1951-1961 and around 2,2% for the next three decades until 1991 (Kapila, 2014). Thus, India's population was 361 million in 1951, 439 in 1961 and 548 in 1971 (Kapila, 2003). Although this proposition has to be deepened, this increased the population growth rate had unplanned impacts on the food needs and the per capita GDP growth objectives.

Family planning received importance during the 1940s too. The need to import food, the Bhore Committee Report that highlighted the issue of family planning and the 1951 Census that registered a significant increase in the population took Nehru to announce a national family planning program. The First Five Years Plan referred specifically to a program of family limitation and population control. India was the first country in the world to adopt an official national population policy in support of family planning. According to Kapila (2014) the results of the program were mixed. On one hand, many Indian people had reservations about the promotion of the modern contraception. The resources allocated to the program were not so abundant and there was not much experience (in the world) in this type of programs. On the other hand, there were significant achievements in larger towns. For instance, Madras began applying vasectomy with success and it was then followed by Kerala, Mysore, and Maharashtra. In the Third Plan, the relevance of voluntary sterilization was

reinforced and the resources were increased significantly. Sterilization camps were used to promote vasectomy and there was a shift in the approach to family planning: from a clinic-based approach to a community extension strategy.

According to the figures presented by Bhagwati and Desai (1970), the infrastructure and social services between 1950/1 and 1965/6 show a steady increase. As can be seen in the next table, the education system expanded considerably. The number of schools went from 231.000 in 1950/1 to 505.000 in 1965/6. Technical education, engineering, and technology admission capacity also increased markedly. The number of hospitals was almost tripled, going from 113.000 to 300.000, the registered nurses went from 15.000 to 45.000 and the doctors also experienced a significant growth. There was a substantive growth in towns and village electrification, going from 3.700 to 52.300, and in the installed capacity, going from 2,3 million kW. to 10,2 million kW.

Chart 14 - Growth in infrastructure and social services. 1950-1 to 1965-6.

Activity	Unit	1950-1	1965-6	% 1950-1 vs. 1965-6
Schools	thousands	231,0	505,0	11,9
Students enrolment				
Primary stage	Millions	19,2	51,5	168,9
Middle stage	Millions	3,1	11,0	252,6
Secondary stage	Millions	1,2	5,2	329,5
Technical education (engineering and technology) admission capacity				
Degree level	thousands	4,1	24,7	502,4
Diploma level	thousands	5,9	49,9	745,8
Medical facilities				
Hospital beds	thousands	113,0	300,0	165,5
Doctors	thousands	56,0	86,0	53,6
Nurses	thousands	15,0	45,0	200,0
Electricity: installed capacity	million kW.	2,3	10,2	393,5
Electricity: town and villages electrified	thousands	3,7	52,3	1313,5
Railways: freight carried	million tonnes	93,0	205,0	120,4
Surfaced roads	thousands km.	156,0	284,0	82,0

Source: own elaboration based on Bhagwati and Desai (1970)

Agriculture has been a main challenge for Indian development⁶⁵. Broadly speaking, India inherited a semi-feudal agrarian structure that was almost stagnant in the first half of the century, with a significant gravitation both of landlordism and the zamindar's intermediation. Land reform was pushed in the understanding that it was positive both in terms of equity and productivity. Chandra et al (2008) points out four main aspects of Nehru's period with respect to land reform and agriculture policy: 1) abolition of intermediaries (zamindars, jagirdars, etc.), 2) tenancy reforms to reduce rents and confer ownership rights to tenants, 3) ceiling on size of landholding and the excess over these ceiling to be taken over by the State and redistributed among small farmers and the landless and 4) cooperativization programs.

India tried to make land reform under a democratic regime, without using compulsory methods, such as in the URSS, China, Japan or Korea, and with landlord and zamindar consolidated as upper caste groups in the Indian social structured. With most of the Indian peasants having tiny lands, there was an important debate on land reform, where the fear that the agriculture production of the country would be reduced was pushed by different sectors, mainly in favor of a greater concentration and mechanization. The judicialization of the land reform, pushed mainly by the zamindars, made the process delayed, making the Central and the State governments dependent on the courts' decisions. Significant institutional challenges were there for the implementation of the land reform, such as the measurement of the land holdings. In 1954 the Planning Commission proposed a census of land that failed because the state governments did not support it. For instance, Hyderabad conducted a well-designed survey, but Uttar Pradesh refused and Kashmir did not participate even in the debate over land reform (Kapila, 2014). As the Constitution of 1949 left the adoption and implementation of land and tenancy reforms to the state governments, the advances were heterogeneous in nature.

The idea that conceptually-backed the abolition of intermediaries was that if the ownership of land was clearly identified with management and operation of land this would be more productive and would reduce rents. Tenancy reforms had three main objectives: to guarantee the security of tenure to tenants who had cultivated a piece of land continuously for six years, to reduce rents payments and to give the right to the tenants to acquire the cultivated

⁶⁵ Here I will point out some main aspects mainly related to land reform that can be deepened in Appu (1995), Vaidyanathan (1994), Basu (1994), Chandra et al (2008), Kapila (2003, 2014), Bardhan (1984), Chakravarty (1987), between many others.

land in better conditions than the market price. Many efforts were made with respect to the imposition of ceilings on the size of landholdings. It was thought to reduce the extremely uneven distribution of land. However, with huge pressure from upper castes related to land interests, there was not able to build a strong consensus in the Indian society about this issue, and this was reflected in the extreme difficulty in implementing this programme with even a reasonable degree of success.

Overall, there seems to be a consensus in the literature that the objective that advanced most in the implementation phase was the zamindari elimination, but the advances in the other objectives such as tenant reforms and ceiling were limited and heterogeneous (Bardhan, 1984; Appu, 1995; Vaidyanathan, 1994; Kapila, 2014; Rao and Storm, 1998; Ray, 2014; between many others). The judicialization of the process and the administrative delays were the main bottlenecks. Regional disparity in terms of political and bargain power was a fact. For instance, in Kerala and Bengal, governed by the Communist Party, reforms significantly advanced, but in Uttar Pradesh, Bihar and Madras the zamindars could retain lands under personal cultivation, reinforcing them as landlords. With respect to the evaluation of the achievements Appu (1995, p. 217) says:

“Thus the programmes of land reform implemented since Independence did not lead to any significant redistribution of land, or, the removal of all the obstacles to increasing agriculture production... the laws for the abolition of intermediary interests were implemented fairly well. But in the case of tenancy reform and ceilings on holdings, the policies adopted were ambivalent and there were large gaps between policy and legislation and between legislation and implementation... tenants became owners of or acquired rights in only about 4% of the operated area. The enforcement of ceilings led to the redistribution of less than 2% of the operated area. Thus these two measures taken together led to the redistribution of only 6% of the operated area.”

Cooperative farming was the main official policy in the scheme of agrarian reorganization (Kapila, 2003). As states by Chandra et al (1987), early planners hoped that cooperative arrangement at the community level and motivated workers helped by trained workers of the Community Development programme (1952) would help to implement rural development projects and contribute with critical institutional changes, such as the land reform, organizing cooperatives, etc. In this respect, Bandyopadhyay (2004, p. 499) says:

“Nehru thought that the best way to move forward to enhance agricultural productivity was through cooperative farming by peasants holding 1-2 acres of land; he did not like large-scale capital-intensive farming or the collective farming model. Such efforts were to be coordinated through the "community development" schemes or the Panchayati Raj on the Gandhian model. As Nehru (1963) defined it, this

meant "decentralization in favour of village-elected councils which... were to be given authority and resources to carry out schemes of development."

However, the cooperative movement neither reached its main goals. According to Chandra et al (2008) two main types of cooperatives were formed: 1) Traditional and influential families formed cooperatives mainly to evade land reforms and access to State financing and incentives and 2) State-led cooperatives were formed as pilot projects, but they had access to the worst land, previously uncultivated, without access to irrigation, etc. Besides, the cooperative movement, instead of promoting people empowerment soon became overstaffed government departments with officials, clerks, inspectors, etc.

All in all, despite the general goals of the land reform process and the cooperative movement, were limited achieved and having in mind the preference for the heavy-industry way of the Second Five Years Plan, State role in agriculture development was not insignificant. According to Panagariya (2008), irrigation investment was 16,3% of the total outlay in the First Plan and 9% in the Second and Third Plan. Irrigation was also linked to electric power, stimulated through the building of several mega hydroelectric power projects. Different extension efforts were made such as the Block Development Programme, the Agricultural Extension Officers and the Village Level Workers and many agriculture research laboratories and institutes were created. Availability of chemical fertilizers increased from 73.000 tonnes in 1950/1, to 780.000 tonnes in 1965/6 (Chandra et al, 2008).

Different estimations state that agriculture output growth for this period was between 2,5% and 3%, to Rao and Storm (1998) the agricultural output growth was 2,7%, around 7 times higher than during the first half of the century and slightly superior to the population growth. Around half of this growth was explained by increases in the yields per acre and half by increasing cropped area. This growth has been unevenly concentrated, mainly based on the North-West states (Vaidyanathan, 1994), a characteristic that would continue and even reinforced in the later periods. At the same time, import of foodgrains continued increasing, from 12 million tonnes in the First Plan to 20 million in the Second and 32 million in the Third. The war with China, in 1962, and Pakistan, in 1965, and the drought of 1965-7, pointed out the need to give a new step in the Indian agriculture, introducing high-yield variety seeds, with the land-reform achieving only a limited and heterogeneous advance.

3.2.2. Shocks, political radicalization and technological efforts with Indira Gandhi (1966-1977)

Indira Gandhi, Nehru's daughter, was Indian Prime Minister on two occasions, between 1966 and 1977 and from 1980 to 1984, when she was assassinated. In this section, I will deal with her first 10 years as Prime Minister. If Nehru's period is one of quite a general consensus in the literature, Indira's one is perhaps the most controversial one. No doubt, several 'shocks' such as the wars with Pakistan of 1965 and 1971, the droughts of 1964-66 and the oil peak of 1973 impacted on India causing different economic and political internal stresses and consequences. A lower growth rate than during Nehru's years, different and substantial technological efforts and the consolidation of a strong leadership under Indira's figure that included the declaration of the Emergency in 1975 were some of the main features of this period.

Shocks, radicalization, and political stress. As explained in Chandra et al (2008), after Nehru's death, his succession occurred under the direction of the Congress leaders' group called the Syndicate. Lal Bahadur Shastri, an old member of the Congress Party, was elected as Prime Minister and he offered Indira Gandhi the Ministry of Information and Broadcasting. According to Ghosh (1998) the war with China in 1962 led to an increased in the defense expenditure, that went from 2% of GDP in 1960/61 to 4% in 1963/64. However, the drought of 1964-66 significantly reduced the buffer food stocks and worsened the balance of payments situation (Panagaryra, 2008; Gosh, 1998). The military confrontation with Pakistan in September 1965 related to the Kashmir Valley, added geopolitical tension with both the US and the UK that suspended all food and arms aid to both countries and China declared India as an aggressor. Thus, external shocks were the main characteristic of Indira's government, as stated by Panagariya (2008, p. 47):

“External shocks included two consecutive drought years during 1965-67; a war with Pakistan in 1965 that come on the heels of a war with China in 1962; another war with Pakistan in 1971, which was preceded by a huge influx of refugees and culminated in the creation of Bangladesh; two further consecutive droughts in 1971-72 and 72-73; and the oil price shock in October 1973, which contributed to a nearly 40% deterioration in India's terms of trade over 1972-76. The decline in the growth rate in agriculture is to be attributed largely to droughts that more than offset the positive contribution of the Green Revolution...”

As the food situation was critical, Shastri introduced food rationing in seven states, created the State Food Trading Corporation and gave initial steps to the implementation of the Green revolution. After nineteen months as Prime Minister, Shastri suffered a heart attack and

died. Indira Gandhi, young and heiress of Nehru's political aura, emerged as an interesting figure to the Syndicate members. Indira assumed in 1966 with India suffering a severe drought, famine growing in some States and a "Plan holiday" for two years to redirect resources to import seed to feed the population. During the first four years of the Third Five-Years Plan India imported 25,4 million tons of food grain, but during 1965-66 and 1966-67, India had to import 19 million tons (Panagariya, 2008). Around 15 million tonnes of wheat were imported from the USA, under the PL 480 aid program, with President Johnson maintaining India on a "ship to mouth" existence, by subjecting these shipments to constant threats of suspension. As the U.S. shipments were the only escape from famine for India, he intruded into domestic policy issues, playing a critical role in forcing the devaluation of the rupee in June 1966, the introduction of a number of changes in the industrial control system and the initial set up of the Green Revolution.

However, as highlights by Gosh (1998), the 1966 devaluation failed to have any significant effect on the export performance and the balance of payments was sustained mainly through external aid. On the contrary, the devaluation accelerated domestic inflation rate and generated an increasing feeling of anger among the Indians, as they identified that Johnson was negotiating with the hunger of the Indian people and influencing in the Indian sovereignty. As put by Chandra et al (2008, p. 282):

"President Johnson promised to send 3,5 million tonnes of foodgrains to India under PL-480 and give \$900 million in aid. But actual dispatches to India were irregular and came in small installments. Moreover, the President took charge of the dispatches in order to control their amount and timing on a 'tonne-by-tonne' basis and thus to ensure that 'India changed its farm policy' as also its position on Vietnam. Indira Gandhi felt humiliated by this 'ship-to-mouth' approach of the United States, and refused to bow before such ham-handedness and open pressure."

In the domestic front, the critical economic situation at the end of the 1960s, the internal disputes between Indira, the Syndicate and the other regional and local Congress political leaders, in addition to the political dislike of the big landlords and farmers with respect to the State participation in agriculture through food trade commercialization ended with a defeat of the Congress in the 1967 Lok Sabha (parliamentary) election. Besides, different left groups spin-off from Congress, in what was called the Naxalites movement. Inspired by the Cultural Revolution and criticizing parliamentarism they looked for a more radical path to communism.

Congress parliamentary majority was drastically reduced, giving place to a period of coalition governments at the regional level and accelerating the antagonisms between the Syndicate, with a more conservative posture, and Indira. This process ended with the split of Congress in 1969. The different political details and implications of the Congress split could be deepened in Chandra et al (2008), among others. For our ends, we shall highlight that this split gave space to a radicalization in Indira's policymaking framework, which was initially postulated in 1967, through the Ten-Point Programme, including the nationalization of banks and insurance companies, state trading in import and export trade, ceilings on urban property, further regulations over monopolies and economic power concentration, public distribution of foodgrains, promotion of rural housing and abolition on princely privileges. Indira won the 1971 elections and with the 1971 military victory over Pakistan, she achieved her political momentum, ratifying a State-led, self-sufficient and pro-poor policy agenda. As explained by Chandra et al (2008):

“During 1971-74, the government undertook several measures to implement its left-of-center agenda. In August 1972, general insurance was nationalized and five months later the coal industry. The ceiling was imposed on urban land ownership. The MRTP Act to check the concentration of industrial enterprises in a few hands had already been passed in 1969 and an MRTP Commission appointed in 1971 to implement the Act... Legislation to reduce ceilings on agricultural landholdings and distribute surplus land to the landless and marginal farmers was also passed in several states. The central government initiated a programme of cheap foodgrain distribution to the economically vulnerable sections of society and a cash scheme for creating employment in rural areas. It also made it compulsory for nationalized banks to open branches in underbanked areas such as small towns, rural clusters and the poorer parts of the cities and to make credit available to small industries, farmers, road transporters and self-employed persons...”

With this policy agenda, the internal political tension and polarization increased, with different upraising movements in Gujarat and Bihar. In 1975 Indira declared the state of Internal Emergency⁶⁶. The Emergency and different political roughness such as taking political prisoners, the press censorship and the forced sterilization programs led Indira to call elections in 1977. The opposition front led by the Janata Party won and for the first time India had a non-Congress Prime Minister.

Green revolution (and bank nationalizations). The marked increased in the population growth after independence and the slow but steady rise in income per capita put long-term

⁶⁶ In this video, Indira Gandhi was interview by a BBC reporter on the Indian geopolitical and internal political situation during her first government: <https://www.youtube.com/watch?v=q8aETK5pQR4>.

pressure on the Indian agriculture, causing a continuous increased in foodgrain imports during the early 1960s (Chandra et al, 2008; Rao and Storm, 1998). The droughts of 1965/66 and 1966/67 installed the urgent need to improve agriculture production, placing economic self-reliance and food self-sufficiency as a top objective of the economic and foreign policy and giving place to the implementation of the so-called green revolution⁶⁷.

In general terms, as explained by Rao and Storm (1998), the New Agricultural Strategy (NAS) implied a re-switch from a institutional-based approach, applied until mid-sixties, which consisted basically in the implementation of land reforms and public investment in agriculture infrastructure, mainly major irrigation, to a technology-based approach based on the introduction of the high-yielding varieties (HYV), minor irrigation works, chemical fertilizers and pesticides in determined deliberately concentrated regions and crops (mainly wheat). Referring to this new approach, Chakravarty (1987, p. 24) states:

“The new policy marked a notable shift in the perception of what constituted the crucial constraint in the agrarian sector. Earlier theorizing had maintained... that it was basically the absence of knowledge of appropriate agriculture practice, along with the maintenance of an obsolete social structure, which prevented increases in agricultural production. Land reform was considered very important, at least in principle; in practice, the issue was largely evaded. The new strategy seemed to deny the critical importance of land reform even on the level of principle. Instead, the emphasis was shifted towards technological modernization...”

Chakravarty (1987) highlights the main aspects of the new approach, supported by the US: 1) a shift from major to minor irrigation works, that implied a shift from public financed large irrigation projects to small tube wells and energized pump sets, 2) adequate provision of credit to those considered to be credit-worthy, that meant the large farmers, 3) an increased in the rate of fertilizer and energy (electricity and diesel) consumption, 4) the development of fertilizer-sensitive varieties of grains. According to Kapila (2003, p. 228) the seed-fertilizer-water package needed better agricultural practices for the effective utilization of the technology:

First, the plan requires the fertilizer-water input at particular stages of growth to give the best yields. Secondly, as fertilizers can be absorbed by weeds as well as by the plant, effective weeding is required to prevent waste of expensive fertilizer. Thirdly, while the HYV seeds give higher yields, they are more prone to damage from excessive watering. For example, shorter-stemmed dwarf varieties are more reliable

⁶⁷ The debate on green revolution is diverse and there are many kinds of literature on it. In this section, I will deal only with some issues, mainly based on the works of Rao and Storm (1998), Chandra et al (2008), Chakravarty (1987), Bardhan (1984), Kapila (2003, 2014), Panagariya (2008). A deeper discussion on the subject could be found in these and many other authors.

to be flooded. They thus require more effective water control and better drainage. The need is for controlled and adequate water supplies. Fourthly, being relatively new and non-acclimatized strains, they are more prone to local pests and diseases than established indigenous varieties and therefore, require a supply of germicides and pesticides.

In concrete, in 1965 C. Subramaniam, Nehru's Minister of Steel, Mines and Industry was appointed as Minister of Food and Agriculture by Shastri and sustained by Indira Gandhi. At the institutional level, the Agricultural Price Commission (APC), the Food Corporation of India (FCI) and the National Dairy Development Board (NDDB) were created in 1965. APC established minimum support prices in order to ensure remunerative prices for farmers, FCI distributed food grain throughout the country and maintained buffer stock foodgrains, becoming a major player in the procurement and distribution of grains, NDDB promoted milk production by small producers (Panagariya, 2008).

The Rockefeller Foundation was trying to introduce the HYV from the *Centro Internacional de Mejoramiento de Maiz y Trigo* (CIMMT) of México in India with the support of the Ford Foundation. The new seeds could yield more than double of the existing levels. However, the implementation of the new policy faced strong opposition from the cabinet, the public and the parliament (mainly from the left), but with the support first of Shastri and then of Indira, Subramaniam advanced with public demonstrations of the HYV potential and finally managed to implement a pilot experiment. According to Panagariya (2008), in 1966 India imported 18,000 tons of Mexican seed that added to 5,000 tons of seed that already existed in India that were multiplied from 250 tons imported in 1965. They were distributed in Punjab, Haryana and western Uttar Pradesh where the irrigation of the Nehru's period had been concentrated and the results were decisive: in 1967/68 India produced 17 million tons of wheat, compared with the previous record high of 12 million tons.

Several complementary investments and institutional efforts were involved in this first phase of the Green Revolution. The spread of the HYV seeds was supported by public investments in fertilizers, canal water, power, irrigation and credit (Kapila, 2014; Bardhan, 1984; Rao and Storm, 1998, etc.). Although below other East Asia countries including China, as can be seen in the next table based on Rao and Strom (1998), there was an impressive expansion in the use of chemical fertilizers. Nutrients per unit of the cropped area increased from less than 1kg. per hectare in the early fifties to about 5kg. in the early sixties and to 32 kg. at the beginning of the 1980s. The gross irrigated area increased from 22% in the early 1950s to 38% at the beginning of the sixties and to 50% at the beginning of the 1980s.

Electricity consumption in Indian agriculture went from 833 million kWh in 1960/61 to 4,470 in 1970/71 and to 14,489 in 1980/81.

Chart 15 - Use and capital formation in Indian agriculture. 1950-1 – 1980-1

	Unit	1950-1	1960-1	1970-1	1980-1
Fixed inputs					
Tractors	No./1.000 ha of gross cultivate area	0,1	0,2	0,9	2,7
Electrical pumps		1,0	16,8	52,0	59,8
Diesel pumps		2,7	19,1	50,1	56,0
Gross fixed capital formation	Rs crore	-	1777	2884	4864
Public	Rs crore	-	589	789	1892
	%		33%	27%	39%
Private	Rs crore	-	1188	2095	2972
	%		67%	73%	61%
Chemical fertilizers	kg/hectare	-	1,9	13,1	31,8
Electricity	Million kW.	203	833	4.470	14.489
Net irrigated area	Million hectares	20,9	24,7	31,1	38,7
Canals	%	39,8	42,1	41,3	39,5
Tanks	%	17,3	18,5	13,2	8,2
tube-wells	%	28,7	29,6	38,2	45,7
Gross irrigated area	Million hectares	22,6	28,0	38,2	49,8
Area under HYV sedes	% of gross cultivated area	0,0	0,0	9,3	24,9

Source: own elaboration based on Rao and Storm (1998).

Public investment, which represented around 30% of the total agriculture gross fixed investment, ‘crowded in’ private investments, mainly in farm assets, that boomed. Electric and diesel pumpsets increased from 421,000 to 2,4 million between 1960/61 and 1970/71, tubewells increased from 90,000 to 460,000 and tractors from 31,000 to 140,000 (Chandra et al, 2008). With respect to the public-private complementation Kapila (2003, p. 231) states:

“...apart from the introduction of HYVs of seeds for wheat and rice, public investment in agriculture was stepped up significantly. The new technology raised

the profitability of investment for farmers. Besides, in agriculture, there is a high complementary between public and private investment. As a result, the annual gross capital formation in agriculture, public and private combined, at constant prices, rose much faster than in the pre-green revolution period. This is reflected in the accelerated increase in gross irrigated area. From less than one million hectares per annum during the pre-green revolution period, it increased to about 2.5 million hectares per annum during the seventies. However, owing to the land constraint, the growth of the net sown area slowed down considerably. This explains why despite the accelerated increase in capital formation and the introduction of new technologies, the growth rate of agricultural output was no higher than in the pre-green revolution period.”

In 1969, Indira decided the bank nationalization, through the Banking Companies (Acquisition and Transfer of Undertakings) Act, nationalizing all banks whose nationwide deposits exceeded 500 million rupees, adding 14 banks and 54% of banks branches into public sector property and totalizing 84% of the bank branches in the public sector (Panagariya, 2008). A main objective of nationalization was to canalize resources into agriculture and rural areas. This objective was significantly achieved: bank branches jumped to 35% in 1972 from 22 in 1969; population per branch declined from 64,000 in 1969 to 29,000 in 1976 and 19,000 in 1981; rural credit expanded from 2% in 1969 to 6% in 1976 and 11% in 1981; rural bank deposits increased from 3% in 1969 to 9% in 1976 and 13% in 1981 (Panagariya, 2008). Besides, in 1972, by the General Insurance Business (Nationalization) Act, the General Insurance Corporation (GIC) was created as a holding company, mainly oriented to provide insurance to poor farmers and rural area population (Nayyar, 2015). Both nationalizations contributed to the channeling of resources to agriculture and rural areas.

During the 1970s, according to Kapila (2014), the drought of 1972/73 produced a decrease in the foodgrains of 7% pushing again the imports from the US and making Government take over the wholesale trade in wheat, although this move showed no results and was abandoned. As the oil-peak of 1973 pushed up fertilizer prices, in 1977 a retention price scheme was introduced for urea, the main fertilizer, in order to dislocate local price from international market price movements. As power consumption increased substantially during the 70s, energy subsidies significantly increased. Another main trend of the 70s was the extension of HYV technology from wheat to rice, favored by the growth of tube wells and expanding green revolution to new areas.

With respect to the results, according to Chandra et al (2008) between 1967/68 and 1970/71 foodgrain production rose by 35%. Between 1964/65 and 1971/72 aggregate food production increased from 89 to 112 million tonnes, a 10% per capita increase. Net food imports decreased from 10.3 million tonnes in 1966 to 3.6 million in 1970. India achieved the

self-sufficient in food status with buffer stocks of 30 million tones and exporting significant amounts of food at the beginning of the 70s. According to Rao and Storm (1998) figures showed next, foodgrains output growth between 1967/68 and 1981/82 was 2,21%, being minor to the 2,93% growth of the pre-green revolution period, because of the decreased in the cultivated area: yield growth rate in foodgrains between 1967/68 and 1981/82 was 1,85, but the growth in the area used was 0,37. These numbers give an account of a technology-intensive agricultural output growth rather a land-intensive one. Besides, output growth was particularly high in wheat, achieving 5,21% increased between 1967/68 and 1981/82, more than 2pp superior than all the other foodgrains such as rice, maize, etc.

Chart 16 - Indian agricultural growth. 1891-1991. % per annum.

	Pre-independence period (1891 - 1946)			Pre-green revolution period (1949-50 - 1964-5)			Early green revolution period (1967-8 - 1981-2)			Late green revolution period (1981-2 - 1991-2)		
	Area	Yield	Output	Area	Yield	Output	Area	Yield	Output	Area	Yield	Output
Foodgrains	0,31	-0,18	0,11	1,41	1,43	2,93	0,37	1,85	2,21	-0,26	3,19	2,92
Rice				1,33	2,13	3,49	0,69	1,45	2,16	0,62	3,25	3,87
Wheat				2,68	1,27	3,99	2,60	2,55	5,21	0,28	3,06	3,33
Jowar				0,99	1,50	2,50	-0,84	3,50	2,61	-1,96	1,83	-0,10
Maize				2,66	1,18	3,87	0,10	0,49	0,58	0,11	2,46	2,62
Non-Foodgrains	0,42	0,86	1,31	2,52	0,93	3,54	1,06	1,34	2,41	1,71	2,55	4,30
All crops	0,40	0,01	0,37	1,61	1,30	3,13	0,54	1,74	2,29	0,49	2,93	3,42

Source: own elaboration based on Rao and Storm (1998)

Specifically, with respect to the Indian research institutions, the Indian Council of Agricultural Research (ICAR) and the Punjab Agricultural University played a relevant role in the indigenization of the HYV seeds. As shown in the next table, an intense process of import substitution on chemical fertilizers was done, going from a ratio of imports over the availability of 59,8 in 1969/70 to 41,5 in 1979/80. According to Long (1988, p. 404), India performed well in indigenizing the HYV varieties:

“A major test for India’s research effort in agriculture came when the new and potentially highly productive strains of short-stem wheat and rice began to be distributed by the international agencies that had developed them. India’s agricultural research system met this suddenly developed opportunity splendidly. It moved rapidly to examine the utility of these new strains for India and undertook to develop modified strains of the “green revolution” varieties to fit India’s climatic needs. The Indian government did its part by importing and later producing locally the necessary fertilizers... Other problems and other opportunities remain but it is clear that India’s agricultural research activities are solidly based and well supported. Given the climate-specific character of agriculture, the decentralized character of state-operated R&D is surely desirable...”

Chart 17 - Chemical fertilizers. Domestic production and imports. 1950-1983. In 1.000 tonnes of nutrients.

	1960-1 to 1969-70	1970-1 to 1979-80	1980-1 to 1983-4
Domestic production	4.368	19.408	16.036
Nitrogenous based	3.050	14.942	12.217
Phosphatic based	1.318	4.466	3.819
Imports	6.510	13.785	7.287
Nitrogenous based	4.747	8.147	3.645
Phosphatic based	777	1.984	1.001
Potassic based	986	3.654	2.641
Total availability	10.878	33.193	23.323
Imports / Availability (%)	59,8	41,5	31,2

Source: own elaboration based on Chakravarty (1987)

Green Revolution also implied some desired and undesired consequences that were not except critics. Some main consequences explained by Chakravarty (1987) were: 1) the increased in the purchased inputs in the agriculture sector, deepening agriculture-industry linkages and the need to ensure flows from industry to agriculture, 2) the monetization of the Indian agriculture increased drastically, 3) the price-support policy introduced a downward

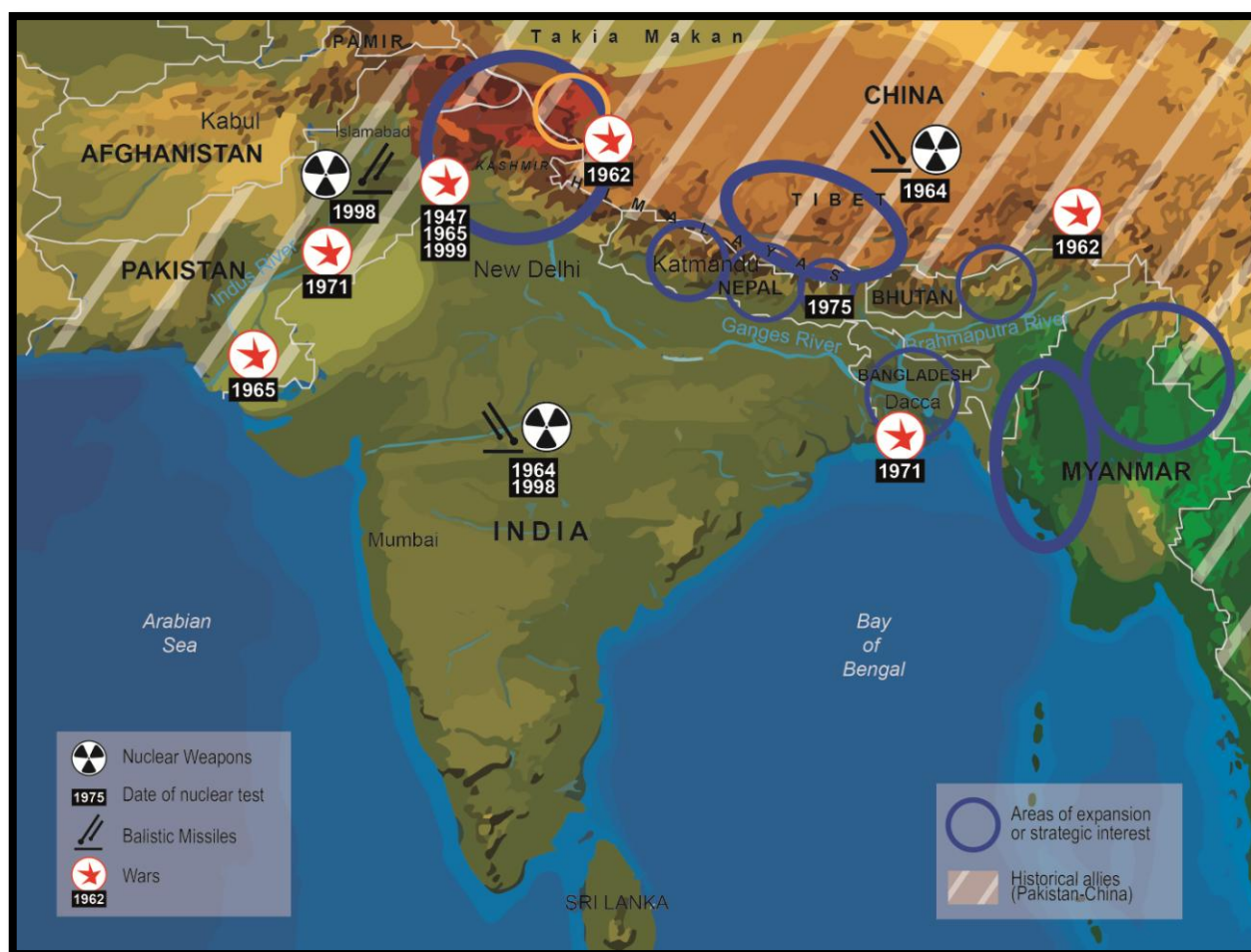
rigidity in agriculture prices, turning the price determination part of a wider political process, 4) the greater use of energy and oil-based fertilizers made agriculture much more sensitive to fluctuations in the world market, particularly of oil prices, 5) there was an increased in the mechanization of the agriculture. Green Revolution increased output, giving more than proportionate benefits to the farmers located in the structurally better-endowed regions such as Punjab and West Bengal.

With respect to concentration aspects, Rao and Storm (1998) pointed out that, as the Green Revolution was consolidated around the best agriculture and infrastructure endowed regions, in a strategy of concentrating growth region-wise, class-wise and crop-wise, the 'building on the best' capitalist development in the favored regions was the direct outcome. Environmental consequences such as erosion, deforestation and an increased in flooding and drainage problems, related mismanagement and unregulated expansion, mainly in poor areas, are highlighted by different authors such as Rao and Storm (1998), Kapila (2014), Chandra et al (2008) and Shiva (1991).

In our view, the green revolution during Indira's period needs to be understood as a significant institutional effort made under a stressful agriculture and food security context, path dependence in nature and explicitly concentrated. The whole process succeeded in increasing agricultural productivity and output although reinforcing the regional and income inequalities. Tenants that did not have the security of tenure and small peasants without access to credit were the main losers given the increased in the agricultural capital/output ratio. However, overall, as food crops prices went down, there was a general improved in the poor leaving conditions. The role of the State and the Indian NSI was central in the whole process, through direct public investment in infrastructure, crowing in private investment, building buffering stocks, giving credit and minimum prices, etc. The indigenization of the HYV technology was another significant effort and achievement.

The triad consolidation: Nuclear, Space, and Defense. As can be seen in the next map, in 9 years, between 1962 and 1971, the Indian subcontinent confrontations and military events included a mayor military Indian defeat with China, in 1962, two military Indo-Pakistani confrontations, in 1965 and 1971, and China going nuclear, with her detonation in 1964. These events necessarily impacted on the Indian NSI profile, deepening the nuclear, space and defense debates, strategies, capabilities, and R&D expenditure (Joseph et al, 2008).

Figure 20 - Main Indian military confrontations and events between 1962 and 1999



Source: elaborated by Rosaura Flynn.

After the military defeat of 1962 against China, defence capability's upgrading and modernization, including the development of nuclear weapons, increasingly occupied the Indian strategists, policymakers, and public debate. Although receiving US military aid after 1962, as said, in 1965 the US and the UK stopped military assistance. This, added to the Johnson's 'ship-to-mouth' approach to the Indian agrarian crisis, pushed Indira to freeze relationships with the US and deepen the connection with the URSS. China's nuclear detonation of 1964 and the Indo-Pakistan war of 1965 added pressure on the nuclear issue, as described by Ogden (2011, 292):

“China's nuclear tests at Lop Nor on 16 October 1964 confirmed India's perceived threat and added credence to the notion that nuclear weapons were force equalizers that overcame military asymmetries between states. In addition, nuclear weapons became seen as a shortcut to a modernized defence force that would exponentially improve India's security. After Indian leaders failed to illicit nuclear guarantees from the USA and the URSS... pressure grew for India's nuclear option to be realized and in 1964 Indian Prime Minister Lal Bahadur Shastri launched a

programme to reduce the time in which India could be weapons capable to six months. Chinese threats of opening a second front during the 1965 India-Pakistan war reinforced this necessity, as did the emergence of close China-Pakistan ties aimed at limiting India's regional influence. Post-1964 the nuclear debate in India thus became dominated by the threat posed by China, the cost of nuclear weaponization and the morality of having such weapons."

According to Cohen (2001) there were three lobby groups involved in the Indian nuclear debate of the second half of the sixties: the 'nuclear abolitionists', based on Gandhian non-violence philosophy and Nehru's antimilitarism; the 'nuclear hawks', willing to support a nuclear strategy and the 'contingent hawks', who did not see India going nuclear soon, unless a threat appeared with China or any other country. During the 1960s, the 'option' strategy sustained by this third group was explicit or implicit adopted. However, after the military confrontation with Pakistan in 1971, the global and regional context forced the nuclear weaponization option and the deepening of the relationship with the URSS, as put by Ogden (2011, p. 293):

"...although India had fought a successful conflict with Pakistan in 1971 (which led to the creation of Bangladesh) and had signed the 20-year treaty of Peace, Friendship and Cooperation with the USSR, India's regional security environment was deteriorating. This deterioration was typified by the US tilt to Pakistan in the 1971 war (during which the USA sent ships into the Bay of Bengal), by deepening China-Pakistan ties and, most critically, by the US-China rapprochement under Richard Nixon and Mao Tse Tung from 1972. These relations effectively created a China-Pakistan-USA united front against India and were strengthened by China's regional nuclear monopoly. Such factors combined with a variety of domestic pressures, and India's Prime minister Indira Gandhi... decided to carry out a nuclear test to demonstrate India's capability. With a sufficiently developed nuclear programme at hand and under the codename 'Smiling Buddha', India undertook her first nuclear test on 18 May 1974 – a test described as a Peaceful Nuclear Explosion (PNE)"

Space activity was seen as a critical asset in the technological base not only for economic security but also for military security. As a consequence, the Indian space programme received a significant military push. With this respect, Reddy (2011, p. 319) says:

"At a symposium in New Delhi called to review China's success in space in May 1970. Scientists, defence experts, economists, political analysts and members of parliament decided by an overwhelming majority that the Government should revise its nuclear policy and produced the bomb immediately. When the Government of India outlined to the public the profile of a 10-year nuclear energy *and* space development programme in July 1970, which included among other things the development of an experimental satellite launch vehicle, the 'bomb-for-security' lobby saw it as a firm step towards nuclear weaponry. Although a separate missile development programme, the *Devil's Programme*, was initiated in the defense sector in 1970/71, it was the space programme that had already established a modest infrastructure in rocketry, which continued to attract the attention of the 'bomb-for-security' lobby."

The Indian space institutions got dense during the 1970s (Joseph et al, 2008). In 1972, the Space Commission was created to be in charge of the space policymaking, under the newly created Department of Space (DOS). The DOS was directly under the charge of the Prime Minister, Indira Gandhi, linked to the Indian Space Research Organization (ISRO), which was set up in 1969. The DOS/ISRO conducted experimental missions in the field of satellite technology, launch vehicles, and space applications. ISRO gained experience in running satellite-based instructional television system, with support from the NASA, through the Satellite Instructional Television Experiment (SITE). The DOS also entered into the Satellite Telecommunications Experiment Project, using Franco-German communications satellite *Symphonie*. A station that later became the base of the Indian National Remote Sensing Agency (INRSA) was built in Hyderabad to receive data from the US Landsat. In the area of scientific satellite technology, ISRO built its first satellite, the Bhaskara-I and the Bhaskara-II and one experimental communication satellite, the APPLE (Ariane Passenger Payload Experiment). Furthermore, in 1973 ISRO developed the four-stage launch vehicle SLV-3 and during the 1970s different experimental launches occurred. After a first failure, the second launch in 1980 placed a small scientific satellite of 40 kg. into earth orbit, positioning India as a member of the select group of space-faring countries.

As said, after the Nixon-Mao approximation of 1972, the URSS wanted to balance China's power in Asia, increasing cooperation with India. Naval and space technical assistance, MiG-21 fighters planes, tanks, ships and other weapons and diplomatic support at the UN Security Council were obtained from the URSS. In particular, the Soviet support to the Indian space program during the 1970s was significant, as explained by Reddy (2011, p. 315):

“In building Indian capabilities in satellite technology, the URSS played a vital role. Both the Aryabhata and the Bhaskara satellites were developed by joint teams of Indian-Soviet scientists and engineers. An important feature of these experimental satellite projects was that they were not modeled after the early generation satellites of the space powers, but represented state-of-the-art technology. The APPLE satellite, up-to-date in some of its features, incorporated the three-axis stabilization technology that was mastered by the USA and Europe only in the mid-1970s.”

Thus, at the end of the 70s India consolidated the science-push profile of her NSI based on nuclear, space and defence blocks. According to Long (1988), the Defense Research and Development Organization (DRDO), the Department of Atomic Energy (DAE) and the

Department of Space (DOS) concentrated over 50% of the Indian R&D expenditure at the beginning of the 80s.

Industry nationalizations, regulations, indigenous development and science, and technology policy. As said before, the external shocks, the domestic political disputes, and the economic stress led to a radicalization in Indira's policymaking framework, particularly during the 70s. Nationalizations were done in different sectors. Among the main policies and regulations appear the Monopolies and Restrictive Trade Practices (MRTP) Act (1969), the Industrial Licensing Policy of 1970, the Foreign Exchange Regulation Act (FERA) of 1973 and the introduction of small-scale enterprises reservations in 1967. Related to STI explicit policies, the Patent Act of 1970, the computer industry initial steps, the first Science and Technology Plan of 1973 and the R&D fiscal stimulus scheme should be highlighted.

The industrial nationalizations were mainly done in coal, steel, textile, engineering, chemical and oil sectors (Khanna, 2015; Kabra, 1989; Kaul, 1991; etc.). According to Kabra (1989), between 1970 and 1978, the main nationalizations were: the Indo-Burma Petroleum Corporation, the Indian Cooper Corporation, almost 1.000 coking coal mines, several steel companies such as the Steel Containers, the Indian Oil Blending, Esso and Burma-Shell from oil refining sector, more than 100 textile mills, the Hindustan Tractors and the Britannia engineering, etc.

As a result of the reports of different Commissions and Committees such as the Hazari and Dutt Committees and the Monopolies Enquiry Commission, in 1969 the Monopolies and Restrictive Trade Practices (MRTP) was created to regulate big business (Panagariya, 2008). The Act allowed the government to approve investment activity only if it would not lead to further concentration, although there were exceptions depending on the public interest in some projects and sectors. The Industrial Licensing Policy of 1970 reinforced the government control over industry through the license system, consolidated as the main policy instrument. Furthermore, the small-scale industries reservation policy was introduced in 1967. The list of products began with 47 items and expanded to 177 in 1974 and 504 items in 1978 (Panagariya, 2008). These items include clothing, shoes, leather products, toys, furniture, simple electrical appliances, etc.

Direct import control was consolidated in the form of a list of importable products with restrictions. According to Panagariya (2008) figures, the ratio of imports to GDP dropped to 3.5% in 1972/73, including oil and petroleum products, with an average for the period between 1970 and 1980 of 5.75%. Similarly to the Latin American experience,

although import substitution reduced imports of substitute products, they were replaced by increasing demand for imported capital equipment and technology.

With respect to the policy toward FDI, the crisis of 1965-1967 drew the government attention to foreign exchange outflows resultant from remittances of dividends, profits, and royalties (Panagariya, 2008). In line with the recommendations of the Mudaliar Committee on Foreign Collaborations (1966), first, in 1968, with the creation of the Foreign Investment Board (FIB) and then, in 1973, with the Foreign Exchange Regulation Act (FERA) a restrictive FDI policy was implemented (Abrol, 2013). As explained by Joseph and Kakarlapudi (2014) the Foreign Investment Board (FIB) was set up to deal with all cases involving FDI of less than 20 million rupees and within the 40% equity limit, only permitting bigger shares in priority areas. A maximum of royalty payments was fixed, normally 5% of the sales. Foreign firms were pushed to engage the public and private sector firms as consultants and foreign collaborations were restricted (Mani, 1992). As a result, the number of cases involving foreign equity participation declined from 165 in 1961 to 27 in 1971. IBM and Coca-Cola closed operations in India during this period.

With respect to the technology policy, in 1970 was enacted the Patent Act, which reduced the duration of patents from sixteen to fourteen years and for drug and food for seven years. Consequently, reverse engineering was the way India developed much of its technological capabilities in the pharmaceutical industry, which became with time one of the main Indian industrial sectors. Referring to the Patent Act, Joseph et al (2008, p. 46) say:

“...the Indian Patent Act (1970) played a major role in promoting indigenous technology by way of learning by doing. The Patent Act was one of the cornerstones of India’s indigenous technology development initiative. Comprehensive and extensive, the Act was aimed at protecting the nascent domestic industry and was a role model for many developing countries. In the case of food, pharmaceuticals, pesticides and other agrochemical products, the term of patents was shortened to five years from the date of sealing the patent or seven years from the date of filing whichever was earlier. The act had many interesting features, like the adaptation of process instead of product patenting, reduction in the number of years of patent protection, powerful compulsory licensing provisions, enabling state intervention in pricing of patent products and so on. The mechanism of process patenting proved very effective for the development of pharmaceuticals, light engineering, industrial components and even chemical process equipment industry.”

Computer industry also had a main push during this period (Rajaraman, 2012). After the military defeat with China in 1962, the Government of India realized that electronics and communications were important for defence issues and constituted a committee in 1963 with Homi Bhabha (Chairman of the Atomic Energy Commission) as its chairman to prepare a

plan for its development. One of the main recommendations was to establish a Department of Electronics (DoE) to promote electronics and computer industry and to constitute an Electronics Commission (EC) with wide financial and executive powers. The Department of Electronics (DoE) and the Electronics Commission (EC) were created in 1970. The war with Pakistan and the first Indian nuclear detonation has resulted in embargos on electronics and computer imports from the USA, indirectly pushed the government initiatives related to local production.

The Electronics Corporation of India Ltd. (ECIL) was financed to design, develop and produce computers using components made in India. ECIL made computers called TDC 312 and TDC 316, similar to the PDP series computers made by the Digital Equipment Corporation of the USA. To Rajaraman (2012) an important contribution of the ECIL that is not highlighted in the literature was to provide computers for the Air Defence Ground Environment Systems (ADGES) of the Indian Air Force. These systems were deployed along India's borders to detect intrusion by non-friendly aircrafts. Each system used three TDC 316 computers connected to 8 display units co-developed by ECIL and the Tata Electric Company with fairly complex interface electronics. The systems with radars developed by the Electronics and Radar Development Establishment, Bangalore were designed and deployed during 1969-1984. To Rajaraman (2012, p. 25), ECIL contribution, although not fully successful in the commercialization of computers to the private sector, was really relevant for the industry consolidation:

“During the period 1971-8, ECIL demonstrated that computers could be manufactured in India with local components, imported ICs, and peripherals. It, however, worked more like a cottage industry as the volume of production was small. ECIL's sales effort was poor and hence it could not sell its machines easily. Most of the ECIL machines were bought by the Atomic Energy Establishments, government departments and Universities which obtained grants from the government and were constrained to buy the ECIL machines. Only 4 machines were sold to the private sector. ECIL machines were overpriced and did not have sufficient software. However, the contribution of the ECIL was in the training of over a thousand engineers in designing systems and developing systems software. Many of them later joined the private manufacturers and software companies to lead groups there.”

With the objective of achieving technological self-reliance through promoting indigenous development and consolidating S&T planning, on the institutional level stands out the creation of the National Commission of Science (NCST) of the Department of Science and Technology in 1972 (Krishna, 2013). In 1973 the first Science and Technology Plan

(STP) was formulated, for the period of 1974-1979. As explained by Sikka (2008), the STP (1973) was elaborated by the NCST and not by the Indian Planning Commission, in order to coordinate the potential fragmented technological and research efforts of the different Ministries and departments. The STP (1973) structured the R&D efforts in 24 sectors: family welfare and health, natural resources, fuel and power, heavy engineering, chemical industries, machine tools, mining, steel and metallurgical industries, transportation, meteorology, consumer industries, housing and urbanization and construction technology, marine resources, education, research and extension, special materials, utilization and recycling of wastes, village industries, information, employment of S&T manpower, instruments, small scale industries, refrigeration and air conditioning, environmental quality and pollution control and others.

There was a marked increase in the investment in the science and technology during the period. According to Joseph et al (2008), by the end of Fifth five year plan (1974-1978) an amount of Rs. 13.800 million was invested, quadruplicating the investment in science and technology as compared to the Rs. 3.730 million spend in the Fourth five year Plan (1969-75). The outlay for R&D during the last year of the Plan (1978-79) increased to 0,84% of the GDP. Joseph and Abrol (2009) point out that in 1974 the government implemented a scheme that recognized the in-house R&D units of industrial firms, which were given easier access to imported equipment, raw materials, and tax concessions. The number of these registered units increased from 106 in 1973 to over 900 by the early 1980s (Joseph and Kakarlapudi, 2014).

‘Food’ and ‘Fuel’. As already introduced, Indira Gandhi’s radicalization had a pro-poor policymaking approach. According to Kapila (2014), rural poverty declined from 64% in 1967 to 56% in 1973. However, as explained by Chakravarty (1987), the distributive and poverty issue was already present in the planners' debate. In the Third Five Year Plan (1961-1965), the reduction of inequality was stated as an objective, although in some sense the Mahalanobis model considers that the increase in consumption level could appear at the end of the process of capital accumulation. In the 60s, it was created a working group led by Pitambar Pant in order to study how to raise the minimum level of living. Pant document was presented in 1962 and it broadly stated that some degree of inequality was an essential part of the structure of incentives in any growing economy but 20% of the population would have been not affected by the growth process and had to be taken care by transfer payments. He presented estimations with the conclusion that it was required a growth of 7% per annum in

order to give the poorest three deciles a nutritionally adequate diet. According to Chakravarty (1987, p. 31), Pant work was:

“...probably one of the first attempts in a non-socialist developing country to work out a perspective for poverty eradication. However, because of the disastrous harvest failures in 1965 and 1966, Pant’s base level assumption turned out to be way off the mark, and details on this particular exercise were almost completely forgotten even within the Planning commission itself. The document was never officially published, but an edited version was printed in the mid-seventies in a non-official publication after an Approach document prepared for the Fifth Five-Year Plan had for the first time put the problem of poverty eradication in the foreground of political discussion.”

It was the Fifth Five Year Plan (1974-1978) the first to postulate poverty alleviation (Garibi Hatao or "get rid of poverty") and employment as the main objective. The Minimum Needs Programme (MNP) was introduced in the first year of the Plan with the objective of providing certain basic minimum needs. To Abrol (2014) the pro-poor innovation-making received the main push during these years, through the nationalizations and the channeling of resources to rural areas. Many institutional pro-poor initiatives were implemented such as the Karimnagar project, initiated in Andhra Pradesh in 1972, with the aim of taking science and technology to the people in rural areas. Concretely, the initiative consisted in the identification of a number of proven technologies, which could help in the socio-economic development of the participating community such as the implementation of technologies for rural water supply, road construction and field-test R&D.

At the macro level, according to Chakravarty (1987), it was calculated that a rate of growth of 6,5% in GDP would eliminate the decline in the average level of consumption of the three top deciles. However, a growth of 5,5% could not maintain the consumption level of these deciles. A higher growth rate could be achieved if the capital-output ratio was lowered or if there was a greater inflow of external capital. In this sense, Chakravarty (1987, p. 35) points out the relevance of "food" and "fuel" for the Indian development path:

“It was clear from these exercises that in so far as there were major supply constraints on meeting minimum needs, India’s economic strategy needed to pay greater attention to agriculture and energy. ‘Food’ and ‘fuel’ emerged as the leading sectors, as there was at that time significant excess capacity in sectors such as steel. The Mahalanobis strategy was seen to be not so much basically flawed on the production side as inadequate because of the relatively simple treatment of the agriculture sector and inability to take account of the different end uses of intermediate products. This last deficiency no doubt arose from its highly aggregated character.”

In fact, infrastructural bottlenecks were the main cause of industrial slowdown from the middle sixties. As can be seen in the table below, the capacity of power generation grew more slowly during the 1970s than in the 1960s and in the 1980s. State expenditure oriented to energy during the 1970s reached a plateau at around 18%. But energy bottlenecks were not only related to the planning exercise but to implementation problems (Chackavarty, 1984). Failures to coordinate the coal, power and transport sectors explain part of the shortages. Errors with the estimation in the power demand of the informal sector also can be pointed out, as well as the inter-regional diversities and the growth in the inter-industrial linkages. The Electricity Supply Act was amended in 1975 enabling the central government to deepen its role as central coordinator into power generation and transmission. Both issues, food, and fuel would still be present as a main challenge to the Indian economy until nowadays.

Chart 18 - Rates of growth in Electricity Capacity and Generation. % per annum. 1950-85.

Period	Capacity	Generation
1950-1 - 1959-60	8,31	11,34
1960-1 - 1969-70	12,64	12,07
1970-1 - 1979-80	7,83	7,33
1980-1 - 1984-5	9,36	8,74

Source: own elaboration based on Chakravarty (1987)

3.2.3. “Internal liberalization”, State expenditure and transferences and self-reliance redefined during the Indira / Rajiv Gandhi’s 1980s (1980-1989)

The 1980s are a relevant period for India because GDP growth accelerated and both internal liberalization and State expenditure increased. Some economists such as Nell (2012) and DeLong (2003) situate in the 1980s the beginning of the Indian “fast growth regime”. The annual average real growth went to 5,9% a and the annual average real growth per capita went to 3,8%, from an average of 3.7% and 1,5% respectively for the period between 1950 and 1980. Related to the Indian NSI, during the 80s, exports were given more emphases. Energy, biotech, and supercomputers were especially promoted and supported and the technology

missions⁶⁸ were introduced as the main policy instrument in order to give an answer to specific problems such as water, immunization, oil-seeds, telecommunications, literacy, etc. (Joseph et al, 2008; Krishna, 2013, etc.)

In historical terms, briefly, after Indira Gandhi's defeat in 1977, as defined by Chandra et al (2008), the "Janata Interregnum" longed for only three years, pushing some liberalization initiatives at the economic sphere. Although without reaching political support and economic results, they lost in 1979 against... Indira Gandhi. After the internal political stress caused by the declaration of the Emergency during the 1970s, Indira's second period as Prime Minister was more moderated and ended abruptly with her assassination by her two Sikh bodyguards in reprisal of her order to the Indian army to enter the Golden Temple in Punjab in the so-called Operation Blue Star⁶⁹. Rajiv Gandhi, Indira's younger son, reached power after Indira's assassination. As a young man, he had a modern style, with a more pro-business and pro-technology bias, pushing some steps in the liberalization process, promoting exports and taking some relevant initiatives for promoting technology development.

Internal liberalization, State expenditure & transferences and balance of payments constraint. The second international oil price peak of 1979 deteriorated India's terms of trade by around 30% in less than a year coinciding with the worst harvest in post-independence history with foodgrain output declining by 13% in 1979/80 (Gosh, 1998). Inflation accelerated and India entered an industrial recession. In this context, in the first year of her second period as Prime Minister, showing a much more centrist political approach, Indira's government negotiated a loan from the Extended Fund Facility of the IMF. With respect to its characteristics and conditionalities, Gosh (1998, p.317) says:

"In November 1981, after prolonged negotiations in which the US representative opposed the loan, India was granted a loan of SDR 5 billion, payable in three installments over three years. The conditionalities attached to this loan...involved a set of performance criteria, specifying ceilings on net bank credit to the government and total domestic credit, limits to money supply (M3) and a prohibition on any further import restrictions. In addition, the government issued a 'statement of economic policies' worked out in consultation with the IMF... this set of proposed policies included not just increased in public investment for domestic oil production

⁶⁸ For a pioneer analyses on the relevance of National Missions see (Freeman, 1987).

⁶⁹ After the uprising of a local Sikh leader, Bhindranwale, and his supporters that took the Temple. The army used heavy artillery such as tanks in the operation destroying parts of the Temple and causing the deaths of a large number of Sikh fighters and innocent pilgrims.

and infrastructure, but also several commitments towards economic liberalization..."

The voices in favor of liberalization of the economy were increasing in the Indian domestic debate: Chinese pro-market reforms and the Japanese, Korean and Taiwanese experienced were seen as used as a reference of successful transitions to export-oriented models (Panagariya, 2008; Bardhan, 1984, Lall, 1982). Besides, excessive controls, mismanagement in some State-owned enterprises and rent-seeking were pointed out as relevant issues not only by liberal economists (Chakravarty, 1987; Bardhan 1984; Gosh, 1998). According to Bardhan (1984), both at the level of the State and at the organization of the Congress Party, the popular participation had been declined since independence days in favor of co-opted political operators and a ossified bureaucracy, resulting in the privatization of public resources by special interests groups and the weakening of the State role as a welfare-seeker. The still high poverty indicators were also used as a critic to the State role and a failure of the Indian "socialism". In particular, Bardhan (1984) identifies three main consolidated classes with bargain powers in the 1970s and 1980s: big business, rich farmers, and professionals in the public sector.

Initial steps towards liberalization were taken during the "Janata Interregnum", between 1977 and 1980 (Panagariya, 2008). In the 80s, after the IMF loan, the expected liberalization was not materialized immediately, but a number of committees were set up by the government in order to proposed measures of delicensing and decontrol of domestic economic activity and imports (Gosh, 1998). Particularly, Gosh (1998) points out that planning as a main instrument for the Indian economy started losing preponderance and force during the 1980s. Industry deregulation, trade liberalization and foreign investment and technology imports policy are analyzed in detail in Panagariya (2008) and Gosh (1998). We will mainly highlight that with the Industrial Policy Statement of 1980 and the Technology Policy Statement of 1983 the schemes for capacity expansion and licensing exception were more generous and wide, imposing fewer restrictions in terms of new investment, machinery imports and foreign exchange for the local business community (Joseph et al, 2008). For instance, 30 industries and 82 pharmaceutical products were delicensed in 1985, price and distribution controls on cement and aluminum were abolished, firms that reached 80% capacity utilization in any of the five years preceding were assured authorization to expand capacity, etc.

