Some Indicators of the Structural Dynamics of the Brazilian Economy Between 1985 and 2004

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Resumo

Durante o período analisado a economia brasileira cresceu a uma baixa taxa média em comparação com países similares e com o seu próprio desempenho nas três décadas precedentes. Neste artigo, tentamos investigar se o desempenho recente da economia brasileira pode estar ligado à dinâmica estrutural que ocorreu durante os 20 anos estudados. Utilizamos tabelas de Insumo e Produto e algumas metodologias para avaliar mudanças estruturais – a análise estrutural da decomposição (SDA) e indicadores de ligação industrial – e comparamos com resultados do período precedente. O resultado mais importante obtido foi a relativa rigidez estrutural que marcou o período analisado. A diversificação do setor industrial e o aumento das ligações inter-setoriais que ocorreram no período precedente findaram-se ou foram reduzidas. As mudanças mais significativas foram a maior dependência do setor industrial dos insumos importados para seu processo de produção e uma pequena redução de sua capacidade de gerar emprego. Em termos de emprego, a grande redução ocorreu no setor primário, completando um ciclo de mudança estrutural que se iniciou no período anterior. Um outro resultado interessante está relacionado à SDA. Embora as exportações tenham se tornado a força motriz principal da economia na primeira metade da década atual, o seu crescimento, ainda que acelerado, não foi suficiente para empurrar uma grande economia.

Abstract

During the period analyzed the Brazilian economy grew at a low average rate in comparison to similar countries and to its own past performance in the three precedent decades. In this paper, we try to investigate if the recent performance of the Brazilian economy can be linked to the structural dynamics that occurred during the 20 years studied. We have used Input-Output tables and some methodologies to evaluate changes – structural decomposition analysis (SDA) and linkages indicators – and compared with the previous period. The most important result is the structural rigidity that marked the period analyzed. The diversification of the industrial sector and the increase in the links in the economy that marked the previous period seem to have come to a stop or to have slowed down in the period analyzed. The most noticeable change was that the industrial sector became more dependent on imported inputs for its production process and there was a small reduction in its share of employment. In what regards employment, the greatest reduction was due to the primary sector. Another interesting result is related to the SDA which points out that although exports were the main driving force of the economy in the first half of the current decade, this was not enough to push a large economy.

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Some indicators of the structural dynamics of the Brazilian economy between 1985 and 2004

1. Introduction

During the last three decades the Brazilian economy grew at a low average rate in comparison to similar countries and to its own past performance in the three precedent decades. The basic idea of the paper, therefore, is to investigate if the recent performance of the Brazilian economy, can be linked to the structural transformations that occurred (or not) during the last 20 years. During this period the economy went through deep transformations in the macroeconomic environment, imposed by the stabilization process and the trade liberalization.

Many different explanations were proposed and some authors argue that the Brazilian economy has moved too far in the process of productive structure diversification. The idea is that the diversification diverts resources that could be used to improve the sectors in which the countries already have comparative advantages and that this is hindering its growth. More specifically, these arguments[1] have been put forward in order to criticize, in Brazil, the arguments in favor of a more vertical industrial policy, directed to promote key-sectors in the economy. It has been proposed that the country should focus on the sectors which it has already attained comparative advantage, ignoring the theoretical and empirical lessons from an important group of development economists.

The present work diverges from this idea and tries to improve the basic argument for a vertical industrial policy; that is, sectors diverge in their capacities to affect others and, consequently, the whole economy. As discussed by development economists, sectors diverge in terms of their income and price elasticities, patterns of competition and technological improvements potential. The relative weight of each sector determines the degree of consistency between national points of strength and weakness and changing world demand conditions.

In this paper, we argue that the country's productive structure has an important impact on a country performance, although it is not enduring and changes in the sectors performance might indicate structural changes in the economy. However, the relative sectoral specialization of each country is not, as the neoclassical economists point out, pre-determined in accordance with the endowment and scarcity of the factors. It depends, in fact, on the structural dynamics of the country, which is completely linked to past and current economic policy. As Amsden (1989, p. 243) emphasized: "climbing the ladder of comparative advantage is a matter of creating competitiveness, usually with government assistance, rather than stepping into it".