With respect to trade liberalization, some first steps were introduced in 1978-79 based on the recommendations of the P.C Alexander Committee. It mainly recommended that products not produced domestically be freed from licensing and to simplify the lists of conditions to the product into "banned", "restricted" and "open general licensing" (OGL). This OLG list of products increased constantly during the 80s, reaching 1.007 in April 1987, 1.170 in April 1988 and 1.329 in April 1989 (Panagariya, 2008). However, several items remained in the exclusive import monopoly of the State through canalizing agencies. Crude oil and petroleum products were imported by the Indian Oil Corporation; iron, steel, nonferrous metals and fertilizers through the Minerals and Metals Trading Corporation; cereals through the Food Corporation of India (FCI), etc. Despite the share of "canalized" imports declined during the 1980s, in 1987 there were 17 canalizing agencies in existence.

A relevant aspect was the strong export incentives introduced with Rajiv Gandhi in the second half of the 1980s (Panagariya, 2008; DeLong, 2003). Different schemes were promoted: import process was facilitated when it had an export-related, a duty-free import regime for exporters was introduced, reduction on business income tax for exports profits, duty-free capital imports for exporters, faster processing of exports credits, permission to retain 5%-10% of foreign exchange for export promotion, etc. The export processing zones (EPZ) and 100% export-oriented units (EOU), first introduced in the 1960s and 1970s, were reinforced with the opening of four more zones at Noida, Madras, Cochin and Falta (Aggarwal, 2015).

With Rajiv Gandhi, the "business environment" improved to the national business community, as emphasized by DeLong (2003, p. 197):

"For the first time, private industry executives found it easy to move into powerful ministerial positions in an Indian government. Prime Minister Rajiv Gandhi himself spoke of how his government would pursue "deregulation, import liberalization, and... access to foreign technology" and invoked the example of Japan, which had in less than a generation moved from a country whose products were "synonymous with shoddy goods" to "a byword for the best available"... The first budget of the Rajiv Gandhi government sought to reduce marginal tax rates, reduce tariffs, make restrictions on imports transparent by replacing quotas with tariffs, remove restrictions on large firms..."

Government expenditure went from 25% of GDP in 1979-80 to 30% in 1988-89 and transfer payments went from 3.9% to 10.5% for the same period. The average government expenditure and payment transfers over GDP between 1970-1 and 1979-80 were 21,7% and 2,7% respectively but in the next ten years, between 1980-1 and 1989-90, they went to

28,86% and 9,41% respectively. It means, a 35% increase in the average government expenditure from the 1970s to the 1980s and a 350% increase in transfer payments! The rural employment and self-employment programs that aimed to reduce poverty had a main role in increasing of the transfer payments (Chakravarty, 1987)⁷⁰. Nagaraj (2006) also sustained that the State participation in the economy reaches a peak at the end of the 1980s, employing 19 million people, 60% of them in the State-owned enterprises. Kapila (2003) shows that in 1990 India reached a maximum of 255 State-owned enterprises. According to Panagariya (2008) defense expenditure went from an average of 2,7% of GDP between 1980-1 and 1984-5 to 3,8% in 1988-9 and subsidies from 2,6% to 3,6% for the same period. In the Sixth (1980-1984) and Seventh five year plans (1985-1989), average investment was 22%, half public and half private. Crowding-in effects of the public investment and the investment accelerator seem to be there, as Rakshit (2009, p. 77) points out:

"The demand-led growth during the decade raised capacity utilization and profitability and hence investment demand by private producers. Similar and more pronounced perhaps was the impact of large public sector investment in infrastructure. A measure like broad banding provided greater flexibility to private producers and additional incentives for capacity expansion. Despite the growing aggregate demand, investment and operational costs did not rise; in fact, they declined in some instances, due to the liberalization of imports of capital goods, components, parts and raw materials. Thus the overall economic environment turned relatively congenial for private investors, especially from 1985-5 when the government initiated a fair number of business-friendly measures."

As shown in the Chart 21, the fiscal deficit grew during the 1980s with an average for the decade of 8% and a peak of 9,9% in 1986. The weight of the interest payments was an increasing line of the fiscal deficit. Interest payment went from 2,2% of GDP in 1979/80 to 4,2% in 1989-90 and as a percentage of the total government expenditure, they went from 8,8% to 15,3% for the same period. With respect to this, Rakshit (2009, p. 73) analyses:

"...during the 1980s the 90 percent increase in interest payments as a ratio of GDP was more than twice than that of fiscal deficit (at around 42 percent). Indeed, the growing significance of interest payments over the decade is indicated by the fact that between 1980-1 and 1989-90 these outgoes as ratios of the government's total and revenue expenditure rose from 7.8% and 11.1% percent to 14.2 and 18.1 percent, respectively... one reason for the rising interest payments was the jump in primary deficit. No less important, however, was the reliance on relatively high-cost borrowing instruments for financing the fiscal deficit... after 1981-2 there was a sharp fall in the share of net RBI credit along with a steep rise in that of small saving

⁷⁰ According to figures of Joseph et al (2008) the proportion of people under poverty line went down from 54% in 1973-4 to 38% in 1987-8 and the Gini Index in consumption went from 47% in 1968 to 30% in 1990.

in gross fiscal deficit. Small saving instruments like NSCs and PPF carried a 12 percent interest rate along with substantial benefits by way of tax concessions so that they involved a borrowing cost to the government of around 20 percent... the increase... constituted a switch from a zero cost to an extremely high-cost mode of meeting the fiscal deficit and hence one of the major reasons for the sharp, cumulative rise in the deficit during the decade"

Chart 19 - Indian fiscal and external sector indicators. 1970-1989

Fiscal year	Government expenditure	Transfer payments	Fiscal deficit	Interest payments		Imports	Exports	Trade deficit	Current account deficit
				% of GDP	% of total expenditure				
1970-1	18,2	1,9	4,3	1,6	9,0	4,5	3,6	-0,9	-1,0
1971-2	20,2	2,0	5,0	1,7	8,4	4,6	3,7	-0,9	-1,0
1972-3	20,5	1,9	4,9	1,6	7,8	4,4	4,2	-0,2	-0,6
1973-4	18,5	1,8	4,1	1,5	8,3	4,7	4,1	-0,6	1,7
1974-5	19,2	2,5	3,9	1,5	7,9	6,2	4,8	-1,4	-1,2
1975-6	22,0	2,8	4,4	1,4	6,4	7,0	5,9	-1,1	-0,2
1976-7	23,3	3,4	5,1	2,0	8,4	6,8	6,7	-0,1	1,0
1977-8	22,0	3,1	4,6	1,7	7,8	6,5	6,4	-0,1	1,1
1978-9	23,8	3,6	5,4	2,0	8,3	7,8	6,2	-1,6	-0,2
1979-80	25,0	3,9	6,1	2,2	8,8	8,9	6,5	-2,4	-0,5
1980-1	26,4	8,1	7,5	2,1	7,8	9,8	6,2	-3,6	-1,5
1981-2	26,4	7,3	6,3	2,2	8,5	9,4	6,1	-3,3	-1,7
1982-3	27,7	8,0	5,9	2,5	8,9	9,4	6,3	-3,1	-1,7
1983-4	27,3	8,2	7,3	2,5	9,2	8,8	6,2	-2,6	-1,5
1984-5	29,2	9,4	9,0	2,8	9,6	8,7	6,5	-2,2	-1,2
1985-6	28,3	9,9	8,0	3,1	11,0	8,5	5,6	-2,9	-2,1
1986-7	32,3	10,7	9,9	3,4	1,6	8,2	5,6	-2,6	-1,9
1987-8	31,1	10,5	9,2	3,7	11,8	8,4	5,9	-2,5	-1,8
1988-9	30,0	10,5	8,5	3,9	13,0	9,2	6,3	-2,9	-2,7
1989-90	29,9	11,5	8,9	4,2	14,0	9,6	7,3	-2,3	-2,3

Source: own elaboration based on Rakshit (2009).

Both imports and exports grew as GDP per centage during the 1980s. There was a declining trend of the trade deficit as a ratio of GDP during the decade, going from 3,3% in 1981 to 2,3% in 1989-1990. Exports represented an average of 5,21% of GDP between 1970-1 and 1979-80 and they went to 6,2% between 1980-1 and 1989-90. But imports raised much more, from 4.5% to 9% for the same periods. The raised in the oil price had a lot to do for explaining the increase in the imports, but there was also a marked raise in imports of capital and intermediate goods, especially during the Seventh Plan. According to Rakshit (2009, p. 77), the increase in capital goods imports was related to the “loan pushing” investment:

“...the net benefit of the (external) debt-financed investment expenditure was often negative from the viewpoint of the economy as a whole. The reason lay in some structural features of the Indian economy under which there was a wide gap between the social and the private returns on tied credit from abroad for purposes of domestic capital formation. Recall that during the 1980s imports of capital goods were substantially liberalized and government approval for Greenfield investments as well as capacity expansion was more easily forthcoming. Given domestic credit constraint and easy loan facilities provided by foreign suppliers of machinery and equipment, the policy change led to a surge of import of capital goods even though these goods were easily available in the domestic market.”

Chart 20 - Indian External sustainability indicators

	1980	1987	1988	1989	1990
Total debt stock as % of GNP	11,9	21,9	20,8	26,4	27,1
Total debt stock as % of exports of goods and services	136,0	287,0	280,0	308,0	313,0
Interest on exports %	4,2	14,0	13,4	17,1	18,2
Debt servicing to exports %	9,3	29,4	28,6	29,6	30,1
International reserves as % of imports of goods and services (in months)	7,9	5,3	3,7	4,4	1,9

Source: own elaboration based on Rakshit (2009).

The trade deficit was not the main issue during the 1980s, but, as can be seen from the table before, the relevance of debt service obligations was. External debt/GDP ratio increased from 11,9% in 1980 to 27,1% in 1990, debt servicing went from 9,3% to 30,1% of exports and interest grew from 4,2% to 18,2% of exports. Then, the collapse of the USSR and the other Soviet countries in 1991 and the first Gulf War detonated the balance of payment crises of 1989-90. Imports jumped with sky-rocketing prices of petroleum products and there was a

marked decline of exports to the Middle East, which had become a major market for Indian goods and services. For worst, the remittances of Indians working in Iraq and other petroleum countries also went down drastically.

Redefining self-reliance; national missions; energy, biotech and supercomputers and FDI policy. During the 1980s, the redefinition of self-reliance started been discussed in India, mainly in the Sixth Five Years Plan (1980-1985) and the Technology Policy Statement of 1983. As explicitly observed in the Sixth Plan: "*self-reliance... does not necessarily mean self-sufficiency in all sections of the economy*" adding that "*self-reliance can no longer take the form of indiscriminate import-substitution... export promotion is as much a part of the drive for self-reliance as efficient import-substitution*". With respect to this change, Krishna (2013) comments:

“Having established technological capabilities in some high technology areas such as space, nuclear, pharmaceuticals and green revolution technologies, the government realized that a ‘watertight’ compartmentalised framework on self-reliance and import-substitution of the previous phase was no more tenable for the 1980s... The old policy regime which was often referred to as ‘nationalist technological policies’ of the 1960s was out of date in the 1980s as India had already initiated the indigenisation programmes from defence, space and military industrial projects to pharmaceuticals and the whole public sector enterprises in power, steel, fertiliser, railways, among others. There prevailed a serious concern of the increasing technological gap with industrialised countries and the need for ‘catching up’ within a perspective of endogenous technological capability. As far as India could maintain the balance of her endogenous technological base, it was thought wise to liberalise import of technology and open up to export regimes. This was important as India's dependence on foreign technology increased as the era of the 1980s came into sharp policy focus over new technologies such as microelectronics, information technologies, and biotechnology.”

There were three main discussions related to the achievements and challenges of the Indian STI policy during the 1980s: the “catch up” with the new techno-economic paradigm, the encouraging of the Indian corporate sector to acquire the means to industrial upgrading through technology imports and local R&D expenditures and the link between STI policy and the Indian people needs, particularly with respect to poverty alleviation (Joseph et al, 2008; Krishna, 2013, Lall, 1982; among others).

The emergence of new technologies such as ICT, biotechnology, and nanotechnology led to a challenge that prompted the authorities to make the decision to open the imports and allow the implementation of foreign enterprises to try to absorb and disseminate processes and knowledge in a local scale. As stated in the Technology Policy Statement of 1983 "*there shall be a firm commitment for absorption, adaptation and subsequent development of imported*

know-how through adequate investment in research and development to which importers of technology will be expected to contribute". There was an attempt to stimulate the training and upgrading of the local private sector via tax incentives, credits, subsidies etc. and through the incorporation of new technologies and R&D in-house activities (Joseph, 2008; Long, 1988). According to Joseph and Kakarlapudi (2014) new STI initiatives and programs were launched such as the Programme Aimed at Technological Self Reliance (PASTER), the Technology Absorption and Adaptation Scheme, the National Register on Foreign Collaborations, the Technology Development Fund, the Science and Technology Entrepreneurship Parks. Besides, the Ministry of Science and Technology was created in 1985, with the earlier Department of Science and Technology (DST) and a new Department of Scientific and Industrial Research (DSIR) as the main departments.

Mani (2001) points out that a relevant sub-product of the Technology and Policy Statement of 1983 was the creation of the Technology Information and Forecasting Assessment Council (TIFAC), which prepared the first technology foresight study in India, the Technology Vision 2020. This study focus on the future prospects of the following areas: food processing, civil aviation, electricity, agriculture, sea and road transport, health, life sciences and biotechnology, advanced sensors, industrial engineering, materials and processes, services, electronics and communication, processes and chemical industries, telecommunications and strategic industries.

In "sectoral" terms, biotech, supercomputers, and energy received main attention. In biotech, as explained by Long (1988), a National Biotechnology Board was set up at the beginning of the 1980s under the Department of Science and Technology. The Board issued a report in 1983 with a long-term plan for biotech: manpower development was identified as a priority as well as strong incentives to speed up the development of industrial applications. A Centre for Cellular and Molecular Biology was created and well-supported, increasing resources were oriented to genetic engineering and a new Department of Biotechnology was established. With respect to energy, the percentage of the total resources oriented to power in the Sixth (1980-1984) and Seventh Plan (1985-1989) jumped to 28,3% and 30,5%, it means 10 percentual points more than during the 1970s, where they average 18% of the resources (Chackravarty, 1987). Initial steps were taking in the development supercomputers: the Centre for Development of Advanced Computing (C-DAC) was created in 1987 and in 1991 the first Indian supercomputer was presented, the PARAM 8,000, with all of the hardware and most of the software produced in India.

With respect to the "internal liberalization" and the policy-oriented to improve the competitiveness of the local corporate sector, Joseph et al (2008, p. 49) say:

"With external liberalization policies still on hold, domestic firms were allowed to grow in size and increase their share in the Indian market. During this phase domestic firms also had relatively better protection against imports. Domestic firms also got the government to protect the Indian market from the entry of new foreign firms. The government was made to de-license sufficiently the industrial space, relax the regulations regarding foreign collaborations and foreign exchange and dilute the controls over the expansion of Indian big business to provide them with enhanced access to the home market. The government had eased the restrictions in respect of the scope and terms of duration and payments for technology collaborations. The corporate sector was provided with a wide range of fiscal and non-fiscal incentives to take an active part in the strengthening of in-house capabilities. It was actively encouraged to access the publicly funded R&D institutions for the purpose of consulting them for problem-solving and sponsorship of R&D for taking their assistance in the task of absorption of imported technologies"

The criticism regarding the impact of science on people's living conditions grew during the 80s. As a response, the government implemented the "Technology Missions" around the mid-1980s. According to Krishna (1997), they were time-bounded schemes for tackling the basics needs through redirection of science and technology inputs in water, immunization, oil-seeds, telecommunications, leather, and literacy. With these interministerial and collective efforts, they tried to shape the technology policy to new global challenges and population needs. As observed by Abrol (2014, p. 10) pro-poor innovation efforts and science for the people movements gained more place during the second government of Indira:

"...when Indira Gandhi came back to power at the centre in 1980, the technology policy statement of 1983 that the government brought out incorporated the goal of appropriate technology movements. The programme of Science and Society was launched by the Ministry of S&T in 1983. The scheme of S&T for weaker sections was promoted, which the peoples' science movements have also actively used to undertake their own experiments to practice pro-poor innovation-making. These steps gave the required space to several voluntary organisations to experiment, which were largely created by the people of Gandhian, Left, Nehruvian socialist orientation only."

All in all, as can be seen in the tables below, around 90% of the public R&D expenditure in 1984-5 continued focused in five large agencies: the Defense R&D organization (DRDO), the Department of Atomic Energy (DAE), the Department of Space (DOS), the Council of Scientific & Industrial research (CSIR) and the Department of Science and Technology (DST). In terms of the orientation of the R&D efforts, petroleum, defense, heavy industry, communications, and irrigation concentrated almost 70% of the resources.

Related to the R&D expenditure, public and private, by industrial groups, public expenditure was markedly preponderant in electrical and electronics, defense, fuels, metallurgical industries, telecommunications, and fertilizers. Private sector efforts predominate in chemicals, drugs and pharmaceutical, industrial machinery, transportation, and textiles.

Chart 21 - R&D expenditure by major scientific agencies. 1984-5.
In million rupees and %.

Agency	Expenditure	%
Defence Research & Development Organization (DRDO)	2.254,0	20%
Department of Atomic Energy (DAE)	2.137,5	19%
Department of Space (DOS)	1.746,6	16%
Council of Scientific & Industrial Research (CSIR)	1.464,8	13%
Indian Council of Agricultural Research (ICAR)	1.310,9	12%
Department of Science & Technology	1.255,5	11%
Department of Ocean Development (DOD)	227,1	2%
Department of Environment (DEn)	197,8	2%
Indian Council of Medical Research (ICMR)	194,7	2%
Department of Non-Conventional Energy Sources (DNES)	144,5	1%
Department of Electronics (DE)	88,7	1%
TOTAL	11.022,1	100%

Source: own elaboration based on Long (1988)

Chart 22 - R&D expenditure by central Ministries/Departments. 1984-5.
Millions of rupees and %.

Ministry/Department	Expenditure	%
Petroleum	653,3	20%
Defense Production	577,3	17%
Heavy industry	451,4	14%
Communications	329,9	10%
Irrigation	230,2	7%
Steel	146,8	4%
Industrial development	113,6	3%
Railways	112,4	3%
Commerce	101,2	3%
Chemicals and Fertilizers	99,7	3%
Other	512,7	15%
TOTAL	3.328,5	100%

Source: own elaboration based on Long (1988)

Chart 23 - R&D expenditure of industrial groups. 1984-5. In million rupees and %.

Industry groups	Public Sector		Private Sector		Total	
	Resources	%	Resources	%	Resources	%
Electrical & electronics	505,0	60%	331,0	40%	836	19%
Defense industry	577,3	100%	-	0%	577	13%
Fuels	564,2	98%	9,2	2%	573	13%
Chemicals (without fertilizers)	67,1	18%	307,4	82%	375	9%
Metallurgical industries	192,3	61%	122,2	39%	315	7%
Drugs and Pharmaceuticals	2,4	1%	243,8	99%	246	6%
Industry machinery	21,9	9%	216,0	91%	238	5%
Telecommunication	203,4	92%	17,0	8%	220	5%
Transportation	1,7	1%	190,4	99%	192	4%
Fertilizers	80,3	86%	13,0	14%	93	2%
Textiles	0,6	1%	88,2	99%	89	2%
Other groups	141,5	23%	472,4	77%	614	14%
TOTAL	2357,7	54%	2010,6	46%	4368	100%

Source: own elaboration based on Long (1988)

Regarding higher education, if we take together the Indira and Rajiv Gandhi period, 55 other universities were created, reaching 145 establishments in 1990. There was an impressive increase in the amount of technical and scientific manpower between 1980 and 1991. Degrees in engineering more than doubled, going from 221,400 to 546,700; graduates in science more than tripled, from 750,500 to 2,430,300 and it was also almost tripled the number of medical graduates, increasing from 165,400 to 310,300. Compared with China, India has achieved greater visibility in the world of scientific publications: in 1990 recorded 10,103 publications in the SCI while the current second in the world economy had 6,509.

Chart 24 - Growth of the total scientific and technical manpower. 1950-1991.

Category of personnel	Stock (thousands)				
	1950	1960	1970	1980	1991
Engineering Degree Holders	21,6	62,2	185,4	221,4	546,7
Engineering Diploma Holders	31,5	75,0	244,4	329,4	873,9
Science Postgraduates	16,0	47,7	139,2	217,5	482,0
Science Degree Holders	60,0	165,6	420,0	750,5	2430,3
Agriculture Postgraduates	1,0	3,7	13,5	96,5	168,4
Agriculture Degree Holders	6,9	20,2	47,2	-	-
Medicine Degree Holders	18,0	41,6	97,8	165,4	310,3

Source: own elaboration based on Krishna (2013)

Finally, with respect to FDI policy, the attitude towards FDI during the 1980s tended to be much more open, assigning a greater role to multinational corporations in the promotion of manufactured exports (Abrol, 2013). Higher foreign equity in the export-oriented unit was allowed and procedures for remittance of royalty and technical fees were liberalized, mainly in the newer technologies sectors such as molecular, biotechnology, IT, telecom, etc. Mani (1992) highlights that during this period, the main accent was on technological upgradation in Indian industries with a judicious mix of indigenous and imported technology, allowing imports with an emphasis on R&D indigenization. However, many restrictions and pro-Indian firms schemes still operated, such as the prohibition of foreign brand names, the authorization to Indian companies to be free to manufacture patent products even after the expiry of the collaboration agreement and to free sublicense the technical know-how to another domestic firm, etc. Anyway, according to the World Development Indicators (2017) the average FDI inflows as % of the GDP were 0,04% between 1980 and 1989. It means a marginal contribution.

3.3. Discussing the emergence, consolidation and main challenges of the Indian NSI (1914-1989)

In this chapter, we have mainly deal with the period between the First World War and the last (by now) government of the Nehru-Gandhi family, in 1989. After the “Indian peripherization” period, I decided to make this historical periodization to contextualize the emergence of the Indian NSI, sustaining that some main characteristics of the post-independence Indian path were coined during the first half of the twenty century, mainly after the First World War, with some emergent political movements and conceptual frameworks.

The two world wars gave a main push to the Indian industry, showing the relevance of the State purchasing power and making viable the initial development of the steel industry. The critics of the moderate nationalists to the Raj, mainly based on the wealth drain theory, were installed as a main conceptual and political tool to question the British rule, claiming that industrialization was the principal way to development in the post-independent India. The National Movement got dense during this period and experienced the Gandhian phase, a phase of mass mobilization which included the incubation of a decentralized idea of development. The Russian revolution of 1917 pushed the national movement framework to the left, influencing Nehru’s thinking, installing the need of a planning economy and giving birth to the Communist Party of India and the Congress Socialist Party. In parallel, the idea of a Hindu Science emerged, including a British-educated Indian upper cast scientist elite and an embryonic institutional development with the creation of the Indian Association for the Cultivation of Science and the Indian Institute of Science. Several religious and regional heterogeneities were reinforced, in parallel with the consolidation of a mainstream national movement, with the main critical situation during the partition religious holocaust.

In this context, the "Nehruvian period" is better understood. Without neglecting the key role of Nehru, many institutional initiatives and conceptual guidelines adopted during the post-independence years were matured during the colonial rule. In this sense, the main conceptual frameworks after independence were the Nehruvian, the Gandhian and the left one. Nehru mainly pushed industrialization, planning under a mixed economy and the key role of State and science. Gandhi pushed a pro-poor, village-based model with a key role in local knowledge creation and diffusion. The left pushed the agrarian reform and the centralization of capital. All these frameworks still co-habit and influence in the Indian economic and political debate.

Chart 25 - Selected Indian indicators. 1950-1989.

Selected indicators	Period		
	Nehru 1950-1964	Indira (mainly) 1965-1979	Indira – Rajiv 1980-1989
GDP average growth	4,1	3,2	5,8
GDP per capita average growth	2,0	1,5	3,4
Investment % of GDP	13,7	17,0	21,6
Public Investment % of GDP	5,8	7,3	10,6
Private Investment % of GDP	7,9	9,7	11,0
Sectoral Composition of GDP	1960	1980	1990
Agriculture	48,7	36,1	29,6
Industry	20,5	25,9	27,7
Services	30,8	38,0	42,7
Exports as % of GDP	4,2	3,7	4,7
Imports as % of GDP	6,1	5,5	7,2
Commercial balance	-1,8	-1,8	-2,5
R&D as % of GDP	1958 0,23	1968 0,44	1984 0,90
GINI	1965 31,14	1973 29,17	1988 31,15
Poverty		1973 54%	1987 39%

Source: own elaboration based on Lall (1982, 1992), Joseph et al (2008), Nagaraj (2006), Kapila (2014), Panagariya (2008) and World Development Indicators (2017).

First, during the Nehruvian period, between 1947 and 1964, in political terms, India managed to maintain her territorial unity, based on a formal secular democracy. This is not a minor issue given the stress of Partition. As can be seen in the table before, GDP growth

performance during the period was 4% with a GDP per capita growth of 2%, more than doubling the first half of the century growth rates. Between the main achievements of the Indian NSI understood in a broad sense, we can point out the industrial diversification, based on heavy industry and public enterprises, the strengthening of public sector capabilities, with planning and the Five Year Plans as a main instrument, the irrigation works, the building of the main developmental financing institutions, the acceleration in the investment rates and the developments in power sector, social infrastructure and mortality rates reduction (Nagaraj, 2013a). In particular, a dense network of institutions around science, procuring technological self-sufficiency, was developed.

The non-alignment posture gave space to build networks of technical and military collaboration with different countries. The STI policy was clearly thought from the supply side (science push), with a strong State participation. The first steps were taken towards the developing of nuclear industry and space as main blocks of the Indian NSI. In addition to the explicit policies, Nehru's relationship with science and the scientific community played as a strong implicit policy to support the role of public science for development.

Among this general positive evaluation of Nehru's years, the main weakness were related to the limited and heterogeneous advance in the implementation of the land reform, the exogenous role attributed to exports and the initial tendency to have an excessive focus on heavy industry, without sufficiently considering the forward and backward linkages and the agricultural and infrastructure bottlenecks.

Then, Indira's first period, between 1966 and 1977, was characterized by several shocks as well as many technological and institutional efforts. We understand that the economic critique of Indira's period, presented for instance by Delong (2003), mainly related to the slowdown in GDP the growth rates that went to 3,2% and 1,5% for GDP per capita for the whole period, did not have in mind the stressful external and internal context experienced: the draughts of 1965-7 and 1971-3, the war with Pakistan of 1965 and 1971 and the oil price shock of 1973 with its impacts in terms of industrial costs, trade balance and inflation. This geopolitical and internal pressure should be sufficiently considered when evaluating the growth slowdown.

On the other hand, these pressures resulted in several efforts and developments done by the Indian NSI: the Green Revolution, including the channeling of resources to rural areas, the partial indigenization of the fertilizers and HYV seeds production capabilities, the creation of the National Commission of Science and the first Science and Technology Plan, the

strengthening of the nuclear and defence sectors, the pharmaceutical and computer industry push, the increase in investment rate and the R&D expenditure and the advances in the import-substitution process. Besides, an explicit pro-poor agenda was proposed during this period.

Among the main challenges clearly appear "food" and "fuels". With the need to stress the defense and rural development expenditure, the public resources oriented to power stagnated during these years, at around 18% (see the table below). Food problems were attacked with the green revolution. The relationship between land productivity and rural population density were configured as the main bottleneck for Indian development. The capital-intensive techniques that could be introduced in the Indian agriculture would liberate a huge amount of people, which should be employed in some other way. This is not an easy issue to be solved and it is still a problem for the Indian economy.

Besides, during this period three main groups of interest were consolidated, with clear objectives with respect to public policy: big business, big farmers and the (Hindu-framed) professionals and State bureaucracy. Big business, consolidated through the import-substitution policy, increasingly tended to use the licensing regime, a useful public policy instrument, as a source of rent-seeking and protection. Evolved from zamindars, big farmers consolidated with the green revolution, acted as a main lobby group with respect to subsidies, price support, and institutional credit. The Hindu-framed professionals and bureaucracy used their privilege education and cast networks to reinforce their position in the Indian social structure (and the State structure). Besides, the introduction of several and uncoordinated regulations created excessive bureaucracy and gave space for coalitions between these three groups to capture the State resources and avoid taxation.

Chart 26 - Five Years Plans expenditure by the main area. 1951-1989.

Plans	Agriculture	Irrigation / flood control	Power	Industry/minerals	Transport / communications	Social/community services	Total
First Plan (1951-1955)	14,9	22,0	7,7	4,9	26,4	24,1	100
Second Plan (1956-1960)	11,8	9,3	9,5	24,1	27,0	18,3	100
Third Plan (1961-1965)	12,7	7,8	14,6	22,9	24,6	17,4	100
Annual Plans (1966-69)	16,7	7,1	18,3	24,7	18,4	14,8	100
Fourth Plan (1969-1973)	14,7	8,6	18,6	19,7	19,5	18,9	100
Fifth Plan (1974-1978)	12,3	9,8	18,8	24,3	17,4	17,4	100
Annual Plan (1979)	16,4	10,6	18,4	21,7	16,8	16,1	100
Sixth Plan (1980-1984)	13,7	10,0	28,3	15,8	16,1	16,1	100
Seventh Plan (1985- 1989)*	12,7	9,4	30,5	12,5	16,4	18,5	100

Source: own elaboration based on Chakravarty (1987). * estimated.

With respect to the 1980s of Indira and Rajiv Gandhi, this was a period of growth acceleration with an average GDP growth rate of 5,8% and a GDP per capita growth of 3,4%. It is understood that growth is mainly explained by the increased in public expenditure and personal transfers and the effects of these "autonomous" expenditures in investment, through the accelerator effect. In fact, investment rate growth 5 perceptual point with respect to Indira's first period. At the same time, the share of public expenditures in GDP reached a peak during these years, in terms of expenditure, public enterprises ownership and public employment (Nagaraj, 2013a). In fact, public investment increased, almost equaling private investment with more than 10% each with clear crowding-in effects. Particularly, power investment jumped more than 10 perceptual points with respect to the first Indira's period.

Self-reliance initiated its redefining, introducing a stronger role in exports promotion and different initiatives were launched in order to focus on R&D indigenization efforts. Technology missions were introduced as a main organizational form to directly attack urgent needs such as water, immunization, oil-seeds, telecommunications, literacy, etc. Pro-poor initiatives gained visibility and the emergence of the new techno-economic paradigm was perceived resulting in the promotion of both biotech and supercomputers. R&D efforts concentrated around petroleum and fuels and the triad compose by defence, nuclear and space. Despite the perception that the NSI should be much more connected to the people's needs and productive demands, it has conserved its linear, science push configuration, still until the end of the 1980s.

The increasing weight of the debt interests and serving to exports, the downfall of the URSS and the increased in the oil prices after the Gulf War caused another external crisis in 1989-90 that would mark a turning point in the Indian style of development. Both the external and the internal context were creating the conditions for the weakening of the planning scheme. A prelude to a phase in which markets would have an increasing role in price and quantities determinations as well as effective demand as a general principle of functioning for the economy.

Analyzing the period between 1947 and 1989 as a whole, there are some general characteristics: a) in geopolitical terms, it was mainly configured under the Cold War

scenario which gave space to a non-align foreign policy posture, b) in domestic political terms, India was mainly ruled by Congress, inheritor of the anti-colonial struggle, and particularly by the Nehru-Gandhi family, c) although in a mixed economy, planning and Five Years Plans were the main designing policy instrument and State enterprises and the licensing regime were two main implementing instruments, d) STI policy was mainly conceived as science push, linear and top down, with a marked concentration of R&D in "big science" such as nuclear, space and defence, e) trade (both exports and imports) and FDI were not much relevant in terms of GDP participation.

These main features configured a particular profile to the Indian NSI. Cold War and non-alignment facilitated the development of military and technological collaboration with countries on both sides of the Berlin Wall. The Congress hegemony allowed the development of a secular democracy, which did not suffer any military coup. At the same time, during the whole period, India was governed mainly by one family. Planning, the State enterprises main role, and the different "inward-looking" framework were in part explained as a post-colonial national identity search that was mainly possible in the Cold War context. The science push, linear and top-down STI policy framework, was in part consequence of the Hindu Science movement, but it was also aligned with the most advanced international experience of the moment, such as the Manhattan Project, and closely related to the Indian geopolitical context, which demanded and still demands the building of military capabilities. The low participation of trade was part of the import-substitution planning model, but a main difference with the Latin American experience was the low FDI participation still until the end of the 1980s. It means the commanding "commanding heights" of the Indian economy were under Indian actors, mainly State policymakers and, in the second term, the local bourgeoisie and big farmers.

All in all, India managed to maintain her formal democracy, unified its territory and grew at a not minor rate. From a stalled economy at the first half of the century, in the 'planning' period India achieved an average GDP growth rate of around 4% and 2% for GDP per capita, with an accelerating path. This growth performance could have been more, it is true, but there is no doubt that it represents a structural change with respect to colonial times. Although India received foreign aid and financial assistance from different countries

and multilateral institutions (which clearly conditioned the internal policymaking framework and decisions, such as the case of the FMI loans of 1966 and 1980), she maintained her non-alignment posture with respect to the main world powers, without installing any military base neither from the US nor from the URSS in India's territory. Still, with mistakes and debts, India pursued a sovereign path to development.

The Indian NSI managed to build a diverse industrial base, indigenized different "foreign" technological trajectories such as the HYV seeds and biotech, computers, pharmaceutical, different military technologies such as aircraft, etc. Institutional, productive and entrepreneurial capabilities were created in practically all the sectors of the economy. Particularly in space and nuclear the achievements seems spectacular for a post-colonial country, without similar achievements in any other developing country in the world. Although with heterogeneous results, many efforts were made in terms of manpower education, power, and social infrastructure. Besides, the national private sector also built capabilities and grew, turning into a key political actor.

At the same time, there were some main bottlenecks that have repetitively blocked the growth process as well as some internal debts. Although the achievements of Green revolution, at the end of the 1980s, agriculture still was a limitation for the Indian economy accumulation possibilities during the period. The increased in the agriculture output without generating massive rural unemployment still is the main issue. The same with power: given its energy resources, India has extremely suffered from every increased in the international oil prices. Industrial products could have been more design intensive in order to compete with the international standards, but the external restriction was mainly triggered by the dependence of the Indian economy on oil imports and food imports, as seen in the external crises of 1954, 1965, 1980 and 1989.

In parallel, a main debt of the planning scheme was with the Indian people, in terms of the levels of poverty (and we could add health, nutrition, and social infrastructure). Although since Indira Gandhi explicit poverty alleviation and pro-poor innovation programs were introduced, and significant achievements were reached, still in 1987 around 40% of the Indian people were poor. Perhaps the worst aspect of the "class" arrangement between big business, big farmers, and the mainly Hindu-framed professionals and

bureaucracy were not the rent-seeking behaviours, which has been part both of capitalism and communism worldwide, but the fact that they do not consider as a priority the living conditions of the Indian lower casts. This exclusion seems to be both cast and class-based.

CHAPTER 4 - INDIA SINCE THE 1990S: GROWTH DRIVERS, STRUCTURAL HETEROGENEITY AND NATIONAL SYSTEM OF INNOVATION POLICYMAKING

“There is nothing that many neo-liberal scholars would like more than to fit the story of India’s economic rise as a successful example of their prescriptions. I have argued recently, however, that such an analysis of India is quite misleading... India’s economic growth accelerated around 1980, well before India adopted some liberalizing reforms in 1991. Over the last twenty five years India has indeed liberalized its domestic economy and slowly opened it to the outside world. However, India is hardly a neo-liberal model. India brought down tariffs only slowly, limited foreign investment to certain sectors, continued to maintain fairly strict controls on capital movements, hardly undertook much privatization, and the size of government deficits have remained large, much too large by IMF’s standards of what is prudent.”

Kohli (2007, p. 13)

“A third perspective—a structuralist view—would hold that for a large, agrarian economy like India, a strategy for growth with equity would have to focus on improving agricultural productivity, which would call for considerable public infrastructure investment, and institutional reforms; rapid industrialization would depend on growing market surplus from agriculture and public investment in industrial infrastructure that would ‘crowd-in’ private investment; and, to strategically integrate with the world economy, where export growth would serve as a lubricant for the engine of agriculture-led growth.”

Nagaraj (2013a, p. 202)

“India is set to contribute more than any other country to the projected rise in global energy demand, around one-quarter of the total: even so, energy demand per capita in 2040 is still 40% below the world average. India’s total energy demand more than doubles in our main scenario, propelled higher by an economy that is more than five times larger in 2040 and a demographic expansion that makes India the world’s most populous country. With energy use declining in many developed countries and China entering a much less energy-intensive phase in its development, India emerges as a major driving force in global trends, with all modern fuels and technologies playing a part.”

India Energy Outlook (2015)

“It goes without saying that much of contemporary India’s tremendous dynamism is located in the urban sector. This is true in terms of services, trade and production. But it is also true in relation to politics, culture, the arts, civil society, and education, for example. If the word ‘development’ means anything, it refers to what goes on in the towns. And it is the movement of societies from being predominantly rural to being predominantly urban—i.e. the process of urbanization—that underpins progress and development in our modern world. Therefore the issue arises as to how urbanization comes about.”

Dyson (2008, p. 4)

In this chapter, we will work on the period between 1990 and 2017. This period is commonly described as the one of the liberalization of the Indian economy. I will state some nuances on this wide description introducing some not-so-highlighted evidence, periodizations and interpretations, mainly related to the Indian growth drivers. This evidence tends to support the argument that the Indian growth, although influenced by the liberalization and the market-led framework, is mainly backed by some structural movements which have pushed autonomous expenditures such as the slow, unequal but constant increase in wages, the credit boom, the urban/rural movements, the public and private infrastructure expenditure and the service exports mainly to the US. Finally, we point out some still marked heterogeneities, achievements and debts related to the Indian social and productive structure and her NSI.

4.1. New Economic Policy (NEP), BJP and the Indian Ocean chessboard in XXI century.

For our ends, three main relevant trends characterized the post-1990s Indian political and economic landscape: a) the increasing influence of a (neo)liberal framework, which was mainly expressed in the NEP and, although neither dominant nor exempt from several difficulties to be implemented, has pre-configured the Indian political economy debate and policymaking until nowadays, b) at the domestic level, the emergence and consolidation of the BJP party, based on Hindutva politics (Hindu identity based) and c) with the downfall of the URSS and the re-emergence and consolidation of China as a global superpower (and the boom of the Indian ITC industry), the approximation of India with the western world, particularly with the United States, in order to balance power in a context of increasing weaponization of the Indian Ocean neighborhood.

In chronological terms, the three years after Rajiv Gandhi, every Indian government was formed by a coalition of parties or survived by the support of one party that did not integrate the coalition but supported it from outside. In December 1989 V P Singh assumed as new Prime Minister with the support of a faction of the Congress, the Lok Dal and one major faction of the Janata Party. In August 1990 Iraq invasion to Kuwait directly affected

the Indian external front through and increase in the Petroleum price and a diminishing in the remittances (Desai, 1999). In November 1990 the Parliament ended supporting Singh and Chandra Shekhar was elected as Prime Minister. As detailed explained by Nayyar (2017, p. 42), who was Chief Economic Adviser in these years, the external situation was increasingly deteriorating:

“The external debt crisis and payments situation was the Achilles heel of the economy. It was particularly vulnerable for three reasons: short-term debt was about \$6 billion, of which \$2 billion was rolled-over every 24 hours with overnight borrowing in international capital markets; outstanding NRI deposits, more than \$10 billion, were prone to capital flight, while foreign exchange reserves were a mere \$1 billion that were not enough to finance imports even for a fortnight, let alone debt service payments... The prospect of default hung over our heads like the sword of Damocles.”

The IMF helped raise \$1.8 billion, some debt service payments mainly related to defence purchases were deferred and in April 1991 20 tonnes of gold were sailed for \$200 million to the Union Bank of Switzerland. However, Chandra Shekhar could not hold the Parliament coalition and fell in March 1991; new elections were called. In May 21 Rajiv Gandhi was killed during the election campaign resulting in a political push to Congress which won enough seats in the Parliament to form a minority government with the support of the Left Front parties. P. Narasimha Rao was elected as Prime Minister in June 1991 and governed until 1996, appointing Manmohan Singh as Finance Minister. The NEP was getting born.

According to Nayyar (2017, p. 42) critical decisions were made in one month:

“Exchange rate adjustments, which were announced in two steps on 1 and 3 July, led to depreciation of the rupee by 23.3% vis-à-vis the US dollar. Gold from the reserves assets of the Reserve Bank of India (RBI), 47 tonnes, was shipped out soon thereafter to raise \$405 million from the Bank of England and the Bank of Japan. On July 1991, the Statement on Industrial Policy announced dramatic changes in the morning, while the union budget presented to the Parliament announced far-reaching decision, way beyond the remit of conventional budgets, in the evening. Around then, I was also asked to negotiate a Stand-By Arrangement with the IMF and a Structural Adjustment Loan with the World Bank, both of which were concluded in September 1991.”

As introduced in the chapter before, there were different internal and external, conjuncture and structural factors that pushed for a deepening of the liberalization policies

and framework in the Indian economy (Bhaduri and Nayyar, 1996, Desai, 1999, Ghosh, 1998). In the international landscape, the downfall of the URSS and the Soviet block was a strong hit to the Left mindset and political economy framework all around the world and India was not the exception to this movement, giving space to the spread of neoliberal ideas framework and economists symbolized in the Washington Consensus of 1989. Since the 1980s the Korean, Japanese and other East Asian experiences were introduced in the economic debate as cases of succeeded transitions to “export-led” or/and “market-led” developing economies (Panagariya, 2008; Desai, 1999). Besides, the balance of payments crisis did not leave space for many financing choices than the multilateral organisms which push for classic structural adjustment programs (Desai, 1999; Ghosh, 1998). In the domestic side, after some years of Prime Minister’s changes, most of the political parties were willing to support a Prime Minister in order to maintain political stability (Nayyar, 2017). In ideological terms, there was an increasing mood among the political parties, bureaucracy and some economists, backed by the IMF and the local business community, that efficiency and productivity were a main objective for the Indian economy (Pedersen, 2000; Desai, 1999).

Nayyar (2017) highlights three main objectives of the NEP: to promote growth with efficiency, shifting the emphasis from poverty assistance to growth as poverty redactor; to reduce the role of State and increased the role of market, looking to reduce State ownership and production; and to rapidly increase the degree of openness of the economy in trade, investment and technology. To Rakshit (2009) the macro-stabilization programme consisted of: a) a 18% devaluation of the rupee, in two successive steps; b) a reduction of fiscal deficit through expenditure compression, tax reforms, partial privatization and signals to State Owned enterprises to operate on commercial principles rather than “social” goals; c) granting autonomy of the Reserve Bank to maintain internal-external balance; d) a transition to a system of market driven exchange rate with current account convertibility of the rupee; e) allowing selected Indian corporate firms to raise funds from the international capital markets and f) encouraging of capital inflows either of foreign institutional investment (FII), foreign direct investment (FDI) and non-resident Indian (NRI) deposits.

However, the degree of advance on the NEP objectives and initiatives has not been homogeneous. Next, we summarize the main specific and partial initiatives and their relative degree of advance during the 1990s and 2000s. During this chapter we will deepen on them:

- The investment and imports licensing and entry restrictions were practically abandoned in most of the sectors. Only five sectors remained “licensed”: arms, munitions and defence equipment, aircrafts and warships; atomic substances, narcotics, psychotropic substances and hazardous chemicals, alcoholic drinks and cigarettes and manufactured tobacco. However, consumer goods remained under licensing until 2001, by instance of the World Trade Organization (WTO). No anti-trust legislation was introduced until the 2000s.
- Public sector monopoly was abandoned gradually and only was maintained in railway transportation and atomic energy. However, as we will see, State still maintained high participation in most of the sectors through the Central Public Sector Enterprises (CPSEs).
- A process of privatization of the Central Public Sector Enterprises (CPSEs), also called “disinvestment process” was pushed. However, as we will see, this process was slow, partial and with the Central and State governments still maintaining majority ownership in most of the CPSEs in energy, transport and agricultural sector, between others.
- The 40% maximum FDI threshold was abandoned and the concept of automatic approval was introduced in which the Reserve Bank was empowered to approve equity investment up to 51% in 34 priority industries. The FDI controls were gradually abandoned although they were maintained in retail sector, atomic energy, defense, lottery business and FM, cable networks and broadcasting.
- Imports of foreign technology were almost liberalized.
- Trade tariffs were gradually lowered. However, they still widely exist and there are some sectors such as automobiles that remained highly protected.
- Agriculture tariff have been maintained (and subsidies increased).

- Financial sector was subjected to des-regulation, foreign competition and partial privatization of a number of public banks. Basel norms were adopted. However, public banks, both of the Center and the States levels, still maintained a considerable share of the Indian banking sector.
- Export restrictions were gradually eliminated and export supporting programmes were implemented.
- Infrastructure sectors such as railways, electricity, oil, coal, telecommunications, ports, and airports still remained under the State gravitation. Public Private Partnerships (PPP) schemes were developed and implemented during the 2000s as a second-best option to the privatization process in order to increase private sector participation.
- Deficit reduction was postulated as a main objective. A Fiscal Responsibility and Budget Management Act (FRBMA) was signed in 2003, but it was suspended with the crisis of 2008. The general achievements with respect to fiscal deficit reduction were extremely limited and the State participation in GDP did not decreased if we compared 1990 and 2016.

After Rao's government, the center-right National Democratic Alliance (NDA) led by BJP won parliament and Atal Bihari Vajpayee was elected Prime Minister in 1998. In 2004, Congress came back leading the United Progressive Alliance (UPA) a coalition of centre-left parties, with Manmohan Singh, the former Rao's Minister of Finance, as Prime Minister. After 10 years of Congress-led government, in 2014, Narendra Modi, from BJP, was elected Indian Prime Minister being the contemporary Prime Minister.

As pointed out by Bandyopadhyay (2004) and many others the gradual rise of BJP was based in a reinvented Hindutva politics which reaffirm the Hindu identity from the level of the State. For many analysts, despite the BJP is mostly a northern and western Indian phenomenon, while on south, east and north-east still remained less influenced, the BJP emergence means a paradigm shift in Indian politics. As for the first time after the 1984 election a single political Party, under the leader Narendra Modi, won absolute

majority in the Lok Sabha, getting 281 of the 543 seats, thus being able to govern alone⁷¹. It is a main change with respect to the secular approach of the Congress party. In concrete, for our ends, BJP's main lines of government combine a nationalistic and Hindu-based discourse and practices at the domestic politics, a (neo)liberal discourse for the international press and foreign investors and an emphasis in defence expenditure and nuclear development.

All in all, the Indian military needs and expenditure exceed the "BJP military doctrine" and should be understood in the broader geopolitical pressures faced by India in the XXI century. According to SIPRI, the Indian military expenditure as percentage of GDP averaged 2.9% in the 1990s, 2.7% in the 2000s and 2.5% between 2010 and 2015. Despite the slightly decrease in the participation, with an economy growing around per year 7.5% average during this period, the military expenditure in US\$ has constantly increase from around 10 billons in the 1990s to almost 50 billons in 2015⁷². In terms of the Central government expenditure, SIPRI estimated that in 2015 the Indian military expenditure was around 9%, a similar share to the US, being in the top ten countries in the world. According to SIPRI (2018), India was the largest importer of major arms in 2013–17 accounting for 12% of the global total, with an increasing of 24% between 2008–12 and 2013–17. The IHS Jane's Defence Budgets forecast (2015) projected that the Indian total military expenditure in US\$ would surpass the Russian one before 2018, reaching 60 billion US\$ and converting India in the third country in the world in terms of total military expenditure, after the US (around 800 billons) and China (around 240 billons).

There are several factors that push India's need to strength its military capabilities, between them, we can point out: the re-emergence of China as a main global economic and military superpower, with Indo-Chinese borders still as a matter of dispute in areas such as Kashmir and an increasing competition in terms of energy needs; the growing relevance of

⁷¹ At the same time, other significant political development of the 1990s was the higher participation of the "socially underprivileged" groups in the electoral politics. This included Dalits (Banujan Samaj Party (BSP), OBSs (Samajwadi Party, SP), Adivasis, Muslims and other religious minorities and women politically organized. In fact, in 1995, a government was formed by a co-halition between BJP (Hindu Nationalism) and BSP (Dalits political party).

⁷² It is important to highlight that the Indian military expenditure is composed by around 50% of salary and pension payments. R&D activities represent around 5% of the total Indian military expenditure.

the Indian Ocean in terms of flux of commerce (particularly China's petroleum imports) and its geopolitical relevance for military operations in South Asia and in the Middle East (with the Diego Garcia Island as a pivotal point with US military base), the increasing nuclear weaponization of the Indian neighbors; and the terrorist attacks suffered inside the Indian borders⁷³, mainly from Pakistani groups. According to Pant (2011, p. 42) in military terms:

“India has embarked upon a massive military development programme. Much of this military development is focused upon projecting power throughout the Indian Ocean. It includes the addition of a sea-based leg to its nuclear posture, substantial air force development... and major investment in the expansion of its surface and submarine naval capacities. Most significantly, it awaits delivery of the refurbished Kiev-class Admiral Gorshkov aircraft carrier (renamed INS Vikramaditya), due in late 2012, and it is building an indigenous 40,000- ton Vikrant-class aircraft carrier, due to be launched by the end of 2010 and commissioned by 2014, a development picked up in China.”

In terms of nuclear power, according to SIPRI, in 2015, India was in a similar situation to Pakistan, with around 100 warheads each (not depleted), only surpassed by France, China, the United Kingdom, Russia and the US.

Chart 27 - Nuclear warheads stock. Main countries. 2015.

	Depleted nuclear warheads	Other warheads	Total 2015
United States	2.080	5.180	7.260
Russia	1.780	5.720	7.500
France	290	10	300
United Kingdom	150	65	215
China		260	260
Pakistan		100-120	100-120
India		90-110	90-110
Israel		80	80
North Korea		6	6

Source: SIPRI

⁷³ In 2008, India suffered ten coordinated terrorist attacks in Mumbai, causing 173 death and 327 injured.

Main Indian military capabilities by type of force and CPSEs

Air: HAL (Hindustan Aeronautic Limited) is the main Central Public Sector Enterprise having technology transference contracts with Boeing, Airbus Group, Lockheed Martin and United Aircraft Corporation (UAC). Among its production, the Su-30MKI fighters, the MiG-27 fighters and the Hawk advanced jet trainers are highlighted. HAL coordinate a dense network of local and foreign suppliers being almost a monopoly for the jet production in India. All in all, in 2014, the government explicit incentivized the private sector entrance and production by excluding HAL of a public bidding.

Land: OFD (Indian Ordnance Factories) is the main CPSEs with a network of more than 40 plants around India to produce weapons, vehicles, ammunitions, clothing, explosives, etc. Recently, mainly the Indian private sector enter to compete in the vehicle production, with Tata Motors producing the 4x4 Ashok Leyland and logistic and tactic vehicles and M&M producing light vehicles. In particular M&M has signed joint ventures for defense production with foreign firms such as BAE Systems, Ashok Leyland and Krauss-Maffei Wegman (KMW).

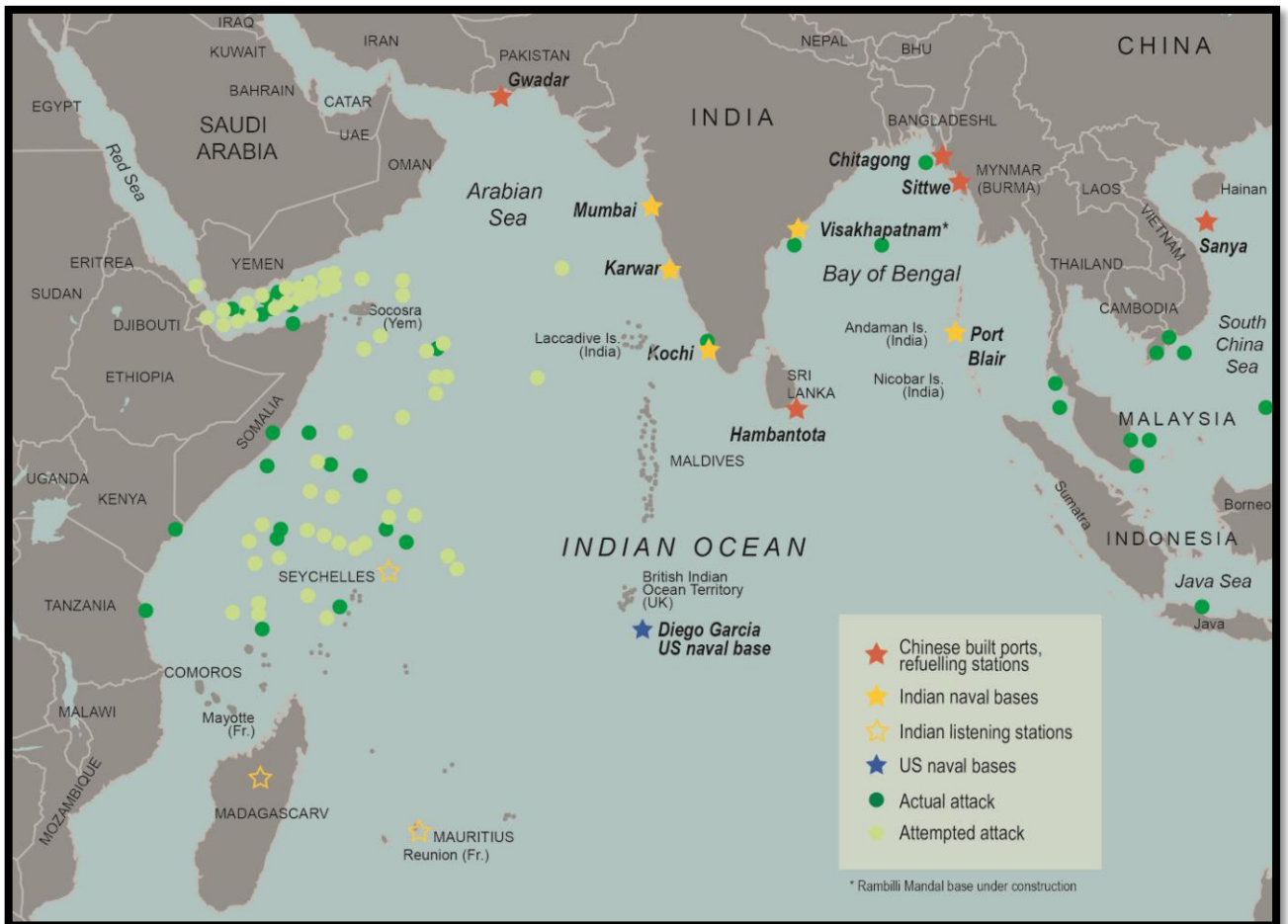
Naval: Indian ships building capabilities are not minor. The main State-owned shipyards are Garden Research Shipbuilders and Engineers (GRSE), Goa Shipyard Limited (GSL) and Hindustan Shipyard Limited (HSL). Since the 1990s, they have built around 50 vessels. The Indian Navy's Corps of Naval Constructors is in charge of the coordination of the sector production. In 2010s, several PPPs (Public Private Partnerships) were signed both with local and foreign private sector firms such as ABG Shipyard, Bharati Shipyard, Pipavav Defense & Offshore Engineering y LTSB.

Electronics: the Indian capabilities in electronics are relevant, mainly based in the CPSE Bharat Electronics Limited (BEL). BEL produce and develop radars, telecommunications systems, electronic defense systems, electro-optic systems, missiles, fire control systems and land operation systems for tanks and military vehicles between others developments. The Indian private sector is also involved through the main ICT enterprises such as Wipro, Rolta, HCL, Samtel, Infosys and Tata.

Source: own elaboration based on Cassiolato et al. (2008), IHS (2015) and the CPSEs web site.

The Indian Ocean geopolitics has a lot to do with the militarization of India and her neighbors (Gonzalo, 2016b). Kaplan (2013, 2010a, 2010b) states that the Indian Ocean is where the rivalry between the US and China in the Pacific interlocks with the regional rivalry between China and India and with America's fight against Islamic terrorism in the Middle East, mainly to contain Iran. But principally, the growth dynamic of China, India and their neighbor and the needs generated by their processes of urbanization are pushing the XXI century economic and military competition. In fact, as shown in the next map, the Indian Ocean is being a chessboard for the Chinese, Indian and American power projection. China has been building ports and re-fuel stations (which could be converted in military bases) in Chittangong (Bangladesh), Sittwe (Burma), Hambantota (Sri Lanka) and Gwadar (Pakistán). India has naval bases in his own territory, at Mumbai, Karwar, Kochi, Visakhapatnam and the Andaman Islands and listening stations in Madagascar, Sychelles and Mauritius. The US has a main military naval base in the Diego Garcia Island. In this context, according to the Technology Perspective and Capability Roadmap (2013) published by the Indian Ministry of Defence, the Indian naval and air force capabilities and their integration is a main priority for the Indian defence needs.

Figure 21 - Indian, Chinese and American presence and pirates attacks in the XXI century Indian Ocean in the XXI century.



Source: elaborated by Rosaura Fynn based in Kaplan (2010b).

With the downfall of the URSS and the emergence of China, India has been approximating to the US. For the US, the Indian Ocean chessboard has achieved great relevance, in order to balance China's expanding and to have access and contention to the Middle East countries. The broader context of relations between India and the US include segments of the entrepreneurial community of both countries, with a key role played by the Indian Americans that were pioneers at Silicon Valley boom and the public and private

actors related to defence, nuclear energy, tourism⁷⁴, finance and real estate (Scott, 2011; Cohen, 2001; Gonzalo and Kantis, 2017; Fair, 2009). We will deepen later in this chapter on the role of Indian Americans and the Indian Diaspora, who has been seen by the Indian policymakers since the 80s as a source of US\$ dollars, contacts and financing (Dubey, 2011; Gonzalo and Kantis, 2017).

With respect to defence, according to the East West Center (2017), the India-US defence trade ascended to 15 billion dollars in 2016, when India was named a “Major Defense Partner” of the United States, a status which was created to facilitate technology sharing to a level at par with that of the United States' closest allies and partners. According to SIPRI (2018) between 2008–12 and 2013–17 arms imports from the USA increased by 557%, making it India’s second largest arms supplier⁷⁵. The Defense Framework Agreement was renewed in 2015 and the Defense Technology and Trade Initiative (DTTI) aim to strengthen defense cooperation through technology. The Logistics Exchange Memorandum Agreement (LEMOA) furthers cooperation by allowing for an exchange of logistics support, supplies, and services between the two countries’ armed forces and opening access to each other’s military bases. India conducted over 50 events with the US including bilateral exercises and personnel exchanges. Since 2000s, India had acquired from the US 13 C-130 Hercules transport aircraft, 12 P-8I Poseidon ASW aircraft, 51 RGM-84L Harpoon-2 anti-ship missile, 15 CH-47F Chinook transport helicopter, 22 AH-64D Apache combat helicopter, between others⁷⁶.

As analyzed by The Wire (2017), in the 2017 India-US joint statement, signed both by Narendra Modi and Donald Trump both countries agreed in increase cooperation in terrorism, defense, nuclear energy, cyber space, smart cities and investment and trade. In fact, the relevance of India for the US has been increasing from Clinton to Trump, with no

⁷⁴ According to the East West Center (2017) more than 1,2 million US tourists visited India in 2015, accounting for over 15% of all international visitors and contributing over US\$ 3 billion to the Indian economy. In the same year, over 1 million Indians traveled to the United States. As the 7th largest source of visitor spending in the United States, Indian tourists contributed US\$ 11,4 billion to the US economy. Non-stop flights connect five American cities to the Indian cities of Delhi and Mumbai. More than half of the passengers traveling on direct flights to India departed from Newark, New Jersey.

⁷⁵ India’s arms imports from Israel also increased by 285% between 2008–12 and 2013–17, making Israel the third largest supplier to India.

⁷⁶ At the same time, Israel has also transformed in a main weapon supplier to India.

changes on the main emphases between republicans and democrats. Particularly with respect to the maritime cooperation, the 2017 statement says:

“Resolving to expand their maritime security cooperation, the leaders announced their intention to build on the implementation of their “White Shipping” data sharing arrangement, which enhances collaboration on maritime domain awareness. President Trump welcomed Prime Minister Modi’s strong support for the United States to join as an Observer in the Indian Ocean Naval Symposium. Noting the importance of the upcoming MALABAR naval exercise, the leaders determined to expand their engagements on shared maritime objectives and to explore new exercises.”

Figure 22 - Narendra Modi (Indian PM) and Donald Trump (US President) in their meeting in 2017.



Source: Reuters

All in all, as discussed by Bandyopadhyay (2004), a main challenge for the Indian foreign policy continues to be her relationship with Pakistan, mainly with respect to Kashmir. With the militant insurgency growing since the 80s, encouraged and financed by the Pakistani army, India got involved in a proxy war in Kashmir and a short war in Kargil in 1999. A main consequence of the conflict was the nuclearisation of the region with the BJP-led NDA government deciding to go nuclear, detonating three devices in May 1998

(Chandra et al, 2008). The tension caused by the Indian nuclear weaponising included economic and technological sanctions since her persistent refusal to sign the restrictive Nuclear Non-proliferation Treaty and the Comprehensive Test Ban Treaty. However, in August 2008, the US-India Civil Nuclear Agreement was signed, ending with India's nuclear isolation and allowing her to purchase nuclear fuel and technology from the US for civil nuclear installations.

4.2. Interpretations on the Indian growth since 1990s.

In this section they are presented and clustered some authors who discuss on the recent Indian growth path. Although it is not an exhausted list, we understand that it helps to capture some main group of visions and understandings⁷⁷. There is a mainstream interpretation of the post-1990s growth process which is represented by a group of authors that we have grouped under the conceptual approach of market-led and pro-trade which mainly explain the growth process directly linked to the liberalization process. In the case of Panagariya (2008), market discipline is seen as the main growth driver. Bhagwati and Panagariya (2013) also stressed on trade liberalization an efficiency gains. For Desai (1999) competition both at economic and social level is the mechanism that has pushed growth and ends with a Patrimonial State. Although in some of these works, the channel from liberalization and competition to growth is not so clearly defined; efficiency gains and exports are more or less explicit postulated as the principal growth drivers.

There is a sub-group of authors such as Rodrick and Subramanian (2005) and Delong (2003) that, from a more explicit "supply-side" approach sustain that the main growth driver was the change in the governmental attitude to the local business community, which began in the mid-80s with Rajiv Gandhi and then it was deepened since the 1990s. The change in the business environment, mainly the attitude towards the national entrepreneurs and the domestic business community, would have resulted in an increment

⁷⁷ Clearly, each work and author presents much more details and nuances. Any oversimplification of the author's arguments is our own responsibility.

of investment and the liberalization, first oriented to the local business community, during the 1980s and then more broad, would have also pushed exports.

A third group, from a different conceptual approach synthesized as (neo) Marxist, emphasizes in the financial-led, super-exploitation and unsustainable pattern of growth. Chandrasekhar (2017, 2016, 2008) points out that India has deepened since the 1990s a financial-led mode of growth, in a global context of financial globalization. Capital inflows triggered a boom in domestic credit mainly to finance elite and upper middle class/caste consumption in durables goods, real state, automobiles, etc. Household consumption and overfunded corporate investment has been the main drivers of growth for him. Ghosh (2016) goes in a similar line, stressing on the FIRE (finance, insurance and real estate) sectors as the main drivers of growth. Bhaduri (2008) highlights the impressive increment of the productivity since the 1990s, without a corresponding increase in salaries, increasing the exploitation of the Indian working class. Patnaik (2009) points out the role of labour reserves to restrict salary increases and a more inclusive path of growth. In general terms, elite consumption, exports and construction are the main growth drivers for these authors.

A fourth group of authors work from “demand-side” frameworks. Both Nell (2012) and Nabar-Bhaduri and Vernengo (2012) adopt a demand-led model with balance of payment restriction. Nell (2012) sustains that service exports has been growing as an indirect result of the protectionist policies of the “planning era” and that they contributed to push the Indian external restriction. Nabar-Bhaduri and Vernengo (2012) argue in the same line but state limits of the service-led Indian growth, comparing it with the Mexican maquila. Rakshit (2009) builds a mix explanation stressing that in the first half of the 1990s the good monsoons impacted on the rural expenditure, and then mainly exports and government expenditure oriented to domestic services led the growth process. He points out the role of the forward and upward linkages of the different sectors and their impact on service growth. Thus, exports, domestic household expenditure and government expenditure are the main drivers of growth for these authors.

Finally, there is a fifth group of scholars, much more eclectic, which use different conceptual approaches and empirical elements to explain the Indian growth. Nayyar (2017) adopts an institutionalist perspective, highlighting the role of the technological, educational

and productive capabilities that were developed during the planning period and, then, scaled up after liberalization. The channel to growth is not clearly defined in Nayyar (2017) but we inferred that it is mainly through exports. Azad et al (2017) divide the growth process in different sub-periods (1990-2000, 2001-2008 and 2009-2016) exports, credit, State expenditure and Public Private Partnerships (PPP) have pushed growth in the different sub-periods. Bardhan (2010) build a narrative on both China and India growth process, from a political economy approach, accepting the relevance of the entrepreneurial push and exports after liberalization, despite stating some nuances and mix evidence with respect to the role of the State and the markets contribution. Nagaraj (2017a, 2013) analyses the 2003-2008 growth period mainly as a credit boom phase, with an increase in private investment, FDI and real estate investment. Banga (2006) highlights the intersectoral links of growth and the effects of trade liberalization and pro-business attitude.

Chart 28 - Some main Indian growth interpretations since 1990s.

Broad conceptual approach	Authors	Conceptual Approach	Growth explanation	Channel
Market-led, pro-efficiency, pro-liberalization and pro-trade	Panagariya (2008)	Pro liberalization, pro market, pro export, pro efficiency	Opening the economy to the world markets and subjecting it to greater market discipline has been at the heart fo the sucess India has achieved	Exports + efficiency
	Desai (1999)	Pro economic and social competition	Ending with the "Patrimonial State" and bringing both economic and social competition to India	Competition and exports
	Bhagwati and Panagariya (2013)	Pro- liberalization, pro-trade	Liberalization, cause an increase in trade and investment and a reduction in poverty	Exports and investment
	Sikdar (2015)	Not defined	Openness to current account trade has indeed played a significant role in India's growth surge. The main driver have been the lowering of trade restrictions on a wide range of imported technologies and imputs and a spectacular acceleration in the export of commercial IT enabled services	Imports efficiency gains + exports
Attitudinal shift and pro-business environment	Rodrick and Subramanian (2005)	Supply-side / Pro Business environment	Attitudinal shift by the government in the 1980s in favour of private business enterprises that was pro-business rather than pro market	Investment
	Delong (2003)	Pro liberalization, pro export	Attitudinal shift and liberalization	Investment and exports
"Demand" side	Nell (2012)	Demand-side hypothesis with balance of payments constrain (Kaldor + Thirwall)	Faster export growth allowed government spending to remain at a high level. This is the indirect effect of export growth working through Hicks's super-multiplier. Faster export growth and hence faster output growth for a given income elasticity of demand for imports in the post-liberalisation period is therefore the endogenous outcome of protectionist demand-side policy measures.	Export + Government expenditure
	Nabar-Bhaduri and Vernengo (2012)	Demand led growth with balance of payments constrain	Service (both export and domestic market) led	Export + consumption
	Rakshit (2008)	Demand side	Mixed: goods monssons in the years after the NEP, exports, government expenditure on domestic services	Domestic private consupction + exports + government expenditure

Broad conceptual approach	Authors	Conceptual Approach	Growth explanation	Channel
(Neo) marxists	Chandrasekhar (2017, 2016, 2008)	(Neo) marxist	Financial led growth - The capital inflow triggered a boom in bank credit, focussed largely on retail lending (loans for housing, automobile and durable purchases, and sundry personal expenditures) and on lending to investments in capital intensive industry and infrastructure.	Personal consumption and investment pushed by credit
	Ghosh (2016)	(Neo) marxist	FIRE (finance, insurance and real estate along with related professional services) led growth	Consumption and construction
	Patnaik (2009)	(Neo) marxist	Growth based on subsistence salary and large labour reserves	Elite and upper classes consumption and exports
	Bhaduri (2008)	(Neo) marxist	Productivity (explotation) increase	Elite consumption and exports
"Eclectic" approaches	Nayyar (2017)	Institutionalist	The success is to a significant extent attributable to institutional capacities which existed at the time that the reforms were introduced. The essential foundations were provided by the preceding four decades of economic development in India. The entrepreneurial abilities were created. A system of higher education was developed. The social institutions and the legal frameworks necessary for a market economy were in place.	Not clear, (implicitly) exports
	Azad, Bose and Dasgupta (2017)	Not defined	Different growth momentums push by exports, State expenditure, public and private credit and PPP	Exports, credit, State expenditure and PPP
	Bardhan (2010)	Political economy / eclectic	A mix of exports, entrepreneurial push, elite and upper classes consumption	Exports, consumption, investment
	Nagaraj (2017, 2013, 2008)	Not defined / Structuralist	The Indian economy boomed for five years at close to 9% annually, from 2003 to 2007. Output expansion was underpinned by a sharp rise in the investment rate, largely domestically financed, boosted by an unprecedented influx of foreign private capital under benign macroeconomic conditions. Credit for consumer durables and housing has also played a relevant role during 2000s.	Exports, Investment, Foreign Investment, credit, real state

Source: own elaboration.

4.3. A big picture of the Indian growth evidence post 1990s⁷⁸.

Next, I present some evidence in order to build our own understandings on the growth process since the 1990s. Dealing with Indian statistics is not an easy issue. There are many works questioning them, particularly with respect to the GDP growth rate, the size of formal private sector and the poverty line measuring (Nagaraj, 2017b, 2016, 2015, 2014; Ghosh, 2017; Krishnaji, 2012; between others). Although these discussions are extremely important for the precise understanding of the Indian economy, they are out of the scope of this research. That said, I mainly work with three sources of data: the Reserve Bank of India (RBI), the Ministry of Statistics and Programme Implementation (MOSPI) and the World Bank (WB). In some particular subjects, I have complemented this data with some specific authors and sources.

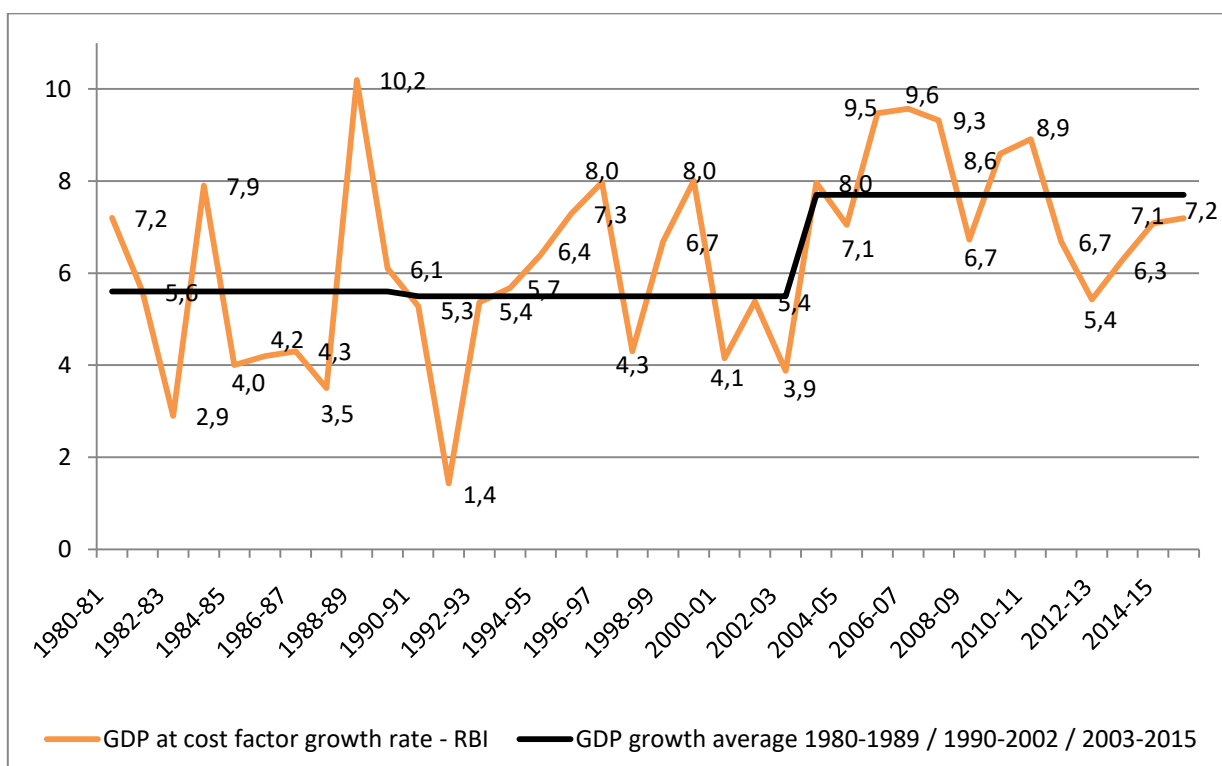
A first look at the Indian GDP growth rates since the 1980s look impressive. The average growth rate for the 1980s was 5,6% for GDP and 3,3% for GDP per capita, for the 1990s, GDP growth was 5,8% and GDP per capita 3,7% and for the 16 years since 2000 to 2015 GDP growth average was 7,1% and GDP per capita 5,4%. From these figures, in an overall picture of substantive growth, a first insight is that the main growth acceleration occurred since the 2000s and not immediately after the NEP implementation: GDP and GDP per capita growth average increased 2pp for the 2000s. What is more, if we see the graph with the average growth rate from 1990 to 2002, which include thirteen years after the NEP implementation, we can see that the average GDP growth rate was 5.5%, lower than 5.6% of the 1980s and 7.7% from 2003 to 2015.

⁷⁸ I would like to thank Fabian Amico for the discussions and knowledge exchange in order to build this big picture on the Indian economy. Pablo Moldovan has also contributed with useful comments on this section.

Chart 29 - Indian average GDP and GDP per capita growth rates.

Growth rate average	GDP	GDP per capita
1980s	5,6	3,3
1990s	5,8	3,7
2000-15	7,1	5,4

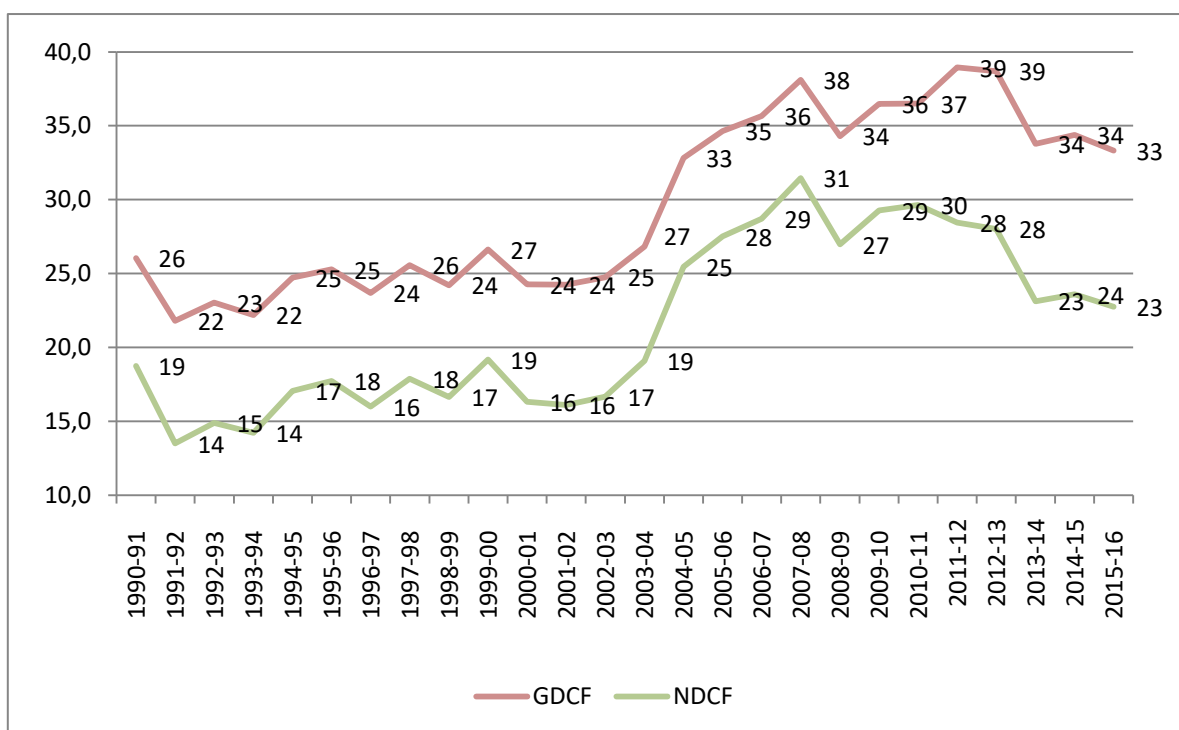
Source: own elaboration based on RBI.

Graphic 3 - Indian GDP growth rate and growth average. 1980-2015.

Source: own elaboration based in figures from the Reserve Bank of India (RBI).

The Gross and Net Domestic Capital Formation (GDCF and NDCF) evolution confirms that the growth momentum of the Indian economy was achieved quite years after the NEP initial implementation. Since 2003-4, GDCF jumped from an average of around 24% from 1991-2 to 2002-3 to an impressive average of around 35% from 2003-4 and 2012-13.

Graphic 4 - Gross and Net Domestic Capital Formation (GDCF and NDCF) % of GDP. 1990-1 / 2015-6.



Source: own elaboration based in figures from the Reserve Bank of India (RBI).

It is not to say that the 5.5% average growth rate after the NEP was not significant, but to contextualize it in the broader Indian growth path. After reaching a minimum of 1.4% growth after the contraction of 1991-2, GDP recovered and reached a pick of 8% in 1996-7, with an average growth rate for this period of around 6,5%. However, since 1997-8 to 2002-3 GDP growth rate were more instable and lower, with an average of 5.4% for this period. According to Rakshit (2009), the recovery in GDP growth experienced between 1992 and 1997 was not so related to the NEP implementation but it was mainly based on an “exogenous” variable: the good monsoons. As we can see in the graph before, agricultural GDP growth average 5% between 1992-1993 and 1994-5 and reached a peak of around 9% in 1996. In a still agrarian economy as the Indian one, the “good” monsoons contribute both in terms of agrarian incomes, peasants and farmers consumption and farmers investments.

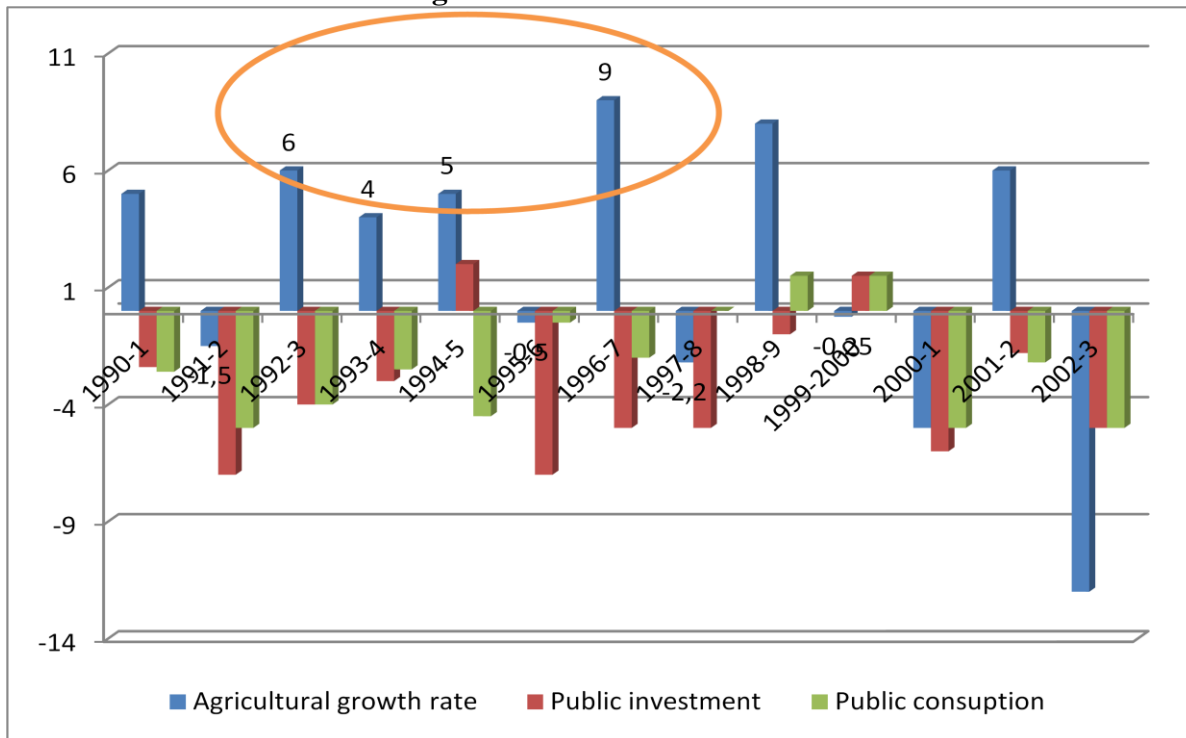
Although public investment and public consumption show negatives growth rates during the 1990s, significant cutback in income tax rates and exclusion of financial assets

from wealth tax contributed to pushed upper class/cast demand. In fact, the tax-GDP ratio fell about 2% during the 1990s (Rakshit, 2009). To Nair (2005) and Mundle and Rao (1997), another major implication of the fiscal policy during the 1990s was the relative increase in non-development expenditure. As a percentage of GDP, it has increased from 10.45 in the 1980s to 13.35 per cent in 1997. This means a shift in the composition of government expenditure from investment to consumption, mainly salary bills of government employees, transferes and subsidies (Mundle and Rao, 1997)

With the international support of the IMF and the World Bank, nationalized banks were recapitalized, NRI deposits were made more attractive and quantitative restrictions to bank credit were removed. In this sense, Azad et al (2017) say that the reforms initiated in the early 1990s reduced the statutory liquidity ratio (SLR) and cash reserve ratio (CRR) and also dilute the norms of priority sector lending⁷⁹, flexibilizing the credit requirements and restrictions. All this initiatives stimulates private consumption. Exports, although not showing the impressive performance of 2000s, contributed slightly, passing from around 5% to around 10% of GDP at the end of 1990s.

⁷⁹ Capital markets reforms also permitted easier inflows of FII and FDI. However, although increasing, the total foreign investment (FI) average 1.4% of GDP between 1993-1994 and 1997-1998. At the same time, as state by Azad et al (2017) the amount of capital mobilised from the primary equity market touched merely 1% of the GDP at its peak in 2007–08.

Graphic 5 - Agricultural GDP, Public Investment and Public Consumption annual growth. 1990-1 / 2002-3.



Source: Rakshit (2009).

According to Rakshit (2009), between 1997 and 2003, some bad monsoons and the retraction of public investment in infrastructure particularly in irrigation and urban-rural transport have been main factors behind the slowdown. Between 1991 and 2002 capital formation in infrastructure as proportion of the GDP went from 6.34% to 3.5%, pushed by the pursuit of macroeconomic adjustment programme under which the government tried to reduce fiscal deficit. This produced a negative impact on private capital formation, depress agricultural growth and aggravate the demand deficiency in the non-agricultural sector.

Next, it is presented a simple national account exercise based on the World Bank figures in order to give a snapshot on the contribution of the main components of the aggregate demand to the GDP growth. This exercise is useful to give a basic idea of which

have been the main aggregate demand components behavior and their impact on GDP⁸⁰. If we take the whole period, from 1990 to 2015, exports contributed 20% to GDP growth, household final consumption expenditure 43%, government consumption 7% and gross domestic capital formation 30%. If we divide this period in two sub-periods, the first one of around 5.5% GDP average growth rate, from 1990 to 2002 and, the other one of 7.7% average growth rate, from 2003 to 2015, the shares are quite similar, although GDCF reduced its contribution for 1990-2002 to 23% and then increased it for the period between 2002 and 2015 to 32%.

Chart 30 - Aggregate demand accounting exercise (at constant local currency)

Aggregate demand components	Exports of goods and services	Household final consumption expenditure	General government final consumption expenditure	Gross domestic capital formation
Demand composition (1990)	6%	60%	12%	22%
% increase 2015/1990	1417%	322%	280%	613%
Weight increased (ex post)	88%	193%	32%	136%
Growth contribution (%)	20%	43%	7%	30%
% increase 2002/1990	305%	72%	81%	97%
Weight increased (ex post)	19%	43%	9%	22%
Growth contribution (%)	20%	46%	10%	23%
Demand composition (2002)	13%	53%	11%	23%
% increase 2015/2002	275%	145%	110%	262%
Weight increased (ex post)	36%	78%	12%	59%
Growth contribution (%)	19%	42%	6%	32%

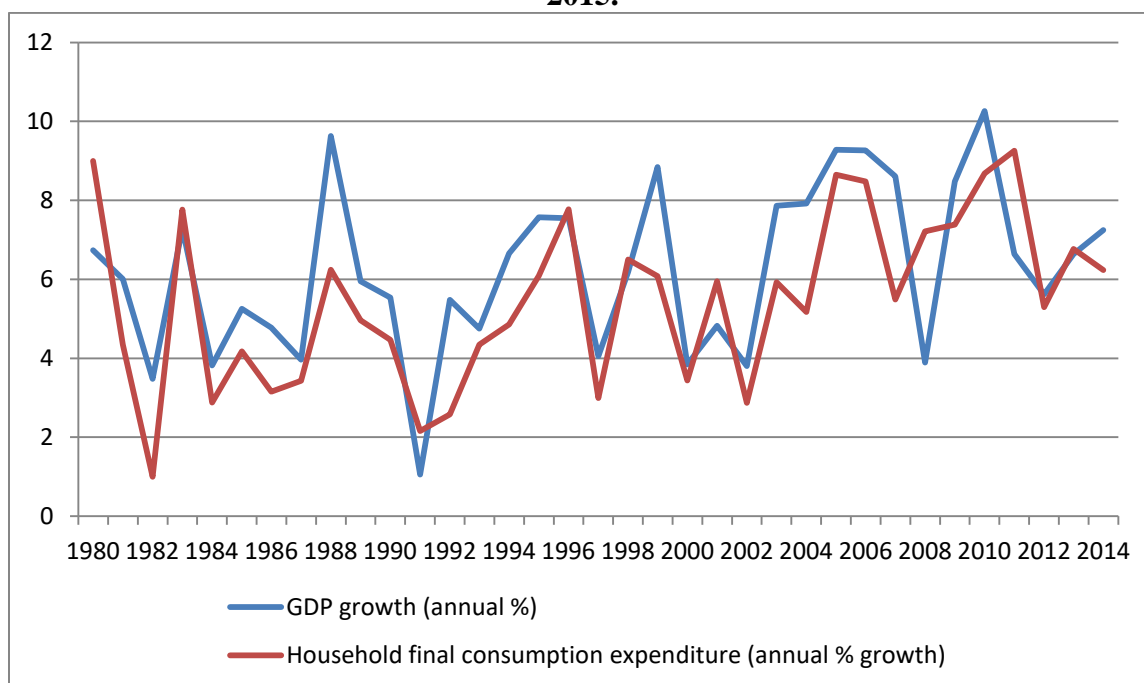
Source: own elaboration based on World Bank database.

This simple exercise suggests that private consumption, GDCF and exports are the main contributors to the Indian growth process since 1990s. Then, with respect to the

⁸⁰ In methodological terms, we first calculated which was the weight of each component of the aggregate demand in 1990, then we compute the growth of each one for the period under study and multiplied it by the share of participation and finally be “normalize” it as a proportion of the GDP growth.

behavior of each component of the aggregate demand, it is interesting to see the evolution of the private consumption growth, which explains around 40% of the demand growth, vis-à-vis the GDP growth rate: both series show a close correlation. As we will see in a next section, there are some indicators that reveal that salaries and income have been slightly increasing during the period under analysis.

Graphic 6 - GDP and household final consumption expenditure growth rates. 1980-2015.

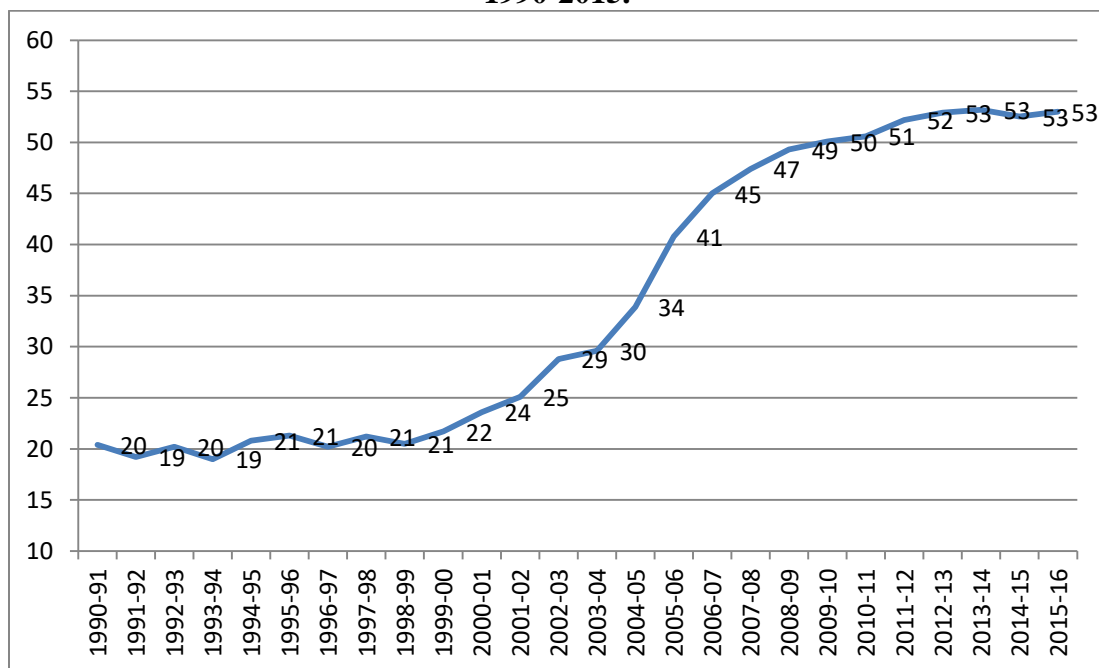


Source: own elaboration based on World Bank database.

Closely related with household consumption, a crucial aspect to understand the Indian economy performance, particularly since the 2000s, is the remarkable credit expansion (Azad et al, 2017; Chandrasekhar, 2017, 2016, 2008 and Nagaraj, 2013b, 2008). In the 2000s, the commercial banks credit as percentage of GDP boomed, going from an average of around 20% during 1990s to reach more than 50% at the beginning of 2010s⁸¹.

⁸¹ The figures presented by Azad et al (2017) about credit oriented to industry, services and agriculture are much lower. However, we are using the data presented in the RBI Handbook of the Indian Economy. Our figures are in line with the ones presented in Chandrasekhar (2016).

**Graphic 7 - Private and Public Commercial banks total Credit as % of GDP.
1990-2015.**



Source: own elaboration based on RBI.

In particular, if we see the deployment of bank credit by major sectors between 2005 and 2017, credit oriented to housing and real estate (Commercial Real Estate + Housing Personal Loans + Priority Sector Housing) average around 20% of the total gross bank credit⁸². From the total personal loans, housing represents around 50%. If we add together the total personal loans (which include consumer durables, education, credit card and advance consumption and vehicle loans) and the credit related to real estate and housing, they average around a third of the total gross bank credit. One third of the total amount of credit that has more than doubled in the 2000s. Nagaraj (2008), for instance, emphasizes on the role of personal loans to stimulate automobile and durable manufactures consumption as well as construction industry in the 2000s. With respect to the sectoral credit allocation since the 1990s, Chandrasekhar (2016) says:

⁸² We could only find this data for the period 2005-2017. Between 2005 and 2011, the figures correspond to credit stock at March and since 2012 to 2017, they correspond to credit stock at September.

“There were also significant changes in the sectoral distribution of credit. Overall there were two sets of sectors that gained in share. The first comprised of retail advances, covering housing loans, loans for automobile and consumer durable purchases, educational loans, and the like. The share of personal loans increased from slightly more than 9 per cent of total outstanding commercial bank credit at the end of March 1996 to close to a quarter of the total more recently. The second area of change was the distribution of credit going to industry, which at around 40 per cent of total bank credit outstanding was still substantial. The share of infrastructural lending in the total advances of scheduled commercial banks to the industrial sector rose sharply, from less than 2 per cent at the end of March 1998 to 16.4 per cent at the end of March 2004 and as much as 35 per cent at the end of March 2015. That is, even as the volume (though not share) of lending to industry in the total advances of the banking system has risen, the importance of lending to infrastructure within industry has increased hugely. Sectors like power, roads and ports, and telecommunications have been the most important beneficiaries...”

We will deepen on the this in the next sections, but for now, these figures are enough to say that the credit expansion since 2000s, in particular oriented to personal consumption, housing and real estate and infrastructure, is a main feature of the Indian post-1990s growth.

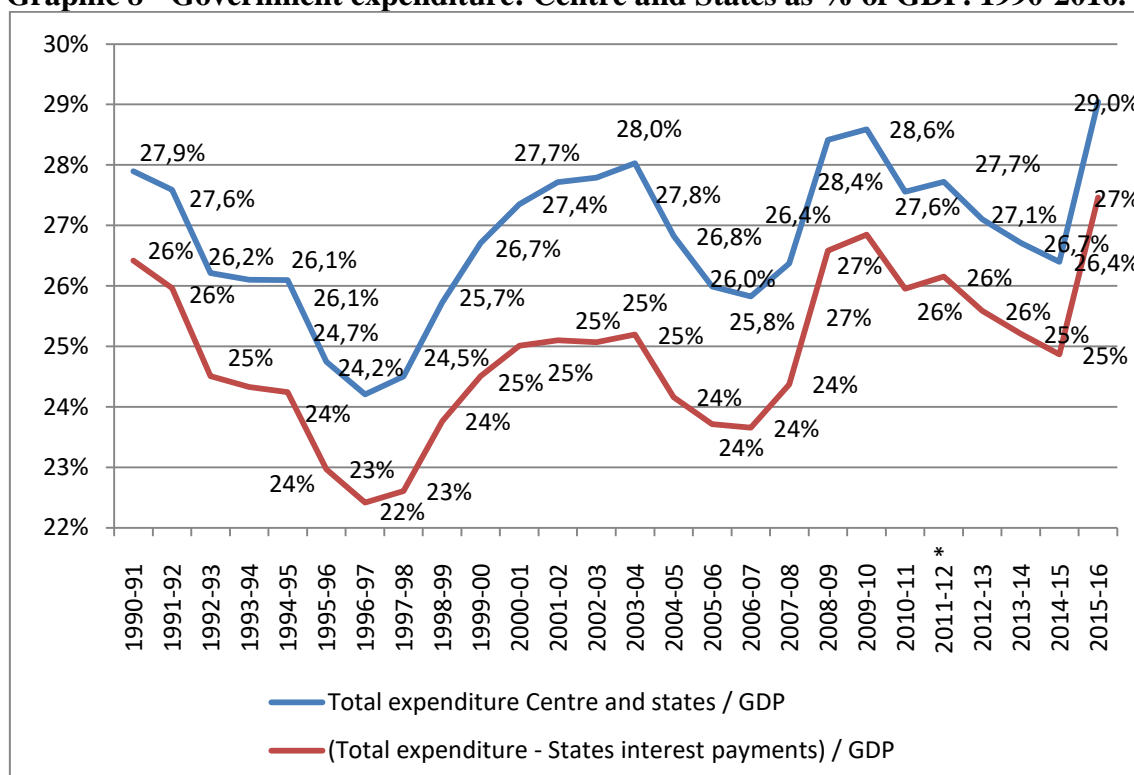
Chart 31 - Deployment of Bank Credit by Major Sectors. 2005-2017. Billion rupees and %.

Major Sectors	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Gross Bank Credit	10.459	14.455	18.481	22.492	26.473	30.885	37.494	44.912	52.969	57.193	62.016	69.167	72.068
Food Credit	411	406	469	443	455	485	623	893	949	1.054	1.030	1.611	398
Non-food Credit	10.048	14.048	18.012	22.048	26.018	30.400	36.870	44.020	52.020	56.138	60.987	67.556	71.671
Agriculture & Allied Activities	1.242	1.739	2.303	2.753	3.386	4.161	4.834	5.389	6.100	7.208	8.133	9.427	9.971
Industry	4.231	5.504	6.973	8.583	10.543	13.114	16.131	20.163	23.715	25.071	26.293	26.522	26.404
Services	2.010	3.201	4.207	5.493	6.462	7.267	8.907	10.279	12.553	13.227	14.014	16.590	17.749
Transport Operators + Shipping	94	216	351	443	487	617	779	849	923	999	1.065	1.147	1.201
Trade, Tourism, Hotels & Restaurants	622	912	1.163	1.360	1.579	1.838	2.139	2.694	3.329	3.647	4.052	4.435	4.716
Professional Services + Computer Software	123	188	290	347	538	559	591	645	810	976	1.106	1.389	1.486
Commercial Real Estate	135	267	440	631	924	921	974	1.155	1.358	1.617	1.649	1.810	1.863
Non-Banking Financial Companies (NBFCs)	228	343	489	789	988	1.134	1.841	2.424	3.070	2.925	2.961	3.701	3.862
Other Services	803	1.272	1.470	1.919	1.943	2.196	2.580	2.512	3.062	3.063	3.182	4.108	4.619
Personal Loans	2.363	3.602	4.527	5.217	5.624	5.856	6.996	8.188	9.653	10.632	12.547	15.017	17.547
Consumer Durables	89	71	91	97	81	82	62	70	96	143	161	195	178
Housing	1.339	1.852	2.309	2.603	2.793	3.009	3.590	4.213	5.056	5.787	6.829	8.058	9.086
<i>% Housing of Personal Loans</i>	<i>57%</i>	<i>51%</i>	<i>51%</i>	<i>50%</i>	<i>50%</i>	<i>51%</i>	<i>51%</i>	<i>51%</i>	<i>52%</i>	<i>54%</i>	<i>54%</i>	<i>54%</i>	<i>52%</i>
Credit Card Outstanding + Advances	402	486	638	757	788	715	704	758	856	855	997	1.155	1.309
Education	56	99	152	205	285	368	430	535	582	626	672	712	720
Vehicle Loans				586	619	637	730	964	1.186	1.144	1.331	1.635	1.786
Other Personal Loans	674	1.092	1.331	966	1.053	1.040	1.477	1.648	1.876	2.077	2.557	3.262	4.468
Priority Sector	3.749	5.107	6.359	7.480	9.324	10.921	12.693	13.984	16.445	18.930	20.992	23.389	24.266
Agriculture & Allied Activities	1.242	1.739	2.303	2.753	3.386	4.161	4.834	5.389	6.100	7.208	8.133	9.385	9.950
Micro & Small Enterprises	-	-	-	2.520	3.091	3.735	4.447	4.958	6.075	7.355	8.124	8.744	9.079
Housing	902	1.332	1.603	1.807	1.971	2.178	2.408	2.516	2.910	3.168	3.317	3.585	3.688
Others (including weaker sectors)	741	912	-	1.665	2.134	2.799	2.939	3.496	4.237	4.957	5.561	6.238	6.647
Commercial Real Estate + Housing Personal Loans + Priority Sector Housing	2.376	3.451	4.352	5.041	5.688	6.108	6.972	7.884	9.324	10.572	11.795	13.453	14.637
<i>% of Total Gross Bank Credit</i>	23%	24%	24%	22%	21%	20%	19%	18%	18%	18%	19%	19%	20%
Personal Loans + Commercial Real Estate + Priority Sector Housing	3.400	5.201	6.570	7.655	8.519	8.955	10.378	11.859	13.921	15.417	17.513	20.412	23.098
<i>% of Total Gross Bank Credit</i>	33%	36%	36%	34%	32%	29%	28%	26%	26%	27%	28%	30%	32%

Source: own elaboration based on RBI and Economic and Political Weekly.

In relation to government expenditure, despite it was not the main driver of growth, we cannot say that it experienced a permanent reduction as was postulated in the NEP objectives. In fact, it experience periods of decreasing, mainly after the NEP, but when the economy was slowing down, State expenditure was used to stimulate growth, both at the end of 1990s and during the global crisis started in 2007.

Graphic 8 - Government expenditure: Centre and States as % of GDP. 1990-2016.



Source: own elaboration based on RBI.

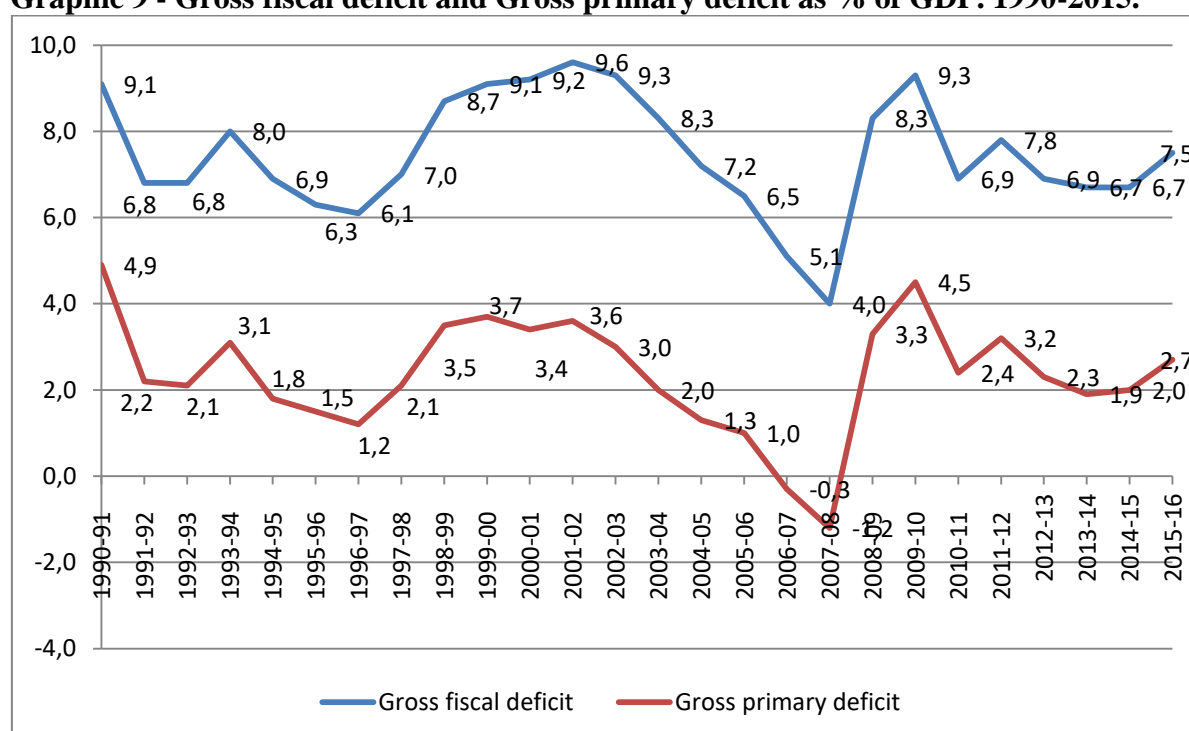
If we analyze the evolution of the Centre plus the States expenditure as a percentage of GDP, we see that after the NEP implementation, indeed, there is a constant decrease in the government expenditure share. This reduction has been the result both of the adjustment policies implemented and the effects of the recovery of the growth between 1992 and 1997 which statistically reduce the State share as the GDP increase. However, in the second half of 1990s, when the GDP growth rates turn more instable, State participation in the economy recover in order to reach in 2003 the same level that in 1990, at around 28% (25% excluding the States interest payments). It means, after a decade of NEP, the government expenditure as percentage of GDP was

almost the same (however, the interest paid by the States took a bigger share, as can be seen in the graph before).

In 2003, the Fiscal Responsibility and Budget Management Act (FRBMA) passed in the Parliament, which was aimed to reduce fiscal deficit to 3% of GDP. We can see a new reduction in the State participation with a new minimum of 26% (less than 24% excluding States interest payments) in 2006. However, in 2006, an ambitious State funded rural employment guarantee scheme, the National Rural Employment Guarantee Scheme (later “Mahatma Gandhi” was added to its title, and is known as MGNREGS) passed through the Parliament with the support of Congress and left parties and was initiated to boost public works and increase rural income offering 100 days of guaranteed employment for rural labour. Since 2007 to 2009 the State expenditure again pushed up, in order to deal with the subprime crisis started in 2007 which affected the Indian external sector (Nagaraj, 2015; Azad et al, 2017). In fact, the FRBMA fiscal deadlines and goals were postponed. In 2009, the State participation reach a new peak of 28,5% of GDP. Since then, we can see a new decrease in the State participation until 2016, when another peak was reached at 29% of GDP. Thus, in 2016, around 25 years of the NEP implementation, State expenditure is bigger in proportion of GDP!

Furthermore, if we take a look in the gross fiscal deficit we can see that for the whole period between 1990 and 2015 it has been superior to 5%, with peaks of 9% and an average of 7.5%. In general terms, according to Rakshit (2009), for several years the successive budgets have been characterized by over estimating of tax collections. Fiscal policy has tended to overestimate the effects of government expenditure reduction vis-à-vis tax collection as a way to reduce deficit. Besides, tax reduction, rural subsidies and exemptions (instead of public investment expansion) have clearly contributed to the fiscal deficit.

All in all, it seems that in middle of the pressing from the multilaterals organisms and a policymaking framework that has been influenced by the neoliberal times, the different tentative to reduce the global State expenditure in the Indian economy has had back and forth and fiscal deficit remained as a main feature of the Indian economy. But, what is more, State expenditure, as seen, has been used as a clear anti-cyclical mechanism.

Graphic 9 - Gross fiscal deficit and Gross primary deficit as % of GDP. 1990-2015.

Source: own elaboration based on RBI.

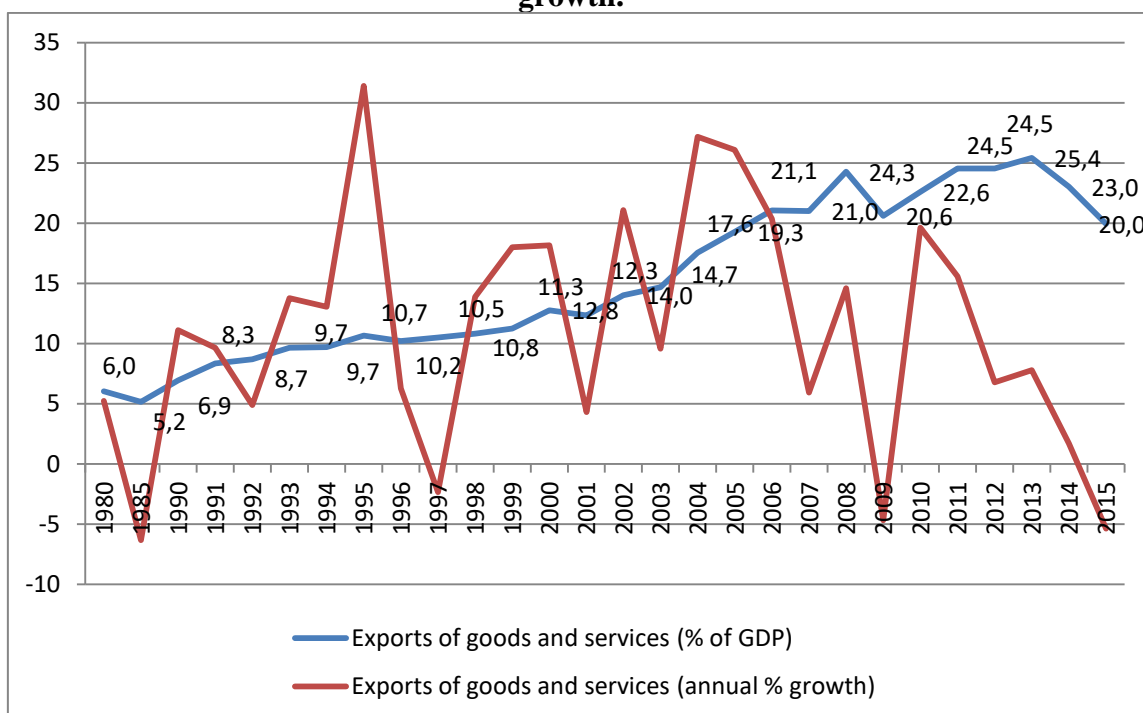
In relation to exports, which explain around 20% of the growth in aggregate demand, we observe that during the 1990s, in comparison with the 1980s, they passed from around 5% of GDP to 10%. However, the main increase occurred during the 2000s, when they surpassed 20% of GDP participation. A main driver of the exports growth were the service exports, in particular the ICT ones, mainly to the US. To Rakshit (2009), among the demand side factors, it was the export of services which recorded the most spectacular growth especially over 1997-2005. The emergence of foreign demand as a major source of services growth constitutes one of the most striking features of the Indian economy. However, since service exports were relatively small in 1990 their quantitative impact on GDP was modest in the initial step. They became increasingly important over the time with a ratio of exports of services to the service GDP participation increasing from around 5% in 1991 to 14% in 2004-5. Referring to the external performance since the 1990s, Azad et al (2017, p. 86) say:

“India’s merchandise exports–GDP ratio, which had risen from the 1980s’ average of 4.4% to 7.6% in the 1990s, witnessed a sharp rise to 9.3% in 2000–01 and continued to rise to almost 15% in 2008–09... While this points towards an important role played by export markets in stimulating the economic boom in the 2000s, it is noteworthy that imports have also grown much faster than exports in the 2000s unlike in the 1990s, which reflects a net dampening effect of trade openness on aggregate demand. The import–GDP

ratio had risen sharply from an average of 9% in the 1990s to 10.6% in 2000–01, further to 24.4% in 2008–09. The merchandise trade deficit, which had remained consistently positive for India through the 1980s and 1990s, rose to historically high levels in the 2000s, reaching 9.5% of GDP in 2008–09.”

We will particularly explore the role and peculiarities of the Indian service exports and the external sector evolution and sustainability since the 1990s in a next section.

Graphic 10 - Exports of goods and services. 1980-2015. % of GDP and annual % growth.



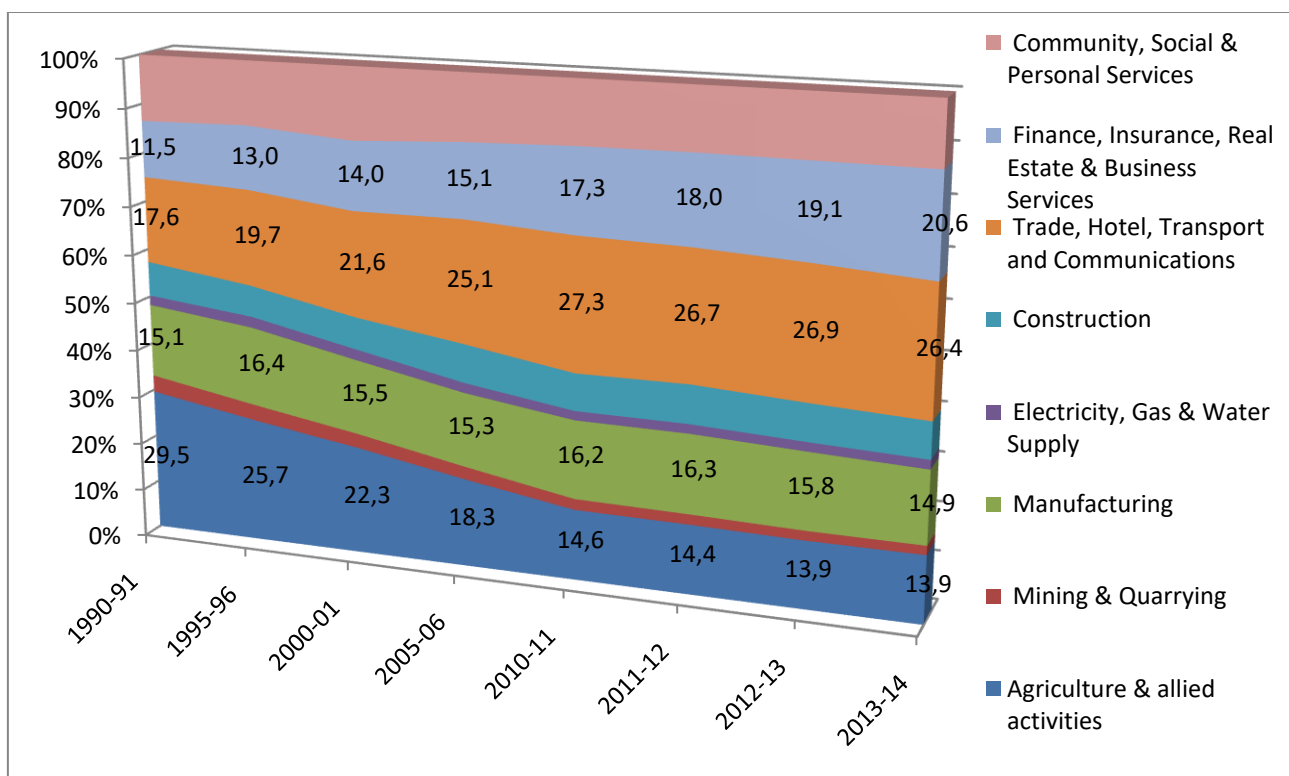
Source: own elaboration based on World Bank database.

Next, if we analyze the sectoral composition of GDP for the period 1990-2013⁸³, we can see that there is a marked increase in the participation of trade, hotels, transport and communication and finance, insurance, real estate and business services, both registered as services, going between 1990 and 2013 from 17.6% to 26.4% and from 11.5% to 20.6% respectively. It means, both sectors increased their share in around 10 pp in 24 years in order to represent together almost 50% of GDP! In contrast, agriculture participation significantly decreased, going from 29.5% to 13.9% and

⁸³ 2013 was the last figure available.

manufacturing stay stagnant at around 15%. These figures goes in line with the work of Ghosh (2016), Chandrasekhar (2017, 2016), Azad et al (2017) and Nagaraj (2013b), who point out the impressive increase of the FIRE (finance, insurance and real estate) sector along with related professional services as a main characteristics of the Indian growth, particularly since 2000s.