In what follows we examine the input-output relations and the structure of final demand, to identify how it can help to explain the growth performance, the capacity to generate employment, as

[1] For two examples involving analyses of the Brazilian experience see Ferreira, P. C. G. (2005) and Canedo, et alli (2007).

well as the sectors' impact on the trade balance in different periods of time, in order to capture possible hints for the recent economic performance, much different from the previous period. Input-output tables have been used in many ways and for many different purposes. In contrast with the methodologies inspired by neoclassical theory, in the IO approach used here, the economic growth is viewed as a demand-led process. In fact, we consider the demand expansion as the proximate cause of economic growth. Of course, technical change and other supply factors can have an influence on economic growth, but only through its effects on the demand side. There is no direct link from technical change to growth as in the usual mainstream literature. Technical change helps to reduce possible constraints, but it is not an immediate cause of growth. We capture this Keynesian-Kaleckian idea in a accounting or "ex post" approach known as "Structural Decomposition Analysis"[2], the first method to analyze structural change applied in this paper. The other method[3] is to identify the sectors that tend to be the drivers or the bottlenecks of the growth process, by calculating some linkages indicators.

In order to do this study, the paper was divided in three parts plus this introduction. In the first one, we discuss the general changes that characterized both periods: before 1985 and between 1985 and 2004. In the following section we take a closer look at the structural dynamics of the second period using the methods presented above. This analysis is conducted to the whole economic structure and to the industrial sector separately. We conclude the paper with some final comments and try to point out to the future works.

2. Structural Dynamics in the Contemporary Brazilian Economy: Main Changes

2.1. Before 1985

The analysis that follows is similar to many previous works that analyzed different periods of the Brazilian Economy. Most of these works cover the period between 1950 and 1980, a period of intense structural change in the Brazilian economy. During the 1950s, the industrialization process in Brazil was intensified characterized mainly as an intense import substitution industrialization (ISI), which resulted in major structural changes: "promoted the appearance of many different industrial sectors, with special emphasis on those with high income and population elasticities and with high forward and backward linkages" (Baer, Fonseca e Guilhoto, 1987, p. 275). In the period that followed, especially after 1968, there was a deepening on the industrialization process, even after the first oil shock in 1973-74, which extended up to the second oil shock in 1979 and came to a drastic end after the debt crisis in 1982. This second process was partially based on the

[2] For a survey, see (Rose and Casler, 1996). Note that the authors do not mention the possibility of using the decomposition with a Keynesian approach.
[3] Both methods are briefly explained in the appendix I.

intensifying the import substitution, by internalizing new sectors, especially the capital goods producers', and partially on substantial investments in infrastructure projects

Since the debt crisis, however, the Brazilian economy has never recovered a substantial development process as in the previous period. In fact, both decades that followed, 1980s and 1990s, where marked by low growth rates and the end of the industrialization spurt; and the current decade seems to be following the same pattern. During this second period, however, there was an increase in the degree of openness of the economy and a change from a hyperinflationary period to a major price stabilization process. It is important, therefore, to highlight some of the previous results in order to evaluate up to what extent there was actually a change in the pattern of the structural dynamics that took place before 1985 and the period that followed it, which is examined in this paper. We focus on the work of Baer, Fonseca e. Guilhoto (1987)[4] which use a similar method as the one bellow to analyze this previous period.

In this work the authors used data from industrial censuses for the years 1970, 1975 and 1980, and of input-output tables for the years 1959, 1970 and 1975. Besides the general structural change represented by a major decline in agriculture and an increase in manufacturing industry, the major findings can be divided into four sources of change. According to the authors the *productive structure* was altered given the industrialization trends of the economy and to the increased concentration of income which accompanied it. Between 1959 and 1975, there was an increase in the share of capital goods, consumer durables and intermediary goods (except paper and rubber products); while non-durables (except for clothing and shoes) and agriculture declined.