Graphic 11 - Sectoral Composition of GDP (at Factor Cost factors). 1990-2013.



Source: own elaboration based on RBI.

The evolution of the GDCF composition by sector shows some similar trends (even stronger in some sectors). Agriculture share decreased from 20.2% in 1980 to 14.4% in 1990 and 7.3% in 2015. Real estate, ownership of dwelling and professional services impressively increased, more than doubling, from 11% in 1990 to 26.1% in 2015. Construction raised from 1.3% in 1990 to 6% in 2007 and then declined to 3.9% in 2015, although still tripling the 1990 participation. Trade, repair, hotels and restaurants also tripled, increasing from 3.3% in 1990 to almost 10% in 2015.

With respect to real estate, information technology outsourcing and services sector boom created a massive demand for high quality commercial real estate, met by private sector, mostly in and around the metropolitan cities. Besides, the slow but constant urbanization process contributed to press urban housing demand, particularly

by the upper class/cast groups. Construction performance seems to be fueled by the credit expansion, the different public housing and urban development programs and the rural construction push, stimulated by the slightly increase in rural incomes and the decrease in the cement price since the 1990s (Mahajan and Nagaraj, 2017). Nagaraj (2008, p. 58) affirms:

“The boom in private housing since the late 1990s spurred by income tax concessions to individuals in a low interest rate regime, together with the massive road building project – the Golden Quadrilateral Programme connecting the four metros that started in 2000 – seem to account for the growth in construction. These measures were precisely intended to revive the sagging economy. Though officially the project is now more or less complete (with considerable time and cost overruns), it is followed up by the north-south and east-west corridor projects diagonally interconnecting the four metros. Though these investments have only marginally added to the net road length, they have widened the highways, improved their quality and expanded the carrying capacity of the existing road network.”

Graphic 12 - GDCF share by sector. 1980-2015.

Activity	1980-1	1990-1	2000-1	2007-8	2010-11	2015-6
Agriculture, forestry and fishing	20,2	14,4	9,5	7,1	8,0	7,3
Mining and quarrying	3,2	5,4	1,6	4,5	3,9	1,5
Manufacturing	22,3	27,4	30,6	34,6	29,9	17,6
Electricity, gas, water supply & other utility services	11,0	12,0	8,5	5,8	6,0	9,1
Construction	1,1	1,3	1,7	6,0	4,8	3,9
Trade, repair, hotels and restaurants	3,9	3,3	2,8	6,6	8,8	9,7
Transport, storage, communication & broadcasting services	10,9	10,5	15,9	6,5	8,1	6,8
Railways	2,6	2,0	1,2	1,3	1,3	2,0
Communication & services related to broadcasting	1,3	2,5	5,3	2,6	3,4	1,9
Others	6,9	6,0	9,4	3,1	3,3	2,9
Financial services	0,5	1,3	1,4	0,8	0,7	1,2
Real estate, ownership of dwelling & professional services	9,6	11,0	16,1	11,9	13,0	26,1
Public administration and defence	14,9	10,4	7,8	8,9	10,1	10,8
Other public services	2,5	3,0	4,1	7,3	6,7	6,0
Total GDCF % of GDP	21,5	23,9	24,6	36,7	34,8	33,3

Source: Nagaraj (2013b) and National Accounts Statistics 2017 (MOSPI)

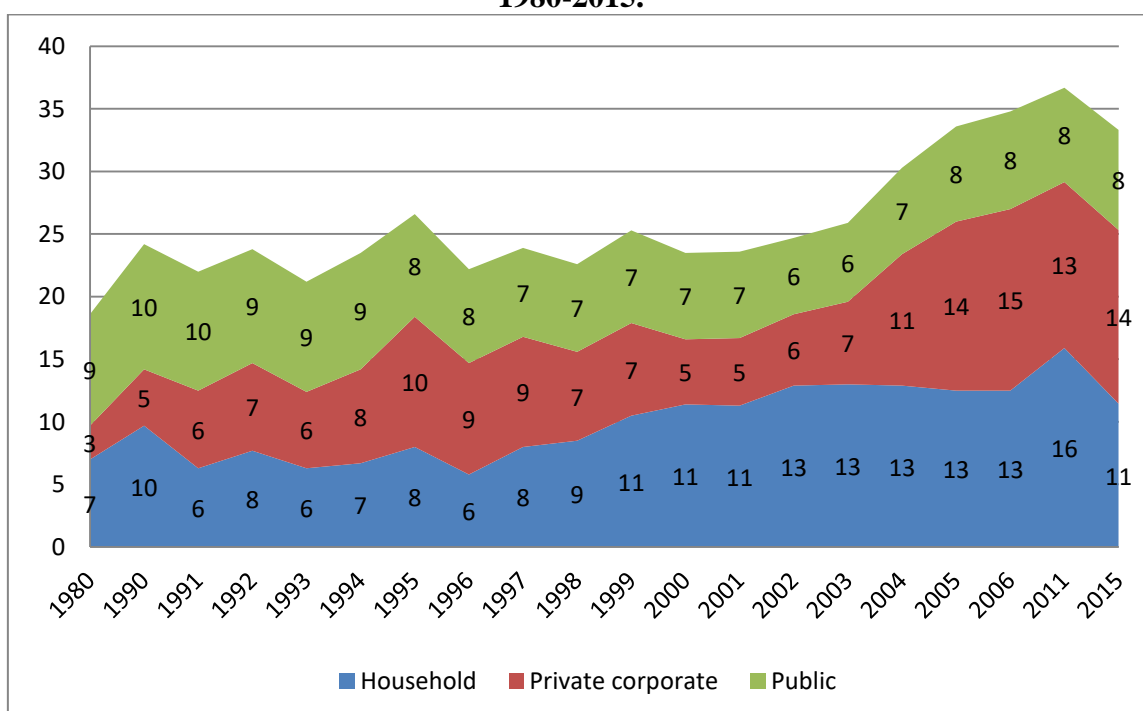
With respect to the participation of private corporate sector, public sector and households in GDCF, public sector reduced its share from 10% in 1990 to 6% in 2002 and then recovered to 8% since 2005⁸⁴ (see Nagaraj (2015) for a deeper discussion). Since then, public sector contribution stabilized at 8%. Private sector went from 5% in

⁸⁴ These figures are particularly highly discussed (Nagaraj, 2015; 2008, etc.). Most of the critics suggest that there is an overestimation of the private corporate sector. However, as there is no other source or data, we choose to use them.

1990 to 10% in 1995, decreased again to 5% in 2000 and since then increased to around 14%. The GDCF growth between 2003 and 2007 was mainly lead by private investment. In this sense, several studies such as the ones of Nair (2005), Rakshit (2009), Bhattacharyya (2008) and Bhaduri (2005) show that private corporate investment, particularly in manufacturing, have responded to some kind of accelerator mechanism. For instance, Nair (2005, p. 29), who analyses the determinants of fixed investment in the Indian private corporate manufacturing sector, says:

“The estimated coefficient for the level output is positive and significant in all the specifications. This shows that the standard accelerator mechanism is important in explaining corporate investment behaviour. The coefficient on output is positive and statistically significant at 5 per cent level in all the specifications. It suggests that increase in output lead to an increase in fixed investment. One interesting result is internal resources is a major determinant of corporate investment in all the specifications. Even after the introduction of financial sector liberalisation the firms depend on profit for investment”

Graphic 13 - GDCF. Participation of Household, Private corporate and Public. 1980-2015.

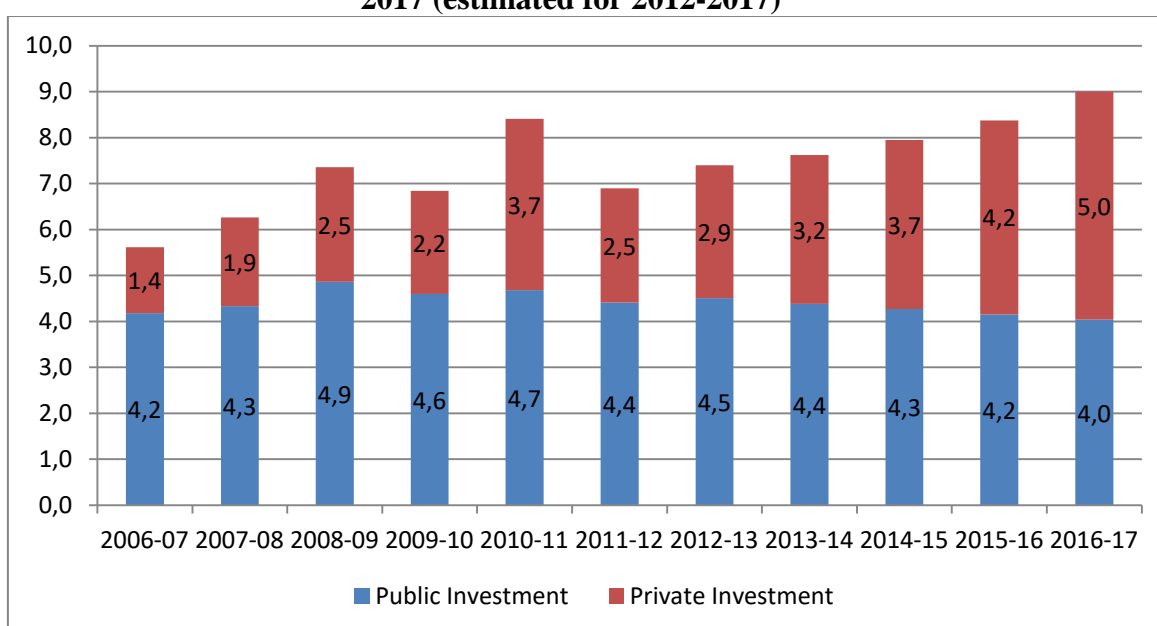


Source: own elaboration based on the Report of the High Level Committee on Estimation of Saving and Investment (2009) and MOSPI.

The faster expansion of private investment in the 2000s occurred not only in manufacturing and services where the private corporate sector had a traditional presence, but also in the infrastructure sector, where private investment was practically absent till the 1990s. According to the Twelfth Five Year Plan (2012-2017) total

investment in the infrastructure sector (defined as electricity, roads and bridges, telecommunications, railways, irrigation, water supply and sanitation, ports, airports, storage, and oil and gas pipelines) reached a peak of little more than 8% of GDP in 2010 with private sector participation increasing from 1.4% of GDP in 2006 to a peak of 3.7% in 2010. Since 2012, the figures are estimated; however, they projected an increasing participation of private sector. At the same time, public investment in infrastructure was superior to 4% of GDP for all the years.

Graphic 14 - Total investment in infrastructure. Public and Private Sector. 2006-2017 (estimated for 2012-2017)



Source: own elaboration based in the Twelve Five Year Plan.

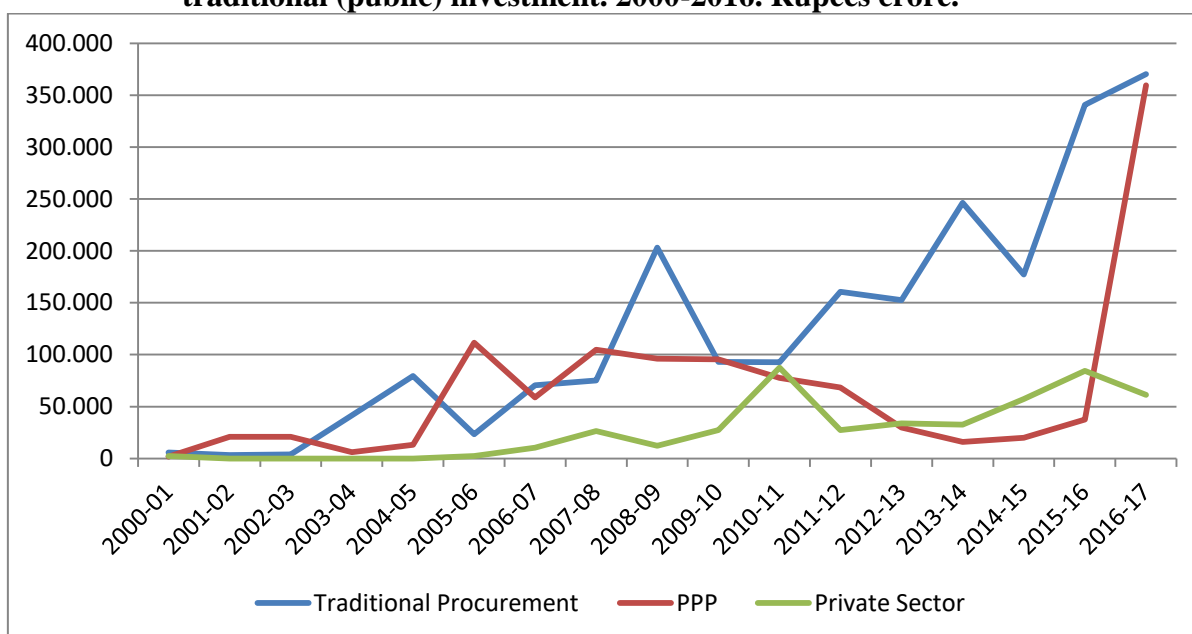
Traditional procurement, its mean, public procurement was the main form of infrastructure expenditure. However, the PPPs (Public Private Partnerships) have played an increasing role to stimulate and mobilize private investment in infrastructure⁸⁵ mainly since the 2007 global crisis. According to Azad et al (2017, p. 92):

⁸⁵ There are different types of PPP contracts and modalities, as we will explore in a next section. In each of them, the private and the private sector divide their roles and involvement. In this sense, inside the category of PPP, there is both private and public investment. In the aggregate numbers that we present here, that are taken from the World Bank Database and the Department of Economic Affairs of India, it is not possible to desegregate between the public and private investment proportion of the PPPs. However, in general terms, most of the investment is registered as private; despite it commonly received support from the public sector banks.

“Data on infrastructure projects from the Department of Economic Affairs (DEA) database show the rise in the number and value of PPP projects (above 5 crore rupees) from 2002–03. The total number of PPP projects peaked at 89 in 2010–11 and 2011–12, while in terms of total project cost it peaked at 786 billion rupees in 2007–08. Since 2012–13, there has been a gradual decline in the PPP projects. Private sector projects in infrastructure kick-started in 2006–07 and peaked in 2014–15 at 106 projects with a total project cost of 314 billion rupees. Traditional government projects also saw an increase from 11 projects with a total project cost of 264 billion rupees in 2003–04 to 110 projects with a total cost of 1.1 trillion rupees in 2008–09. Government projects peaked in 2013–14, both in terms of numbers at 315 projects as well as in terms of project cost at 1.4 trillion rupees.”

Our own data processing of the Department of Economic Affairs’ database on PPPs, private investment and government investment (traditional procurement) shows, in line with Azad et al (2017), PPPs reached a peak between 2007 and 2009, then they decrease and they reached another peak in 2016.

Graphic 15 - Infrastructure expenditure by PPPs, private investment and traditional (public) investment. 2000-2016. Rupees crore.

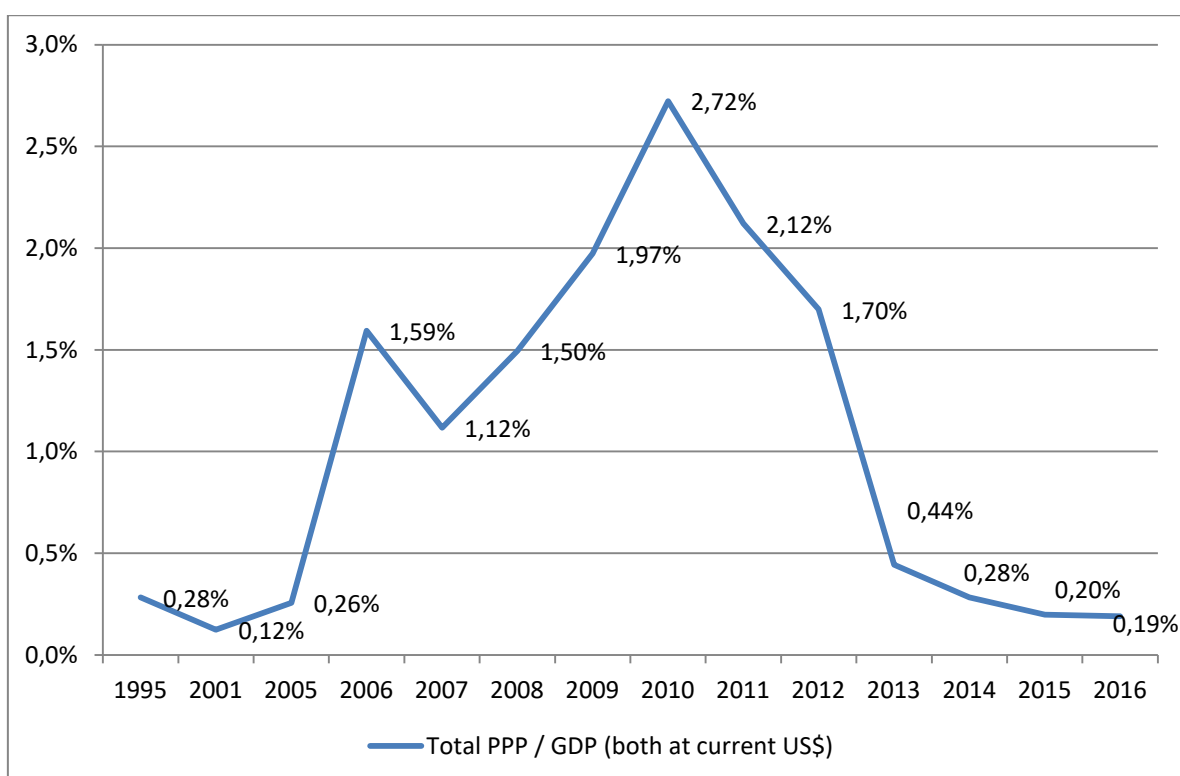


Source: own elaboration based on the Department of Economic Affairs’ database.

According to the World Bank database, PPPs constantly increased its share on GDP since 2007, reaching a peak of 2.7% in 2010. Then, they decreased to less than 0.5% since 2013. Most of the PPP were signed in energy and transport sectors, reaching

peaks of 30 billion US\$ in 2010 and 22 billion US\$ in 2012 respectively. According to Azad et al (2017) and Chandrasekhar (2016)⁸⁶ the role of public banks financing has been relevant in supporting PPP and private investment in infrastructure since the 2000s. We will particularly deepen on the role of PPP on the energy sector in a next section.

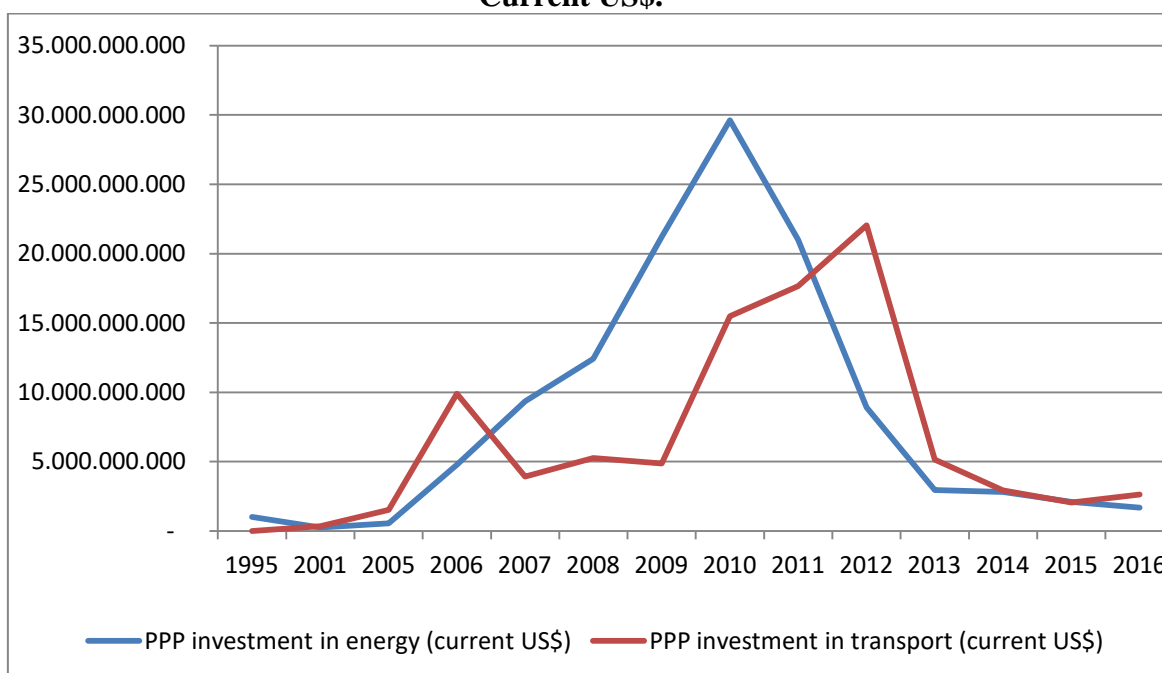
Graphic 16 - Public Private Partnerships (PPP) as % of GDP. 1996-2016.



Source: own elaboration based on World Bank database.

⁸⁶ At the same time, both authors are critic with respect to the public financing of PPP, signaling that private sector is not dealing with the risk of investment. No doubt, this is a relevant issue to be discussed; however this is not the objective of this section.

**Graphic 17 - PPP investment in energy, transport and water sanitation. 1995-2016.
Current US\$.**



Source: own elaboration based on World Bank database.

Finally, the household share in GDCF went from 10% in 1990 to a minimum of 6% in 1996 and then constantly increased to reach a pick of 16% in 2011. The relevance of household share in GDCF, which surpassed both private corporate sector and public sector share in 2011, is close related to the relevance of the informal sector in the Indian economy and the real estate and construction boom pushed by the families, which is mainly capture in the national accounts as household investment. In particular, the investment in housing and construction by channeling the remittances that come from the Non Resident Indians (NRI) is not a minor phenomenon in some States such as Kerala. However, I neither have enough empirical support in order to be more precise and convincing. In line with Nagaraj (2008), I understand that the role of household share in the GDCF deserves much more exploration and research.

Summing up, in this section some main features of the Indian growth post-NEP were highlighted. Two main phases of growth were identified. The first one refers to the initial years after the NEP implementation until around 2002, with two internal sub-periods, from 1992 to 1997, with an increasing growth rate, and from 1997 to 2002, where the growth rates were more irregular. This first phase, although showing an average growth of around 5.5%, do not differ significantly from the growth average reached in the 1980s. However, the second and main growth period was between 2003 and 2015: despite the slowdown caused by the 2007 global crisis, from 2003 to 2015 the Indian economy average growth rate was almost 8% and the GDP per capita average growth rate almost reached 6%.

Broadly, from 1990 to 2015, private consumption has been the main growth driver, followed by GDCF which mainly answered to this stimulus through the accelerator effect, particularly in manufacturing, and exports. Besides, the role of household investment in housing, construction and real estate (financed by a credit), PPPs and public investment, should not be underestimated when analyzing the impressive behavior of the GDCF.

In particular, the first period, between 1990 and 2002, was mainly pushed by the agriculture performance and private (and also public) consumption. The second and more impressive growth period, between 2003 and 2015, had different drivers: the credit boom directed to housing and real estate, private consumption and corporate investment, the increase in exports, mainly the services and ICT exports to the US, and the State intervention through direct public procurement, organizing PPP or by public employment programs, mainly after the 2007 global crisis.

4.4. Growth drivers, external sector, “structural heterogeneity” and National System of Innovation policymaking.

In the next part of this chapter we will deepen on some particular aspects of the Indian growth process which were highlighted in the section before, despite they were not sufficiently explored. Given the relevance of household expenditure, GDCF and exports to explain the Indian growth, we will present some figures and understandings on the evolution and dynamic of: employment, wages and household consumption, real estate and construction boom, public and private sector involvement in energy sector and the external sector and the exports performance. Then, we will briefly present some evidence on the “structural heterogeneity” of the Indian productive and social structure and the Indian National Innovation System policymaking.

4.4.1. Employment, wages and household consumption:

As said, statistics on labour market and household income are not so easy to deal with in India. Here, we will present some main features on them, working with the available statistics and assuming the limitations of our own knowledge. For the evolution of employment and wages, we mainly based on the statistics presented in RBI, MOSPI and in the works of Thomas (2015, 2012), Papola and Kannan (2017), Chandrasekhar and Ghosh (2015), Ghosh (2015), the India Labour Market Update (ILO, 2016) and the Global Wage Report 2016/17 of the ILO (2016). For household consumption we used different sources.

According to the figures presented by Thomas (2015), based on the Indian Census of 2011 (the last edition), out of India’s total population of 1227.4 million, 472.5 million were workers and 10.8 million (or 0.9 % of the total population) were unemployed. Among the population that was not part of the labour force, there were 337.5 million students and another 232.4 million who, according to the official statistics, were described as attending to domestic duties. India’s low official unemployment figures are related to the large numbers of persons who are either underemployed and or who do not join the labour force due to lack of sufficient employment opportunities. From the Report on Fifth Annual Employment - Unemployment Survey (2015-16) we can observe that the unemployment rate for all

India was estimated in 5% of the persons aged 15 years and above who were available for work could not get work. The unemployment rate was higher among females: it was 8,7%, whereas for males it was 4%. In particular, Bhaduri (2008) highlights that open unemployment was the highest at young urban women.

Chart 32 - Distribution of India's Population by Activity Status, 2011-12, in million.

Activity Status	Rural Male	Female Male	Urban Male	Urban Female	Total
1 Employed	234,4	101,6	109,1	27,4	472,5 (38%)
2 Unemployed	4,3	1,6	3,5	1,5	10,8 (0,9%)
3 Labour force (1 + 2)	237,7	103,2	112,5	28,9	483,3 (39)
4 Students	129,1	102	58,1	48,2	337,5 (27%)
5 Attending domestic duties only	0,4	68,9	0,4	65,9	135,6 (11%)
6 Attending domestic duties and also engaged in other activities for household use	0,9	75,8	0,2	19,9	96,8 (8)
Population	431,7	409,8	199,8	186,1	1227,4 (100%)

Source: Thomas (2015)

According to the work of Papola and Kannan (2017) on the structure of employment by location, gender and labour status, of the total employment of India, in 1993-4, 55% were self-employed, 13% were regular (organized/formal) and 32% were casual workers. In 2011-2 the percentages were quite similar: 52,2% of self-employment, 18% of regular workers and 30% of casual workers. It means, for an economy that have grown around 7% per year in the last almost 30 years, to pass from 13% of regular workers to 18% is almost insignificant. In the rural areas, self-employment is even greater, representing 56% in 2011-2, 9% of regular workers and 35,4% for casual workers. Urban areas registered the major share of regular workers, with 43,3% in 2011.

Chart 33 - Percentage share of employment by location, gender and labour status. 1993-2011.

	1993-4			2004-5			2011-2		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
RURAL									
Self-employed	57,8	58,8	58,2	58,1	63,7	60,2	54,5	59,3	55,9
Regular	8,5	2,7	6,4	9,0	3,7	7,6	10,1	5,6	8,7
Casual	33,7	38,5	35,4	32,9	32,6	32,8	5,5	35,1	35,4
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
URBAN									
Self-employed	42,2	45,0	42,7	44,8	47,7	45,4	41,7	42,8	41,9
Regular	41,5	29,0	38,9	40,6	35,6	39,5	43,4	42,8	43,3
Casual	16,3	26,0	18,4	14,6	16,7	15,1	14,9	14,4	14,8
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
TOTAL									
Self-employed	54,0	57,0	55,0	54,7	61,4	56,9	50,7	56,1	52,2
Regular	16,4	6,1	13,1	17,2	8,3	14,3	19,8	12,7	17,9
Casual	29,6	36,9	32,0	28,1	30,3	28,9	29,4	31,2	29,9
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Source: own elaboration based on Papola and Kannan (2017).

With respect to the employment by sectors, in line with the decline in the share of agriculture and allied activities in the GDP, the share of these sectors in the country's total employment also declined from 68,2% to 47,5% between 1983 and 2011 (see the tables before). In fact, between 2004 and 2011 agriculture has lost around 33 million workers. However, while agriculture and related activities have suffered a slow and steady decline in their shares in total employment in India, an absolute fall in agricultural employment was not registered until the 2009-10. To Thomas (2015), there have been some factors that led to the withdrawal of workers, including male workers, from agriculture. First, the marked acceleration in the growth of persons employed in

construction in rural India after 2004-05, a significant part of which occurred in the less developed and chiefly agrarian states such as Uttar Pradesh, Rajasthan, Bihar and Madhya Pradesh. Secondly, the decline in persons employed in agriculture occurred hand in hand with a marked rise in persons attending to educational institutions: the decline in agricultural employment in India between 2004-05 and 2011-12 was almost entirely among persons who were younger than 35 years. In this sense, the decrease in the agriculture employment could be revealing some positive aspects of the Indian economic performance since 2010s.

On the other hand, as can be observe in the table before, since the 2000s, construction has become the major source of incremental employment in India. Persons employed in construction increased by only 5,3 million between 1983 and 1993-94 and by 13,9 million years between 1993-94 and 2004-05, but by 23,9 million during the seven years after 2004-05. Between 2004-05 and 2011-12, the construction sector accounted for almost half, it means 23,9 million out of 48 million, of the incremental non-agricultural employment generated in India and almost all of the new employment opportunities that emerged in the country's rural areas. To Chandrasekhar and Ghosh (2015) the construction boom also was the main driver of the urban employment since 2000s. Then, trade, hotels, transport and communication, much more related to urban jobs, was the second main incremental growth driver of employment, totalizing in 2011 78 million workers.

Chart 34 - Net Increase in the Number of Workers in India, 1993 to 2011-12, in Millions

Time-periods	All-workers	Agricultural workers	Non-agricultural workers
1993 / 2004	83,4	18,2	65,2
2004 / 2011	14,7	-33,3	48

Source: own elaboration based on Thomas (2015).

Chart 35 - Sector-Wise Distribution of india's GDP and Employment

	Shares in GDP (%)		Shares in employment (%)		Employment in millions
	1982-3	2011-2	1983	2011-2	2011-2
Agriculture & allied activities	34,3	14,1	68,2	47,5	224,4
Mining & quarrying	3,1	2,1	0,6	0,5	2,6
Manufacturing	14,3	15,7	10,6	13	61,3
Electricity, gas and water	1,6	1,9	0,3	0,5	2,5
Services & construction	45,9	66,3	19,9	38,5	181,7
Construction	6,9	7,8	2,3	10,6	49,9
Trade, hotels, transport & communication	17,3	27,5	8,8	16,5	77,9
Financing, real estate & business services	8,9	18,1	0,7	2,9	13,5
Community, social & personal services	12,9	12,8	8,1	8,6	40,4
GDP/Total employment	100	100	100	100	472,5

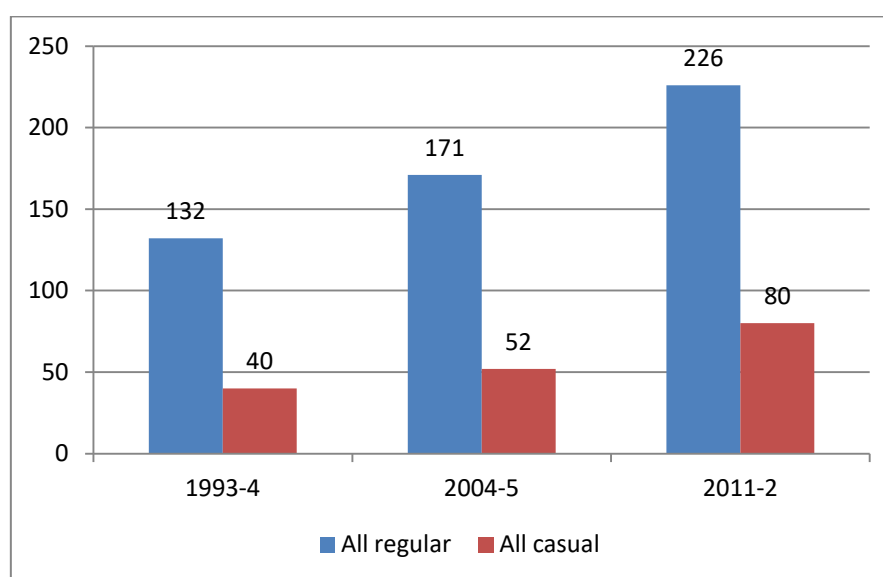
Source: own elaboration based on Thomas (2015).

With respect to real wages, Papola and Kannan (2017) present two series, for regular and for casual workers⁸⁷. Both series show an increase in the real wage: regular workers increased their wage between 1993 and 2011 in around 70% and casual workers doubled their wages. Particularly, fast growth of construction and increasing use of non-standard workers in all sectors has led to increase in the demand for 'footloose' workers, pushing up wages of casual workers. The employment generation

⁸⁷ Regular wage employment is associated with jobs in the formal or, what in India is called the organized sector of the economy, whereas the casual wage employment is largely, if not only, associated with work in the informal or unorganized sector. However, according to Papola and Kannan (2017) since the initiation of economic reforms in the early 1990s, an increasing share of regular workers, even in the formal sector, is faced with informal work conditions. At the same time, the urban labour market is largely composed of regular workers with 74 percent of the total wage workers in 2011-12, whereas the rural labour market is largely composed of casual workers with 81 per cent of the total wage workers. In that sense what happens to the wages of regular workers has a greater consequence for urban labour. Similar what happens to wages of casual workers has a greater consequence for rural labour. Finally, there are several differences in wages between economic sectors and industries, occupation, region, gender, cast and religion. Some of these differences are explored by Papola and Kannan (2017) and Chandrasekhar and Ghosh (2015) but they are out of the scope of this research.

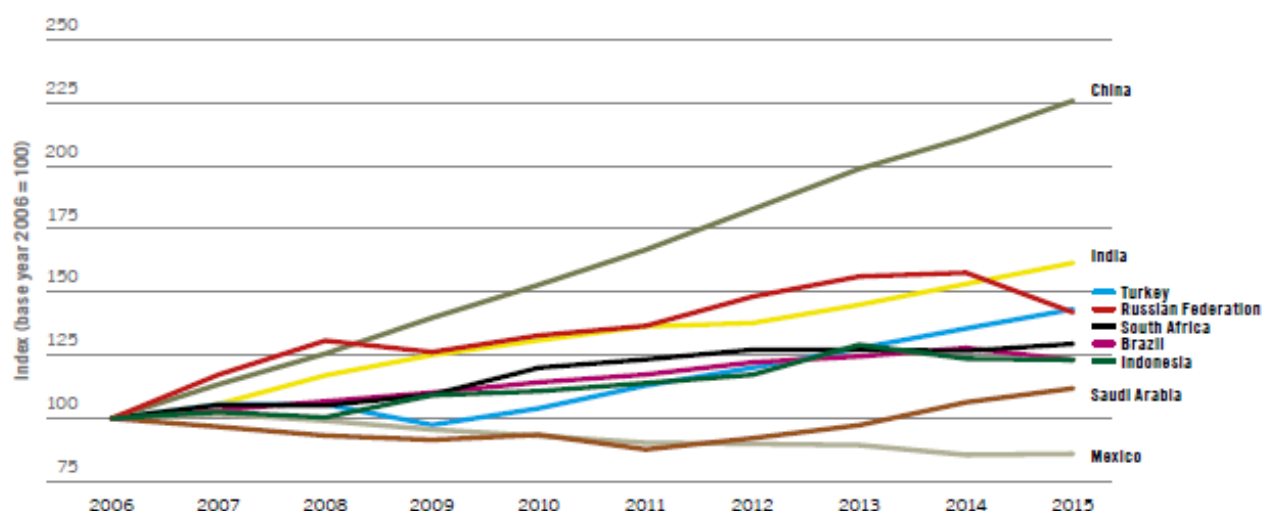
that took place in the organized sector post economic reforms has been largely informal. In fact, according to different surveys quoted in Papola and Kannan (2017), employment expansion in the manufacturing sector during the early 1990s took place mostly through a non-permanent workforce. At the same time, the difference between regular and casual wage was almost maintained, with the proportion of casual to regular wage passing from 30% in 1993 to 35% in 2011.

Graphic 18 - Real wage rate (in Indian rupees). 1993-2011.



Source: own elaboration based on Papola and Kannan (2017).

Papola and Kannan (2017)'s figures are consistent with the ones presented in the Global Wage Report 2016/17 (ILO, 2016). We can observe in the next graph that since 2006 average real wages more than doubled in China, increased by about 60% in India and between 20% and 40% in most other developing countries.

Graphic 19 - Average real wage index for emerging G20 countries, 2006–15.

Note: 2015 figures are preliminary estimates as national estimates are not yet available for all countries.
Source: Global Wage Report 2016/17 of the ILO (2016)

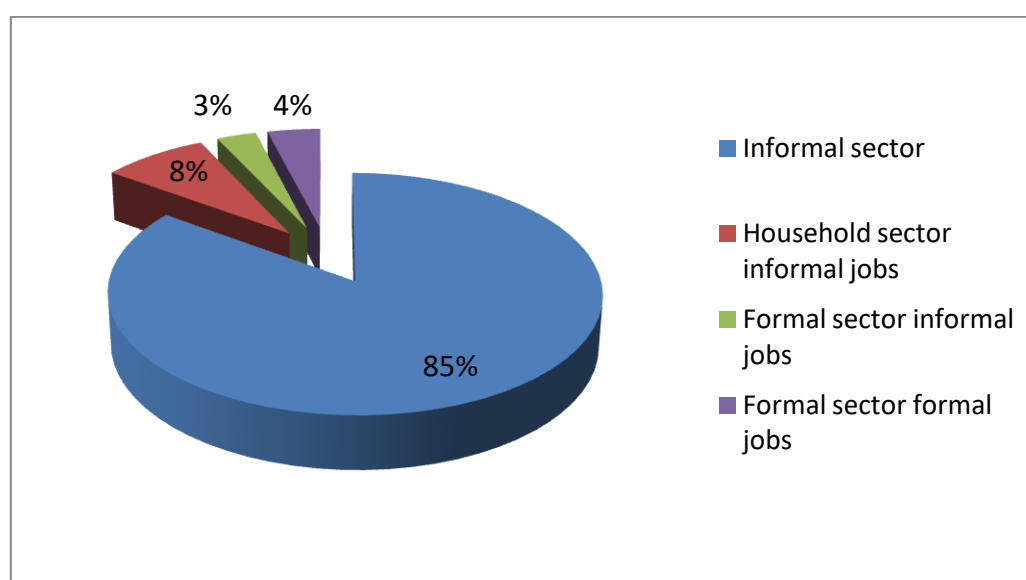
However, according to the works of Abraham and Sasikumar (2017) and Kannan (2014), the wage share of organized sector in gross value added has constantly declined since 1980s. In Abraham and Sasikumar (2017) they present figures showing that wage share was 28,5% in 1980, 21,4% in 1990, 15,5% in 2000 and 11% in 2012. In Kannan (2014), wage share was 32% in 1981, it went to 28,7% in 1993 and it continued decreasing to close to 21% in 2004-05. Chandrasekhar and Ghosh (2015) show figures in the same line, showing a reduction of the share of compensation to employees from around 40% in the 80s to 34% in the 2000s. At the same time, there has been an increase in capital intensity pushed by the changing composition of demand for manufactured products both in the domestic and foreign markets and the trade policies, credit policies and technology acquisition policies which favored capital-intensive goods and projects. Such demands came from the economically well-off classes of the society. Furthermore, to Papola and Kannan (2017), the post-NEP period witnessed a decline in the power of trade unions. In fact, the direct intervention by the state in the labour market particularly in wage fixation, except in government public sector, has been virtually absent and earlier wage fixing institutions where government had a role (like the Wage Boards) have been discontinued.

Wage inequalities are also highlighted by the Global Wage Report 2016/17 (ILO, 2016). In India, the lowest-paid 50 per cent receive 17,1 per cent of all wages paid

out and the top 1 per cent earn about 33 times as much as the bottom 10 per cent. Looking at gender, the proportion of women in the bottom two deciles is similar to that in Europe (about 60 per cent), but drops precipitously thereafter and the upper half of the distribution women represent no more than 10–15 per cent of wage earners. For Papola and Kannan (2017) the wage inequality measured as a gini coefficient presented no changes between 1993 and 2011, no equity improvements in 30 years of high growth economy. Besides, there has been a significant increase in wage inequality between skilled and unskilled workers in India's manufacturing sector.

In 2004, according to Chandrasekhar and Ghosh (2015), informal employment represented almost 85% of the total employment. As shown in the Report on Fifth Annual Employment - Unemployment Survey (2015-16), in 2015, at the all India level, just 20,6% of workers except self employed received paid leave and 21.6% availed social security benefits, with a majority 71,2% of workers were not eligible for social security benefits. Besides, 64,9% of the regular wage workers, 67,8% of the contract workers and 95,3% of the casual workers do not have a written job contract. Only 27 % of the regular wage workers and 11,5% of the contract workers had written job contract of more than three years.

Graphic 20 - Distribution of employment, 2004–05 (%)



Source: own elaboration based on Chandrasekhar and Ghosh (2015).

On the other hand, despite the State has had a minor role in the determination of salary and in the improvement of the minimum wage implementation, the relevance of the State interventions in the labour market and their relationship with the increase in rural wages since the mid 2000s was not minor, as highlighted by Papola and Kannan (2017, p.46):

"in an overwhelming number of categories, growth in wages during the second period (2000s) is seen as faster than during the first period. This is especially so for rural areas, primary sector and socially most disadvantaged groups. This is especially so for casual workers. Here it would be in order to record several national level state interventions in the form of programmes and schemes to improve the livelihood security of the rural poor, if not the inequality between the rich and the poor. These are the National Rural Employment Scheme (NREGS) under the National Rural Employment Guarantee Act (NREGA), the National Rural Health Mission, the Sarva Shiksha Abhayan (SSA) for improving the elementary education and the rural housing schemes of the central government (e.g. Indira Awas Yojana) and schemes by the state governments. All these put together must have helped in raising the consumption level as well as establishing a measure of social security that could have helped in raising the reserve price of labour. In addition, the accelerated growth in the economy increased the demand for labour in the construction sector in urban areas leading to increased migration of labour from the primary sector of the economy. Therefore, the higher growth rate in the wages of rural casual workers could be interpreted as a result of the public intervention and expenditure in rural areas as well as the increased demand for unskilled casual workers leading to a higher reserve price of labour."

Major Employment Generation Schemes functioning in 2016 in India

Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) enacted on 2005, with the aim to enhance livelihood security of the households in rural areas of the country by providing at least 100 days of wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work.

Prime Minister Employment Generation Programme (PMEGP) was launched in August 2008 with the objective to generate employment opportunities in rural as well as urban areas of the country by providing credit linked subsidy for setting up of micro enterprises.

Swaranajayanti Gram Swarozgar Yojna (SGSY) came in to effect on 1999, with the aim at bringing the rural BPL families above poverty line by organizing them in to Self Help Groups (SHGs) through the process of social mobilization and their training and capacity building, provision of credit linked subsidy, technology inputs etc. in order to enable them to be self employed and taking up some income generation activity.

Swarna Jayanti Shahari Rozgar Yojna (SJSRY) for urban areas a holistic scheme implemented in 1997 with the aim to provide gainful employment to the urban unemployed and under employed poor population and to help them set up self employment ventures and also through providing wage employment by utilizing their labour construction of socially and economically useful public assets.

Besides the above listed schemes there may be some other schemes of the Centre/State governments from which the households have got benefitted. They are included under the category of 'Other schemes'.

Source: own elaboration based on Report on Fifth Annual Employment - Unemployment Survey (2015-16).

According to Ghosh (2015) the MGNREGA was a historic legislation based on two interlinked goals: to ensure livelihood security to rural residents by providing at least 100 days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work and to use the programme to mobilise existing surplus labour in the countryside, to unleash productive forces and generate more economic growth in rural areas. She states that total spending on the programme amounted to 0,8% of GDP in 2009, almost 1% GDP of autonomous expenditure oriented to the bottom of the Indian pyramid social structure. From the figures presented in the Report on Fifth Annual Employment - Unemployment Survey (2015-16) about 24% households benefitted from employment generating schemes like MGNREGA, PMEGP, SGSY and SJSRY etc. In particular, three poor North Eastern States, Tripura, Manipur and Mizoram, have more than 70% of the households benefitted from MGNREGA. According to MGNREGA web page, a total of 7,6 million people and 5,12 million households were engaged in the MGNREGA in 2016.

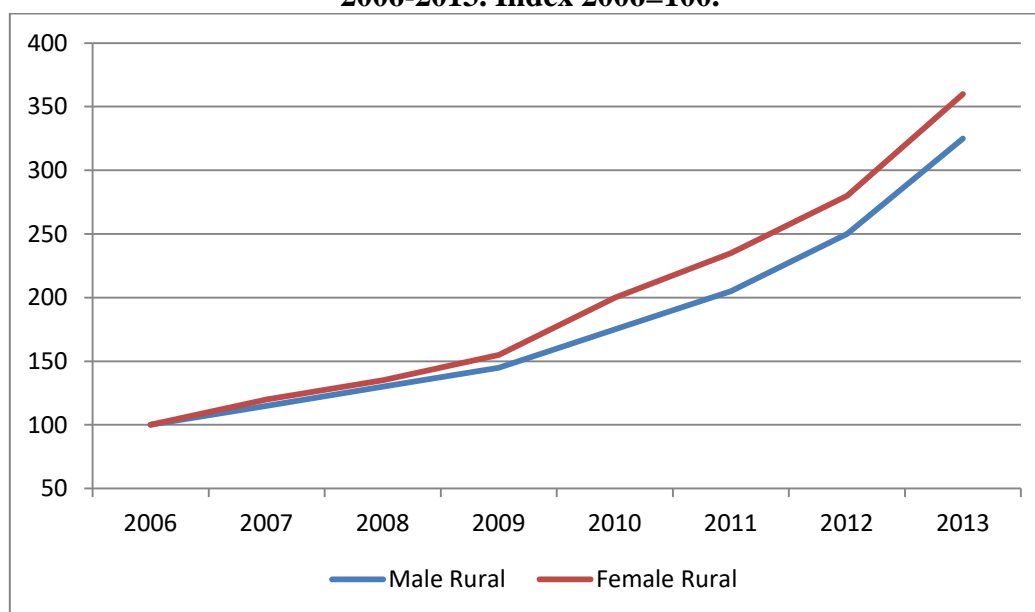
Chart 36 - Estimates of casual workers (by Current Weekly Status) engaged in public works including Mahatma Gandhi NREGA in India, in million people.

Activity Status	Category	2004-5	2009-10	2011-12
Public works other than MGNREGA	Rural Males	0,4	2	2,2
	Rural Females	0,4	1,6	1,2
	All	0,9	4,2	3,8
MGNREGA	Rural Males	0	1,2	1,3
	Rural Females	0	1,2	1,6
	All	0	2,4	2,9
Public works including MGNREGA	All	0,9	6,6	6,7

Source: Thomas (2015)

According to the Indian Labour Market Update (ILO, 2016), daily wage in agriculture has more than tripled since 2006, both in women and men (see the next graph). In this sense, Thomas (2015), in line with Papola and Kannan (2017), Chandrasekhar and Ghosh (2015), Nagaraj (2017a) and Ghosh (2015), highlights that the MGNREGA, the main policy initiative of the first United Progressive Alliance (UPA), produced a substantial impact on rural employment and rural wages. The MGNREGA has stabilized the rural wage floor and provided a better bargaining situation for rural workers. As per the current weekly status, casual workers engaged in public works numbered 0,9 million in 2004-05, but rose to 6,6 million in 2009-10, which included 2,4 million jobs created through MGNREGA. In other words, the highest growth in female and male wages for casual employment in rural areas since 2005 needs to be read in the light of the introduction of the MGNREGS and many other initiatives, such as the National Rural Health Mission, and a national health insurance scheme (Rashtriya Swastha Bhima Yojana).

Graphic 21 - Average daily wage rates of male and female workers in agriculture. 2006-2013. Index 2006=100.



Source: India Labour Market Update (ILO, 2016)

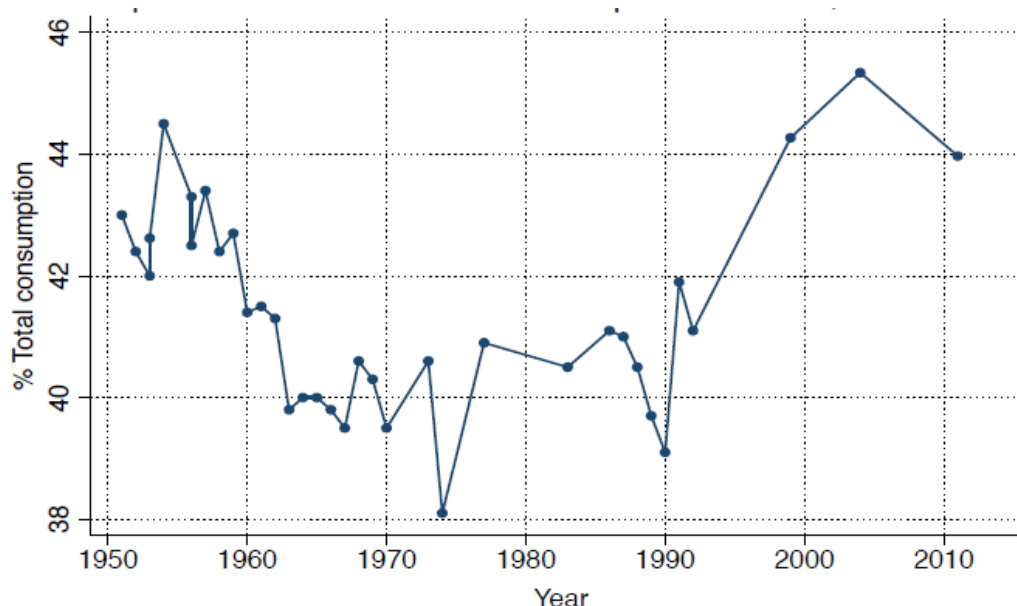
Finally, with respect to household consumption, the general picture described by many authors is one of an increase mainly pushed by the urban upper class/cast/groups linked to the global economy, property and the formal sector (Bhaduri, 2008, 2009; Chandrasekhar and Ghosh, 2015; Nagaraj, 2013b, 2015; Chancel and Piketty, 2017; Patnaik, 2009; Nayyar, 2017; etc.). Bhaduri (2008, p. 12) pointed out that the pattern of household consumption led by a small proportion of rich of upper class/cast groups (although given the 1.3 billion Indian population, in absolute numbers, we are talking of hundreds of millions people!) have created significant markets, from luxury and durable goods to leisure and education:

“With their income rapidly growing, the richer group of Indians demand a set of goods, which lie outside the reach of the rest in the society (think of air-conditioned malls, luxury hotels, restaurants and apartments, private cars, world class cities where poor would be made invisibles). The markets for these goods expand rapidly...”

Chandrasekhar and Ghosh (2015) point out that the national Gini coefficient for consumption increased from 0,31 in 1993 to 0,36 in 2009 and the ratio of urban to rural consumption went up from 1,62 to 1,96. To Chandrasekhar (2011) much of the Indian growth in income belongs to urban residents, with the urban share of national income

having risen from 46% in 1990 to close to 60% in the 2000s. In fact, the largest increases in consumption expenditure seems to be concentrated in the top decile of the urban population: between 1993–94 and 2009–10 with the income of the top urban decile going from 7,1 to 10,3 times that of the bottom urban decile and from 10,5 to 14.3 times that of the bottom rural decile (ILO, 2016). In this sense, according to Chancel and Piketty (2017), as can be seen in the next graph, the participation of top 20% decile in total consumption has increased around 5 percentage points, going from around 39% in 1990 to 44% in 2011.

Graphic 22 - Top 20% share in total consumption in India, 1951-2011



Source: Chancel and Piketty (2017)

However, as we have seen, mainly since 2000s, credit have been a main consumption driver. Next, we complement the previous information with the evolution of credit outstanding and number of accounts by population groups presented by RBI. We can observe that between 1990 and 2016 the number of accounts have multiplied by 10 in the metropolitan areas, going from 32 to 322 million, the urban accounts have more than quadrupled, from 68 to 280 millions, semi-urban accounts have almost tripled and rural account doubled. The amount of credit is not deflated, so it is not a precise indicator. However, only in order to give a general idea of the trend and significance of the increase, we could say that metropolitan credit expanded in current terms by 11.631%, going from 388 billion rupees to 45.540 billion, urban credit raised

5.681%, going from 224 billion to 12.966 billion and semi-urban and urban credit expanded 5.221% and 2.789% respectively. These figures confirm the relevance of credit for household consumption expansion, particularly in metropolitan and urban areas.

Chart 37 - Credit of scheduled commercial banks. According to population groups.

Rupees billion and Million for accounts

Year	Rural		Semi-urban		Urban		Metropolitan	
	No. of Accounts	Amount Outstanding	No. of Accounts	Amount Outstanding	No. of Accounts	Amount Outstanding	No. of Accounts	Amount Outstanding
2016	573	7.358	448	9.363	280	12.966	322	45.540
2015	528	6.554	395	7.966	238	11.791	282	42.474
2014	483	5.667	391	7.178	254	10.615	259	39.361
2013	457	5.240	346	6.757	209	9.878	270	33.379
2012	417	4.422	313	5.283	177	8.549	401	29.779
2011	400	3.924	288	4.520	169	7.795	350	24.517
2010	371	3.851	270	3.679	162	5.936	383	19.985
2005	294	1.605	182	1.428	102	2.123	194	6.369
2000	251	594	149	648	78	796	66	2.563
1995	294	335	169	318	75	373	43	1.083
1990	284	255	155	176	68	224	32	388
2016 vs. 1990	102%	2789%	190%	5221%	314%	5681%	901%	11631%

Source: own elaboration based on RBI.

Since 1990s, as we will see in the next section, India has been experience a significant process of electrification. Related this process, the per capita consumption of electricity shows a slightly but constant increase since 2006 with kerosene, mainly used in rural areas, constantly reducing its participation.

Chart 38 - Per capita annual consumption of electricity and petroleum products. 2006-2015

Year	Electricity (in Kwh)	Petroleum products (in kgs)			
		LPG	Motor Spirit	HSDO	Kerosene
2006	401,9	9,6	8,2	37,8	8,4
2007	437,3	10,6	9,0	41,5	8,2
2008	477,2	10,6	9,7	44,5	8,0
2009	521,4	11,2	10,9	47,9	7,9

2010	587,5	12,1	12,0	50,8	7,6
2011	643,6	12,6	12,3	53,1	6,7
2012	667,5	12,6	12,7	55,9	6,1
2013	698,8	13,0	13,7	54,6	5,7
2014	748,6	14,2	15,0	54,8	5,6
2015	781,0	15,3	17,0	58,2	5,3

Source: own elaboration based on the Socio-economic Statistics (MOSPI, 2017).

Furthermore, it is interesting to observe the evolution of new vehicles population presented by the Ministry of Surface Transport (MOSPI, 2017). We can see that between 2012 and 2001, it means around a decada, the total amount of registered vehicles in India almost tripled, with cars, taxis and two-wheelers registering the highest increases with 232%, 217% and 199% respectively. Thus, total amount of registered vehicles went from 54.991.026 in 2001 to 159.490.578 in 2012.

Graphic 23 - Number of motor vehicles registered in India. 2001-2012.

Year	Two-wheelers	Light Motor Vehicles (Passengers)	Cars	Taxis	Buses	Others (*)	Total
2001	38.556.026	1.777.130	5.297.219	634.357	633.900	8.092.394	54.991.026
2002	41.581.058	1.878.261	5.748.036	688.204	635.006	8.393.772	58.924.337
2003	47.519.489	2.113.781	6.594.166	825.416	720.696	9.233.736	67.007.284
2004	51.921.973	2.167.324	7.267.174	901.889	767.593	9.691.982	72.717.935
2005	58.799.702	2.337.264	8.072.650	939.738	678.521	10.673.844	81.501.719
2006	64.743.126	2.492.726	9.109.855	1.039.845	762.341	11.470.374	89.618.267
2007	69.128.762	2.697.449	10.146.468	1.042.347	1.098.422	12.593.812	96.707.260
2008	75.336.026	2.903.821	11.200.142	1.201.862	1.156.568	13.554.435	105.353.854
2009	82.402.105	3.146.619	12.365.806	1.307.805	1.205.793	14.522.905	114.951.033
2010	91.597.791	3.615.086	13.749.406	3.615.086	176.642	15.745.230	127.745.972
2011	101.864.582	4.016.888	15.467.473	1.789.417	1.238.245	17.084.189	141.865.607
2012	115.419.175	4.242.968	17.569.546	2.011.022	1.296.764	18.511.821	159.490.578
2012 vs 2001	199%	139%	232%	217%	105%	129%	190%

Source: own elaboration based on Transport Research Wing, Ministry of Surface Transport (MOSPI, 2017). (*) Includes jeeps, multi axled, articulated vehicles, trucks and lorries of light motor vehicles, omni buses, tractors, trailers, etc..

To sum up, in general terms, we tried to show these main features: **a)** self employment still represents around a half of the Indian workforce, around 85% of the jobs are informal ones and there are still fragrant conditions for different segments of the Indian labour market, **b)** although in a much lower rythm that the GDP growth, wages have grown since 1990s, particularly since 2000s, **c)** in line with the GDP composition change, agriculture has expulsed workers (since the second half of the 2000s), construction and trade, hotels, transport and communication turned to be the most dynamic sectors in terms of employment, and manufacture show an stagnant behavior, **d)** the MGNREGA has clearly contributed to increase the rural wages since the second half of 2000s, **e)** led by the upper class/casts/groups related to urban areas, global economy and property there has been an increased in the aggregate household consumption, mainly since 2000s, with credit playing a relevant role, particularly in urban areas.

4.4.2. Urban/rural growth drivers: real estate and construction boom⁸⁸.

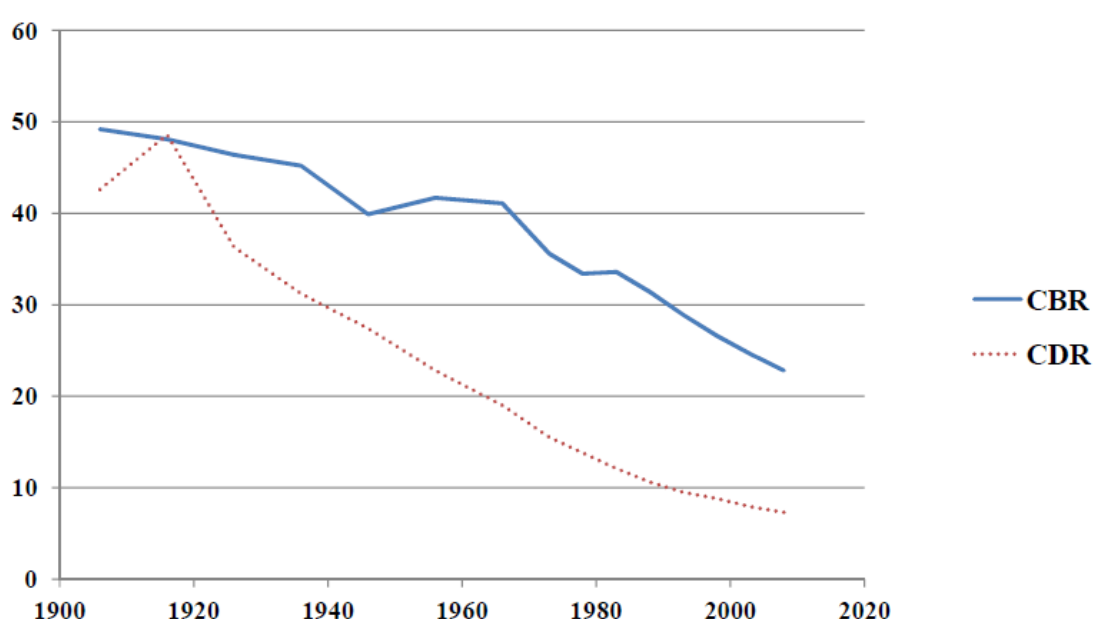
Construction and real estate have significantly boosted the Indian GDP, GDCF and employment growth. In the next paragraphs, we will deepen in the main drivers of the expansion of both sectors. We have already shown the evolution in wages, household consumption, and credit as main factors in order to "generate" effective demand, clearly influencing on the construction boom in India. Complementing the previous information, here we will emphasize on some more structural and interrelated drivers: 1) the demographic transition, the urbanization process and the real estate boom, 2) the rural construction boom, and 3) the housing finance industry and the public housing and urban development programs.

Demographic transition, urbanization and real estate. India is experiencing a demographic transition, which has been pushing urbanization, consequently stimulating real estate, construction and housing program in urban areas. As detailed in Dyson (2008), the Indian demographic transition started around 1960s, going from a former

⁸⁸ I would like to thank Sergio Paez for the collaboration on processing some data for this section and for the relevant discussions.

state in which both the Crude Death Rate (CDR) and the Crude Birth Rate (CBR) were high to another state in which both the death rate and the birth rate would be low⁸⁹. However, as this transition has different rhythms, this resulted in a significant increase in the Indian population. India's CDR during 1991-2001 was around 9%, but it still will take several decades to the CBR to reach the same level as the CDR⁹⁰. As a result of the gap between CBR and CDR, according census data, India has almost quadrupled its population between 1951 and 2011, going from 361 million to 1.210 million⁹¹.

Graphic 24 - Crude Birth Rate (CBR) and Crude Death Rate (CDR). 1900-2020



Source: Kulkarni (2014).

⁸⁹ It is relevant to point out the influence of the public efforts on the mortality decreasing during the 1960s and 1970s. In particular, still insufficient but significant, the vaccines campaigns during Nehru's period and the not except from critics experience of family planning with Indira Gandhi.

⁹⁰ These two differential rhythms between CBR and CDR have several correlations with fertility, mortality, life expectancy and age structure trends which can be explored deeper in Kulkarni (2014). For instance, according to Chandrasekhar (2011), in 2020, the average Indian will be only 29 years old, compared with an average age of 37 in China and the United States, 45 in Western Europe, and 48 in Japan. This feature and the associated low dependency ratio provides the potential for a sharp rise in housing investment financed with credit.

⁹¹ As detailed by Kulkarni (2014), though uncontrolled population growth is no longer an issue for India as a whole, population will be much higher than the present level and India will overtake China and will become the most populated country before 2030. Besides, some regions lagging in demographic transition, mainly the north-central states, would double their populations during the next fifty years creating huge regional growth imbalances with varied socio-political consequences.

This demographic transition played a key role in the urbanization process. The sustained mortality decline in urban areas is the main cause of the process of urbanization⁹². Among other things, urban areas offer economies of scale in terms of providing both health and family planning amenities. Modern forms of water supply, sewage, and access to education are usually better in the urban sector. In this sense, Dyson (2008, p.5) says:

“The huge and sustained fall in mortality that occurred during the second half of the twentieth century further transformed the situation with regards to urban growth and urbanization. India's urban sector has benefited much more from mortality decline than the rural sector. Thus SRS estimates suggest that by 1970-75 life expectation in urban India was a massive 10.9 years higher than in the rural areas; and even by 1992-96, the gap was still put as high as 6.9 years (Registrar General, India 1999:16). To reiterate, today the gap probably still amounts to several years.”

According to Census data, urban population ratio has increased a little bit more than 10 percentage points between 1971 and 2011, going from 19,7% to 31,2%. In terms of people, the urban population more than tripled between 1971 and 2011, going from 108 to 377 million. For the first time since independence, the increase in urban population of 91 million between 2001 and 2011 is larger than the increase in the rural population of 90.5 million. Besides, the annual growth rate of urban population was 2.76% during 2001-2011, which is slightly above that experienced during 1991-2001. All in all, India is still a mostly rural country, with more than 800 million people living in rural areas in 2011. In this sense, the Indian urbanization process is clearly much slower than China's.

⁹² Internal migrations produced both by push and pull factors, could have also contributed, as a second force, to the relatively slow but constant Indian urbanization process.

Chart 39 - Total, Rural and Urban Population (in million). Urban %. 1951-2011

Census Year	Total Population	Rural	Urban	Urban Ratio
1951	361	299	62	17,3%
1961	439	360	79	18,0%
1971	547	438	108	19,7%
1981	665	507	157	23,6%
1991	836	621	215	25,7%
2001	1.028	742	286	27,8%
2011	1.210	833	377	31,2%

Source: own elaboration based on Census data.

In international terms, as can be seen next, India's urbanization is still below the world's average. In 2015, according to MOSPI data, India's urbanization rate was 32,7% and the world's average was 54%. In fact, India's urbanization rate is still lower than the African (40%) average, mainly pushed by Nigeria and Congo, and Asian (48%) one, mainly pushed by China, Pakistan, and Indonesia. However, in absolute terms, India's concentrated more than 10% of the world's urban population. The average annual growth rate of urban population between 2000 and 2015 was 3% in India, only surpassed by the Asian (3,4%) and African (4,6%) average. Furthermore, between the 15 largest urban agglomerations ranked by population size in 2010, India had three cities: Delhi, with 22 million, Mumbai, with 19,4 million, and Kolkata, with 14,2 million⁹³.

⁹³ At the same time, in relation to the Indian States, there are marked internal heterogeneities. For instance, according to MOSPI data, in 2001, Delhi presented an urbanization ratio of 97,5% and Chandigarh 97,25% but Meghalaya, Uttar Pradesh, and Rajasthan registered ratios of only 20%, 22%, and 25% respectively.

Chart 40 - Urbanization evolution by Continents. 2000-2015

	India	Asia	Africa	Europe	Latin American and Caribbean	North America	Oceania	World
Annual urban population								
2000	288	1.393	279	517	396	250	22	2.856
2005	330	1.622	331	526	433	264	24	3.199
2010	373	1.865	395	538	468	280	26	3.571
2015	420	2.113	472	547	503	295	28	3.957
Percentage of population living in urban areas								
2000	27,7	37,5	34,5	70,9	75,3	79,1	70,5	46,6
2005	29,2	41,1	36,3	71,7	76,9	80,0	70,5	49,1
2010	30,9	44,8	38,3	72,7	78,4	80,8	70,7	51,6
2015	32,7	48,2	40,4	73,6	79,8	81,6	70,8	54,0
Average annual rate of change of urban population								
2000-2015	3,0	3,4	4,6	0,4	1,8	1,2	1,8	2,6

Source: own elaboration based on MOSPI data.

After showing the Indian demographic transition and its relationship with the advances in the urbanization process, we will point out some indicators of the urban housing situation and the real estate boom. According to the latest IBEF (2017) report, there are different real estate segments in India: 1) residential spaces, contributing with more than 70% of the real estate expansion, 2) commercial spaces, principally offices, 3) retail spaces, 4) hospitality spaces, mainly hotels and 5) Special Economic Zones (SEZs), particularly related to IT sector.

With respect to residential spaces, according to MOSPI (2017) the total number of housing units in 2001 was 193 millions of which 137.7 million were in rural areas and 55.8 million in urban areas. In 2011, the total number of occupied housing units has increased to 246.7 million out of which 167.9 million were in rural areas and 78.9 million were in urban areas. The proportion of rural and urban households has evolved in the same line that the urbanization process: in 1951, around 20% of the households were urban but in 2011 this proportion went to 32%⁹⁴. In parallel, it is also important to point out that the deficit in houses for the whole India has increased between 2001 and 2011, going to 10.7 million, mainly in rural areas. This fact put pressure on the housing demands, given space to both public programs of housing, as we will see, and credit-oriented programs.

⁹⁴ At the same time, the total deficit in houses have constantly increased since 1981, reaching 10,7 million in 2011. This fact has led to an increase in the slum population and deterioration in some urban housing indicators, as we will see in a next section.

Chart 41 - Number of Households occupied residential houses and deficit in houses. Urban, rural and total. In millions. 1951-2011

Census year	Rural			Urban			Total		
	No. of Households	No. of occupied residential houses	Deficit in houses	No. of Households	No. of occupied residential houses	Deficit in houses	No. of Households	No. of occupied residential houses	Deficit in houses
1951	53,6	54,1	-0,5	12,3	10,3	2,0	65,9	64,4	1,5
1961	68,9	65,1	3,8	15,6	13,8	1,8	84,5	78,9	5,6
1971	79,6	72,7	6,9	20,9	18,0	2,8	100,4	90,8	9,7
1981	90,9	86,1	4,8	28,9	27,6	1,3	119,8	113,7	6,1
1991	111,6	107,9	3,7	40,4	39,1	1,3	152,0	147,0	5,0
2001	137,7	135,1	2,6	55,8	52,1	3,7	193,6	187,1	6,5
2011	167,9	159,9	7,9	78,9	76,1	2,7	246,7	236,1	10,7

Source: own elaboration based on MOSPI data.

With respect to the average number of persons per house, we observe a reduction both in rural and urban areas, going from 5.5 persons per house for total India in 1981 to 3.7 in 2011. In 2001, the urban average of persons per house was slightly lower than rural, with 3.4% and 3.8%, respectively. Clearly, these figures indicate that the increase in the total amount of houses, both rural and urban, are reducing the number of persons per house.

Chart 42 - Average number of persons per house. Rural, urban and total. 1991-2001

Average number of persons per house				
	1981	1991	2001	2011
Total	5,5	5,3	5,1	3,7
Urban	5,3	5,0	4,9	3,4
Rural	5,5	5,4	5,1	3,8

Source: own elaboration based on MOSPI data.

The type of building also has evolved: the proportion of pucca⁹⁵ houses in urban areas have increased from 57% to 93% between 1986 and 2012. This means that there

⁹⁵ A pucca construction is one that includes varying combinations of the following materials: cement; concrete; oven-burnt bricks and/or hollow cement/ash bricks; stone and/or stone blocks; jack boards (cement plastered reeds); iron, zinc, or other metal sheets; timber; tiles; slate; corrugated iron; asbestos cement sheet; veneer; plywood; artificial wood of synthetic material; and polyvinyl chloride (PVC)

have been improvements in the type of construction and materials used for housing. This trend reflects both the increase in the urban income and the improvements in the construction sector practices in India.

Chart 43 - Distribution of census households by type of household structure. Urban. 1986-2012. %.

Type of structure	1986	1991	1994	2000	2001	2002	2003	2004	2006	2009	2012
Pucca	57,2	66,8	70,4	75,2	77,2	81,8	81,7	85,5	86,0	92,0	93,6
Semi pucca	25,7	22,8	20,0	17,4	16,0	13,7	13,4	10,2	10,0	6,2	5,0
Kutchha	17,0	10,2	9,5	7,4	6,8	4,4	4,8	3,5	4,0	2,1	1,4

Source: own elaboration based on MOSPI data.

Concerning real estate prices, according to IBEF (2017) Mumbai and Bengaluru have been rated as the top real investment destinations in Asia. In particular, following data from the NHB RESIDEX⁹⁶, there has been a general trend of increasing prices in the Indian real estate sector, with some marked increases in cities such as Chennai, Pune, and Mumbai, with increases of 311%, 185%, and 175% respectively between 2007 and 2017. Bengaluru and Delhi, although experiencing increases of 39% and 118%, as departed from higher prices, do not figure as the sharpest increases. At the same time, a significant increase in real estate activity was registered in cities like Indore, Raipur, Ahmedabad, Jaipur and other 2-tier cities, opening new avenues of growth for the sector.

Chart 44 - NHB RESIDEX evolution in selected Indian cities. 2007-2017

Cities	2007	2012	2013	2014	2015	2016	2017	2017 vs. 2007
Bengaluru	100	106	109	107	115	125	139	39%
Chennai	100	314	310	349	364	373	411	311%

material. A kutchha house is made up of wood, mud, straw and dry leaves. A hut is a kutchha house. A semi-pucca house is one in which at least one basic component, either roof or walls, is made with pucca materials.

⁹⁶ NHB RESIDEX is India's first official housing price index. It was an initiative of the National Housing Bank (NHB) undertaken at the behest of the Ministry of Finance, Government of India. The index was formulated under the guidance of a Technical Advisory Committee (TAC) comprising of stakeholders from the housing market. It was launched in July, 2007 and since then the coverage of NHB RESIDEX was expanded gradually to 26 cities. See the website for more information: <https://residex.nhbonline.org.in/>.

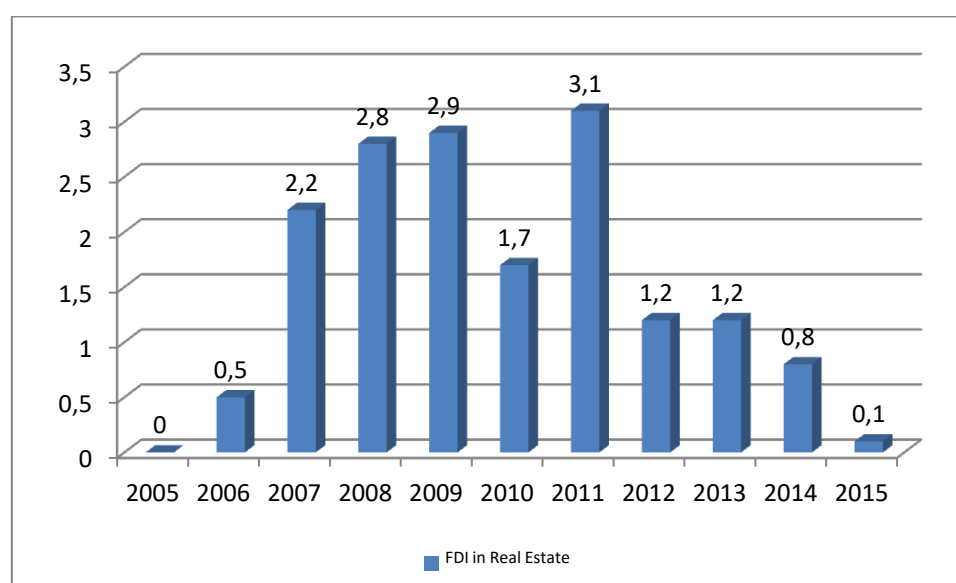
Delhi	100	195	202	199	190	188	218	118%
Kolkata	100	209	197	206	212	220	243	143%
Mumbai	100	217	222	229	238	262	275	175%
Pune	100	205	221	232	251	267	285	185%

Source: own elaboration based on NHB RESIDEX.

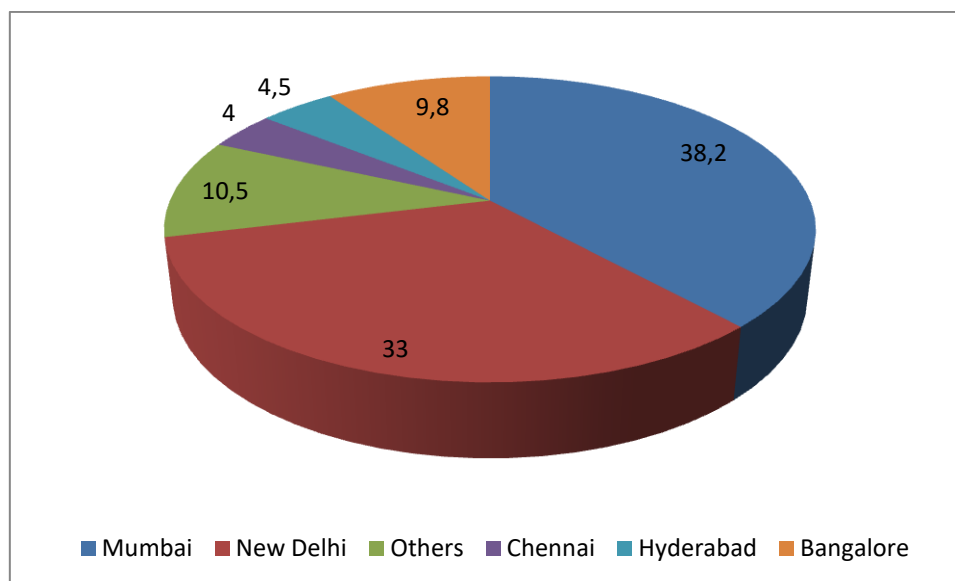
There is a significant segment of the real estate sector, particularly commercial spaces, and the SEZs, which are closely connected with the Indian insertion in the global economy, particularly with the FDI. According to IBEF (2017) real estate is the 4th largest sector in terms of FDI inflows, concentrating around US\$ 25 billion from April 2000 to June 2017 and with a projected growth to US\$ 25 billion by 2022. According to the figures on FDI of the Department of Industrial Policy and Promotion, FDI inflows to real estate reached a peak in 2011, with 3,1 billion US\$ dollars, but it also registered significant inflows in 2009, 2008 and 2007. After 2011, the FDI oriented to real estate has decreased significantly; further research on this trend should be conducted.

With respect to the preferred locations, FDI in real estate went to Mumbai, Delhi, and Bangalore, with around 38%, 33%, and 10% respectively between 2000 and 2010. Clearly, these cities are mainly associated with the ICT sector, which has been a main link with the global economy.

Graphic 25 - FDI in real estate sector. Billion US\$. 2005-2015



Source: own elaboration based on the Department of Industrial Policy and Promotion.

Graphic 26 - FDI inflows by main cities and states related. 2000-2010

Source: own elaboration based on Shaban & Sattar (2016).

The Indian government has implemented several policies in order to stimulate the FDI, particularly in the Special Economic Zone (SEZs) such as 100% FDI permitted for developing townships within SEZs with residential areas, markets, playgrounds, recreation centres, etc. Furthermore, with respect to the retail and hospitality spaces, they are still nascent segments of the real estate market. However, in the case of retail, the increase in the urban upper caste/class consumption is pushing foreign brands to open their branches in India. India's population below 30 years of age targeted by global retail brands is expected to drive demand for organised retail. By now, around 215 malls are operational in India and 26 new malls are expected to become operational in 2017. Concerning hospitality places, Delhi and Mumbai are by far the biggest hospitality markets in India, followed by Bengaluru, Hyderabad, and Chennai. Besides hotels, the hospitality market comprises serviced apartments and convention centres. A mix of a robust domestic tourism industry, the increasingly global nature of Indian businesses and fiscal incentives to hotels are boosting this segment.

Rural construction boom. Although most of the literature, research, and private consultancy reports are focused in the Indian urban transformation, Mahajan & Nagaraj (2017) and Thomas (2015) have pointed out the marked increase in the rural construction employment dynamic. As we have seen, construction share in the total workforce more than doubled between 1999 and 2011. In particular, with respect to

rural construction, Mahajan & Nagaraj (2017) highlight that: a) between 1999 and 2011 there has been a rising share of public works employment, from 6% in 1999 to 34% in 2011, as a proportion of total workforce in construction, mainly related to the MGNREGS rural employment program, b) in 2009, around 80% of total private sector construction workers in rural areas are engaged in residential construction, not in commercial sites, c) there has been a sharp rise in conversion of kutcha houses into pucca houses. With respect to this last point, we can observe next an impressive reconversion from kutcha houses to pucca houses in rural India, with pucca houses share going from 17,2% in 1986 to 65,8% in 2012.

**Chart 45 - Distribution of census households by type of household structure.
Rural. 1986-2012. %.**

Type of structure	1986	1991	1994	2000	2001	2002	2003	2004	2006	2009	2012
Pucca	17,2	26,5	29,6	38,4	40,5	45,7	43,9	48,2	50,0	55,0	65,8
Semi pucca	33,1	34,6	37,9	31,6	32,9	32,7	34,9	32,8	31,0	28,0	24,6
Kutcha	49,6	38,9	32,4	30,0	26,6	21,5	21,1	17,2	19,0	17,0	9,6

Source: own elaboration based on MOSPI data.

In this sense, Mahajan & Nagaraj (2017, p. 62) say:

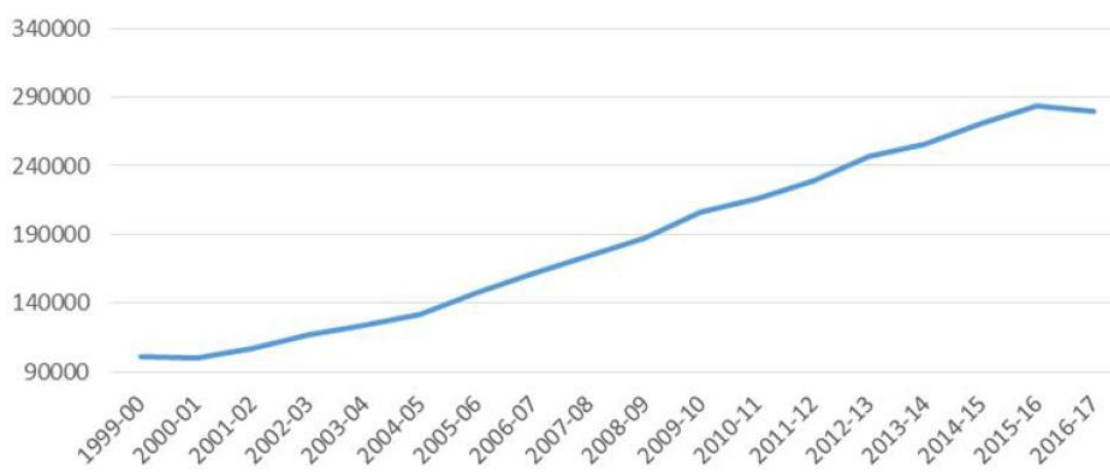
“If the foregoing reasoning is correct and evidence credible, then the argument that construction employment boom as mostly an urban phenomenon does not hold. In reality—invisible to urban eyes—the boom seems to consist of widespread minor (incremental) construction by farm households, such as converting mud walls to brick and cement walls, and thatched roofs replaced by concrete roofs, and cement lining of irrigation channels, etc. These minor investments by rural households are now possible with the easing of supply constraints of cement and steel, with better market integration.”

In fact, the rural construction boom is not so related to the urbanization process but to the increase in rural income and the diminishing price of the construction inputs such as cement. We have already shown the increase in the rural wage, particularly after the implementation of the MGNREGS⁹⁷. From the “supply” side, as can be seen next, between 1999 and 2016, cement production in India has almost quadrupled, going from

⁹⁷ The increase in credit has also played a role. Besides, although without evidence to assure it for the whole rural India, we understand that the NRI remittances have also stimulated rural construction. For instance, in Kerala, this way of financing construction through remittances is quite significant.

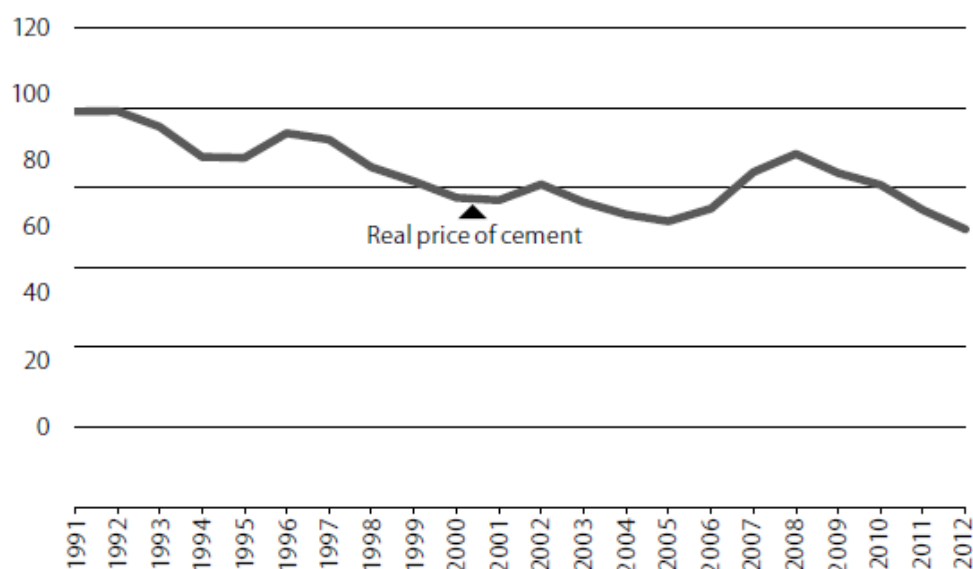
around 90 million tones to almost 290 million in 2015. The quantity of cement production grew annually faster than the manufacturing sector growth rate of 6%. Cement real price has decreased by around 40% between 1991 and 2012. The increase in the demand and the improvement in the production techniques seem to be the main causes behind the decrease in the cement prices.

Graphic 27 - Cement production in India. Thousand tones. 1999-2016



Source: Chandrasekhar and Gosh (2017)

Graphic 28 - Real price of cement. 1991-2012



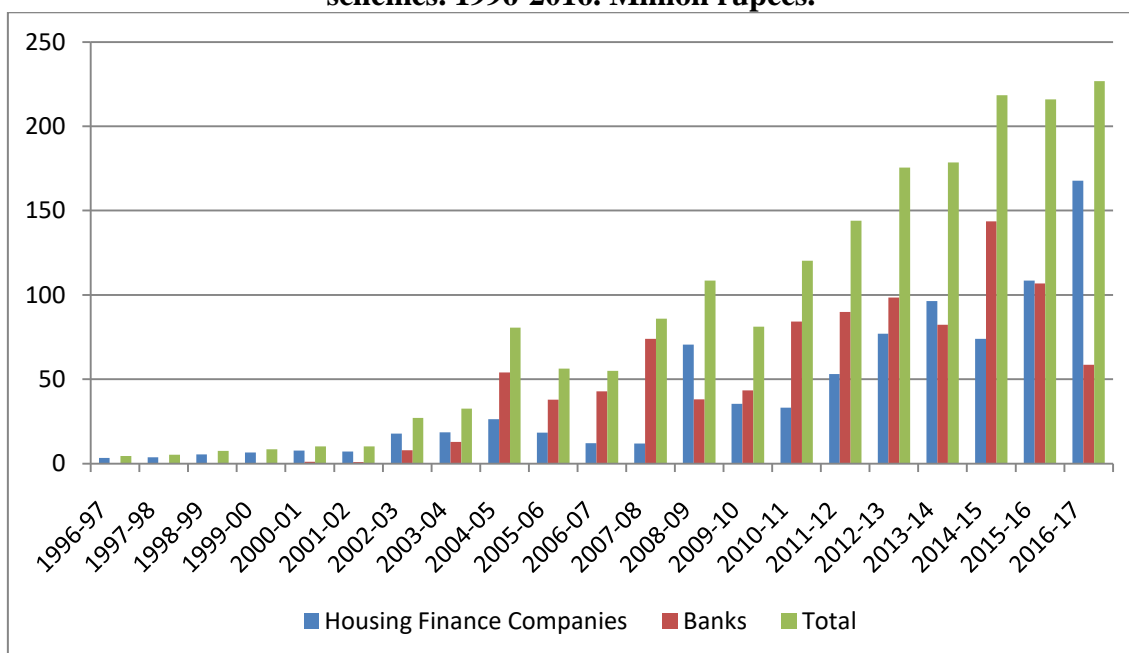
Source: Mahajan & Nagaraj (2017)

Housing finance industry and public housing and urban development programs. A third main element that has been pushing the real estate and construction

boom was the development of a housing finance industry and the implementation of several public-led housing and urban development programs both at rural and urban India. According to Chandrasekhar (2011), in historical terms, the creation of the National Housing Bank (NHB) in 1988 was an attempt to make housing finance companies significant financial intermediaries, helping create new housing finance companies and regulating them. Many new HFCs were set up, including several sponsored by banks and financial institutions and some with equity support from the NHB. According to the Committee on Financial Sector Assessment (CFSA), in 2008 the number of HFCs was around 43 with 12 of them accounting for 90% of the business. In the NEP's years, the emphasis shifted to incentivize banks to enter into housing finance business.

In 2002, the Reserve Bank of India following the Basel Capital Accord of 1988 and the New Capital Adequacy Framework, decided to liberalize the prudential requirement on risk weight for housing finance by banks and encourage investments by banks in MBS (mortgage-backed securities) of HFCs. The RBI allowed banks extending housing loans to individuals against mortgage of residential housing properties. As we can see next, although the figures are not deflated, since 2002, banks share in the National Banking House scheme has been constantly increasing, with an impasse in the 2007-8 crises. at the same time, housing finance companies, backed by the National Banking House, still has a relevant participation. In 2016, of 236 million rupees on disbursements, housing finance companies contributed with 167 million and banks with 59 million.

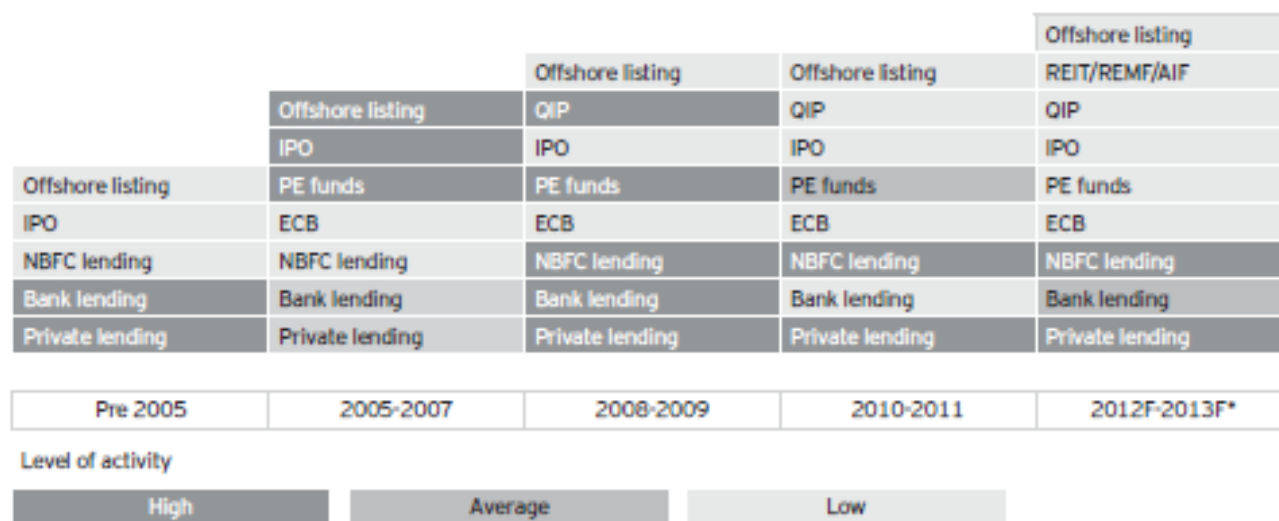
Graphic 29 -Disbursements by National Banking House under its refinance schemes. 1996-2016. Million rupees.



Source: own elaboration based on RBI.

In 2005, FDI was allowed in the real estate sector, pushing another transformation of instruments and funds developed for the Indian market. According to FICCI-EY Indian Real Estate Report 2013 (EY, 2013), as can be seen in the next chart, in addition to the traditional sources of funding, the Indian housing finance industry began to receive global real estate funds, private equity funds, hedge funds, etc. Private equity funds peaked in 2007 and following the financial crisis of 2007-2008, funding has been more at a project level than at an entity level. Funds have been actively looking at residential projects due to their self-liquidating nature and commercial leased assets that provide attractive rental yields along with capital appreciation.

Chart 46 - Major channels of financing real estate development in India. Pre-2005-2013



Source: FICCI-EY Indian Real Estate Report 2013 (EY, 2013)

Furthermore, as in the case of the electrification, the rural employment, and other initiatives, several massive public-financed urbanization national missions and programs were launched since the mid-2000s. The main one was launched in December 2005, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), with several subsequent spin-off programs related to urban development and housing. With an investment of Rs 50,000 crore (around 7 billion US\$ dollars) in a mission period of seven years beginning 2005-06, the JNNURM has been the single largest initiative of the Government of India for planned urban development. The mission had two components: basic services for urban poor and integrated housing and slum development program which aimed at integrated development of slums through projects for providing shelter, basic services and other related civic amenities⁹⁸.

During the JNNURM, the funds of the Centre have been channeled through state-level agencies. The share of grant funding by the central government went from 35% in the largest cities to up to 90% in cities in the Northeast. Most cities received grants covering 50% or 80% of costs depending on size. States levels had significant

⁹⁸ The mission was further divided into four submissions— Urban Infrastructure and Governance (UIG), Basic Services to the Urban Poor (BSUP), Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT), and Integrated Housing and Slum Development Programmes (IHSDP).

autonomy to decide about the funds' execution. The projects covered by JNNURM funded road network, storm water drains, bus rapid transit system, water supply, solid waste management, sewage treatment, river and lake improvement, slum improvement and rehabilitation, housing building, etc. Around 60 cities participated in the program.

After the end of the period of the JNNURM, in June 2015, it was launched the “*Pradhan Mantri Awas Yojna (PMAY) – Housing for All*” to promote affordable housing for the weaker section through credit-linked subsidies and by providing affordable housing through public and private stakeholder collaborations. Under the Housing for All scheme, 60 million houses are to be built which include 40 million in rural areas and 20 million in the urban area by 2022. In the urban areas, it has been proposed to build 20 million houses for urban poor including Economically Weaker Sections and Low Income Groups in urban areas by the year 2022 through a financial assistance of ₹2 trillion (US\$32 billion) from central government. The Mission has four components: (i) in-situ slum redevelopment with private sector participation using land as resource, (ii) affordable housing through credit linked subsidy, (iii) affordable housing in partnership with private and public sector (in the form of PPPs) and (iv) beneficiary led house construction/enhancement. The houses given under this scheme are owned by females or jointly with males.

A Technology Sub-mission was set up to facilitate the adoption of modern, innovative and green technologies and building material for faster and quality construction of houses under the PMAY Mission. The Technology Sub-Mission will mainly work on the following aspects: i) Design & Planning ii) Innovative technologies & materials iii) Green buildings using natural resources and iv) Earthquake and other disaster resistant technologies and designs.

Main National Missions connected to urban development

In addition to the Housing for All program, several State-led missions were launched in 2014 and 2015 related to urban development. Next, there are some of the main ones we a brief characterization:

Atal Mission for Rejuvenation and Urban Transformation (AMRUT): the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was launched in June 2015 for development of basic infrastructure in 500 cities. The objective was to (i)

ensure that every household has access to a tap with assured supply of water and a sewerage connection; (ii) increase the amenity value of cities by developing greenery and well maintained open spaces; and (iii) reduce pollution by switching to public transport or constructing facilities for non-motorized transport. The total outlay for AMRUT was Rs. 50,000 crore, for five years, and it will be operated as a Centrally Sponsored Scheme.

Smart City Mission (SCM): it was launched in June 2015 with the objective of promoting cities that provide core infrastructure, a clean and sustainable environment and application of ‘Smart’ Solutions. This includes adequate water supply, assured electricity supply, sanitation, including solid waste management, efficient urban mobility and public transport, affordable housing, especially for the poor, robust Information Technology (IT) connectivity and digitalization and e-Governance. The Mission covers 100 cities for five years with Central Government financing supporting an average Rs.100 crore per city per year.

Swachh Bharat Mission (SBM): it was launched in October 2014 with a target to make the country clean by October, 2019. The admissible components under SBM with broad funding pattern are (i) Household toilets including conversion of insanitary latrines into pour-flush latrines (Rs.4000 per toilet as an incentive from the central government), (ii) Community toilets, (iii) Public toilets, (iv) Solid Waste Management (v) Information, Education & Communication and Public Awareness and (vi) Capacity Building and Administrative & Office Expenditure.

Source: own elaboration based on the Missions websites.

Summing up, in this sub-section we have a deal with the real estate and construction growth drivers mainly since the 2000s. We have seen that the Indian demographic transition, based on the gap between the reduction in the mortality rate and the birth rate, has been pushing a slow but constant urbanization process, which has pressed over the urban housing needs and the real estate sector. This pressure resulted in: **a)** an increase in the proportion of the urban houses compared to rural houses (reaching 32% of total houses in 2011), **b)** an improvement in the type of construction in urban areas (with pucca houses ascending to around 93% of the total urban houses), **c)** a reduction in the number of persons per house (both in rural and urban areas), **d)** an increase in the prices. At the same time, the Indian insertion in the global economy and

the high growth performance has also pushed commercial real estate business, where FDI has had an increasing role until 2011. Special Economic Zone (SEZs), hospitality and retail spaces have been gaining relevance in the Indian real estate market too. Rural construction has also fueled growth, mainly of rural employment, pushed by the improvement in the quality of houses, from kutchha to pucca houses. First, the increased in rural incomes and, second, the improvements in the cement and construction industry which have been reducing cement prices, have contributed to the rural construction boom. Last but not least, plus to the improvements in wages and income, the advances in the housing finance industry and the massive public finance programs on housing and urban development have been relevant too.

4.4.3. Energy: infrastructure expenditure, CPSEs, disinvestment/privatization and massive electrification⁹⁹

In this section we will briefly explore two main connected issues: on one hand, the main challenges and efforts related to the energy sector and, on the other hand, the main features of both public and private sector involvement in this sector, particularly in terms of investment. In 2006, the Indian Prime Minister Manmohan Singh said in an interview with Financial Times that “*the quest for energy security is second only in our (India’s) scheme of things of food security*”¹⁰⁰. Energy has always been a main issue for the Indian development since independence. However, in the contemporary high-growth-days; it has turned the main bottleneck to growth, implying several geopolitical, technological and institutional challenges. According to the Integrated Energy Policy (2006, p. xiii):

“To deliver a sustained growth rate of 8% through 2031-32 and to meet the lifeline energy needs of all citizens, India needs, at the very least, to increase its primary energy supply by 3 to 4 times and, its electricity generation capacity/supply by 5 to 6 times of their 2003-04 levels. With 2003-04 as the base, India’s commercial energy supply would need to grow from 5.2% to 6.1% per annum while its total primary energy supply would need to grow at

⁹⁹ I would like to thank Elisa Possas for the applied assistance in processing the data of this section and for the discussions on this issue.

¹⁰⁰ Quoted in Pardesi and Ganguly (2009).

4.3% to 5.1% annually. By 2031-32 power generation capacity must increase to nearly 8,00,000 MW from the current capacity of around 1,60,000 MW inclusive of all captive plants. Similarly, the requirement of coal, the dominant fuel in India's energy mix will need to expand to over 2 billion tonnes/annum based on the domestic quality of coal. Meeting the energy challenge is of fundamental importance to India's economic growth imperatives and its efforts to raise its level of human development.”

Urbanization, GDP growth, and rural electrification are the main drivers of the energy demand in India. To the International Energy Agency (2015)¹⁰¹, although India uses only 6% of the world's primary energy, energy consumption has almost doubled in the 2000s. It is projected that India will contribute more than any other country to the global rise of energy demand. A large expansion of coal output makes India the second-largest coal producer in the world, but rising demand also means that India becomes the world's largest coal importer, overtaking Japan, the European Union, and China by 2020. India is the world's third-largest importer of crude oil, although a large and efficient refinery sector gives it a surplus of oil products, mainly transport fuels, for export. India's power system needs to almost quadruple in size by 2040 to catch up and keep pace with electricity demand which, pushed by rising incomes and new connections to the grid, increases at almost 5% per year.

The Twelfth Five Years Plan (2012-2017) calls for several efforts and actions in order to deal with the energy challenge: a) to step up the domestic production of coal, oil and gas and other energy sources implementing energy efficiency technology and R&D efforts, b) to provide a stable policy regime in order to ensure substantial private investment including foreign investment in oil and natural gas blocks and new capacities for renewable energy, c) to emphasize investments in renewable energies, d) to invest in energy assets in foreign countries, especially for coal, oil and gas and uranium, e) to meet any possible disruption in oil supplies, having in mind the import-dependent, storage capacities need to be created.

Energy security has become a central aspect of the Indian foreign policy, in what Sachdeva (2011) calls “energy diplomacy”. According to the work of Pardesi and Ganguly (2009) the Indian energy security strategy includes: a) diversification of suppliers and sources of energy, trying to harness hydroelectricity to reduce dependence

¹⁰¹ There are several studies discussing and highlighting the relevance of the Indian energy transition. Only to quote two of them, we could mention the works of Mishra and Kumar (2012) and Trnum (2013).

on fossil fuels developing several joint power projects with her neighbouring countries: Bhutan, Nepal, Myanmar and Afghanistan, b) to purchase equity on coal, oil and gas abroad, both by the Power Central Public Sector Enterprises (CPSEs) and the national private companies, in countries such as Indonesia, Australia, Bangladesh and South Africa, c) to promote investment in oil refining infrastructure and capabilities in order to emerge as an “energy outsourcing hub” in the Indian Ocean, d) to increase the energy reserves, e) to promote cooperation with China, oriented to reduce the competition for energy security, and with the US, to develop civil nuclear energy, e) to boost military capabilities, mainly navy and air force, to enforce energy trade in the Indian Ocean.

Given this impressionistic big picture, it is clear that India needs to increment both public and private investment in the energy sector. Next, we present some data supporting the argument that although private sector has significantly increased his role in infrastructure and energy sector since the 2000s, the Indian Central State still has a principal position, mainly through public procurement, Central Public Sector Enterprises (CPSEs), the organization and financing of PPPs and the direct involvement in several infrastructure projects, mega-projects and national missions and massive electrification programs¹⁰².

According to the Twelfth Five Years Plan (2012-2017), for the period between 2007 and 2012, the total investment in infrastructure in India was 7.21% of GDP¹⁰³, with the public sector contributing with 4.57% (Centre 2.5% and the States 2%) and the private sector 2,64%. Electricity, renewable and oil and gas totalized investment for around 2.7% of the GDP, with electricity, by large, as the main sector with 2.2% of investment (total investment in the electric sector was more than 10 times the one in oil and gas). Thus, these three sectors concentrated more than one-third of the total investment in infrastructure in India. Public sector investment was superior to the private sector in electricity, with 1.24% of GDP and 0.92% respectively and oil and gas, with 0.12% and 0.07% respectively. However, the private sector was the main investor

¹⁰² We will mainly deal with figures since the 2000s because they are the more disaggregated ones and, as shown in the section before, these have been the years when the private sector increased its participation in the infrastructure sector.

¹⁰³ Infrastructure figures include electricity (including renewable energy), roads and bridges, telecommunications, railways, irrigation, water supply, ports, airports, storage and oil and gas pipelines.

in renewable energy, with 0.23% of GDP, and the public sector only contributing with 0.03% of GDP investment¹⁰⁴.

For the period between 2012 and 2017, the figures are projected. According to Azad et al (2017) these figures would finally be smaller, both for private and for the private sector. However, for our ends, we will just mention that the intentions were to increase the private investment in infrastructure, in order to reach a “fifty/fifty” relationship between public and private sector with the general trend of the public sector investing around 4% of GDP in infrastructure continuing.

Chart 47 - Investment in infrastructure. Centre, States, Total Public and Private. 2007-2017¹⁰⁵. Rupees crore and %.

Sectors	11th Plan		12th Plan	
	(2007-2012) (Total)	% of GDP	(2012-2017) (Projection)	% of GDP
Grand Total	2.424.277	7,21	5.574.663	8,18
Centre	856.717	2,55	1.601.061	2,35
States	680.056	2,02	1.289.762	1,89
Total Public	1.536.773	4,57	2.890.823	4,24
Private	887.504	2,64	2.683.840	3,94
Electricity	728.494	2,17	1.501.666	2,20
Centre	233.501	0,69	440.796	0,65
States	184.696	0,55	347.043	0,51
Total Public	418.197	1,24	787.839	1,16
Private	310.297	0,92	716.827	1,05
Renewable Energy	89.220	0,27	318.626	0,47
Centre	9.630	0,03	33.003	0,05
States	1.018	0,00	5.425	0,01

¹⁰⁴ See the Report on India’s Renewable Electricity Roadmap 2030 (2015) for further details on the renewable sector.

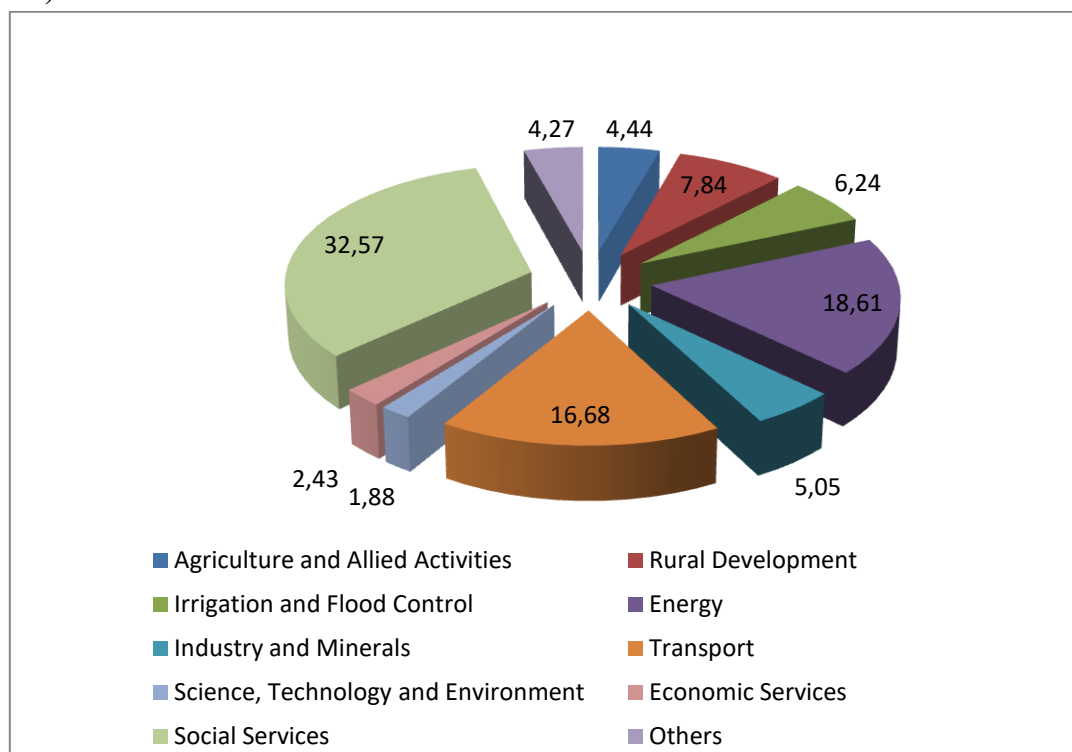
¹⁰⁵ The figures for 2007 to 2012 are confirmed, the ones for 2012-2017 are estimated in the Twelfth Five Years Plan (2012-2017).

Total Public	10.648	0,03	38.428	0,06
Private	78.572	0,23	280.198	0,41
Oil and Gas Pipelines	62.534	0,19	148.933	0,22
Centre	35.179	0,10	71.594	0,11
States	4.070	0,01	5.969	0,01
Total Public	39.249	0,12	77.563	0,12
Private	23.284	0,07	71.370	0,10

Source: own elaboration based on the Twelve Five Years Plan (2012-2017).

To give an idea of the relevance of energy in the Indian public expenditure, in the next chart we present the total outlay of the Eleventh Five Year Plan (2007-2011) including Center, States and Central Public Sector Enterprises (CPSEs) by major sectors. We observe that energy is the second main sector, centralizing around 19% of the outlay, only surpassed by social services. The third main sector of expenditure is transport, mainly related to highways and route construction.

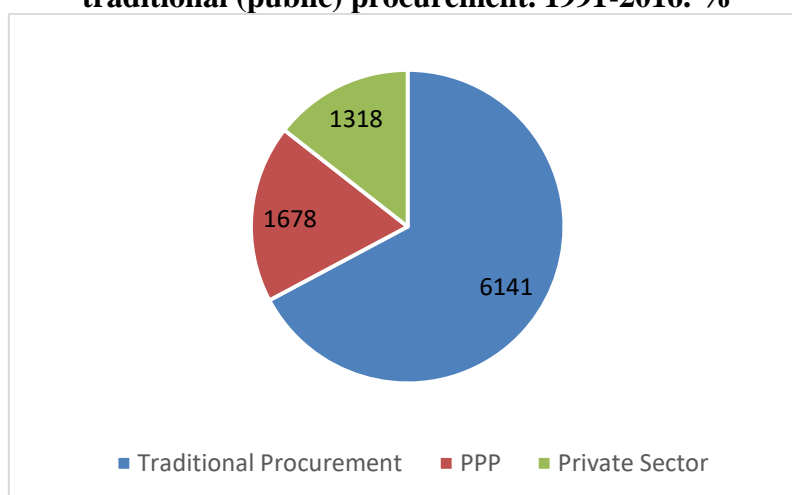
Graphic 30 - Total outlay (Center + States + Central Public Sector Enterprises) by major sector. % of the accumulated outlay of the Eleventh Five Years Plan (2007-2011)



Source: own elaboration based on the Twelfth Five Years Plan (2012-2017).

Since 2000s, there were three main forms to mobilize infrastructure projects: PPPs, private investment and traditional (public) procurement¹⁰⁶. The Department of Economic Affairs' database presented a total of 9.137 projects in infrastructure between 1991 and 2016. From the total amount of projects executed in this period, 6.131 (around two third of the total amount) were contracted as traditional (public) procurement, there were 1.678 of PPPs and 1.318 of private investment. With respect to the total expenditure, the proportions are similar, 59% of traditional procurement, 26% of PPPs and 15% of the private investment.

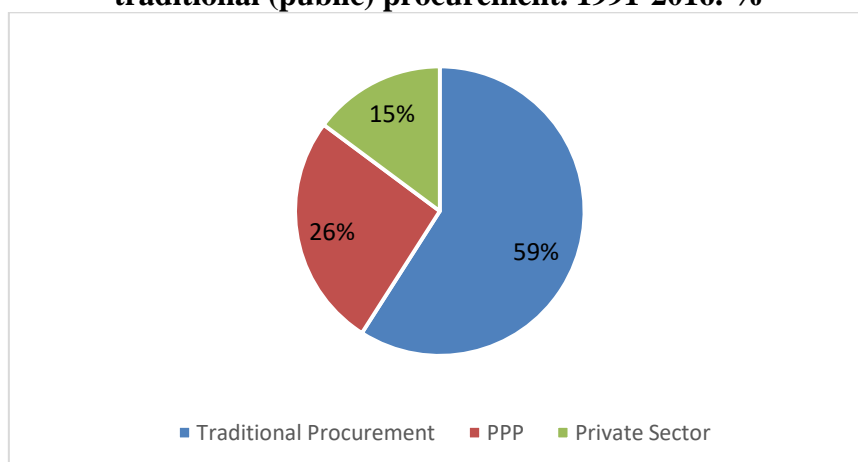
Graphic 31 - Total number of infrastructure projects. Private, PPPs and traditional (public) procurement. 1991-2016. %



Source: own elaboration based on the Department of Economic Affairs database on infrastructure projects.

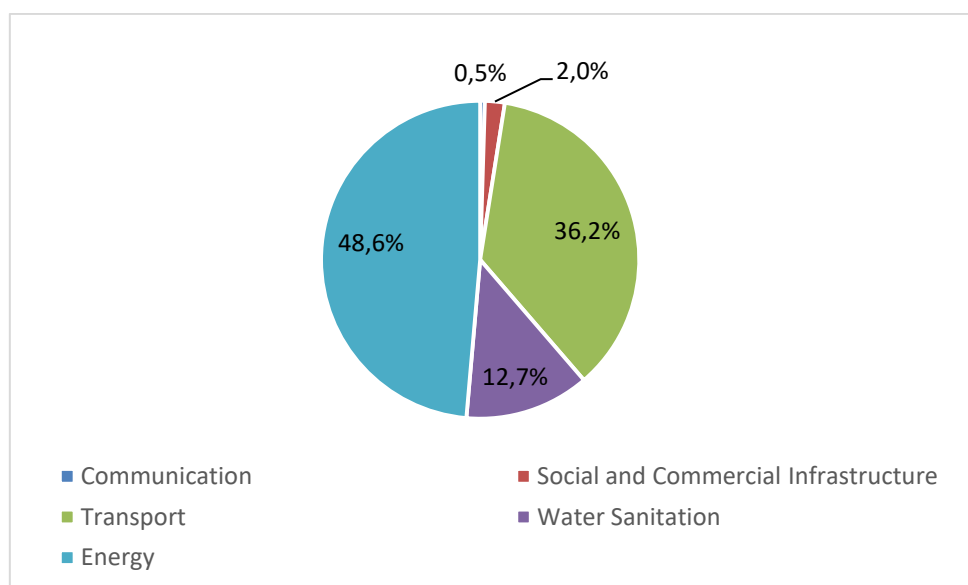
¹⁰⁶ According to the official web page of the Department of Economic Affairs on PPPs (<https://www.pppinindia.gov.in/>), PPPs are defined as infrastructure projects owned, developed and implemented jointly by the Government and private sector, through a partnership arrangement. Public Private Partnership means an arrangement between government or statutory entity or government owned entity on one side and a private sector entity on the other, for the provision of public assets and/or related services for public benefit, through investments being made by and/or management undertaken by the private sector entity for a specified period of time, where there is a substantial risk sharing with the private sector and the private sector receives performance linked payments that conform (or are benchmarked) to specified and pre-determined performance standards, measurable by the public entity. Government Infrastructure Projects (Traditional Procurement) are defined as infrastructure projects owned, developed and implemented by the Government and Private Sector Infrastructure Projects are infrastructure projects implemented by the private sector.

Graphic 32 - Total expenditure in infrastructure projects. Private, PPPs and traditional (public) procurement. 1991-2016. %

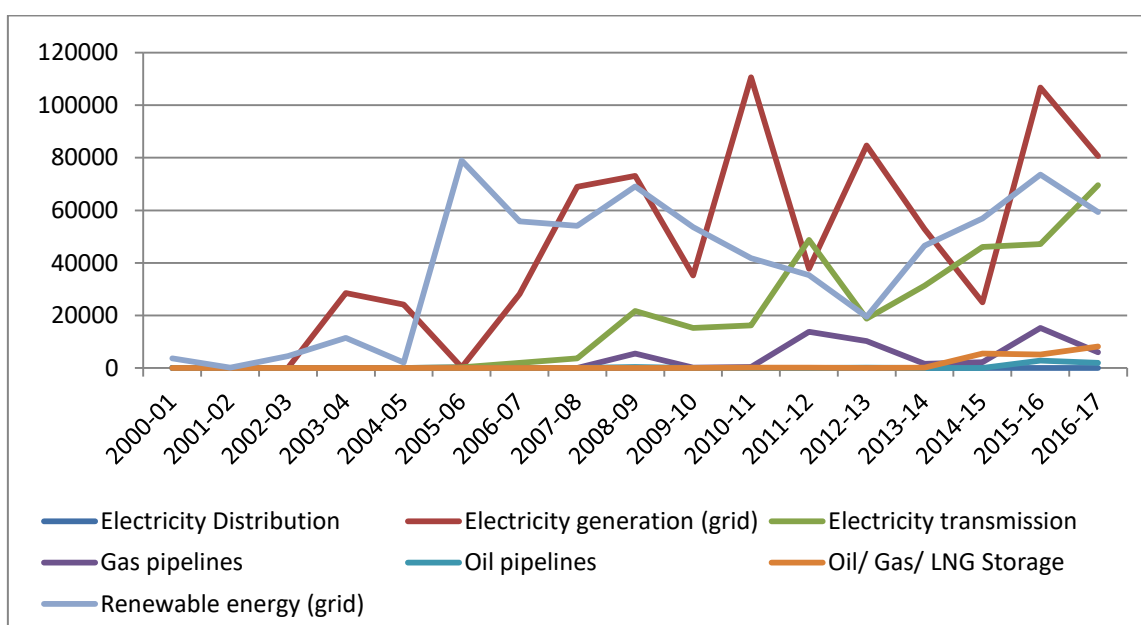


Source: own elaboration based on the Department of Economic Affairs database on infrastructure projects.