The *final demand structure* was also modified. On the one hand, durable consumer goods sectors increased their share, going in the opposite direction of non-durable goods, except clothing/shoes and processed foods. In fact, the authors point out the decline of raw agricultural products and the rise of processed foods. On the other hand the proportion of production destined for personal consumption declined indicating a rising trend in the interdependence of sectors which occurred in the years 1959-75[5]. This trend did not increase the country's economic autarky, in many sectors the share of exports in total output increased, especially for sectors like metal products, machinery, transport equipment, paper products and chemicals.

[4] For a different methodology to analyze the same period see Hewings, et al. (1989). Although the authors are testing different methods, the basic results are similar.

[5] "According to Hirschman (1958), this type of structural change is usually associated with the intensification of the industrialization process, i.e., the higher per capita income and the share of the population employed in the industrial sector, the greater will be intersectoral transactions" (apud Baer, Fonseca and. Guilhoto 1987).

In terms of technological change, the authors point out that by the 1970s most sectors incorporated the latest technology into their expansion plans, which are captured by the decline in the share of labor in value added and by the increase of the installed power per worker.

2.2. Between 1985 and 2004

The stimulus for our paper was the fact that the Brazilian statistical office (IBGE) has been working in updating the Brazilian IO benchmark table for 2000 and 2005 and they were supposed to be available by July of 2007. Even though the updating was not complete, in March of this same year, the 2004 national account data was released with a new reference. Thus, in order to capture the most recent results, it was possible to update6 the IO matrix, by using partial information coming from the 2004 Make and Use tables and the last official IO matrix published based on 1996 data. To better understand the changes that took place in the economy, the results were aggregated7 into 10 sectors, as shown in Table 1, that encompass the whole economy, and into 7 manufacturing and mining sectors, as shown in Table 7, in order to analyze separately what happened in these sectors. In order to allow for comparison among the different years, all the values are considered at constant prices (R$ 2003). We used for each sector a specific deflator for output, final demand and value added. Those related to 1985 and 1996 refers to the old series. For the year 2004, we used the original data at constant price published by IBGE, that is, at previous year prices.

As can be seen in Table 1, there was practically no change in the hierarchy among the aggregated sectors in terms of its contribution to output, value added and occupations. The two most important movements were the increase in the share of service sectors in all three components, and a decrease in the primary sector employment. The bad performance of the financial sector seems at odds with what is known about this sector in the Brazilian economy; in fact, this is a "measurement effect" which is basically related to the reduction of inflation.