In relation to the main sectors of expenditure in infrastructure, including public, private and PPPs projects, energy is at the top, with 48.6% of the expenditure and transport is the second one, with 36%. Both sectors concentrated 82% of the expenditure between 1991 and 2016. After them, water sanitation received 13% of the resources and social and commercial infrastructure and communication around 2.5%. In particular, if we observe the evolution of the total expenditure in energy between 2000 and 2016, electricity generation, electricity transmission and renewable energy are the top three, concentrating more than 90% of the expenditure.

Graphic 33 - Infrastructure expenditure by main sectors. 1991-2016. %.

Source: own elaboration based on the Department of Economic Affairs database on infrastructure projects.

Graphic 34 - Energy expenditure by subsector. 2000-2016. In rupees crore

Source: own elaboration based on the Department of Economic Affairs database on infrastructure projects.

Central Public Sector Enterprises (CPSEs) play the main role channeling public investment in India (Nagaraj, 2008, 2006; Khanna, 2015; Kapila, 2014). However, with

the NEP, the privatization and disinvestment agenda was launched in India¹⁰⁷. In this sense, the Indian CPSEs experience in dealing with the mainstream global privatization agenda in the 1990s is an interesting and particular one. As detailed in Nagaraj (2008) and Khanna (2015), the advances in the privatization and disinvestment process have been from partial to modest. Based on their works, there has been identified four phases in the privatization/disinvestment process:

1. From 1992 to 1998: The Congress Party-led government pushed a policy of disinvestment up to 20% of shares to mutual funds, the general public, and workers (since 1993 foreign investors were also allowed to participate). However, only one CPSE was privatized: the automobile company Maruti Udyog was sold to Suzuki (the petroleum marketing company IBP was sold to another CPSE, the Indian Oil Corporation)¹⁰⁸. In 1997, the Disinvestment Commission recommended to restructure the CPSEs before disinvestment, to strength the well-functioning CPSEs and to utilize the disinvestment proceeds to create a fund to restructure CPSEs. The well-functioning CPSEs were declared *Navaratnas* (jewels in the government crown) and were granted a greater managerial and financial autonomy.

2. From 1998 to 2004: a coalition led by the right-wing BJP now led the government pushed privatization and "strategic sales". Twelve CPSEs were privatized including the Indian Petrochemicals, VSNL (it had the monopoly of long-distance communications and it was the largest provider of the internet), Bharat Aluminium and several hotels that were run by the Indian Tourism Development Corporation. At the same time, there were several allegations of corruption and malpractice in some deals.

3. From 2004 to 2014: a Congress-led government, in alliance with two communist parties, reached power. The disinvestment process was frizzed and a Board for Reconstruction of Public Sector Enterprises was launch with the objective of restructuring the sick CPSEs. The Board recommended restructuring 60 CPSEs, to close two and to sale other two.

¹⁰⁷ The privatization framework can be read in the works of World Bank (1990), Bhagwati and Srinivasan (1993) and Bhandari and Goswami (2000) between others.

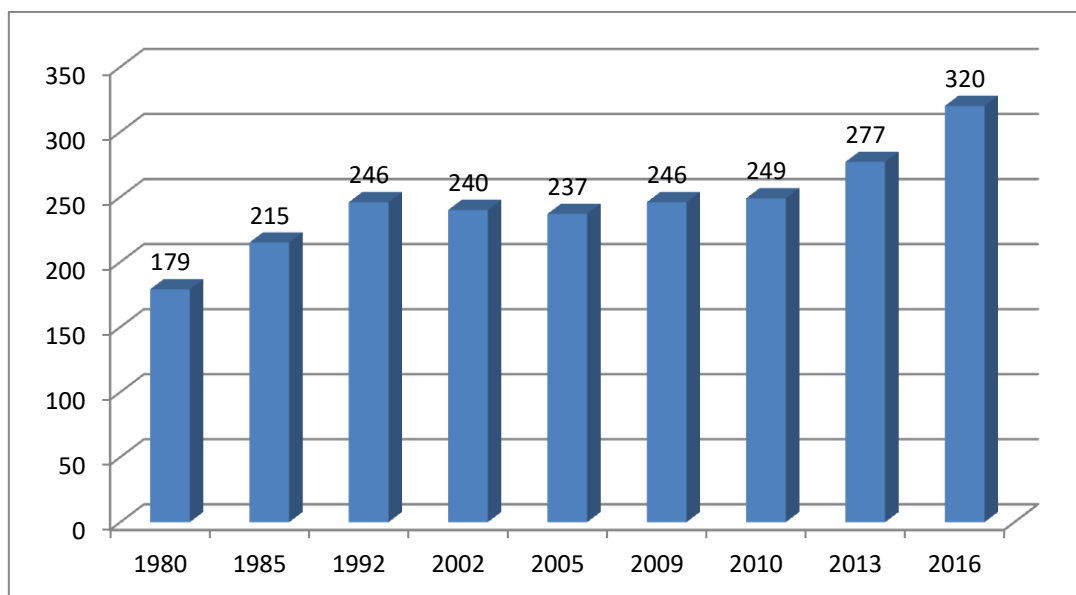
¹⁰⁸ According to Nagaraj (2008) a corruption scandal with the stockbroker Harshad Mehta led to a slowdown in the Indian stock market that stayed depressed until the mid 1990s, critically discouraging the CPSEs sales in the stock market.

4. From 2014 to nowadays: a BJP government won, led by the actual Prime Minister Narendra Modi. The policy of disinvestment and privatization has been ambiguous. Some initiatives have gone in line with a strengthening of the privatization process. For instance, Bharat Earth Movers Limited (BEML), one of the nine defence public sector units, Salem, Durgapur and Bhadravati plants of Steel Authority of India Limited (SAIL), Bridge and Roof Company, Dredging Corporation of India, Hindustan Fluorocarbons were identified for strategic sale. However, there have not been massive sales and the role of the CPSEs in some sectors has been reinforced.

In resume, less than 40 CPSEs were totally privatized between 1990 and 2016. In fact, if we observe the evolution in the number of Central Public Sector Enterprises (CPSEs)¹⁰⁹ in the next chart, they have even increased! In 1992 there were 246 CPSEs, but in 2016 they were 320¹¹⁰. It means, new CPSEs were created during the post-NEP years. Although some of these new CPSEs have been created to establish PPPs with the private sector or to finance the private sector, it does not seem as a process of reduction of the CPSEs role in the Indian economy.

¹⁰⁹ A Government company is defined as any company in which not less than fifty-one percent of the share capital is held by the Central Government, or by any State Government or Governments, or partly by the Central Government and partly by one or more State Governments and includes a company which is a subsidiary company of such a Government company. The Public Enterprises Survey covers those Government companies wherein more than 50% equity is held by the Central Government. However, the subsidiaries of these companies, if registered in India, wherein Central Government has more than 50% equity are also categorized. The Survey does not cover departmentally run public enterprises, banking institutions, and insurance companies. Finally, there are several Public Sector Enterprises that belong to the States level. Although quite relevant both in terms of amount and investment, these enterprises are not included here given the data restrictions.

¹¹⁰ These numbers include the CPSEs under construction which are being launched but still not in the market.

Graphic 35 - Amount of CPSEs. 1985-2016. Selected years.

Source: Public Enterprise Survey, various issues.

According to Khanna (2015) there are some politico-economic reasons that explain the low advance of the privatization process in India: a) although most of the governments since the 1990s express their commitment to the privatization process, the majority of the voters were against privatizations, b) trade-unions and middle class groups have resisted the reforms, c) there were many government changes during this period, causing different re-adjustments in the privatization strategy, d) a number of cases of privatization received severe critics of corruption, e) there are some strategic sector where the government do not want to lose control.

As reported in the Public Enterprise Survey 2015-2016, while there were five CPSEs at the time of the First Five Year Plan, there were 320 CPSEs (excluding 7 Insurance Companies) as on 31st March, 2016. Services and manufacturing, with 113 and 87 each, are the main CPSEs sectors. However, in terms of investment, the 14 electricity CPSEs (11 of generation and 3 of transmission) totalized around 25% of the total CPSEs investment between 2013 and 2015. Besides, there are 76 enterprises under construction, being subsidiaries of existing CPSEs which are going to operate in particular States or new CPSEs to operate in new sectors.

Chart 48 - Public Sector Enterprises (PSEs). March 2016. Quantity and Investment. In rupees crore.

Cognate Group	Nº of Enterprises (31/3/2016)	Financial Investment During*				
		2013-14	2014-15	2015-16	Average I (2013-2015)	% of total Investment
Agriculture	5	1.181	1.302	1.443	1.308	0,12%
Agro-based Industries	5	1.181	1.302	1.443	1.308	0,12%
Mining	25	62.389	86.249	88.523	79.054	7,28%
Coal	8	15.843	17.375	17.379	16.866	1,55%
Crude Oil	5	41.929	64.178	66.174	57.427	5,29%
Other Minerals & Metals	12	4.618	4.697	4.970	4.761	0,44%
Manufacturing	87	158.679	154.565	150.657	154.634	14,23%
Steel	5	24.914	23.616	29.006	25.845	2,38%
Petroleum (Refinery and Markets)	8	87.753	84.333	72.316	81.467	7,50%
Fertilizers	7	16.074	15.566	7.170	12.937	1,19%
Chemicals & Pharmaceuticals	16	6.294	6.885	15.283	9.487	0,87%
Heavy Engineering	7	2.640	1.617	1.593	1.950	0,18%
Medium & Light Engineering	20	11.096	12.519	12.912	12.176	1,12%
Transportation Equipment	8	2.446	2.382	2.210	2.346	0,22%
Consumer Goods	12	3.682	3.828	6.305	4.605	0,42%
Textiles	4	3.781	3.817	3.862	3.820	0,35%
Electricity	14	236.035	269.456	300.402	268.631	24,72%
Power Generation	11	154.013	174.849	194.930	174.597	16,07%
Power Transmission	3	82.022	94.608	105.471	94.034	8,65%
Services	113	509.971	555.254	601.507	555.577	51,13%
Trading & Marketing	22	19.420	16.543	16.494	17.486	1,61%
Transport Services	15	66.350	70.463	72.604	69.806	6,42%
Contract & Construction Services	17	10.607	11.231	11.541	11.126	1,02%
Ind. Dev. & Tech. Consul. Servs.	23	1.193	1.388	1.625	1.402	0,13%
Tourist Services	9	388	326	406	373	0,03%
Financial Services	21	389.670	431.714	470.721	430.702	39,64%
Telecommunication Services	6	22.344	23.589	28.117	24.683	2,27%
Enterprises Under Construction	76	23.841	28.729	29.313	27.294	2,51%
TOTAL	320	992.096	1.095.554	1.171.844	1.086.498	100,00%

Source: own elaboration based on the Public Enterprise Survey 2015-2016.

Several CPSEs are leading companies with significant market-shares in sectors such as petroleum (ONGC, GAIL, HPCL, BPCL and Indian Oil Corporation), mining (Coal India Ltd. and NMDC), power generation (NTPC and NHPC), power transmission (Power Grid Corporation of India Ltd.), nuclear energy (Nuclear Power Corporation of India Ltd.), heavy engineering (BHEL), aviation (Hindustan Aeronautics Ltd. and Air India Ltd.), storage and public distribution (Food Corporation of India and Central Warehousing Corporation), shipping and trading (Shipping Corporation of India Ltd, and State Trading Corporation of India Ltd.), steel (Steel Authority of India Ltd

and Rashtriya Ispat Nigam Ltd) and telecommunication (BSNL and MTNL). If we see next, from the top ten CPSEs in terms of investment during 2015-6, eight of them are from the energy sector (five from oil and gas and three from power), one from steel and one from telecommunications.

Chart 49 - Top 10 CPSEs in terms of investment in 2015-2016. Rupees crore and % of total CPSEs investment

CPSE Name	Sector	Investment	% of total CPSEs investment
Oil & Natural Gas Corporation Ltd.	Oil & Gas	256597,89	12,7
NTPC Ltd.	Power - Generation (Thermal)	213273,09	10,5
Power Grid Corporation of India Ltd.	Power – Transmission	193861,88	9,6
Bharat Sanchar Nigam Ltd.	Telecommunications	173738,80	8,6
Indian Oil Corporation Ltd.	Oil & Gas	171581,22	8,5
ONGC Videsh Ltd.	Oil & Gas	124217,81	6,1
Steel Authority of India Ltd.	Steel	100201,74	5,0
Nuclear Power Corpn. of India Ltd.	Power - Generation (Nuclear)	59725,68	3,0
Bharat Petroleum Corpn. Ltd.	Oil & Gas	59148,57	2,9
Hindustan Petroleum Corpn. Ltd.	Oil & Gas	56925,52	2,8
Total		1409272,20	69,6
Grand Total		2026315,31	100,0

Source: own elaboration based on the Public Enterprise Survey 2015-2016.

In terms of R&D expenditure, Bharat Heavy Electricals Ltd. and Bharat Electronics Ltd. are at the top. However, after them, five CPSEs related to energy integrate the top 10, including four from oil and gas and one from power (generation). These figures go in line with the work of Mishra et al (2013) that highlights the

relevance of CPSEs expenditure in R&D for India, in particular, related to oil and gas, defense, heavy equipment, power, and electronics.

Chart 50 - Top 10 CPSEs in terms of R&D expenditure in 2015-2016. Rupees crore and % of total CPSEs expenditure

CPSE Name	Sector	Expenditure in R&D (in ₹ crore)	% of total CPSEs investment
Bharat Heavy Electricals Ltd.	Heavy equipments	893,07	24,7
Bharat Electronics Ltd.	Electronics	704,27	19,5
Oil & Natural Gas Corporation Ltd.	Oil & Gas	539,74	14,9
Steel Authority Of India Ltd.	Steel	277	7,7
Indian Oil Corporation Ltd.	Oil & Gas	235,27	6,5
Hindustan Petroleum Corpn. Ltd.	Oil & Gas	180,32	5,0
Ntpc ltd.	Power - Generation	129,68	3,6
Bharat Sanchar Nigam Ltd.	Telecommunications	79,47	2,2
Gail (India) Ltd.	Oil & Gas	76,49	2,1
Beml Ltd.	Heavy equipments	66,63	1,8
Total		3181,94	88,1
Grand Total		3611,84	100,0

Source: own elaboration based on the Public Enterprise Survey 2015-2016.

In relation to the disinvestment process up to the fiscal year 2015-6 for the top ten CPSEs in terms of investment, we can see that in:

- the Oil & Natural Gas Corporation the Government of India (GoI) had 68,9% of the shares, with foreign investors with 7,2% and the rest of private investors 23,9%;
- NTPC the GoI had 63% of the shares, with foreign investors with 10,7% and the rest of investors 26,3%;
- Power Grid Corporation GoI had 57,9%, foreign investors 26,3% and the rest 15,8%;
- Bharat Sanchar Nigam and the Nuclear Power Corporation of India, GoI had 100% ownership and ONGC Videsh is totally owned by another CPSEs;

- the Indian Oil Corporation 58,6% of the shares were from the GoI, 4,2% of foreign investors and 37,2% of the rest of investors;
- Bharat Petroleum Corporation 55,8% was of the GoI, 21,1 of foreign investors and 21,1% of the rest of local investors;
- Hindustan Petroleum Corporation 51,1% of the shares are of the GoI, 19,3% of foreign investors and 29,6% of the other local investors.

It means, the Government of India still has around 60% of the shares of the top 10 investing CPSEs, maintaining in some sectors such as nuclear the 100% of the ownership. The participation of foreign investors, in general terms, is not superior to 20% of the shares. A little more of 20% of the shares are distributed among different types of national investors.

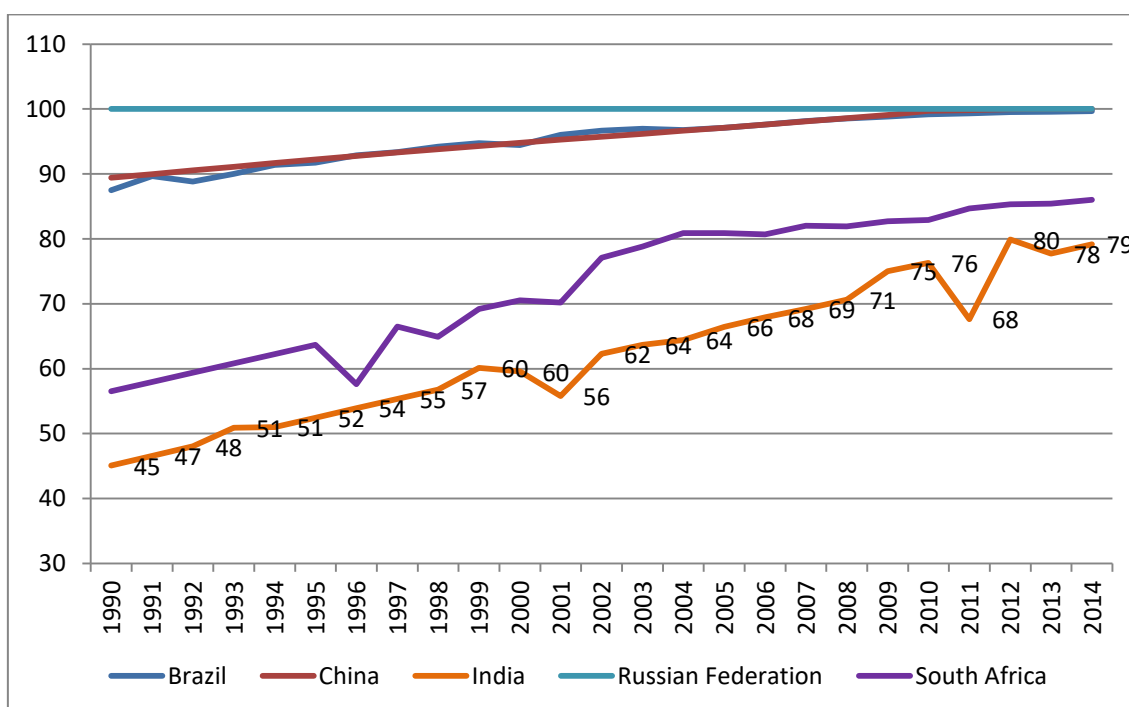
Chart 51 - Top 10 CPSEs in terms of investment. Shares ownership at 2015-2016 fiscal year

CPSE Name	Shareholders					
	GoI	Others	Mutual Funds	Financial Institutions	Insurance Companies	Foreign Investors
Oil & Natural Gas Corporation Ltd.	68,9	13,5	0,9	1,2	8,3	7,2
NTPC Ltd.	63,0	3,3	6,4	16,1	0,6	10,7
Power Grid Corporation of India Ltd.	57,9	7,5	4,8	0,8	2,8	26,3
Bharat Sanchar Nigam Ltd.	100,0	0,0	0,0	0,0	0,0	0,0
Indian Oil Corporation Ltd.	58,6	24,9	1,6	0,5	10,2	4,2
ONGC Videsh Ltd.	Wholly owned by another CPSE					
Steel Authority of India Ltd.	-	-	-	-	-	-
Nuclear Power Corp. of India Ltd.	100,0	0,0	0,0	0,0	0,0	0,0
Bharat Petroleum Corp. Ltd.	55,8	14,6	5,7	0,1	2,7	21,1
Hindustan Petroleum Corp. Ltd.	51,1	15,6	9,9	4,1	0,0	19,3

Source: own elaboration based on the Public Enterprise Survey 2015-2016 and the web page of each CPSE.

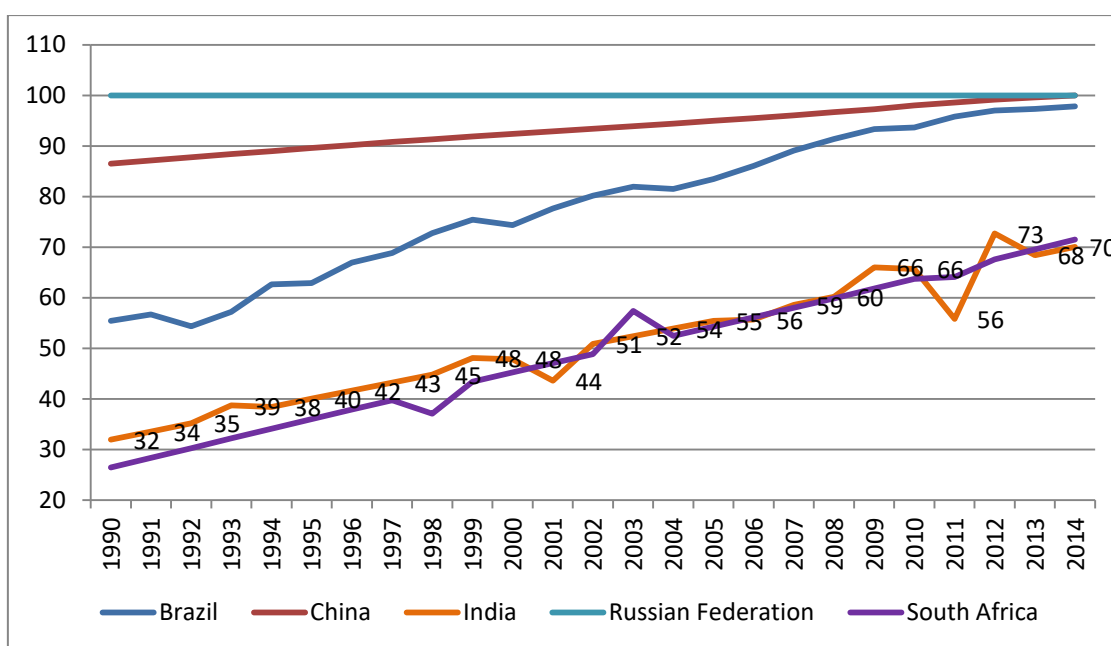
Last but not least, the electrification process in India has advanced significantly since the 1990s. According to the World Bank, in 1990, less than 45% of India had electricity access, but in 2014 the electrification rate reached 80%. Rural electrification went from around 30% to 70% for the same period. Although it is true that the Indian electrification rate is still much lower than the other BRICS countries, the rate of increase in the Indian electrification is marked.

Graphic 36 - Access to electricity. % of population. BRICS countries. 1990-2014



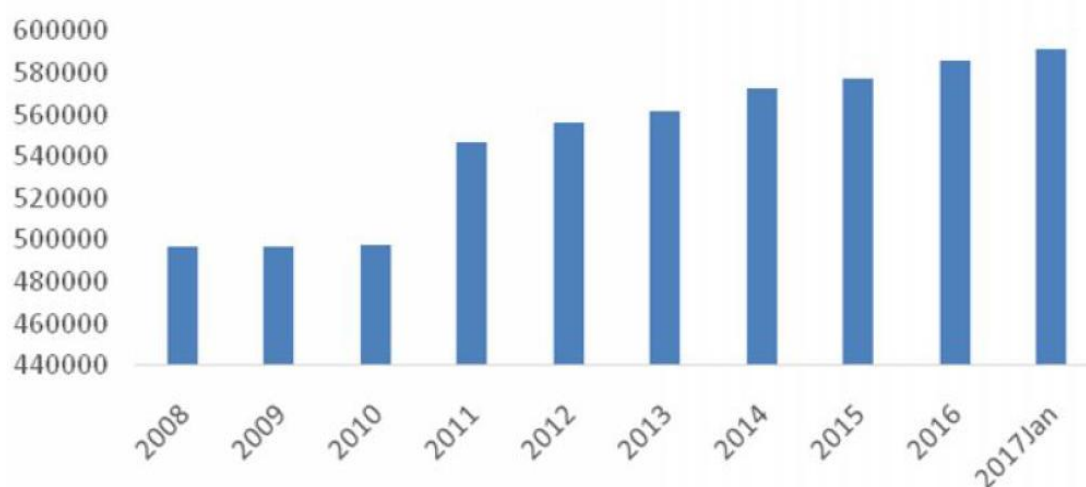
Source: own elaboration based on World Bank database.

Graphic 37 - Rural access to electricity. % of rural population. BRICS countries. 1990-2014



Source: own elaboration based on World Bank database.

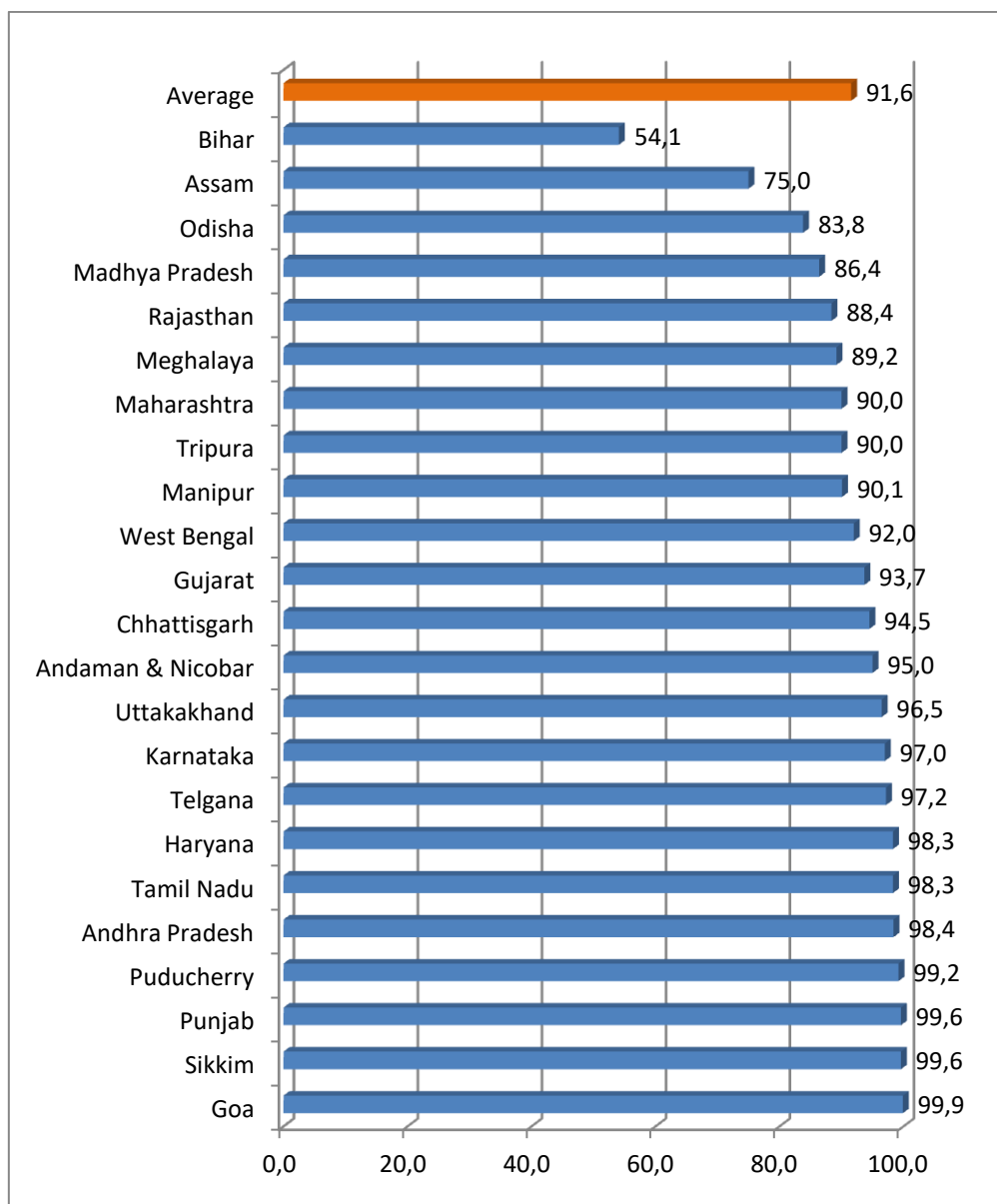
A main push on the electrification process came in 2005 with the launch of the Rajiv Gandhi Grameen Vidyutikaram Yojana (RGGVY), a mainly Central government-funded program. The principal aims of RGGVY were to electrify all villages and habitations, to provide access to electricity to all rural households and to provide electrical connection to Below Poverty Line (BPL) families free of charge. In 2010-11, there was a significant increase in budgetary outlay for the RGGVY. As a consequence, in the next chart, we see a marked increase in the number of electrified villages in 2011. With Narendra Modi as Prime Minister, the program changed its name to Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY). The Rural Electrification Corporation, a CPSEs, is the Nodal Agency for implementation of DDUGJY.

Graphic 38 - Number of electrified villages in India. 2008 - Jan 2017

Source: Chandrasekhar and Ghosh (2017)

According to the DDUGJY web page, in January 2018, from 597,464 census villages, 596,167 villages have been electrified. It means, 99,7% of village electrification. However, village electrification is not the same that household with access to electrification. Village electrification is defined as: a) basic infrastructure such as distribution transformer and distribution lines provided in the inhabited locality as well as the Dalit basti/hamlet where it exists, b) electricity is provided to public places like schools, health centres, dispensaries, community centres, etc. c) the number of households electrified is at least 10% of the total number of households in the village. This requires only the provision of the electricity line, not actual continuous access to electricity. So, even if a few houses in a village receive only a couple hours of electricity a day for a few days in the year, the village is still deemed to be electrified.

According to the National Family Health Survey (NFHS-4) carried out in 2015-16 the average of electrified rural households was around 90%, with some States with a low level of rural household electrification such as Bihar (54,1%), Assam (75%) and Odisha (83,8%) and others such as Goa, Sikkim, Punjab and Puducherry with around 99% of rural household electrification. However, to Chandrasekhar and Ghosh (2017), between 71% and 60% of all households in India have electricity (even this could be no regular electricity) with rural access lower than urban.

Graphic 39 - Rural households with electricity. 2015-6

Source: own elaboration based on Chandrasekhar and Gosh (2017)

According to the Twelfth Five Year Plan (2017-2012) the demand for non-commercial energy is expected to decline with increasing expansion of the network and access to commercial energy. According to Mishra and Kumar (2013), under growth average scenarios of 8% and 9%, electricity consumption in India is going to multiply more than 8 times by 2030, displacing non-commercial firewood and chips and kerosene.

Chart 52 - Demand Scenario of Various Energy items for Household Consumption in India under 8% and 9% annual GDP Growth Rates. Totals in Mtoe (Million Tonnes of Oil Equivalent).

Year	Firewood and Chips		Electricity		Dung Cake		Kerosene		LPG	
	8%	9%	8%	9%	8%	9%	8%	9%	8%	9%
2000	79,62	79,62	8,43	8,43	29,61	29,61	10,07	10,07	6,42	6,42
2006	88,64	88,78	18,17	19,26	36,97	37,33	12,98	12,77	15,85	16,87
2011	94,11	94,05	27,17	29,68	40,42	40,48	14,01	14,02	23,94	26,07
2016	98,44	98,50	38,38	42,28	41,93	41,35	14,84	14,70	33,11	35,93
2021	102,06	102,46	50,39	54,78	41,79	40,87	15,16	14,93	41,63	44,16
2026	104,64	105,07	61,37	64,95	40,95	40,28	15,17	14,93	48,11	49,63
2031	106,39	106,59	69,72	71,80	40,47	40,21	15,12	14,96	52,27	52,89

Source: own elaboration based on Mishra and Kumar (2012)

Although the heterogeneities, there is no doubt that the electrification process has advanced significantly since the 1990s and this process has been pushed by huge State-financed programs. In this sense, the advance in the electrification process implies several changes in the household consumption (for instance, opening new markets for home appliances), a wide range of new business opportunities for the power sector, the Indian entrepreneurs and the informal sector and it is a potential booster for the Indian productivity. At the same time, it still implies a huge challenge that is still not resolved, in order to ensure the provision of continued energy to the whole Indian villages and households.

The Ultra Mega Power Projects (UMPPs) Programme and the National Missions in Power

The main way to channel resources in infrastructure since the Eleventh Five Years Plan (2007-2011) has been the megaprojects. Until March of 2016, there were 1,076 projects under implementation in the central sector, out of which 278 projects were Megaprojects (each costing `1,000 crores and above) and 798 were Major projects (each costing between `500 crores and `1000 crore). Particularly, with the Twelfth Five Year Plan (2012-2017) it was launched the Ultra Mega Power Projects (UMPPs) Programme which brings in private investment into power generation. They have launched nine Ultra Mega Power Projects (UMPPs) with an initial capacity of 4,000 MW to attract `160–200 billion of private investment implemented in Gujarat, Madhya Pradesh, Andhra Pradesh, Jharkhand, Orissa, Tamil Nadu, Maharashtra, Karnataka, and Chattisgarh.

At the same time, different national missions were launched oriented to the power sector. Among others, we can highlight these missions in the power sector:

National Mission for Enhanced Energy Efficiency (NMEEE): one of the eight missions under the National Action Plan on Climate Change. NMEEE aims to strengthen the market for energy efficiency by creating conducive regulatory & policy regime. The Mission seeks to upscale the efforts to unlock the market for energy efficiency which is estimated to be around Rs. 74,000 crore & help achieve total avoided capacity addition of 19,598 MW, fuel savings of around 23 million tonnes per year & greenhouse gas emissions reductions of 98.55 million tonnes per year at its full implementation stage

Jawaharlal Nehru National Solar Mission (JNNSM): launched in 2010, the Mission has set the ambitious target of deploying 20,000 MW of grid-connected solar power by 2022. It is aimed at reducing the cost of solar power generation in the country through long-term policy; large-scale deployment goals; aggressive R&D & domestic production of critical raw materials, components, etc.

Indian Electrical Equipment Industry Mission Plan: the aim of this Mission Plan is to make India the country of choice for the production of electrical equipment and reach an output of US\$ 100 billion by balancing exports and imports.

National Smart Grid Mission (NSGM): a smart grid is an electrical grid with automation, communication and IT systems that can monitor power flows from points of generation to points of consumption (sometimes even down to the appliances level) and control the power flow or curtail the load to match generation on a real-time basis. The NSGM is the institutional mechanism for planning, monitoring, and implementation of policies and programs related to Smart Grid activities.

Source: own elaboration based on the Twelfth Five Year Plan (2012-2017).

Summing up, it has been briefly discussed the Indian energy challenge and the role of the public and private sector. The main point are: a) India is dealing with a major challenge, which can affect her growth path and it is in this big picture that the Indian efforts to increase both public and private investment and capability building efforts should be contextualized; b) public investment in infrastructure has been maintained since the 2000s slightly above 4% of the GDP and private investment has increased, but still below 4% of GDP. The main sector of private investment is, by large, renewable energies; c) from the three main contractual forms implemented to mobilize infrastructure, traditional (public) procurement is clearly the one which received most resources, with around 60% of the total expenditure between 1991 and 2016. However, PPPs and private investment gravitation has increased since the global crisis of 2007; d) energy (mainly electricity generation, transmission and renewables) and transport are the main sectors of infrastructure expenditure; e) the advance of the privatization process since the NEP implementation has been modest, with less than 40 CPSEs fully sales, f) with respect to disinvestment, of the top ten CPSEs in terms of investment, overall, Centre has maintained around 60% of the shares, foreign investors less than 20% and local investors a little more than 20% and g) the electrification process, although with regional heterogeneities, has significantly advanced, pushed by massive public sector programs, creating several business opportunities to the private sector.

4.4.4. External sector: capital account management, remittances, exports, and FDI.

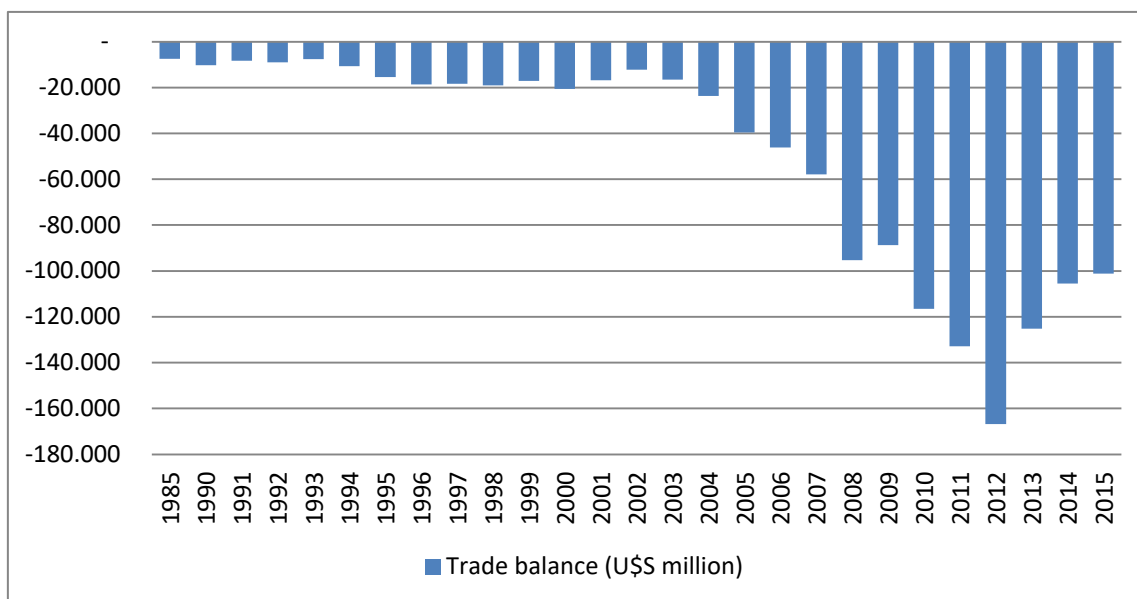
Next, we will analyze the main Indian external sector indicators in order to give some understanding on this issue.

Chart 53 - Main Indian balance of payments indicators. 1980-1 / 2016-17

Year	Trade				Invisibles			Capital account		Total reserves US \$ Million
	Exports/ GDP	Imports/ GDP	Exports + Imports / GDP	Export - Imports / GDP	Receipts / GDP	Payments / GDP	Net / GDP	Foreign Investment / Exports	Foreign Investment / GDP	
1980-81	4,6	8,9	13,5	-4,3	3,9	1,2	2,8	0,0	0,0	6.823
1990-91	5,8	8,8	14,6	-3,0	2,4	2,4	-0,1	0,6	0,0	5.834
1991-92	6,8	7,9	14,7	-1,1	3,6	2,9	0,6	0,7	0,0	9.220
1992-93	7,7	9,9	17,6	-2,2	3,8	3,0	0,8	3,0	0,2	9.832
1993-94	8,2	9,7	17,9	-1,5	4,1	3,1	1,0	18,7	1,5	19.254
1994-95	8,3	11,1	19,4	-2,8	4,8	3,1	1,8	18,3	1,5	25.186
1995-96	9,1	12,3	21,4	-3,2	5,0	3,4	1,5	14,9	1,3	21.687
1996-97	8,8	12,6	21,4	-3,8	5,5	2,9	2,6	18,0	1,6	26.423
1997-98	8,7	12,5	21,2	-3,8	5,7	3,2	2,4	15,1	1,3	29.367
1998-99	8,2	11,4	19,6	-3,2	6,2	4,0	2,2	7,0	0,6	32.490
1999-00	8,3	12,3	20,6	-4,0	6,7	3,8	2,9	13,8	1,2	38.036
2000-01	9,9	12,6	22,5	-2,7	7,0	4,9	2,1	14,9	1,5	42.281
2001-02	9,4	11,8	21,2	-2,4	7,7	4,6	3,1	18,2	1,7	54.106
2002-03	10,6	12,7	23,3	-2,1	8,3	4,9	3,4	11,2	1,2	76.100
2003-04	11,1	13,3	24,4	-2,2	8,9	4,3	4,6	23,7	2,6	112.959
2004-05	11,8	16,5	28,3	-4,7	9,6	5,3	4,3	18,0	2,1	141.514
2005-06	12,6	18,8	31,4	-6,2	10,8	5,7	5,0	20,3	2,6	151.622
2006-07	13,6	20,1	33,7	-6,5	12,1	6,6	5,5	23,1	3,1	199.179
2007-08	13,4	20,8	34,2	-7,4	12,0	5,9	6,1	37,3	5,0	309.723
2008-09	15,4	25,2	40,6	-9,8	13,7	6,2	7,5	14,8	2,3	251.985
2009-10	13,4	22,0	35,4	-8,6	12,0	6,1	5,9	35,9	4,8	279.057
2010-11	15,0	22,4	37,4	-7,4	11,1	6,5	4,6	23,6	3,5	304.818
2011-12	17,0	27,4	44,4	-10,4	12,0	5,9	6,1	16,3	2,8	294.398
2012-13	16,8	27,5	44,3	-10,7	12,3	6,4	5,9	17,8	3,0	292.046
2013-14	17,2	25,1	42,3	-7,9	12,6	6,4	6,2	11,2	1,9	304.223
2014-15	15,6	22,7	38,3	-7,1	11,9	6,1	5,8	24,5	3,8	341.638
2015-16	12,7	19,0	31,7	-6,3	11,2	6,1	5,2	15,5	2,0	360.176
2016-17	12,4	17,3	29,7	-4,9	10,6	6,4	4,3	17,8	2,2	369.955

Source: own elaboration based on the Handbook of Statistics on Indian Economy (RBI). The 2016-7 are provisional figures.

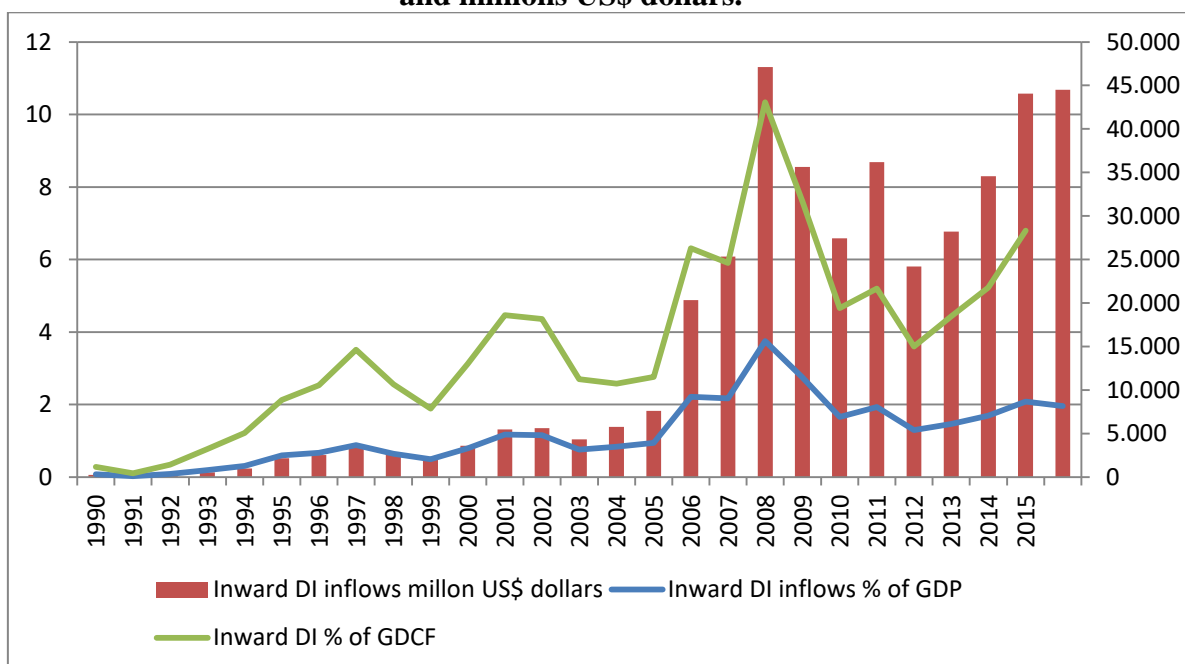
Both exports and imports increased their share on GDP since 1990. Exports of goods and services passed from 4,6% of GDP in 1980-1 to a pick of 17,2% in 2013-4. Between 1990 and 2015 exports grew at an average rate of 10,4%. Imports increased even stronger, going from 8,9% of GDP in 1980-1 to a maximum of 27,5% in 2012-3. The imports of goods and services growth rate between 1990 and 2015 was 11,7%. External trade participation in more than GDP doubled, going from 14,6% in 1990-1 to an average of 38,3% between 2010-1 and 2016-7. As a consequence of the dynamic of imports and exports, the trade deficit increased sharply since the mid-2000s, reaching a peak of 166 US\$ billion in 2012.

Graphic 40 - Trade balance. 1985-2015

Source: World Bank database.

However, the trade deficit was more than compensated by net Invisibles and capital inflows. Net invisibles reflect both services exports boom and NRI remittances, as we will see later. International capital inflows have been a relevant and new feature of the Indian economy post-1990. According to UNCTAD, FDI net inflows experienced a significant increase, going from 236 million in 1990 to a peak of almost 50 billions 2008. In terms of GDP, FDI net inflows reached a maximum of almost 4% in 2008 (and around 10% of GDCF), but it averaged 1,6% between 1990 and 2015. This means that although they have been extremely relevant to the Indian external sector, FDI has not been a main driver of GDP and GDCF growth.

Graphic 41 - Inward Direct Investment flows. 1990-2016. % of GDP, % of GDCF and millions US\$ dollars.

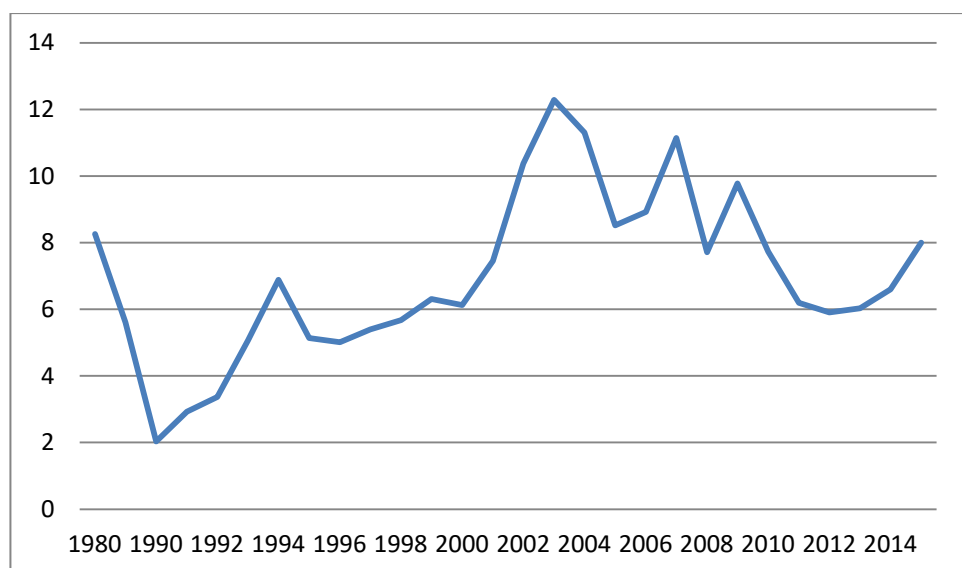


Source: own elaboration based on UNCTAD database.

In addition to an active intervening in the foreign exchange market to stabilize the rupee, according to Gupta and Sengupta (2016, p. 106), there has been a clear hierarchy in the liberalisation of capital flows in India where non-debt flows or equity flows have been given preference over debt flows:

“Within equity flows, direct investments have been the preferred choice compared to portfolio investments, while within debt flows longer term and domestic currency denominated flows have been preferred over short-term and foreign currency denominated flows. This hierarchy has resulted in significantly modifying India’s composition of external liabilities. While in the 1990s, almost 95% of India’s foreign liabilities took the form of debt liabilities, by 2014 the share of debt liabilities had dropped to less than 50%... While many other economies such as China, Brazil, and South Korea have also experienced similar changes in the composition of external liabilities, the extent of reduction of debt liabilities in India, is significantly higher than the comparators. Thus it is evident that the policymakers have been successful in altering the composition of flows.”

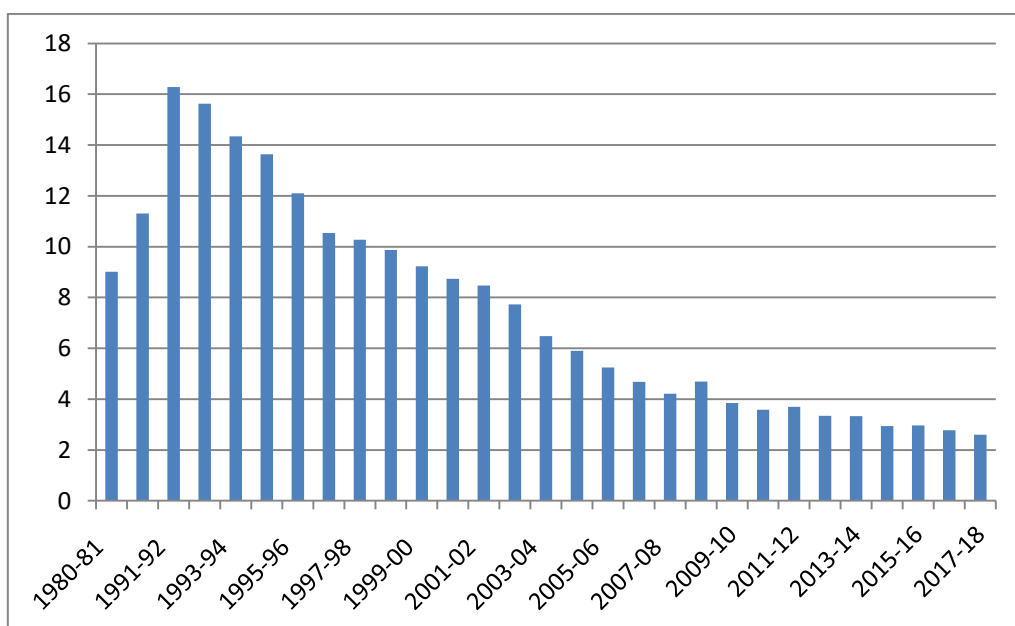
Reserves show an impressive increase, going from 5 billion in the 1990 crises to 369 billion in 2017. Thus, although the imports also increased, the total reserves in months of imports, after reaching a minimum of two months in 1990, recovered to a maximum of twelve months in 2013 and evolved to eight-month in 2015.

Graphic 42 - Indian Reserves in months of imports. 1980-2015

Source: World Bank database.

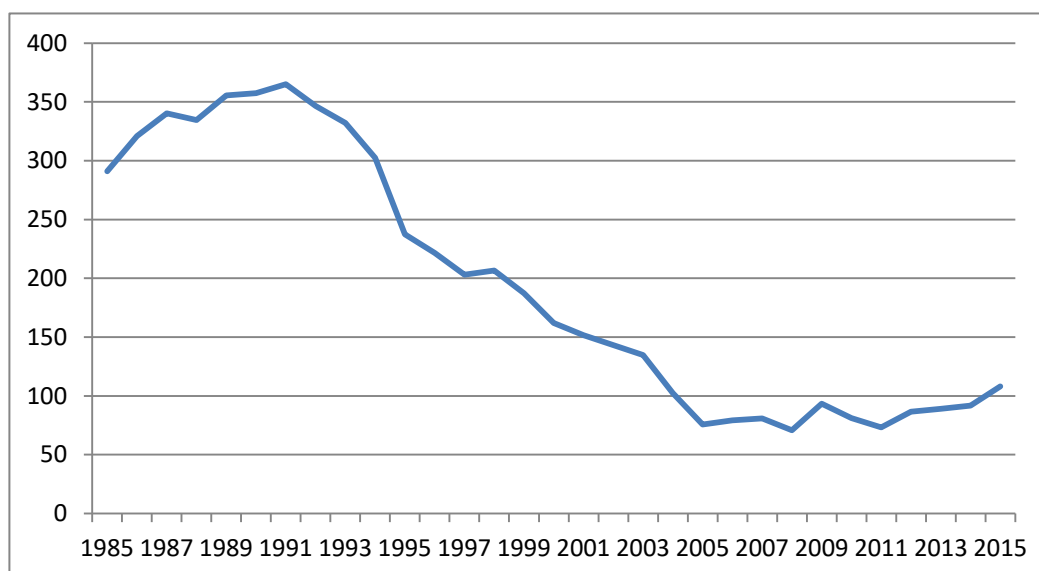
With respect to the central government external sustainability, most of the indicators have improved. After reaching a peak in 1991-2 with the external crisis, the external liabilities of Centre as the percentage of GDP have constantly decreased, going from 16% to around 3% since the 2010s. External debt stock as the percentage of exports of goods and services has significantly reduced, going from more than 350% in 1991 to less than 100% since 2003. Debt service with the IMF as the percentage of exports of goods and services have also decreased from around 30% at the beginning of the 1990s to 3% since 2005.

Graphic 43 -External liabilities of Centre. % of GDP. 1980-1 / 2017-8



Source: own elaboration based on RBI.

Graphic 44 - External debt stock of Centre. % of exports of goods and services. 1985 - 2015



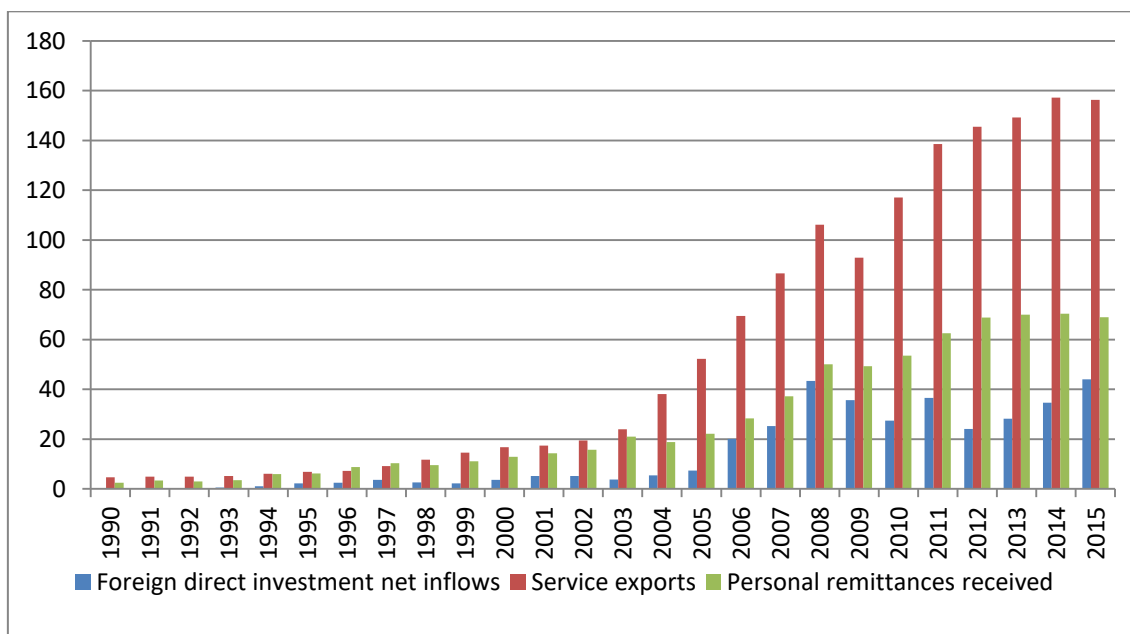
Source: own elaboration based on World Bank Database.

Graphic 45 - Debt service % of exports of goods and services. 1985 - 2015

Source: own elaboration based on World Bank Database.

Next, we will do a zoom in to two of the “new” and extremely relevant components of the Indian external sector, registered in the balance of payments as invisibles, which have significantly contributed to equilibrate the goods trade deficit since the 1990s: remittances and service exports. As we can see next, both service exports and remittances surpassed FDI in terms of US\$ dollars contribution to the Indian economy. Service exports have reached between 140 and 160 billion dollars since 2010, remittances passed 60 billion and FDI was between 20 and 40 billion. Services and remittances are, by large, the two main components in terms of contribution to the external balance.

Graphic 46 - Foreign direct investment, Service exports and Personal remittances. 1990-2015. US\$ billion.



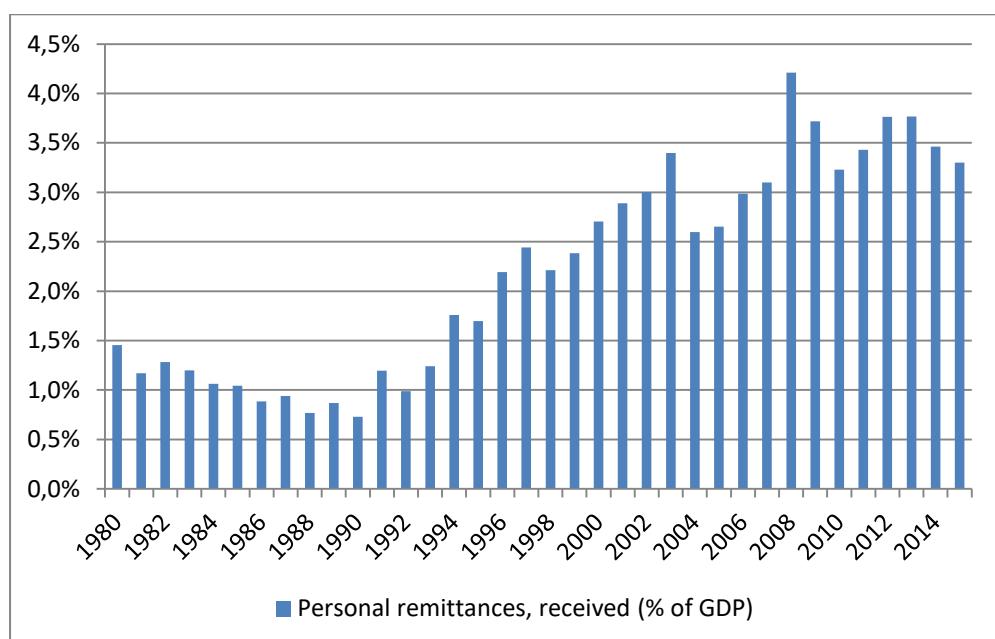
Source: own elaboration based on World Banka Database.

It would be good to highlight a particular and structural aspect of the Indian development path and its implication to the external sector sustainability: the relevance of the brain drain and the Indian Diaspora all around the world, but mainly in the US and the Middle East countries. In fact, both remittances and services exports are closely related to the Non-Resident Indian (NRI) community. As can be seen next, since 2010, India is the first country in the world in terms of remittances inflows, reaching 69 billion US\$ dollars in 2016, over China, Philippines, México, and France, which also integrate the other top 5 countries. The Indian remittances have multiplied by 30 since 1990. In terms of GDP, they have passed from less than 1% at the end of the 1980s and the beginning of 1990s to an average of 3,5% in the 2010s. Thus, they almost doubled the average of US\$ dollars that entered India as FDI during the 2000s.

Chart 54 - Top 10 remittances countries. US\$ Millions. 1985-2017

Migrant remittance inflows	1985	1990	1995	2000	2005	2010	2015	2016
India	2.472	2.382	6.224	12.845	22.125	53.480	68.910	62.744
China	271	124	350	758	23.626	52.460	63.938	61.000
Philippines	806	1.462	5.362	6.957	13.733	20.563	29.799	31.145
Mexico	1.619	3.096	4.365	7.522	22.742	22.080	26.233	28.670
France	1.391	4.034	4.636	8.610	14.212	19.903	23.766	24.373
Nigeria	10	10	804	1.390	14.640	19.745	21.060	20.112
Pakistan	2.540	2.010	1.710	1.080	4.280	9.690	19.306	19.761
Egypt, Arab Rep.	3.210	4.280	3.230	2.850	5.017	12.453	18.325	16.590
Germany	2.018	4.878	4.526	3.640	6.867	12.792	16.133	16.683
Vietnam	1.340	3.150	8.260	13.200	11.880

Source: World Bank Migration and Remittances data.

Graphic 47 - Personal remittances 1980-2015

Source: own elaboration based on World Bank Database.

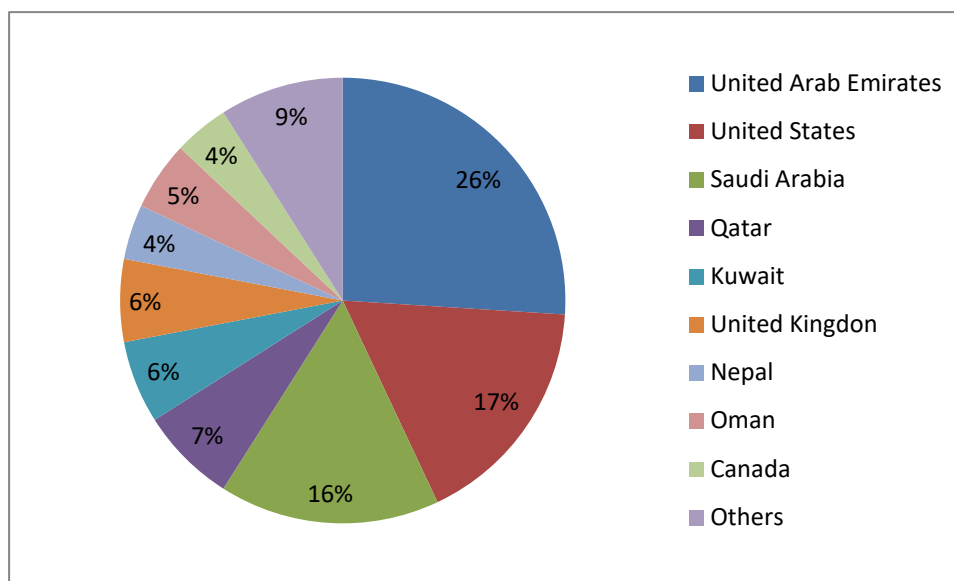
If we analyze the sources of remittances by countries, two main origins appear: the Anglo-Saxon countries, mainly the United States, the UK and Canada and, mainly, the Middle East petroleum countries. The United States represented 17% of the 2016

remittances, the UK 6%, and Canada 4%. The NRI living in the petroleum countries contributed with more than 60% of the remittances, led by the United Arab Emirates, with 26% and Saudi Arabia with 16%.

According to the East-West Center (2017), with 3.5 million people, Indian Americans comprise approximately 18% of the Asian American population of the United States, being the third largest Asian ethnic group living in the United States following the Chinese and Filipinos. Indian Americans are among the wealthiest ethnic groups in the US with a median household income of over \$100,000 in 2015. In fact, the remittances that come from the US are mainly related to high skilled Indian immigration to the Silicon Valley, as we will deepen next.

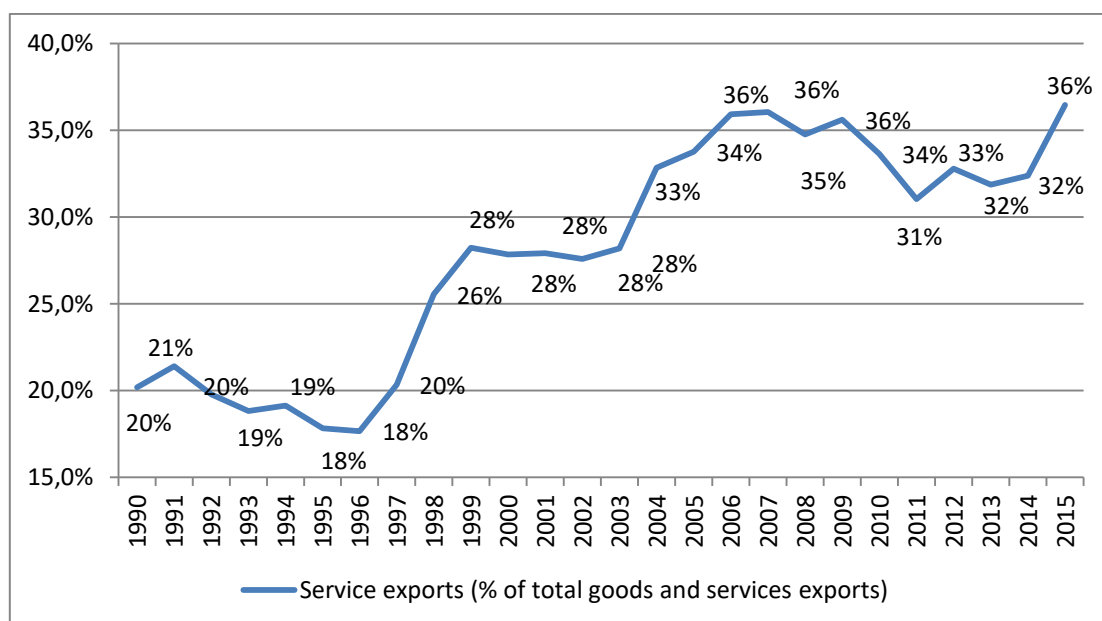
With respect to the petroleum countries remittances, they are mainly related to the historical relationship between the West Indian coast, mainly the Malabar coast, with the Middle East, which has been reinforced since the 1970s, by Indian workers that inserted in the petroleum, construction, nursing and intermediate qualification industries and jobs. In fact, in some South Indian States such as Kerala, the Middle East remittances represent around a quarter of the State GDP and, as it is mostly consumed or invested in construction, it has functioned as an autonomous expenditure.

According to Jayaraman et al (2012), there have been some specific post-1990s policies and initiatives that have stimulated the remittances inflows such as removing the ten-year lock-in restriction to NRI deposits, the facilitation on the process to send money for investment, some incentives to NRI to invest in real estate, etc. But in more general terms, by the late 80s, the NRIs called the attention of the Indian policymakers and they gradually were re-conceptualized as a potential source of knowledge, connections, and capital (Gonzalo and Kantis, 2017; Dossani and Kenney, 2001).

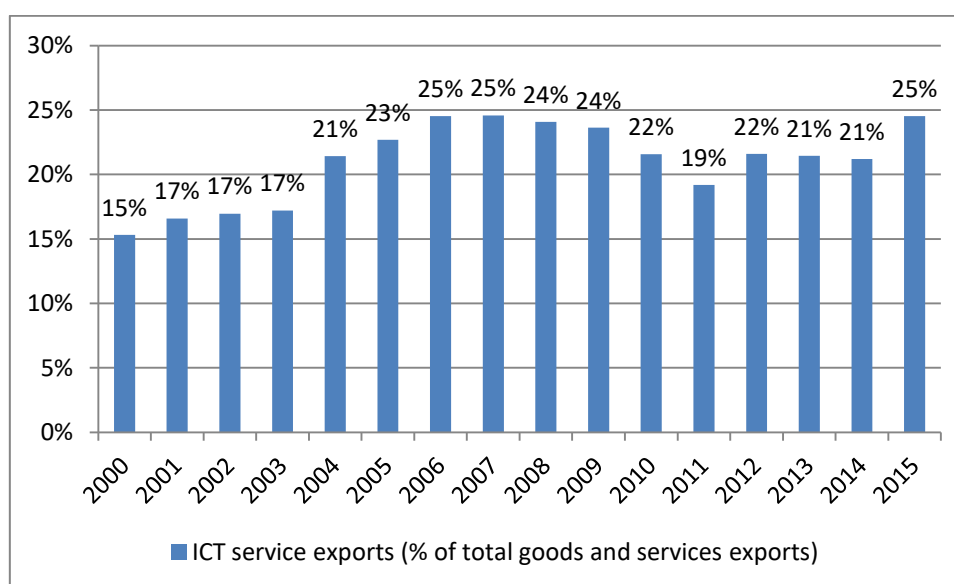
Graphic 48 - Sources of remittances to India by country. 2016

Source: own elaboration based on World Bank data.

It is broadly shared that services exports are a main outstanding feature of the Indian economy in the last three decades. According to the World Bank data, service exports as a percentage of the total exports of goods and services went from 20% in 1990 to 36% in 2015, growing at an average annual rate of 15%. In particular, ICT (Information and Computer Technology) exports increased from 15% of total exports in 2000 to 25% in 2015. Although they have significantly slowed down after the crisis of 2008, ICT exports averaged an annual growth rate of almost 18%. According to Mani (2014b), in 2006, India surpassed Ireland as the first country in terms of Computer and Information Services (CIS) exports, keeping with around 17% of the world market.

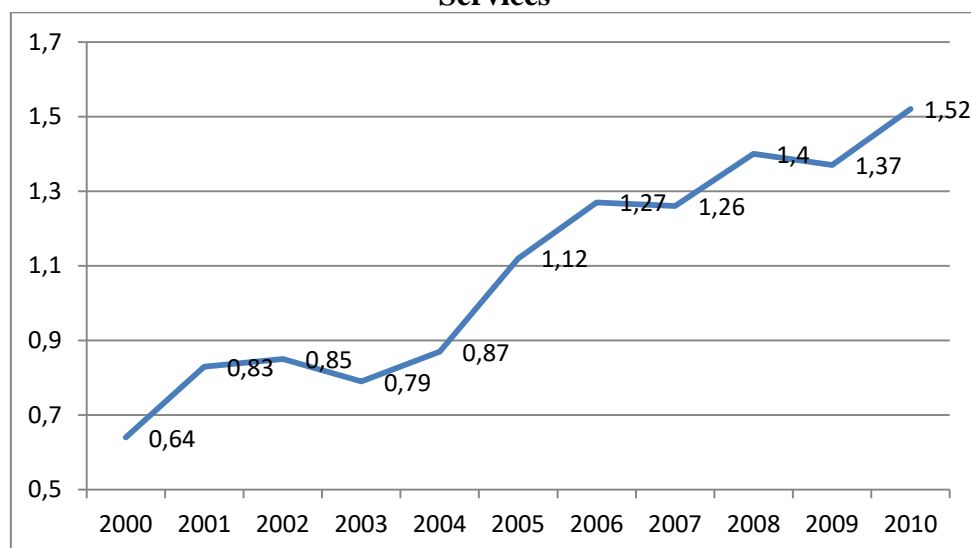
Graphic 49 - Services exports as % of total Indian exports. 1990-2015

Source: own elaboration based on World Bank.

Graphic 50 - ICT exports as % of total exports. 2000-2015

Source: own elaboration based on World Bank.

Graphic 51 - Ratio of India to Ireland's Exports of Computer and Information Services



Source: Mani (2014b)

Between the principal reasons that explain the Indian ICT boom, we can enumerate¹¹¹: a) the process of outsourcing deepened in the US since the 1980s and the nexus role of the Indian Diaspora located in the Silicon Valley with India, b) the qualification and quantity of the Indian manpower, its timeline complementation with the US, the mastery of English language and its relative much minor cost than the developed countries workers, c) the public policy oriented to support the ICT exports: different education programs, fiscal incentives, the establishment of special economic zones and the improvement of physical infrastructure through the development of software technology parks and telecommunication infrastructure, d) the active involvement of the Indian industry association (NASSCOM) and of a new generation of entrepreneurs, e) the Bangalore R&D capabilities accumulation based on the ISRO (Space), DRDO (defense) and State-owned enterprises labs, f) the establishment of the R&D centers and labs of some global firms such as HP, Oracle, IBM, Apple, Google, Microsoft, Intel, etc. since the 2000s.

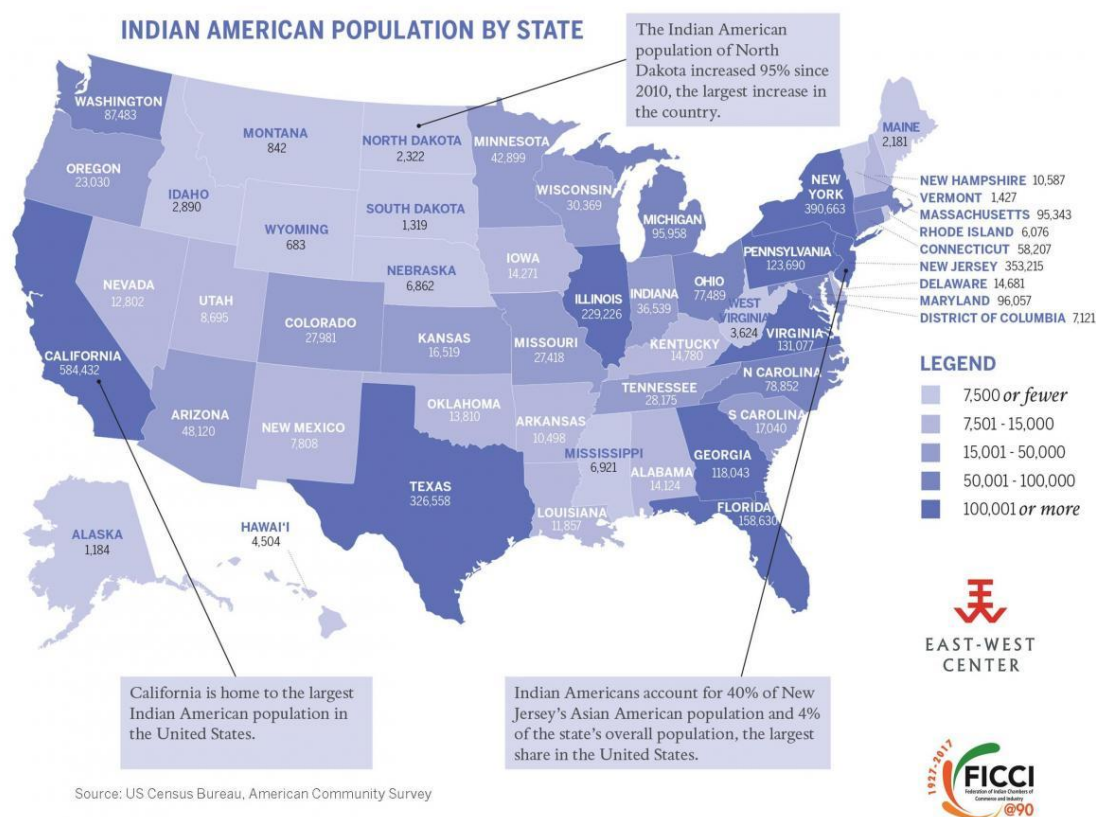
¹¹¹ Several Indian authors have studied the ICT boom and its causes. Between many others, we can highlight the works of Mani (2014, 2009), Joseph and Harilal (2001), Joseph (2014, 2011, 2002), Parthasarathy (2004a, 2004b), Lee et al (2013), Krishnan et al (2009), Chandrasekhar and Ghosh (2017), D'Costa (2003) and Bala Subrahmanya (2016, 2015). In Gonzalo and Cassiolato (2017, 2016) and Gonzalo and Kantis (2006) we have pointed out some elements which explain the success and challenges of the Indian ICT development.

No doubt, the ICT sector has made some relevant contributions to the Indian economy. It generates US\$ dollars, helps to diversify Indian exports profiled, more than half of the revenue is generated by national firms and, according to figures provided by NASSCOM (2017), the whole sector generated 3,9 million jobs in 2017, is the largest private sector (formal) employer of India. At the same time, there are some limitations of the development path of the ICT sector in India. Its contribution has been much more relevant to exports than to GDP: in 2016 it contributed with 25% of the Indian exports and with between 5% and 3%¹¹² of the Indian GDP. It is extremely concentrated in terms of sales (two-thirds of the exports went to the US in 2016) and in regional terms (mainly related to some specific regions and cities of India, such as Bangalore) (D'Costa, 2003 and Joseph, 2014). Furthermore, although there are cases of success, the passage from outsourcing and service firms to the development of products and the construction of their own regional and global value chains is still a challenge for the sector (Lee et al, 2013). Finally, as stated by Chandrasekhar and Ghosh (2017), in parallel with the ICT exports growth, there has been an impressive increment of hardware imports, going in line with the deterioration of the trade balance in goods of the Indian economy since 1990.

Next, some evidence on the relationship between the Indian CIS exports, the Indian Americans, and the Silicon Valley is presented. The Immigration and Nationality Act of 1965 opened the US to immigrants other than traditional Northern European and Germanic groups and the 1970s development of the Silicon Valley attracted the qualified Indian immigration, mainly engineers, constituting them in the main ethnic group involved in the ICT Silicon Valley boom. According to Saxenian (2005) by 2000, around the half of Silicon Valley's scientists and engineers were foreign-born, with Indian and Chinese immigrants alone accounting for over one-quarter of the region's scientists and engineers, approximately 20.000 Indian and 20.000 Chinese. As can be seen in the map before, nowadays, with more than half a million Indian American, it means, almost 20% of the Indian Americans, California is the largest Indian American's State (Chakravorty et al, 2016).

¹¹² There are different problems and discussions around the software contribution to the GDP, in this case, we mainly adopted Joseph (2014) data and NASSCOM data.

Figure 23 - Indian American Population by State. 2016

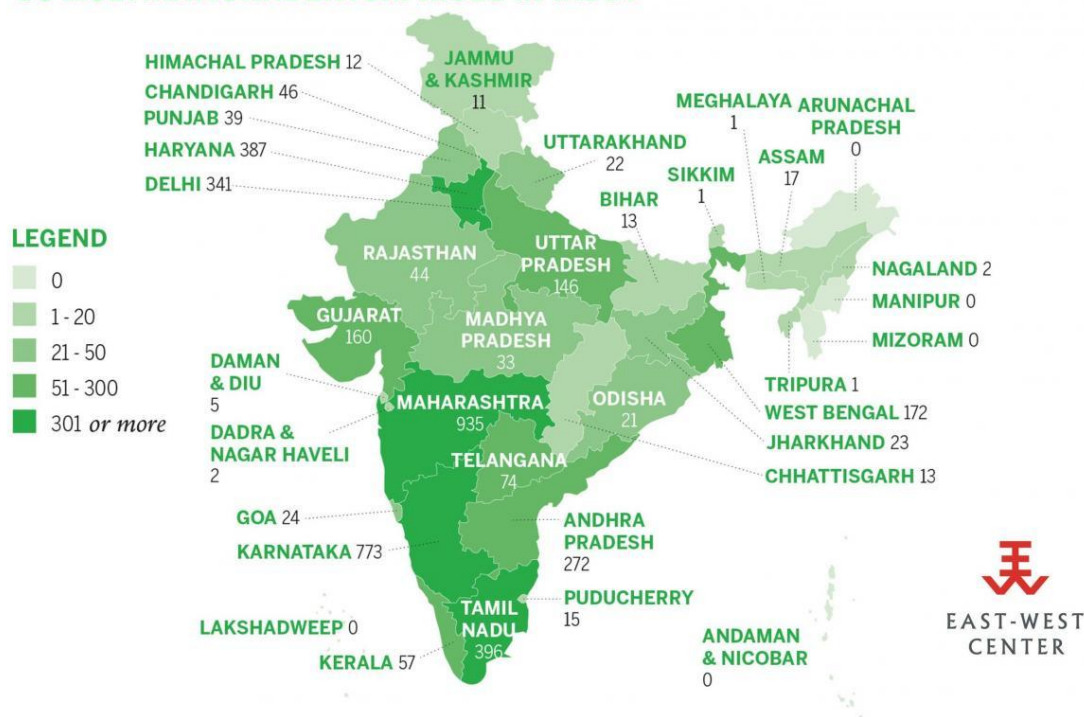


Source: East-West Center (2017)

According to the East-West Center (2017) the total value of US-India bilateral trade increased from \$37 billion in 2005 to \$109 billion in 2015. The US-India direct investment stock went from 10 million in 2006 to 28.3 billion in 2015, representing an increase of 500%. Nearly 2,000 US multinationals are operating in India today. Between them, the State of Karnataka, whose capital is Bangalore, the main Indian ICT city, concentrated 773 US firms, showing a clear link between the US multinationals and the Indian ICT sector. In particular, if we analyze the software business by foreign companies presented by RBI, the US multinationals totalized 65% of it.

Figure 24 - US multinationals enterprises in India by States. 2017

US MULTINATIONAL ENTERPRISES IN INDIA



Source: Uniworld Business Publications (accessed May 2017)

EAST-WEST
CENTER



Source: East-West Center (2017)

Nowadays, Indian American related to the Silicon Valley are playing a key role in the development of the Indian entrepreneurial ecosystem, not just as managers of venture capital funds and angel investors but also as serial entrepreneurs (Mani, 2014a, Bala Subrahmanyam, 2015, Gonzalo and Kantis, 2017). Indian students are the second largest source of international students in the US, being the top destination for Indian students studying abroad: 166,000 Indian students studied in the US during the 2015/6 academic year. In order to give an account of the insertion of the Indian professionals in the US social structure, we can mention Sundar Pichai, who studied technology in the Indian Institute of Technology and did an MBA in Stanford, is the present Google's CEO. Besides, the US firms and government have been directly involved in several investments and innovation support programs such as Startup India, Skill India, Digital India, Smart Cities Mission, Make in India and Clean India.

Summing up, we have seen that the trade balance, mainly of goods, has deteriorated during this period. This is a main challenge for the Indian NSI and a potential vulnerability for the Indian economy. However, this deficit has been more than compensated by capital inflows, personal remittances, and service exports. Between capital inflows, forward direct investment was preferred, showing a growing trend during the period, although with a minor contribution to GDCF. Remittances and services exports were the other new significant segments of the external sector. Remittances are closely related to the Indian Diaspora in the US, many of them educated in Indian institutions at the bachelor level, and with the Indian immigration to the petroleum countries. Services exports are even much more related to the Indian American community in the Silicon Valley and the outsourcing process initiated by the US mainly since the 80s. The Indian NSI has contributed significantly both to the education of the Indian Diaspora and to the accumulation of capabilities that permitted to capitalize the US outsourcing opportunities.

Reserves experienced an impressive increase, reaching 370 billion in 2016-7. The three Central government external sustainability indicators analyzed, the external liabilities of Centre as a percentage of GDP, external debt stock as a percentage of exports of goods and services and debt service with the IMF as a percentage of exports of goods and services, have improved. It seems that the liberalization of the Indian capital account has been carefully managed, with an active policy of reserves accumulation and improving the Indian debt profile. Deeper research should be conducted on the role of the closer Indian foreign alignment with the US during this period and its impact on the Indian capital inflows.

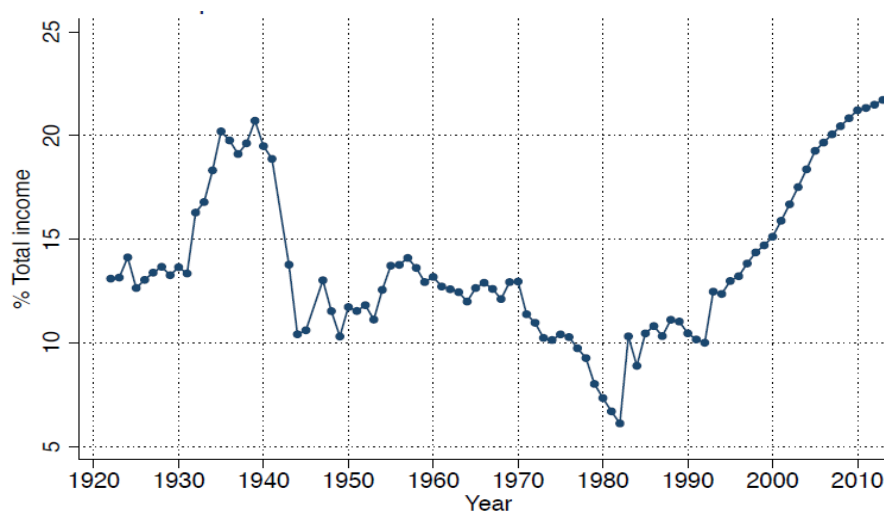
4.4.5. “Structural heterogeneity”:

In this sub-section, a few selected indicators and evidence will be pointed out in order to give account on the still significant (and in some cases increasing) asymmetries

and deficits of the Indian productive and social structure¹¹³, giving an account of a marked structural heterogeneity.

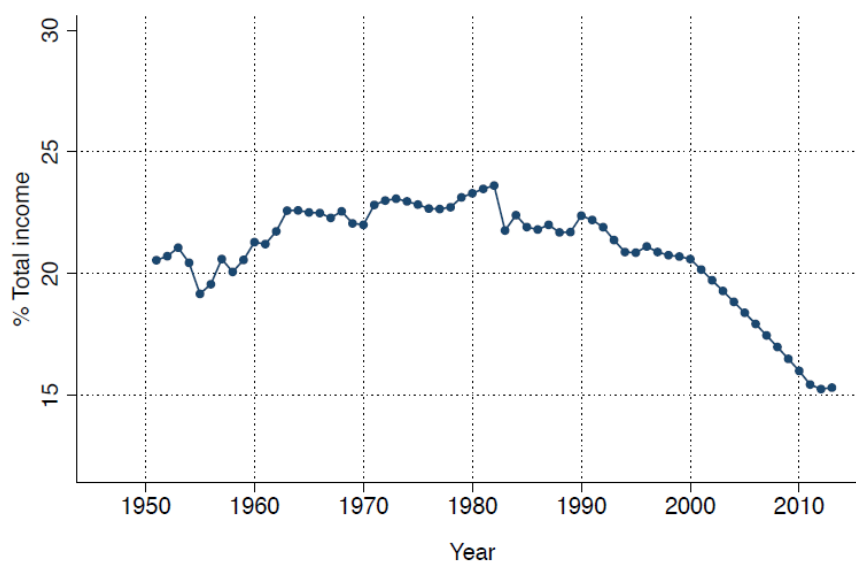
In line with the data shown before about consumption, most of the figures related to income inequality show a trend of increasing concentration favoring the top segments of the Indian society. For instance, in the Forbes' Indian Rich lists, the wealth of the richest Indians amounted to less than 2% of National income in the 1990s, but increased substantially throughout the 2000s, reaching 10% in 2015 and a peak of 27% before the 2008-9 financial crises. As presented next, according to Chancel and Piketty (2017), India recorded the highest increase in the share of the top 1% in national income over the past three decades, going from 6,2% in 1982–83 to 21,7% in 2013–14. Incomes of the top 10%, the top 1%, the top 0,1%, the top 0,01%, and the top 0,001% grew at 394%, 750%, 1,138%, 1,834% and 2,726%, respectively. In fact, India recorded the highest gap between the growth of incomes of the top 1% and the growth rate of incomes of the full adult population. While the incomes of the bottom 50% grew in China over the period 1980–2014 by 312%, those of the bottom 50% in India grew by only 89%. As a result, the participation of the bottom 50% in total income in India decreased from around 22% to around 15%.

Graphic 52 - Top 1 % income share in India: 1922 - 2014



Source: Chancel and Piketty (2017)

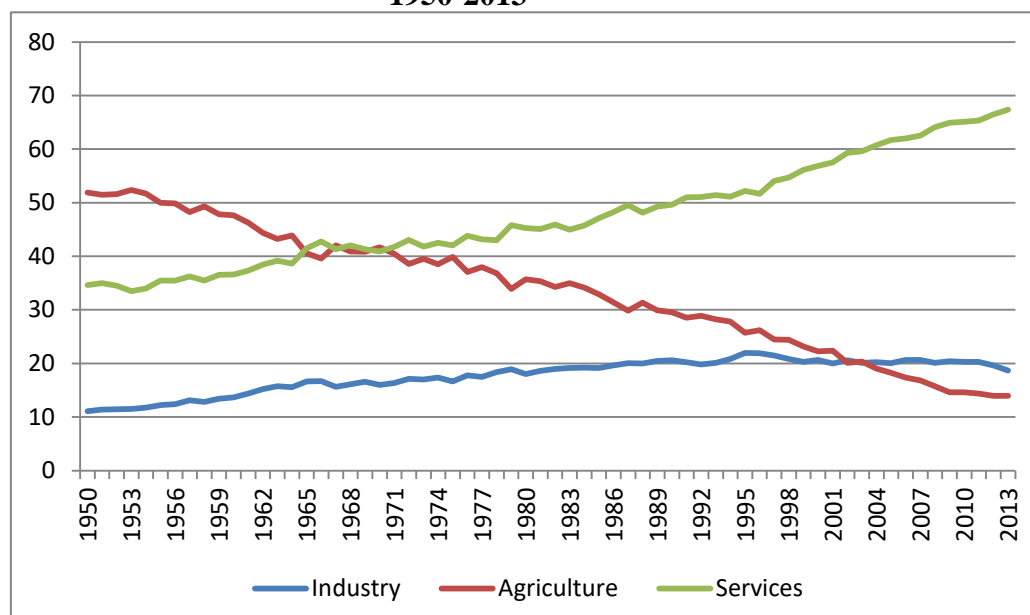
¹¹³ This aspect of India is well work and discuss by several authors. We will only highlight some points in order to give a big picture of the Indian structural heterogeneity. The works of Chancel and Piketty (2017) and Drèze and Sen (2013), among many others, could be seen as a deeper work on inequality and development indicators.

Graphic 53 - Bottom 50% income share in India: 1951 - 2014

Source: Chancel and Piketty (2017)

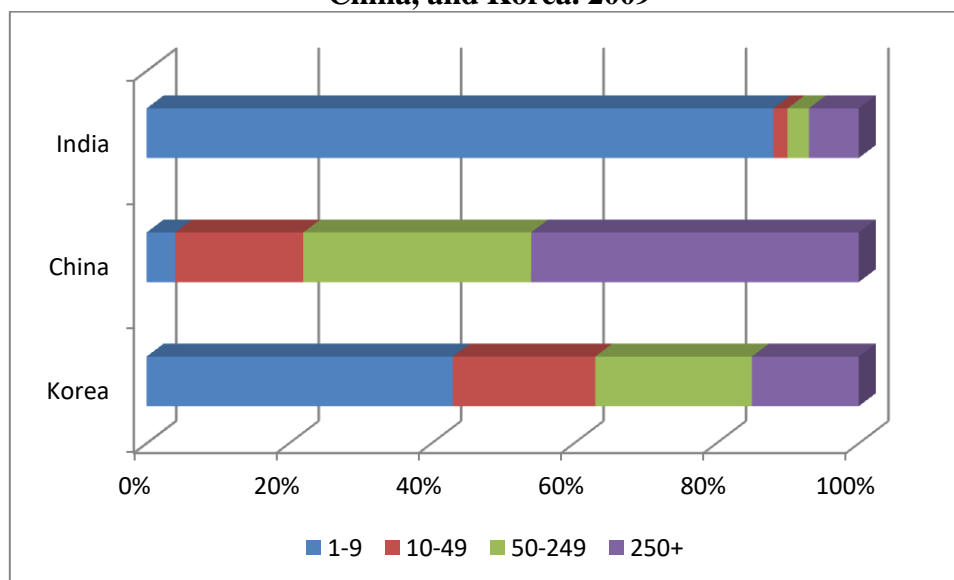
In relation to the productive structure, as can be seen next, the increase in the participation of the service sector (and the decrease of agriculture sector) in GDP is a main long-term feature of the Indian economy. In 1990 services already represented around 50% of GDP and agriculture 30%. In 2013 services were around 68% and agriculture 14%. The stagnant participation of industry, not surpassing 20% of participation since the 1990s, is another main feature of the Indian growth path. In this context, it should be highlighted that, in terms of entrepreneurial structure, India shows an outstanding representation of firms with less than 9 employees. According to the last figures that we have, in 2009, 88% of Indian firms were between 1 and 9 employees. This firm's size distribution is totally different to China's one, where firms between 1 and 9 employees represented less than 10% and to Korea's one, where they represented 40% of the entrepreneurial structure. Mainly, this reflects the significant weight of informal sector and self-employment in the Indian economy.

Graphic 54 - GDP sector share at constant prices: Industry, Agriculture, Services. 1950-2013



Source: own elaboration based on MOSPI.

Graphic 55 - Size distribution of nonagricultural firms by employment. India, China, and Korea. 2009

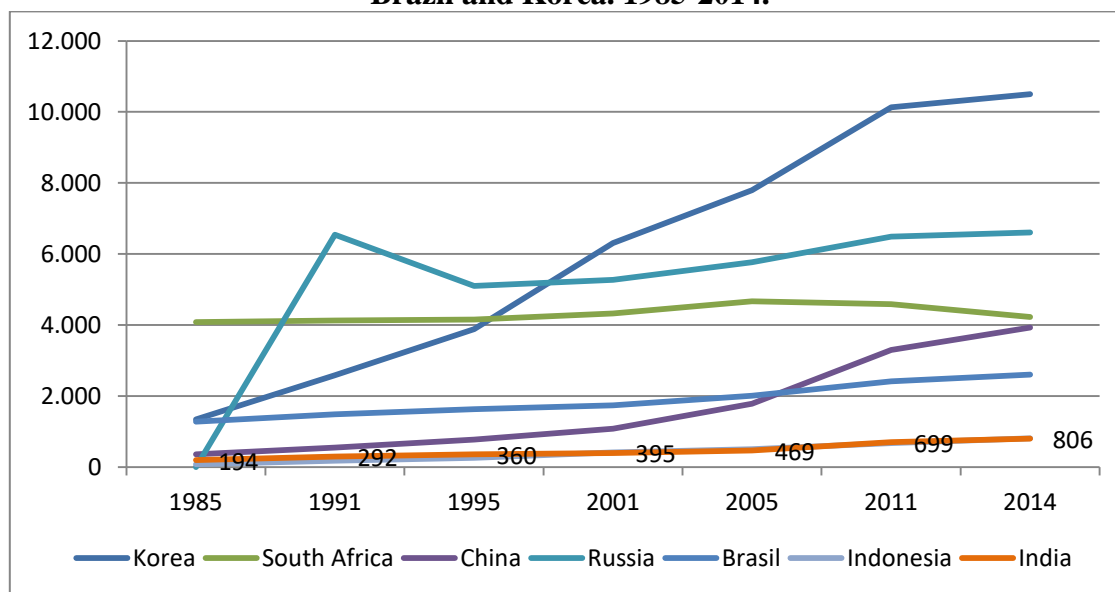


Source: own elaboration based on Bardhan (2010)

Related to the entrepreneurial structure, it is interesting to present the comparison of the Indian per capita electric consumption with respect to other countries such as China, Brazil, Russia, Korea, South Africa and Indonesia. As we have seen, India's electric per capita consumption has been steadily increasing, however, the

Indian levels are, with Indonesian ones, the lowest by large in international terms. Korea per capita consumption, for instance, is more than 10 times the one of India and all the other members of the BRICS show higher electric consumption per capita than India. This fact reflects a still low power intensity of the Indian productive profile.

Graphic 56 - Electric consumption per capita. India, China, Russia, South Africa, Brazil and Korea. 1985-2014.



Source: own elaboration based on World Bank database.

Related to the urban/rural gap, for instance, according to the Census of 2011, while 71.2% of urban India's population had access to drinking water within the premises, only 35% of rural people had. Even worst, 22% of rural people had to move away a significant distance to have access to drinking water.

Chart 55 - Rural-Urban distribution of drinking water facilities. 2011

Drinking Water Characteristics	Total	Rural	Urban
Within the premises	46,6	35,0	71,2
Near the premises	35,8	42,9	20,7
Away	17,6	22,1	8,1
Total	100,0	100,0	100,0
Tap water	43,5	30,8	70,6
Tap water from treated source	32,0	17,9	62,0
Tap water from un-treated source	11,6	13,0	8,6
Well	11,0	13,3	6,2
Covered well	1,6	1,5	1,7
Un-covered well	9,4	11,8	4,5
Tubewell/Borehole	8,5	8,3	8,9
Hand pump	33,5	43,6	11,9
Spring	0,5	0,7	0,2
Tank/Pond/Lake	0,8	1,1	0,4
Other sources	2,2	2,2	1,8
Total	100,0	100,0	100,0

Source: own elaboration based on MOSPI (2017).

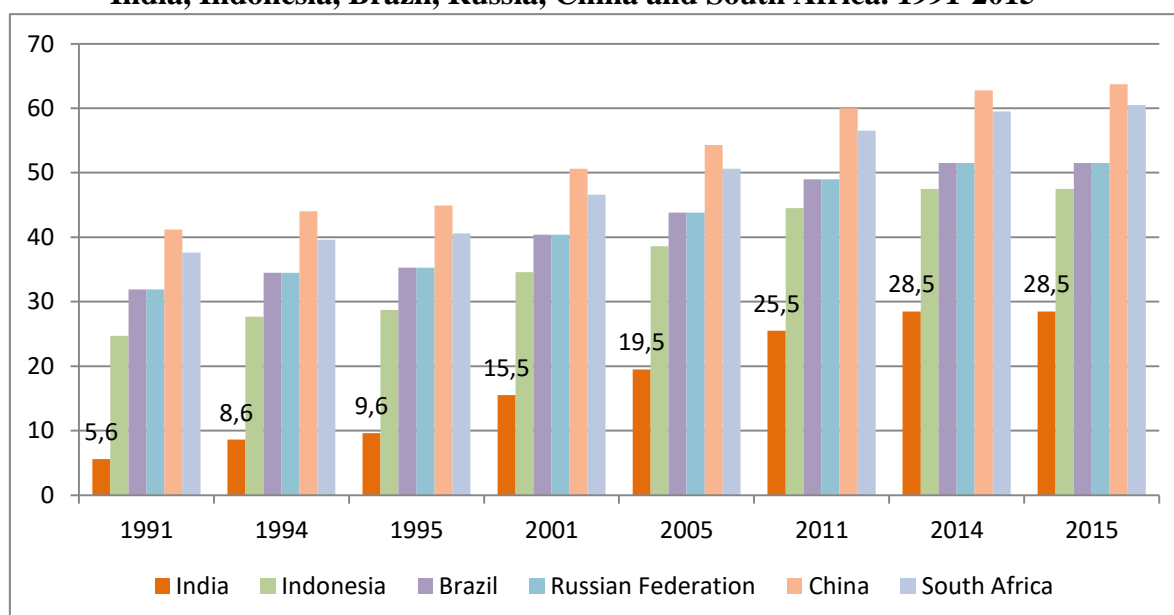
In a similar way, only 30% of rural India had access to a latrine facility within premises, while 81% of urban people had it in 2011. In fact, 67.3% of rural India used open-spaces as the toilet¹¹⁴. In international terms, according to World Bank data, although India has evolved from a proportion of around 6% of rural people using basic sanitation in 1991 to 29% in 2011, India still shows the worst indicator compared with the other BRICS countries and Indonesia.

¹¹⁴ In addition to the rural-urban gap in basic sanitation, as stress by Joseph and Abrol (2009), the digital divide in terms of the use of internet and mobiles is another strong asymmetry of the recent times.

Chart 56 - Rural-Urban distribution of toilet facilities in India. 2011

Type of toilet	Total	Rural	Urban
Latrine facility within premises	46,9	30,7	81,4
Water Closet	36,4	19,4	72,6
Piped sewer system	11,9	2,2	32,7
Septic tank	22,2	14,7	38,2
Other systems	2,3	2,5	1,7
Pit latrine	9,4	10,5	7,1
Other latrines	1,1	0,8	1,7
No latrine within the premises	53,1	69,3	18,6
Public latrine	3,2	1,9	6,0
Open	49,8	67,3	12,6
Total	100,0	100,0	100,0

Source: own elaboration based on MOSPI (2017).

Graphic 57 - Rural population with access to improved sanitation facilities. %. India, Indonesia, Brazil, Russia, China and South Africa. 1991-2015

Source: own elaboration based on World Bank database.

The urbanization process is not exempt from urban bottlenecks. Particularly, between 2001 and 2011 the urban people living in slums went from 55,8 million to 80,8 million, with an absolute increase of 25 million, it means, an increase of 45%.

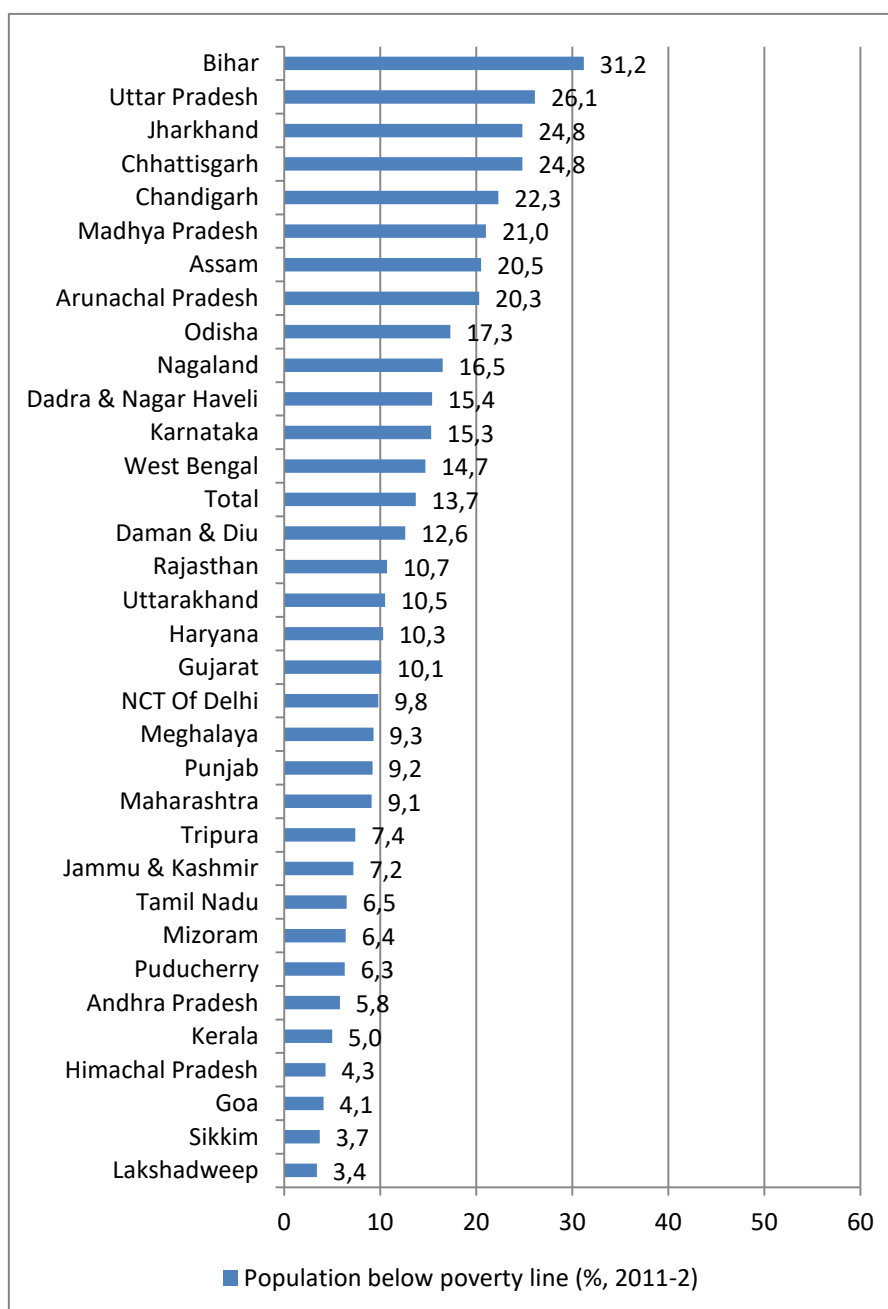
Chart 57 - People living in urban slums. 2001-2011

Urban Slum all towns	2001	2011	Absolute change	%
	55.832.570	80.888.766		

Source: own elaboration based on MOSPI (2017).

In regional terms, there are still significant asymmetries between the Indian States. For example, as can be seen next, with respect to the people living below poverty line¹¹⁵, the Southern States such as Goa, Kerala, Tamil Nadu and Puducherry have the best figures, being below 7%, but the poorest States such as Bihar, Uttar Pradesh, Jharkhand, between others, are above 25%.

¹¹⁵ This poverty line indicator is the one provided by the Government of India, published in RBI.

Graphic 58 - Population below the poverty line by states. 2011-2. %

Source: own elaboration based on MOSPI (2017).

Finally, with respect to human development indicators, we can observe that life expectancy has improved, going from 63.1 years for 2000-2005 to 66.3 years for 2010-2015, however it is still below the Asian average and of all the other continents indicators with the only exception of Africa. In particular, the number of infant death before reaching one year, although improving in the last decades, is still huge in India. In 1985 infant death before reaching one year totalized more than 2,5 million and in

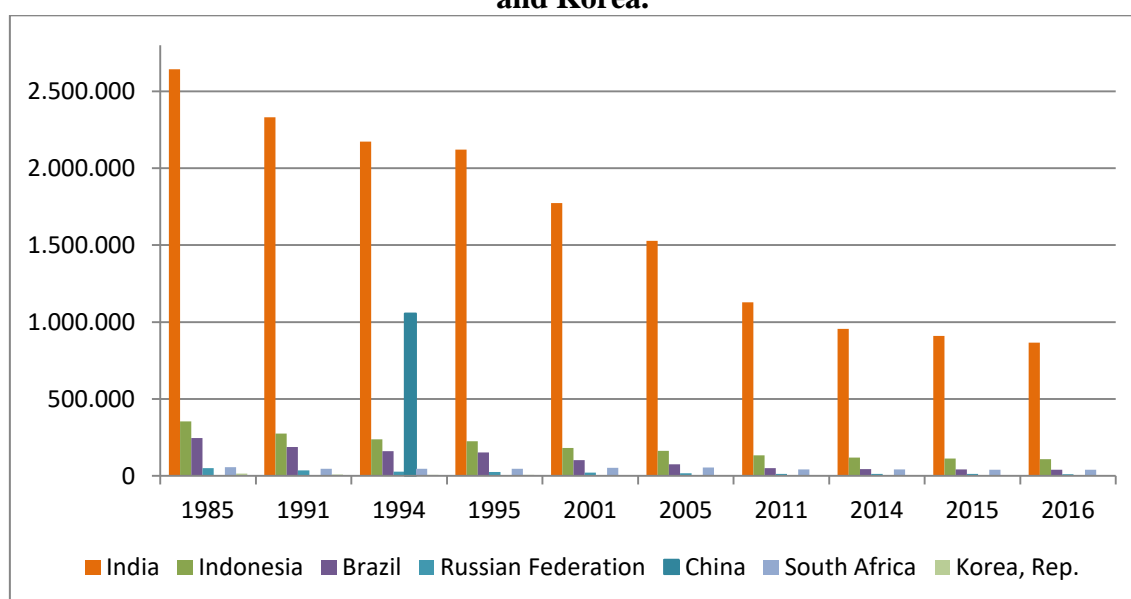
2016 it went down to around 900.000, being, by large, the highest in the comparison with the BRICS countries, Indonesia and Korea.

Chart 58 - Life expectancy at birth. India, the continents, and the World. 2000-2015

Life expectancy at birth	India	Latin American and Caribbean						World
		Asia	Africa	Europe	North America	Oceania		
2000-2005	63,1	68,8	52,9	73,8	72,1	77,4	75,3	67,1
2005-2010	64,9	70,3	55,6	75,3	73,5	78,4	76,8	68,7
2010-2015	66,3	71,4	58,2	76,1	74,7	79,1	77,6	70,0

Source: own elaboration based on MOSPI (2017).

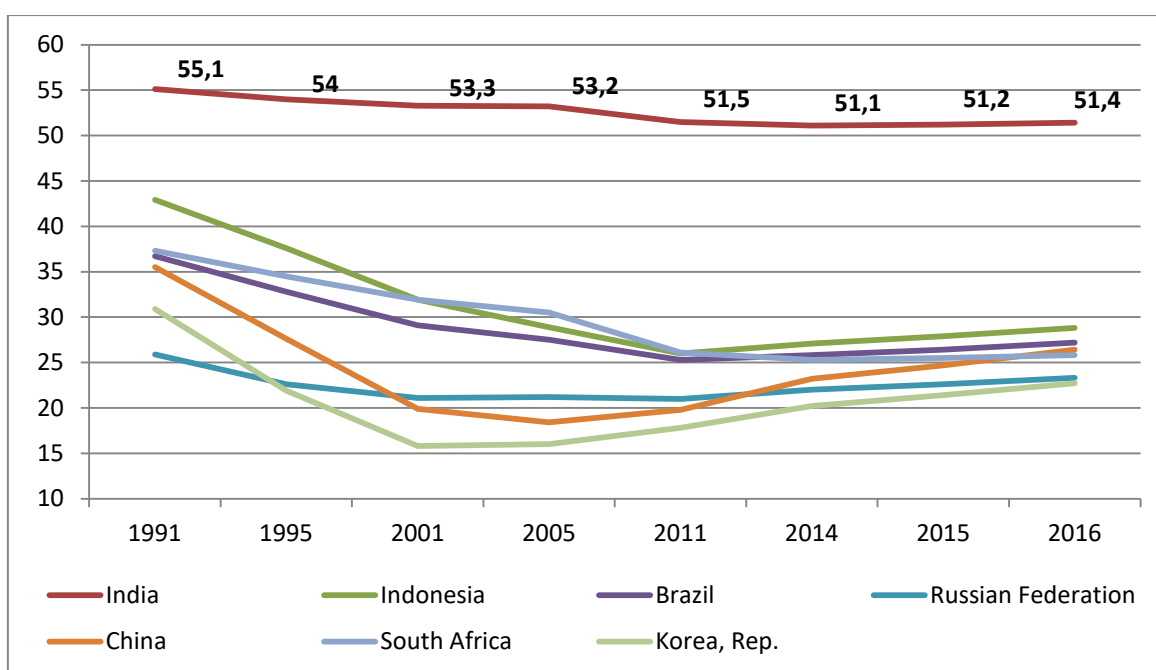
Graphic 59 - The number of infant death Number of infants dying before reaching one year of age. 1985-2016. India, Indonesia, China, Russia, Brazil, South Africa, and Korea.



Source: own elaboration based on MOSPI (2017).

Furthermore, there are strong asymmetries related to Indian women indicators; for instance, if we compare the proportion of anemia in women between fifteen and forty-nine years, India, with around 50%, doubles the indicators of the BRICS, Korea, and Indonesia.

Graphic 60 - Anemia in women of reproductive age (15-49). %. India, Indonesia, China, Brazil, South Africa, Russia, and Korea



Source: own elaboration based on World Bank database.

Summing up, we have presented some selected indicators in order to show that, despite the accelerated growth process, there are still significant (and in some cases increasing) asymmetries in the Indian society. According to the data presented, income inequality has increased. The productive and entrepreneurial structure shows the main relevance of the informal and self-employed economy. The urban-rural gap is marked and States inter-heterogeneity is quite significant. Finally, although some indicators such as life expectancy, infant mortality, and women related indicators have evolved positively during this period, they are still markedly lagged in international terms.

4.4.6. National System of Innovation policymaking, actors, results and challenges

With respect to STI policymaking, I can identify two main general approaches since the 1990s. First, since the New Industrial Policy of 1991, the need to achieve international competitiveness was put first, redefining self-reliance in order to focus on the complementarities between foreign technology and domestic R&D. Then, since the 2000s, with the Science and Technology Policy of 2003 and with the one of 2013, although still stressing the need to achieve global competitiveness, inclusive innovation, entrepreneurial policies, PPPs and the systemic aspects of innovation were more emphasized with several policy initiatives oriented in these lines. All in all, technology missions have continued to be a main instrument for the Indian STI policy.

In 1991, the Ministry of Industry declared (Planning Commission, 1991):

“while the government would continue to follow the policy of self-reliance, there would be greater emphasis placed on building up India’s ability to pay for imports through its own foreign exchange earnings. At the same time, foreign collaborations would be welcomed in investment and technology in order to increase exports and expand the production base requiring higher technology...”

It was understood that the Indian industry has reached a certain level of resilience, sophistication and size and a much more dynamic and competitive relationship with foreign firms was stimulated (Krishna, 2013). According to Joseph and Abrol (2009) the main policy changes of the 1990s were: 1) corporate sector, including foreign firms, were gradually freed from controls, 2) Indian firms were permitted to enter into collaboration with foreign firms of their own choice, 3) fiscal and non-fiscal incentives were implemented for undertaking in-house R&D to encourage firms to innovate in terms of new products, process and take-up imported technology, 4) the IPR (Intellectual Property Rights) were changed in order to grant an absolute monopoly of the generators of intellectual property.

Financing instruments and institutions also experienced changes since the mid-1990s. According to Nayyar (2015) development finance institutions suffered a reduction in their role, mainly being transformed into commercial banks. For instance, with the exception of the Industrial Finance Corporation of India (IFCI) and the State Industrial Development Corporations (SIDC), the Industrial Credit and Investment

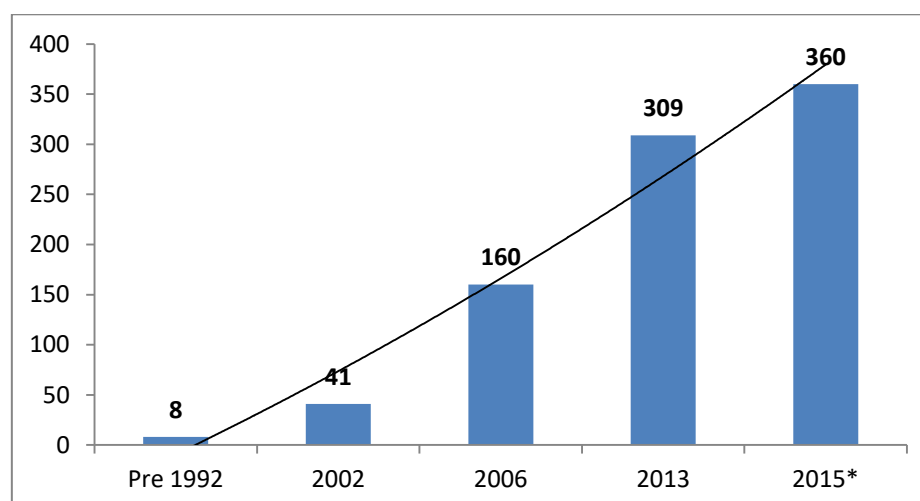
Corporation of India (ICICI) and the Industrial Development Bank of India (IDBI) were reorganized in order to operate in line with commercial banks standards. Long-term financing to the industry was replaced by infrastructure financing. The Infrastructure Development Finance Company (IDFC) was incorporated in 1997 as a private company to foster the growth of private capital flows for infrastructure financing and the India Infrastructure Financing Company Limited (IIFCL) was incorporated in 2006 as a wholly-owned government company to provide long-term finance for infrastructure projects in transportation, energy, water, sanitation, communication and commercial infrastructure. The IIFCL priority has been the financing of PPPs.