Table 1 – Share of Sectors in Total Value of Output, Value Added and Employment

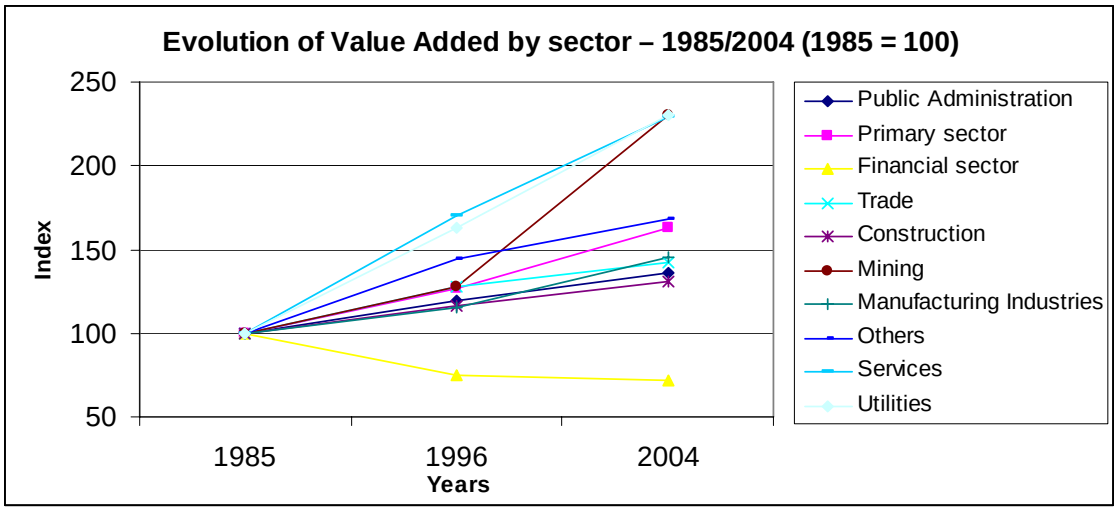
	Total Output			Value Added			Employment		
	1985	1996	2004	1985	1996	2004	1985	1996	2004
Public Administration	11,2%	10,9%	10,7%	15,9%	15,4%	14,4%	10,0%	9,0%	9,4%
Primary sector	7,3%	7,5%	8,4%	8,0%	8,3%	8,7%	31,8%	23,3%	19,2%
Financial sector	7,3%	4,6%	4,5%	11,2%	6,9%	5,4%	2,0%	1,3%	1,1%
Trade	7,4%	7,7%	7,1%	8,0%	8,3%	7,6%	11,0%	14,6%	16,3%
Construction	8,0%	7,5%	6,4%	8,5%	8,0%	7,4%	6,6%	5,9%	5,5%
Mining	1,9%	1,8%	2,4%	2,6%	2,7%	4,0%	0,7%	0,4%	0,5%
Manufacturing Industries	40,4%	39,1%	38,9%	25,3%	23,9%	24,7%	15,2%	13,4%	13,0%
Others	5,0%	5,6%	5,5%	9,1%	10,8%	10,2%	7,7%	9,4%	10,0%
Services	9,2%	12,1%	13,0%	9,1%	12,7%	14,0%	14,5%	22,4%	24,6%
Utilities	2,4%	3,2%	3,2%	2,4%	3,1%	3,6%	0,6%	0,4%	0,4%

Font: For 1985 and 1996 make and use tables by IBGE, for 2004, updated input-output matrix.

[6] Appropriate updating methodologies are discussed in UN (1999), Bulmer-Thomas (1982) e Miller & Blair (1985), Kurz, Dietzenbacher & Lager (1998) e Bacharach (1970) and Grijò and Berni (2005).
[7] For the classification used see Table 15 in the Appendix II.

The performance in terms of value added (Figure 1) seems to indicate the existence of two groups of sectors, in general, the services sectors[8] and utilities have grown much faster than the rest of them. In particular, the manufacturing industries had a performance closer to the slowest sectors, such as construction and public administration. It is interesting to observe, as pointed out above, that even though the sectors performances were differentiated, there seems to be a low variation in the productive structure. Comparing these results with the ones discussed in section 2.1 from previous period, they seem to indicate that the patterns of structural changes in these two periods were much different. Therefore it is important to take a closer look at the changes that happened during the second period, from 1985 to 2004.

Figure 1



3. A closer view of the structural dynamics between 1985 and 2004

3.1. The Economic Structure – all sectors

We broke up the data into two periods, 1985-1996 and 1996-2004. This break has to do more with the data availability than with the possible structural breaks of the Brazilian economy. The main aggregated results are presented in Table 2, where in the last row it is shown the total growth at constant prices of output, value added and employment, which are decomposed in each column into changes in the final demand components, technical change and imports penetration (negative sign) or substitution (positive sign). Therefore, the sum of the entries in each column is equal to the total change presented at the last row.

As can be seen, although the output growth was not much different among the two periods, the performances of value added and employment seem to be characterized by two different patterns.

[8] Service sector are services to business sectors and to families, transports, communications and public utilities.