Particularly with respect to financing innovation, Mani (2014a) points out that since the 1990s there were three main financial instruments: tax incentives, research grants, and venture capital. The former two are almost entirely provided by the government while the latter has gradually been domain by the private sector. Relating to tax-incentives, they have been the main instrument for financing the S&T policy since the 1990s, with a wide range of tax exceptions and deductions schemes linked to R&D activities. Pharmaceutical, biotechnology, chemical, electronic equipments, telecommunications, automobiles and seeds and agricultural implements have been the main industries benefited by this instrument. However, Mani (2014a) points out that private R&D has been inelastic to subsidies during the 2000s.

With respect to research grants, Mani (2014a) distinguishes three main grant schemes: Finances from the Technology Development Board (TDB), Techno-entrepreneurs Promotion Programme (TePP) and the New Millennium India Technology Leadership Initiative (NMTLI). The TDB started in 1996 financing support to the commercialization of indigenous technology, whether developed in-house or acquired from a government research institution. The TEPP was launch in 1998 oriented to help individual innovators, in order to stimulate the emergence of techno-entrepreneurs. It helps the innovator to network with appropriate R&D institutions, technical consultancy, development of models and prototypes, deal intellectually with property rights and gives a grant-aid to develop the prototype and commercialized it. The NMTLI was announced in 2000 with the aim of catalyzing scientific and technological developments as a vehicle for selected Indian industries to attain global leadership. It adopted a strategy of selecting and supporting technological and industry winners in order to project them globally.

Related to venture capital (VC), State-owned institutions such as the Technology Development & Information Company of India Ltd (TDICI) have had the main role in introducing the instrument at the end of the 1980s. However, during the 1990s and mainly since the 2000s, with the Indian ICT boom, the industry has taken off mainly led by private VC funds, with an increasing role of foreign VC funds related to Private Equity funds (Joshi, 2015; Mani, 2014a; Gonzalo and Kantis, 2017). According to Joshi (2015), based on Venture Intelligence (2014), the number of VC funds based in India has gone from 8 in 1992 to approximately 360 in 2015. To this number, foreign VC funds that do not have offices in India but they still invest in India should be added. There were around 200 funds in this condition in 2013¹¹⁶.

Graphic 61 - Number of Indian based VC funds. 1992-2015*



Source: Joshi (2015) based on Venture Intelligence.

According to Joseph and Kakarlapudi (2014), in the 2003 Policy, in parallel to global competitiveness, it was also stressed the need to connect the Indian S&T system with raising the quality of life of the people, particularly of the disadvantaged sections

¹¹⁶ If we take together PE and VC funds, 82% of the Indian investments between 2013 and 2015 were made by foreign funds. As stated in the India VC and Private Equity Report (2015), the Investment made by foreign VC&PE funds exceed that of domestic firms in the ratio of 4:1. Most of the foreign VC funds by-pass the Securities and Exchange Board of India (SEBI) enforcement route and are invested via the FDI route.

of the society. The Science and Technology Policy of 2003¹¹⁷ highlights the achievements of the S&T policy in turning some industries globally competitive such as ICT, biotechnology, and pharmaceutical but also stresses the relevance to give a major emphasis on innovation as a systemic phenomenon (Krishna, 2013). The transformation of new ideas into commercial successes was considered central, given priority not only to R&D and technological efforts, but also to social, institutional and market factors needed for adoption, diffusion and transfer of innovation. In fact, for the first time appeared in the official documents the idea of a “comprehensive national system of innovation”, including, in addition to science and technology, legal, financial and other aspects related to innovation. Among the main initiatives of the STIP of 2013 Krishna (2016) highlights: to enhance the role of private sector in the national science, technology and innovation system in a PPP mode, looking to attain 2% of GDP in R&D, to integrate agriculture R&D policy with national R&D system, to promote mechanism such as the “Risky Idea Fund” and the “Small Idea Small Money”, to position India among the top 5 global scientific powers by 2020, etc.

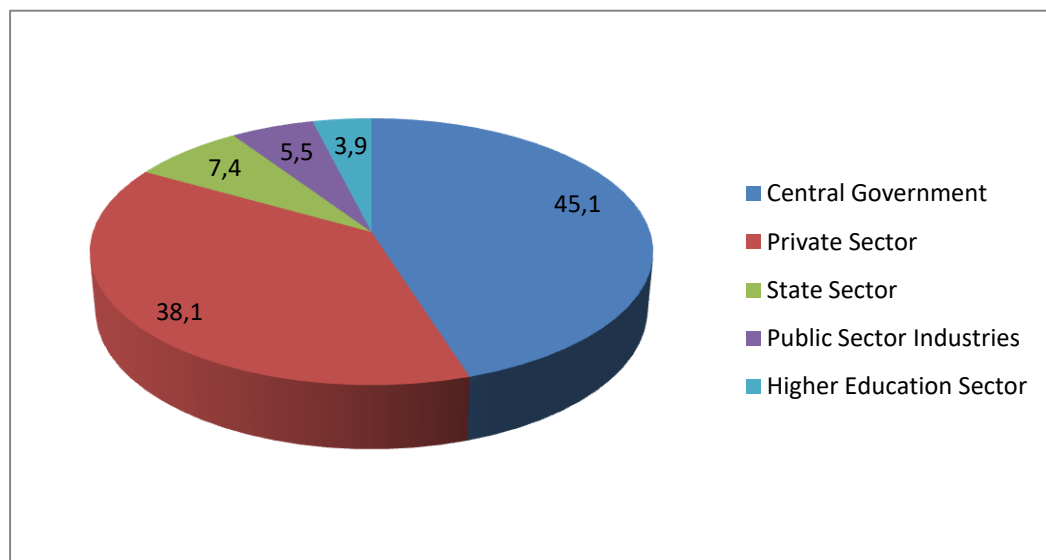
In this policymaking context, since the 1990s the Indian NSI has experienced a process of decentralization with some actors gaining relevance. Krishna (2013) points out that the decentralization of the S&T policies has ended with the domination of physicists, the main S&T policymakers between the 1950s and 1970s. New profiles such as technocrats, chemists and biologists acquired greater relevance in the S&T organizational structure. But also the private sector increased its influence and different grassroots groups achieved more relevance. According to Krishna (2016) the main contemporary Indian NSI actors are a) the public research system (including States and CPSEs), b) the private business enterprises and the transnational corporations, c) the higher education institutions and d) the intermediate organizations, NGOs, and other civil society organizations.

The public system is, by large, the main contributor to the Indian R&D expenditure: Central Government plus State Governments plus CPSEs contributed with 58% of the total R&D in 2014-5, private sector (both national and transnational firms)

¹¹⁷ Besides, with the 2003 Science and Technology Policy a massive exercise on forecasting in 20 sectors was undertaken that resulted in the document titled “India 2020. Vision for the New Millennium”.

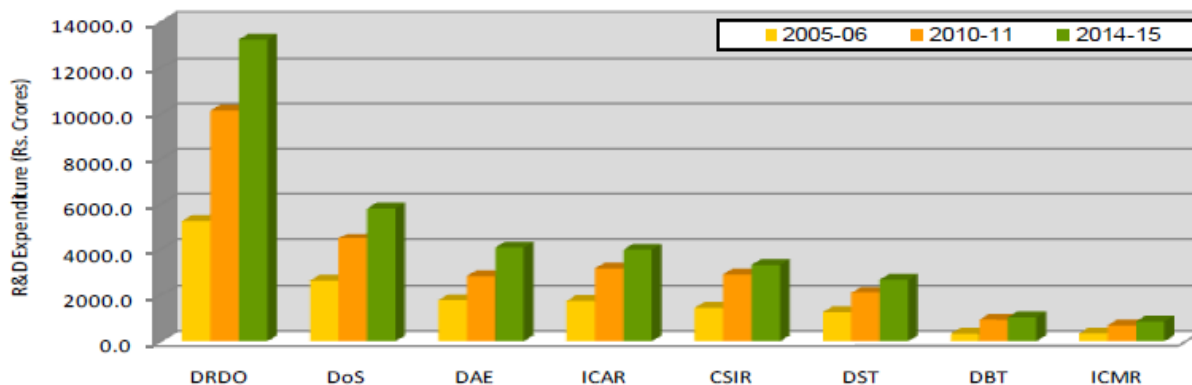
contributed with 38% and higher education (mainly public) with 4%. Next, we will deepen on the different contemporary actor of the Indian NSI.

Graphic 62 - Indian R&D expenditure by sector 2014-2015



Source: Research and Development Statistics at a glance 2017-2018 (2018)

Public sector institutions comprise national laboratories under a number of science and technology agencies from space, atomic energy, agriculture and industrial research and in-house laboratories of the CPSEs in steel, fertilizers, railways, power, chemical, petroleum, etc. With respect to the Central government scientific agencies, in 2014-5, DRDO (Defence Research & Development Organization) accounted for the maximum share, with 37,8%, followed by DOS (Department of Space) with 16,6%, DAE (Department of Atomic Energy) with 11,6%, ICAR (Indian Council of Agriculture Research) with 11,4% and CSIR (Council of Scientific & Industrial Research) with 9,5%. Then, the DST (Department of science and technology), DBT (Department of Biotechnology) and the ICMR (Indian Council of Medical Research M) contributed with less than 10%.

Graphic 63 - R&D expenditure by main public scientific agencies. 2005-2014

Source: Department of Science & Technology, Government of India.

The private sector, both Indian business groups, and transnational enterprises have been gradually growing its relevance and influence on the Indian NSI. With respect to the local business groups, or the so-called "national champions", Rahul Bajaj, from the three-wheeler auto sector, Ratan Tata and Keshub Mahindra, from automotive, Narayana Murthy and the software association Nasscom, Ambani brothers from the petrochemicals and telecommunications industry, Mittal brothers from telecommunications, Baba Kalyani from industrial forging and representatives from the private industrial associations such as FICCI, NASSCOM and CII have gained influenced on the S&T debate. The emergence of the PPPs and the different spaces and forums where the private sector has had the main role are part of this process.

According to Jadhav and Reddy (2017), since the 1990s, the top 30 Indian business groups have increased their participation in terms of sales and total assets. In fact, according to Abrol (2013), Indian business groups are still the dominant actor of the Indian entrepreneurial structure. Indeed, rather than losing their economic dominance with liberalization, business groups, by leveraging their expertise, knowledge, relations and financial strength, were able to harness new opportunities. Relations between the political class and business groups have continued during liberalization and pecuniary benefits such as tax advantage, direct subsidies and favourable transactions related to disinvestment and privatization of state-owned enterprises were there¹¹⁸. If we observe the evolution of the top-20 business groups

¹¹⁸ For a deeper overview of the evolution of the main Indian groups see Sarkar (2010).

since 1990 to 2012, we see the persistence of groups such as Tata, Reliance, ITC, Birla, UB, Mahindra and Mahindra and Larsen & Toubro as the main ones. Then, for instance, groups such as Wipro, related to ITC and Hero, to automotive, have gained relevance recently, in 2010-2012.

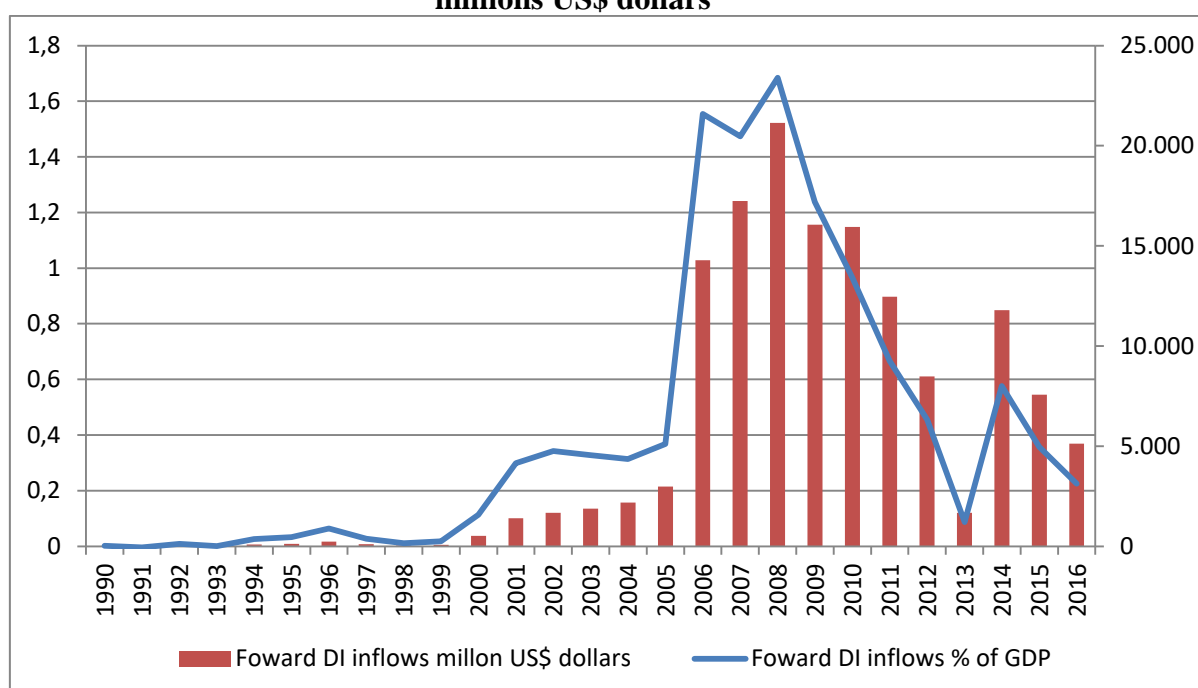
Chart 59 - Top-20 Indian Business Group Ranks. 1990-2012

Ranking	1990-2	2000-2	2010-12
1	Tata	Reliance	Reliance Group (Mukesh Ambani)
2	Reliance	Tata	Tata
3	Aditya Birla	Aditya Birla	Essar (Ruia)
4	Unilever	Unilever	Aditya Birla
5	ITC	ITC	Om Prakash Jindal
6	BK Birla	TVS Iyengar	Larsen & Toubro
7	RPG Enterprises	Larsen & Toubro	Mahindra & Mahindra
8	KK Birla	Mahindra	Reliance Group (Anil Ambani)
9	Mahindra	Videocon	Bharti Telecom
10	Chidambaram M A	Om Prakash Jindal	Vedanta
11	UB	Vedanta	ITC
12	CK Birla	RPG Enterprises	Hero (Munjals)
13	Murugappa	Hero (Munjals)	Ruchi
14	Larsen & Toubro	Chidambaram MA	WIPRO
15	Holcim	UB	Bajaj
16	Thapar	BK Birla	UB
17	Avantha	Essar (Ruia)	TVS Iyengar
18	Vedanta	KK Birla	KK Birla
19	Arvind Mafatlal	Murugappa	Unilever
20	Godrej	Godrej	Adani

Source: own elaboration based on Jadhav and Reddy (2017).

Business groups have had explicit and implicit incentives from the government to deepen their process of concentration in their core business activities and advance in their internationalization process. As can be seen next, according to UNCTAD, the outward direct investment from India has increased mainly since the 2000s, going from almost 0% of GDP to a peak of almost 1.7% of GDP in 2008 and then decreasing to around 0.5% of GDP. Although it is still low in comparison with developed and also some developing countries, these figures show some advances in the internationalization process. Much of these investments were made in neighboring countries such as Bangladesh, Bhutan, Nepal and Sri Lanka and in the US, mainly in the ITC sector. The main companies making foreign investments have been Tata Group, NTPC Limited, Mahindra Group and GMR Group.

Graphic 64- Outward Direct Investment outflows. 1990-2016. % of GDP and millions US\$ dollars



Source: own elaboration based on UNCTAD database.

Nayyar (2008) studied the main characteristics of the internationalization process of the Indian firms in the early 2000s, highlighting the role played by mergers and acquisition of foreign firms. He states that there has been a significant expansion in the number of foreign affiliates firms, going from 187 in the early 1990s to 1700 in the early 2000s. We can see in the next table the main acquisition of foreign firms,

reflecting the Indian main productive structure features: information and technology was the sector with more acquisitions, both in quantity and in terms of US\$ dollars, then follow pharmaceuticals and healthcare and consumer goods, in terms of quantity of acquisitions, and petroleum and gas, in terms of amount of US\$. The acquisition-drivers varied by sectors. For instance, pharmaceutical firms and the automotive sector has been looking for market access, horizontal integration has been important for steel and chemical sector, service delivering was relevant for ICT, the capture of international brand names was important for pharmaceutical and consumer goods sector and access to technology was critical for energy acquisitions and telecommunication.

Chart 60 - Sectoral composition of foreign acquisitions by Indian firms. 2001-2006

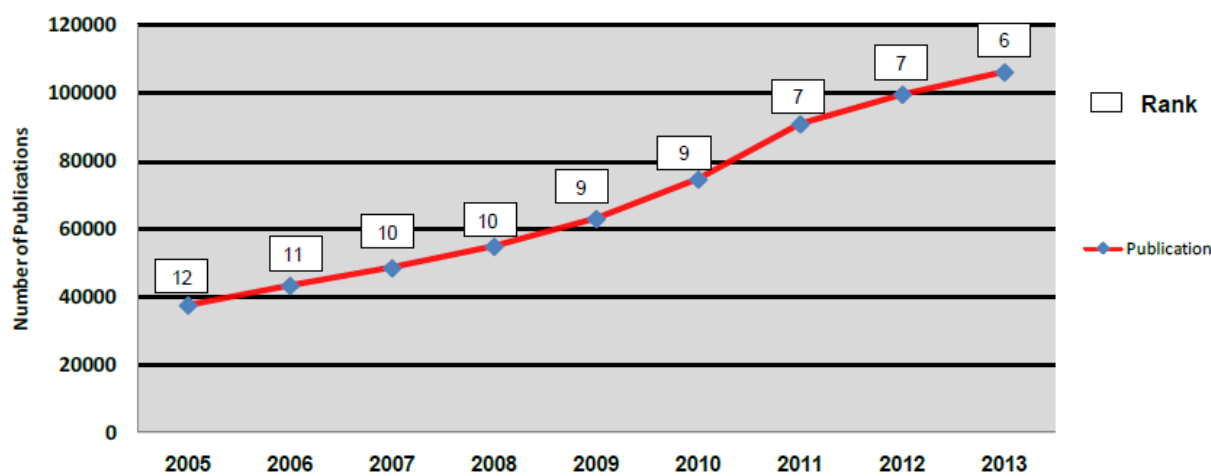
Sectors	Number		US\$ million		Number of acquisitions with no-available values
		%		%	
Information and Technology	105	46,1	2351	24,4	55
Pharmaceuticals and healthcare	23	10,1	1571	16,3	28
Automotive	13	5,7	358	3,7	13
Steel	8	3,5	1079	11,2	1
Metals and minerals	5	2,2	129	1,3	2
Petroleum and natural gas	6	2,6	1445	14,9	7
Chemicals	17	7,5	316	3,3	7
Telecom	5	2,2	638	6,6	16
Consumer goods	25	10,9	1297	13,4	
Others	21	9,2	472	4,9	14
All sectors	228	100	9656	100	143

Source: own elaboration based on Nayyar (2008)

With respect to transnational enterprises, we have already presented some figures showing that despite significant in terms of foreign exchange contribution, FDI inflows have been far to be the main share of GDP and GDCF. However, it is a fact that the Indian entrepreneurial structure has been experiencing an increasing participation of

the transnational enterprises since the 1990s, mainly through portfolio acquisitions. In fact, India has gradually "put in line" her NSI in order to welcome FDI: transnational enterprises can apply to Indian R&D incentives, tax exceptions, and PPPS, no restriction on remittances and technology imports are there, the Intellectual Property Rights were adjusted to the WTO standards, explicit promotion mechanisms have been implemented in many areas from real state to ICT, etc. Particularly, transnational enterprises have gradually increased their presence mainly in ICT and capital goods segments such as transport equipment, mining of iron, parts, and accessories for motor vehicles and their engines, medical appliances and equipment and final consumption retail (Abrol, 2013). According to Krishna (2016) about 300 global transnational firms operate their R&D centers or laboratories in India, as said, mainly in Bangalore, Hyderabad, Delhi, Pune, and Chennai.

The Indian higher education institutions are composed of around 750 universities with 35,000 affiliated colleges (Krishna, 2016). They have historically contributed to the building of the Indian human resources, skills and knowledge base. The Indian Institute of Science (IIS), the Jawaharlal Nehru University (JNU) and the Tata Institute of Fundamental Research are among the most prominent institutions. The around 20 Indian Institutes of Technology and the 6 Indian Institutes of Management are the main link with the productive sector. Universities accounted for around the half of total India's publications. In fact, India's share in global research publications increased from 2.2% in 2000 to 3.7% in 2013 as per SCI database ranking at 6th position in the world in scientific publications ahead of France, Spain, and Italy as per the Scopus database during 2013. During 2009-13 according to SCI database, India's largest share of global research publications were in Chemistry, Agricultural Sciences, Pharmacology and Toxicology, Material Science, Microbiology, Physics, Biology and Biochemistry and Engineering.

Graphic 65 - India's Trend in Scientific Publications, 2005-2013

Source: Research and Development Statistics at a glance 2017-2018 (2017).

Intermediate organizations, NGOs, and other civil society organizations have articulated a dense network that supports the interaction around the Indian NSI and tries to express the voice of different segments of the Indian society. Between the intermediate organizations, we can highlight the role of the National Research Development Council (NRDC), the Technology Development Board (TDB), the Small Industries Development Bank of India (SIDBI), etc. The NGOs have come to influence decision-making, being involved in different fields such as environment, ecology, energy, rural development, women and gender, grassroots innovation, cottage, and micro-enterprises, etc (Krishna, 2016).

Main Modi's STI initiatives

Modi's government was formed in May 2014. Planning Commission was replaced by a new body, the NITI Aayog, and the Five Year Plans were discontinued. However, the STIP 2013 was confirmed. Another relevant organizational change was that besides the Ministry of Science and Technology and the Prime Minister, since 2014 each Ministry has a particular budget for R&D, with various flagship programs. Each flagship programme involves several sectors and heavy coordination between Ministries. The main flagship programs launched were: 1) **Make in India**, 2) **Digital India**, 3) **Skill India**, 4) **Green India**, 5) **Smart Cities and Urban development**, 6) **Clean India**, 7) **Creating new Infrastructure** and 8) **Ease of doing business**. Under these main programs, there are different initiatives and objectives. Particularly with respect to the STI policies and instruments, Krishna (2016) highlights the following initiatives:

National Policy on Skill Development and Entrepreneurship 2015: The policy has five major areas: to address the major obstacles to skills development, to minimize the gap of demand and supply in terms of skills and works with industry, to keep social and geographically disadvantages sectors in mind, to focus on women, to connect entrepreneurs with the larger ecosystem of innovation.

Self-employment and Talent Utilization: it is described as a techno-financial, incubation and facilitation programme to support all aspect of startup business and other self-employment activities, particularly in technology-driven areas.

Atal Innovation Mission: it is a promotion platform involving academics, entrepreneurs, and researchers drawing upon national and international experiences to foster a culture of innovation and R&D. The objective is to provide an umbrella to look into the innovation ecosystem of the country.

National Biotechnology Development Strategy: this replaced the Biotech Strategy-1 formulated in 2007. The role of genetically modifies crops and better quality products has been stressed in this policy.

The Bioenergy Road Map – Vision 2020: this plan document addresses the main challenges of energy security through the use of bioenergy. Some of the goals are: 20% blending of biofuels by 2020, working on commercially Lignocellulosic biofuels from agricultural and forest-based waste, commercially viable option of algal production and working on next-generation biofuels from different biomass.

Consolidated Foreign Investment Policy (2015): it is a document to encourage foreign investment in India. The document homogenized FDI calculations, regulation, established a promotion board, etc.

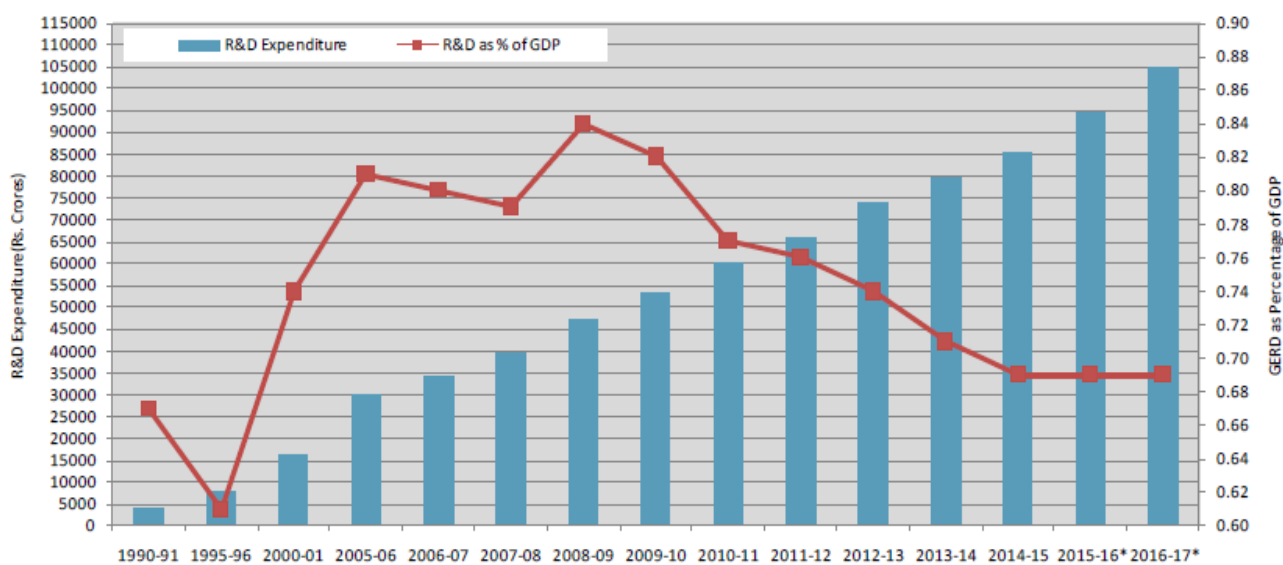
National IPR Policy (2016): the main areas of the policy is popularization and strengthening the administrative machinery for dealing with IPR issues, generation and commercialization of IPR and legal aspects, enforcement and adjudication. In general terms, the policy has gone in line with the post-1990s trend on strengthening IPR¹¹⁹.

Source: own elaboration mainly based on Krishna (2016).

¹¹⁹ For a discussion and critic on the IPR Policy 2016 see Mani (2016).

Finally, despite it is not our aim to do an in-deep evaluation of the Indian NSI policymaking since the 1990s, we will point out some achievements and deficits. Most of the scholars specialized in the study of the Indian NSI describe of a mix landscape, signaling that despite there have been significant efforts and resources oriented to “put in line” the NSI for the national and transnational corporations, the counterpart has been low (Joseph and Kakarlapudi, 2014; Krishna, 2013; Joseph and Abrol, 2009; Abrol, 2013; Mani, 2016; etc.).

We have already shown that public sector contributes with around 60% of the Indian R&D expenditure. Although it is a common feature of developing countries that public sector contributes more than the private sector to R&D, this fact still shows that private sector contribution to R&D is low, despite all the market-friendly, subsidies and institutional efforts done. Mani (2014a) evidence related to inelastic R&D behavior with respect to government subsidies signals a deficit with respect to the STI policymaking instruments. At the same time, as shown next, despite the official goal of achieving 2% GDP in R&D expenditure, India still spends less than 1% in R&D. Although with an average annual GDP growth of 7,5% R&D expenditure in nominal terms has constantly increased since 1990, it is still a low proportion in comparison with any developed countries (Israel, Korea, and Japan are at the top with more than 3,5%, Finland, Germany, and the USA among others are above 2,5% and China is in 2%).

Graphic 66 - National R&D expenditure and its GDP %. 1990-2016

Source: Research and Development Statistics at a glance 2017-2018 (2017).

In terms of productive capabilities and competitiveness achieved by private sector, in general terms, as pointed out by Nayyar (2011, 2008), Joseph and Abrol (2009) and Felipe et al (2013) there have been some industries and business groups that, based in the capabilities accumulated during the planning period and the incentives given since 1990s to internationalize, successfully managed to consolidate in the Indian domestic market, scale up and deepen their global insertion. Joseph and Abrol (2009) and Krishna (2013) highlight the performance of the ITC, pharmaceutical, automobile industry, telecommunications, and aerospace sector. We have already introduced some evidence on the ICT sector¹²⁰, with respect to pharmaceutical, India has emerged as the world's most competitive supplier of a large number of life-saving generic drugs. Nearly 1/3 of the Indian production of pharmaceuticals is exported mainly by national firms which have built their own production capabilities, brand reputation and acquired firms in several countries. Almost 80% of the drugs need in India and parts of South Asia are produced in India. India has the highest number of US FDA-approved pharmaceutical plants outside the USA.

The case of the automobile industry is similar to pharmaceutical. After accumulating capabilities during the "planning era", some Indian firms have managed to

¹²⁰ Telecommunications and aerospace are also two cases of strong State supported sectors with increasing participation to the private sector through different mechanisms such as the PPPs.

consolidate in the Indian market and succeed in their global expansion. For instance, both car segment and automobile components sector has strengthened by establishing joint ventures with Japanese firms. Tata Motors has launched several new models from pick-ups to low-cost cars, entering in different new segments such as passenger cars and defence transport. Hero MotoCorp is another business group that has managed to grow, internationalize and launch several new car models. Mahindra has also launched several models oriented to the Indian domestic market.

The results were not so encouraging for the capital goods industry and agriculture. Stagnant industry participation, increasing imports including liberalization of second-hand machinery imports and tariff reductions and the lack of strong design capabilities have affected the Indian capital goods industry (Joseph and Abrol, 2009). Capital goods sector growth rate went from around 15% during 1985-1991 to 5% during the 1990s. With respect to agriculture, according to Joseph and Kakarlapudi (2014) during 1990-2009 agricultural research received less than 0,4% of the agriculture GDP, while the subsidy for imports ranged from 8% to 11% of agriculture GDP. The rate of growth of public expenditure in research and education declined from 6,3% during the 1980s to 4,8% during 1990-2005. There was significant stagnation in the production of rice-wheat systems and drought are still a main issue (Abrol, 2016). The Indian agriculture post-1990s is broadly characterized by two main policy instruments: price support and import subsidies. In opposition, public investment and links with the Indian SNI has lagged behind.

Related to the industrial performance, capabilities and the trade liberalization effects, we have already seen that since the 1990s the Indian external trade balance has been deteriorating. In addition to this, it is interesting to observe the Indian import composition only to have a gross proxy of the main components required by the Indian productive structure. As shown next, petroleum-related imports represented 30% of imports, being the most relevant item between 2010 and 2016. The Indian petroleum-dependency has been the main characteristic of the Indian development path that has clearly increase with the growth acceleration. As we have seen, several efforts are being and have been done trying to deal with the energy issue. After petroleum, electronic goods, machinery, and transport equipment totalized 19% of imports. These figures go in line with the Indian capital goods poor performance. Fertilizers, mining and steel and chemicals complete the main imports segments in terms of importance.

Chart 61 - Indian imports. 2010-2016

Commodity / Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	Average 2010-16 / Total imports
Petroleum, Crude & products	105.964	154.968	164.041	164.770	138.326	82.944	86.866	30%
Electronic goods	27.939	34.081	32.906	32.378	36.871	40.032	41.941	8%
Machinery, electrical & non-electrical	26.129	33.099	30.765	27.091	28.002	29.483	28.663	7%
Gold	40.547	56.320	53.695	27.477	34.453	31.693	27.490	9%
Pearls, precious & stones	33.830	28.040	22.637	23.849	22.565	20.066	23.849	6%
Transport equipment	14.901	18.725	21.289	19.324	18.403	18.251	21.224	4%
Organic & Inorganic Chemicals	13.464	16.718	16.787	17.464	18.562	16.549	16.578	4%
Coal, Coke & Briquettes, etc.	9.804	17.444	17.008	16.385	17.812	13.641	15.715	4%
Artificial resins, plastic materials, etc.	7.855	8.835	9.990	10.456	12.057	11.772	11.961	2%
Iron & Steel	14.599	18.255	17.701	12.659	16.314	14.963	11.690	4%
Vegetable Oil	5.689	8.119	9.844	9.395	10.613	10.490	10.891	2%
Non-ferrous metals	6.539	8.407	9.038	8.857	10.748	9.713	9.872	2%
Metaliferrous ores & other minerals	6.473	8.113	9.144	8.395	9.305	7.267	6.168	2%
Chemical material & products	3.823	4.549	4.862	4.878	5.303	5.151	5.367	1%
Fertilisers, Crude & manufactured	6.921	11.124	8.771	6.307	7.408	8.019	5.028	2%

Source: own elaboration based on RBI.

With respect to the insertion of the transnational enterprise in the Indian NSI, Krishna (2016, 2013) points out that transnational firms have opened many R&D centers in India. However, Joseph and Abrol (2009) argue that foreign technology licensors have not tended to provide access to disembodied technology in high and medium tech sectors in order not to create capabilities within domestic firms which could turn their competitors. Even much more critical, Abrol (2013, p. 232) states:

“The direct contribution of foreign firms to the activities connected with the processes of the making of major innovations and upgrading of a national system of innovation is found to be insignificant compared to the challenge that India faces. Indirect contribution to the upgrading of NSI through the demonstration, spillover and competition effects has also been less than potentially possible due to the conditions prevailing locally in respect of institutions and incentives necessary for indigenous innovation. Policy regime favoring total freedom for private sector corporations in which the FDI inflows have been assumed to induce technological dynamism in the system during the period of economic reforms is shown to bear the responsibility for the failures experienced recently in respect of policy coordination required for ensuring foreign firms to contribute far more directly and domestic firms to organize spillovers harnessing the development of NSI in India.”

Summing up, since the NEP, in a context of the spread of the neoliberal framework, there have been two main STI policymaking approaches. During the 1990s, the focus was put on the complementarities between foreign technology and domestic R&D. The main instruments to finance innovation were tax incentives, research grants, and venture capital, with no significant addition on private sector R&D expenditure. Since the 2000s, inclusive innovation, entrepreneurial policies, PPPs and the systemic aspects of innovation were emphasized. Overall, development finance institutions reduced their role, operating more close to commercial banks and redirecting financing from industry to infrastructure. Private venture capital, particularly foreign funds, has gained space among the innovation financiers. Among the main NSI actors, in a general movement of decentralization of the STI policy, private sector, mainly Indian groups but also transnational enterprises, gained space, as well as NGOs and grassroots movements.

The evidence presented here reflects mix results. There have been advances in terms of consolidation and internationalization of the national business groups, setting-up of transnational enterprises R&D centers, consolidation and scale-up of some industries such as pharmaceutical, automotive and ITC and in positioning India in the international publications' rankings. However, R&D expenditure is still less than 1% and it is mainly supported by the public sector. Capital goods industry has a slowdown and agriculture developments have been stagnant. Transnational firms involved with the local NSI has been low in comparison with all the incentives, resources and institutional arrangements put in line to improve their insertion. And the connection between the Indian scientific capabilities and the vulnerable and productive sectors is still low.

4.5. Discussing on India since the 1990s: Growth, structural heterogeneity, and NSI

Any analyses of the Indian development path post-1990s should be framed in the context of the downfall to the URSS, the re-emergence of China as a global economic and military superpower and the external and internal pressures in favor of the Indian economic liberalization. In parallel to the consolidation of the neoliberal framework all around the world, the Indian external crisis of 1990 was the event that gave space to the gravitation of a much more market-led, export-led and pro-efficiency agenda and policymaking framework in India. However, at the same time, this general agenda has had several nuances, intermediate agreements and political and strategically restrictions preventing us to say that the neoliberal agenda has full-flag spread around India, as some (neo)Marxist authors state. Better, in Herrera (1973)'s terms, we would say that despite the formal implementation of some explicit neoliberal policies, in line with the official discourse and documents, the Indian implicit policies has tend to act as a an umbrella that still preserve the role of the Indian State and the long-term arrangements between the Indian bureaucracy and the upper cast/class business groups.

Among the new features post-1990s, it is a fact that external trade had much more relevance than in the 1980s. India is more open to trade: the ratio of exports plus imports over GDP has gone from 15% in 1990 to almost 40% since 2000s, with imports growing more than exports. Imports increased with the main component of energy products, capital goods and other intermediate goods and supplies. Exports increase mainly service-led. Another new feature of the Indian economy is the increase in the use of the capital account to finance trade deficits, articulating an active policy of reserve accumulation that has improved most of the external sustainability indicators. "Invisibles" such as services exports and remittances have stringly contributed to finance trade deficit. In my view, these flows are much more related to a particular and unique alignment and complementation of India with the United States and the "petroleum" States than to an abstract idea of liberalization.

In geopolitical terms, the downfall of the URSS and China's re-emergence has pushed India to a closer alignment with the US and the western countries (Israel is another post-1900s emergent military and technological partner) in order to balance China's power's projection. India's relationship with the US has been fueled by mutual

defence and nuclear interests and by the business community related to ITC, real estate, and finance, with a relevant role of the Indian Americans and the Indian Diaspora. More recently, the US-India agenda seems to have been gradually expanding to education programs, tourism, energy (particularly renewable) and agricultural exchanges. However, these links are historically rooted and they are related to, at least: a) the Indian colonial background, which gives Indian upper casts a fluent dominium of the English language and the geographical complementation with the US which allows Indians to work at the US nighttime, b) the Indian NSI, which has educated significant amount of engineers that contributed to the emergence of the Silicon Valley and, more recently, to the building of the Bangalore's ITC entrepreneurial ecosystem and c) the US foreign policy interests with respect to the Indian Ocean chessboard. These are not minor issues that of course deserve much more research.

In the internal front, the "liberalization consensus" has been growing since the 80s, in general terms, including a broad spectrum of actors such as the business community, economists, policymakers and parts of both Congress and BJP party. Obviously, the multilateral organisms have also made their contribution to push it. However, although State expenditure was not the main growth driver during the period under analyses, we cannot say that after more than 25 years of the NEP implementation the State role has been reduced in India. In terms of expenditure, as we have seen, Center and States represented 27.9% of GDP in 1990-1 and 29% in 2015-2016. It is true that there have internal cycles of reduction of State expenditure, but it is also true that State expenditure has increased whenever the Indian economy experienced a reduction in the growth rhythm. At the same time, during this period, there have been implemented several massive public programs in different areas such as rural employment, urbanization, electrification, between many others.

Instead of a reduction in the State participation in the Indian economy there has been a change in the role of the State. Mainly, State has moved from focusing on the direct industrial production to get much more involved in infrastructure development and financing and social transference programs. However, still, CPSEs are main players of the Indian growth dynamic and capability building. In fact, the disinvestment process and the emergence of PPPs in the energy sector is a good case of this movement. The advances in the process of privatization have been from partial to limited, having the local business groups as one of the main beneficiaries. Thus, the PPPs emerged as a

second best option to privatization, in order to mobilize private investment mainly in infrastructure, assuring some minimum levels of profitability and demand. It is also important to highlight that although the Five Year Plans are not more used as a planning instrument since 2017, public procurement has still been the main instrument to mobilize infrastructure and since the 1980s governmental technology mission are the main instrument to achieve collective objectives and deal with social challenges.

Furthermoe, the role of the massive State programs in India has been central in several aspects. In the case of the rural employment one, the MGNREGS, it has been the main cause of the increase in rural wages since the mid-2000s, functioning as an authentic autonomous expenditure in rural India and impacting on employment, consumption patterns, construction, and housing sector, etc. The electrification program, despite its heterogeneity and implementation problems, means the arriving of modern capitalism to rural India (around 800 million people!), with several linkages and benefits to the private sector, in terms of new consumers for durable goods, home appliances, etc. The electrification of rural India necessary implies an increase in the productivity levels for the whole country. With respect to the housing programs, they have had significant multipliers effects in terms of employment, indirect industrial demand, etc.

All this argument does not mean that the private sector has done nothing. In fact, the role of the private sector has increased, showing relevant entrepreneurial and productive capabilities in several industries such as software, automotive, biotech, pharma, telecommunications, defence, steel and the informal economy. Mainly, when we talk about the private sector in India we are mainly talking about: the Indian business groups, the transnational enterprises, the self-employed related to the informal economy and the entrepreneurs of ITC and biotech sector. Indian business groups are historically rooted in the Indian productive and social structure, some of them since the colonial times, with clear relation and support of the State bureaucracy. This fact has continued after the 1990s, consolidating and internationalizing them with the explicit and implicit support. The transnational enterprises have been increasingly growing in terms of participation and influence over the Indian NSI, which has been put in line with the international standards. The informal entrepreneurs are the bulk of the Indian rural (and urban...) economy and are positively affected by the increase in the income

and private consumption. The ICT and biotech entrepreneurs, supported by the Indian NSI, seem to be an entrepreneurial emergent of the new techno-economic paradigm.

However, the relationship between these entrepreneurial agents and the Indian NSI is clearly underdeveloped. Despite some Indian business groups have succeeded in scaling up and internationalize, launching new models and products and so on, their contribution in terms of R&D and in terms of generation of formal and qualified employment is steel marginal. For the case of the transnational enterprises, which have taken advantages of the Indian stock of knowledge and the growing domestic market, the commitment and insertion with the NSI seem to be scarce. The link between the informal economy (the million of informal entrepreneurs and self-employed) and the Indian NSI is still fragile. The ICT entrepreneurs, well connected with the Indian Diaspora and the Indian Americans, seem to be the ones that established a much more dynamic relationship with the Indian NSI.

The indicators and trends introduced about the Indian structural heterogeneity reveal that despite growth acceleration India is still an underdeveloped country with marked social, productive and infrastructural deficits: growing income concentration, growing but still low energy consumption, informality, urban-rural gaps, slum growths, disparity between rich and poor States, improving but still lag in most of the human development indicators analyzed, fragrant gender issues, etc. This shows us that, first, although growth is a necessary condition for development, it is not a sufficient one, and second, neither State not market could solve some basic issues.

In this context, we can point out some main contemporary challenges that should configure the Indian NSI research and policymaking agenda. First, despite the significant Indian scientific and technological capabilities, the links between them and the social, productive and innovative needs are clearly low. Second, trade deficit, despite compensated by invisibles and by capital inflows, reveals an external vulnerability of the Indian economy based on a particular productive structure with a stagnant manufacturing sector. Third, some structural issues should receive a focus: the urban-rural challenges (housing, urban mobility, health, rural electrification, etc.), the energy dependency related to petroleum imports, the slowdown of agriculture productivity and the defence needs related to the Indian Ocean geopolitics.

Finally, with respect to the Indian growth drivers, the main issue of this chapter, we have seen that the 1990s average growth rate was not much different to the 1980s

one, pointing out that the main growth acceleration was since 2000s. It means, growth acceleration came a decade after the NEP's implementation, putting doubts on the relationship between the NEP policymaking and the Indian spectacular growth process. In this sense, to explain growth, private consumption has had a main role, pushed by the upper class/cast consumption, the slow salary increases and the credit boom. GDCF also show a spectacular behavior going from an average of 25% during the 1990s to 35% since the 2000s. GDCF, particularly in manufacturing, mainly answered to the final demand and exports stimulus through the accelerator effect. However, the role of autonomous investments such as household investment in housing, construction and real estate (financed by credit), public investment and the (semi-autonomous?) PPPs investments also contributed to the impressive behavior of the GDCF. Last but not least, exports, mainly service exports to the US, have also had a relevant role.

The urbanization process fueled by the slow but constant increase in wages, public employment, government transferences and housing programs and the credit boom, has functioned as a main structural growth driver, which can be seen in the spectacular growth of real estate and construction. The particular Indian external insertion, based on the services exports to the US and the opening of the growing domestic market to foreign firms and private equity funds, has also contributed in terms of exports and financing. Then, the explicit and implicit arrangements between the Indian bureaucracy and the Indian business groups have managed to mobilize autonomous (and semi-autonomous expenditures) which contributed to the spectacular growth of GDCF.

In sum, in this chapter, I aim to state some nuances on the spread idea that liberalization was the main responsible for the Indian growth. In fact, as we have seen, there are some structural relations, related to demography, migrations, geography, history, capabilities and "public-private" partnerships that have impacted in the Indian autonomous expenditures having a main role in the explanation of the Indian growth acceleration.

FINAL COMMENTS

The main objective of this PhD thesis was to present a long-term narrative on the path of Indian development, informed by a Latin American framework, paying main attention to the (geo)political, technological, financial and institutional aspects related to the specific geographical and demographical features of the Indian subcontinent. Each chapter has concluded with some partial reflections on the different periods and conceptual issues discussed. Clearly, there are some points, concepts and periods that should have deserved much more conceptual and historical deepening. In fact, this thesis is still a picture of my understanding of the Indian society and of the theoretical framework that I am trying to integrate. However, in general terms, I understand that this research fulfilled its main objective.

I understand that the principal contributions of the thesis are: a) to present a long term narrative of the Indian NSI informed by a Latin American framework, b) to discuss the Indian development path integrating the work of several Indian scholars, building an initial dialogue on development and innovation with the Latin American literature, and c) to systematize a dense amount of literature and data on the Indian economic and social structure. At the same time, there are several sub-discussions that have also emerged and been briefly discussed and should deserve further research. In this context, food, fuel, defense and urban/rural challenges will surely configure the Indian development and innovation research agenda in this century.

Our narrative was oriented to observe and transmit some historical events that were more or less explicitly or implicitly present in our conceptual background. In this sense, this thesis tried to push and strengthen the integration between the Latin American Structuralism and Latin American School on Science, Technology and Society, the neo-Schumpeterian conceptual device of the NSI, understood in the broad sense; and the Keynesian-Kaleckian-Sraffian principle of effective demand, with autonomous expenditures as the main long-run growth drivers. This research agenda is still open and under discussion, deserving much more research efforts. Hope that the young PPGE-IE scholars could push this integration avoiding unproductive conceptual sectarianisms in order to properly intervene in the policymaking spheres. It is a difficult moment for critical thinking and political forces both in Latin American and worldwide and we should know to correctly identify the intellectual opponents.

That said, in concrete, we have work on two main long-term movements: in Chapters 1 and 2, the Indian subcontinent internal and external reconfiguration, from a regional center to a periphery of the British Empire. In Chapter 3 and 4 the post-independence re-emergence of India, both in terms of capabilities, growth, and global insertion. The first movement, mainly worked in the global history literature as the Indian “great divergence”, has been worked here as a process of “peripherization”, understood as a broader process than the deindustrialization one. We have tried to show that the Indian peripherization included, at least, the urban, institutional, logistic, and external insertion resetting of the Indian subcontinent. Given the demographical and territorial characteristics of the Indian subcontinent, the British-oriented internal and external reconfiguration had terrible consequences in terms of welfare. This process, operated both by price and no price mechanics, ended in a dual productive structure, in one of the poorer regions of the world, with one of the most relevant religious holocaust of modern history.

Although not much perceived in the contemporary analyses, which mainly view planning as a socialist fancy, I understand that the Indian post-independence re-emergence necessarily implied an inward-looking period. The “nation building” (or the post-colonial building of the Indian NSI) all over the world has been a complex process, implying challenges in almost all the spheres of the Indian society. At the independence times, departing as one of the poorest countries of the world, India was under concrete risks of territorial fragmentation and religious civil war and with no major institutional and scientific capabilities and policy instruments to deal with a relatively autonomous development. Nehru’s period managed to deal with this issues. India maintained her formal democracy, the integration of the territory was achieved and a set of institutions and policies were put in place, more than doubling the growth rate of the first half of the XX century. No doubt, Indira’s period was much more complex, with different internal and external shocks: geopolitical conflicts with Pakistan, pressure from the US, food shortness, external restriction and internal regional and political conflicts. These events clearly impacted in the GDP growth rate. However, main efforts were done in terms of developing defence, institutional and productive capabilities: going nuclear, green revolution, the Patent Act, one of the highest R&D expenditures in terms of GDP of the Indian history, etc. “Food & fuel” clearly configured as main issues for the Indian development since Indira’s period.

During the 80s, some “new” characteristics appeared in the Indian economic development path which were deepened since the 1990s: a significant increase in public expenditure and government transferences, an increasing role of external trade and the capital account in terms of GDP, an acceleration of the GDP growth rate, and the implementation of national missions as a main STI instrument.

Since the 1990s, the URSS slowdown (with China also re-emerging) and some issues of the planning period related to rent-seeking, “industrial fetichism” and the still high poverty indicators were the main factors pushed both by local and foreign actors to advance in with a liberalization agenda. Invisibles such as services exports and remittances and capital flow movements have clearly contributed to move the Indian external restriction, allowing a new acceleration in GDP growth, mainly since 2000. The Indian approximation with the occidental world, particularly with the US, is a trend that is observed mainly with the US as a main market for the Indian services exports, as source of remittances and capital flows oriented to real estate, energy and ICT sectors and in the defence contracts and technological transferences. This trend clearly deserves much more research.

With respect to the internal liberalization, the role of the State and the Indian NSI in economy is still significant: the privatization process has been slow and did not advance much, with PPPs mainly oriented to Indian business groups as a second best option; CPSEs still play a main role in almost all economic sectors; massive public programs are implemented in several areas such as rural income, urbanization and construction, electrification, etc.; public sector contributes with two thirds of the R&D expenditure with defense and petroleum industrial complex among the main technological pushers; huge agriculture subsidies and minimum prices are in force nowadays; etc. Despite a explicit “neoliberal” official discourse and policy framework, the Indian implicit policies seems to still function as an umbrella that maintain the State role, in a more or less implicit or explicit arrangement between the Indian bureaucracy, the Indian business groups, the big farmers and the, still limit but with increasing gravitation, transnational enterprises. In particular, since the 1980s, the State role seems to be gradually moving from direct industrial production focus on infrastructure expenditure and financing and on implementing transference programs to the low-income and rural sectors. This movement, plus the “pushed” external restriction, has given more space to private sector, slowly diminished poverty and more or less

managed to deal with some structural infrastructure limitations of the Indian economy. This does not mean to say that neither market nor state still has solved

With respect to growth, as said, although the external performance has been central to push the external restriction, I have tried to show that in addition to exports, the slow increase in wages, mainly the upper class/caste workers expenditure, credit boom both oriented to final consumption and construction and real estate, government transferences and investment and the arrangements between the State and the Indian business groups in order to mobilize autonomous, and “semi-autonomous” expenditure in the form of PPPs, are among the main growth drivers. Clearly, the urbanization, energy and geopolitical challenges are the main structural challenges that concentrate both technological efforts and autonomous expenditure nowadays.

To conclude, I would like to repeat that it was not a case of Latin American conceptual chauvinism. I understand that Latin American scholars should read, study and interact with “global” authors and literature. In this sense, more than “applying” my Latin American framework, in this narrative it was given special effort to understand India “by itself”. Sincerely, this is not a minor effort. However, some conceptual categories were put to interact to a, in some sense similar, in some sense different, context. This process of cross fertilization between the Indian and the Latin American literature still has to be deepened but I understand that it was possible to give a Latin American flavor to the Indian analysis. Next, I will reintroduce some few insights that deserve much more research related to the Latin American framework.

With respect to the center - periphery scheme, as seen, even until Plassey, the Indian Ocean ecosystem was a center of trade and textiles manufactures, quite cosmopolitan and with significant developed forms of markets and entrepreneurial and shipbuilders communities which channeled Indian textiles into Middle East, Africa, China and even Europe. This is a main difference with respect to the Latin American insertion into global capitalism. Despite when the Spanish people arrived Latin America there were the Mayans, mainly in the contemporary Southern Mexico, Guatemala and Honduras, the different Andean people and several tribes all around the subcontinent, Latin America was neither a manufacture nor a trade center by itself. I am not saying this to underestimate the relevance of the Latin American colonization process but to give an accurate dimension of the structural change that represented the peripherization of the Indian Subcontinent.

With a completely different demographic structure from Latin America, a larger population of around 100 million people, the Indian peripherization process implied millions of death of hunger people because of the price and non price (it means, technological and violent) mechanisms of reconfiguration of the Indian production and its global insertion. Certainly, the main novelties that the European people introduced in the Indian Ocean ecosystem were neither their cosmopolitanism nor their market forms nor trade mechanisms but the naval and military technologies and the financing mechanisms associated to the European war-capitalism. At this last point, the Indian and Latin American peripherization processes were similar. This fact should be pointed out whenever the Latin American liberal scholars remember with nostalgia the “belle epochs” related to the primary commodity cycles, either the one of coffee, milk, meat, rubber, minerals, etc. A liberal approach to international insertion could be reasonable for a small territory, but for a region of a sub-continental dimension and several hundred millions of people like the Indian (or, for instance, Brazilian) one, it implied a disaster in terms of social welfare.

Then, the initial British penetration into the Indian subcontinent, through Plassey battle, included the partnership between the BEIC and the Bengal’s financial and political elite groups, a characteristic that could be found in the whole colonization period with different regional groups of power. In fact, the relationships of partnership and competition between the heterogeneous and fragmented local “elites” or rulers and the foreign powers has been a constant at least since the Mughal period. In this context, zamindars are a main group between them. As both the Mughals and the British used land taxation as a main financing source, zamindars were a key player related to the British capacity to collect tax from peasants. The agriculture “commercialization” process pushed by the British, through peasant indebtedness, meant a process of land concentration in the zamindars hands. This long-term productive and social group, although evolved, has gravitated in the Indian economic and social structure until nowadays, being a main limit, for instance, to the land reform pushed by Nehru. In Latin America, this agrarian large landowner structure has been also present in different regions as a main political actor, blocking different industrial and redistributive tentatives. This is a main difference between the Indian and Latin American experience of development and the Chinese, Japanese or Korean one on which, by coercive ways, the agrarian reform was implemented.

The Indian railway development experience also deserves a reflection. Paradoxically, if Prebisch understood that the diffusion of technical progress was slower or incomplete in the periphery, the railways development represented the implantation of a whole technological paradigm into the Indian subcontinent. However, the design and structure of this technological paradigm was put in line with the British imperial objectives, oriented to military control and to insert the Indian agriculture production into the global market. In this sense, most of the effects in terms of potential technological transfers and autonomous expenditures related to the railway development were capitalized by the British firms through exports or contracts with the Raj. In fact, the Indian railway development is a main antecedent to the PPPs, where the British private firms were assured a minimum profit by contract.

The production of commercial crops and tropical goods oriented both to satisfy the British primary demands and to be triangulated in the external markets to sustain the British trade deficit with China, Europe, and the US was a main role of the Indian subcontinent. Besides, apart from the Indian exports trade triangulation, the home charges and services charges and interest payments help to maintain the Gold Standard. At this point, the Indian moderate nationalist intellectuals such as Naoroji and Dutt made some main contributions in the characterization of the “Indian wealth drain”. This line of thinking could be complemented with the Prebisch center-periphery scheme and the later dependentists and structuralist scholars contributions related to unequal exchange, particularly with respect to the role of the interests and services payments. This complementation between the Indian and the Latin American scholars is a research line that is still unexplored in the development literature.

With respect to Pinto’s structural heterogeneity, it seems that this category has been made for the Indian context. Nowadays, I would say that India is the most heterogeneous country in the world. For instance, cohabitation of high tech/globally inserted sectors with hundreds of millions of rural tribal forms. One of the most important space and nuclear programs in the world and the biggest informal sector in the world. The territorial and religious differences are also extremely significant, from the Hindustan to the tropical south, from the Muslim Sufis to the Dalai Lama. Despite the risk of being impressionistic, this is a fact that can be appreciated by any Indian traveler. The increasing inequality, the deepening of the urban-rural gap, the urbans

slums, the digital gap, the global/local dynamics, etc. are elements that were reinforced in the last decades.

The peripherization process is also central to understand the emerging of the Indian national movement and the frameworks, groups and institutional arrangements that configured the emergence of the Indian NSI and the Indian “national project”, in terms of Herrera (1973). After the wealth drain theory of the moderate nationalist, the Congress Party framework, led by Nehru, consolidated the idea of State intervention in the economy, mainly by planning, industrialization and science development. Both the Russian Revolution and the effects of the Second World War in the Indian domestic industry made it clear the need of public procurement and intervention for development. In parallel, the emergence of an idea of Hindu-Science and the consolidation of a relationship between the Indian political elite and the Indian scientist elite, mainly Hindu-framed, configured the post-independence NSI main features. It was a linear, science-push conception of the STI policy. This institutional setting and the relationship between the Hindu-framed scientific elite and the political elite would forge the Indian NSI explicit and implicit policies, at least, until the 1990s.

This research tried to push the NSI research agenda in order to deepen the broad approach (Cassiolato and Lastres, 2005). As we have seen, the interrelation between the STI policies and the infrastructure, energy and agriculture bottlenecks is central to think the Indian development. India is a clear example to show that R&D by itself does not solve development issues. In fact, it is a case of Nelson (1977)´s *Moon and the Ghetto* paradox. Thus, the NSI framework and policymaking should be integrated to the distributive and infrastructural problems and policies of a country. The Indian case also shows how the scientific and technological institutions of a country are related to the elite´s national project, which has neglected low casts and religious minorities.

To conclude, with respect to growth and autonomous expenditures, the discussion between Furtado (1966) and Serra and Tavares (1970) is illuminating to understand the Indian contemporary growth process. With an increasing deterioration of the income distribution, India´s GDP is booming. The implicit or explicit arrangements between the Indian national groups, the Hindu-framed elite of the BJP party and the transnational corporations and financial capital actors are behind this boom, similarly to the Brazilian miracle “triple”. In this sense, it would be interesting that the autonomous expenditure research agenda, although assuming induced-investment, made a zoom on

the public-private explicit and implicit relationships oriented to mobilized private investment in infrastructure and residential segment, which seems to have a different logic, much more “autonomous”, than the manufacturing one.

All this insights deserve much more research and discussions. I have only given some steps in this South-South understanding. Thanks for the reading.

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