The value added grew much faster in the first period than in the second, while the opposite happened with employment. This last result points to the fact that much of the "productivity growth" associated with the trade openness occurred only in the first period. This fact is corroborated by the analysis of technical change component of the SDA, where the negative result in terms of employment is much greater in the first period, but is close to zero in the second. There is a large literature about the adjustment, at the micro level, that occurred in the Brazilian during the first years of the trade liberalization. This trend was intensified after 1994, given the appreciation of the Brazilian currency the followed the stabilization plan. This increase in productivity, however, seems to be more related to the costs cuts implemented by the firms, especially in terms of employment, than to a new technological improvement path.

Table 2 – SDA of Output, Value Added and Employment – Aggregated Results

		Output		Value Added		Employment	
		1985-1996	1996-2004	1985-1996	1996-2004	1985-1996	1996-2004
Capital Formation	**scale**	4.33%	1.25%	4.42%	1.17%	2.64%	0.90%
	composition	2.20%	-0.18%	2.19%	-0.16%	1.30%	-0.16%
Government Consumption	**scale**	3.30%	3.37%	4.31%	3.92%	2.60%	3.17%
	composition	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Household Consumption	**scale**	22.99%	4.01%	24.07%	3.71%	24.67%	4.78%
	composition	-0.86%	-0.85%	-0.08%	0.39%	-4.59%	0.47%
Exports	**scale**	0.25%	14.81%	0.20%	11.69%	0.15%	10.30%
	composition	0.27%	-0.28%	0.19%	-0.14%	0.28%	0.34%
Import Pent/Subst	**Final Demand**	-4.57%	-0.48%	-4.40%	-0.37%	-3.24%	-0.26%
	Intermediate	-2.58%	-1.82%	-1.78%	-1.50%	-1.37%	-1.33%
Technical Change		-1.02%	0.55%	2.19%	-6.29%	-8.39%	-0.24%
Stocks		-0.37%	1.33%	-0.54%	1.00%	-2.85%	0.31%
Total Change		**23.93%**	**21.72%**	**30.78%**	**13.41%**	**11.19%**	**18.27%**

The most intriguing result, however, is related to the component that contributes the most to the total change. In comparing both periods, there was a clear change from household consumption to exports as the possible driving force. It is important to point out that this is a large economy, with a large internal market. How can one explain this performance of the Brazilian exports? The first thing to notice is that the performance of the Brazilian exports were not much different from the average world exports, in fact, during most of the period analyzed, the performance was even worse than the world exports, probably related to the appreciation of the currency that lasted up to 1999. The effects of the depreciation were stronger after 2001, when the share of Brazilian exports in the world started to grow, but only in 2004 it reached the same level of 1993 (Puga, 2006). During the second period analyzed, in spite of the enormous growth of exports (almost 10% per year), this was not sufficient to push the economic growth that has also been held back by a restrictive economic policy focused exclusively on stabilization goals.

Hence, what seems to be happening in Brazil during this period could be called, as Professor Franklin Serrano has already mentioned ironically in his lectures, an *export-led stagnation*. The basic idea is that an export-led growth is not appropriate for a country with a large internal market.

Since for these countries the share of exports in total output is usually very low, it cannot be pushed only by exports. Therefore, what seems to be explaining this pattern is that, in spite the good performance of the export sector, the internal market was held back by macroeconomic policies, especially those related to price stabilization.

In Table 3, we present the same results as above, but we decompose it by sectors. As can be seen, the total change is the same as in Table 2, but now we can evaluate which sector has a greater relevance for the total result. As expected, given its greater share as shown in Table 1, in terms of output, manufacturing industries seems to play the most important role, which is not replicated in terms of value added and employment. Another important remark is that while the trend of the value added, discussed above, seems to be explained by a generalized decrease of the ratio of value added to output in the second period, the trend of employment seems to be concentrated in a few sectors, especially the primary sector. This result will be discusses in more details below.

Table 3 - SDA of Output, Value Added and Employment – Sectoral Results

	Output		Value Added		Employment	
	1985-1996	1996-2004	1985-1996	1996-2004	1985-1996	1996-2004
Public Administration	2,38%	2,01%	4,20%	1,70%	-0,03%	2,08%
Primary sector	2,00%	2,77%	2,12%	1,38%	-5,97%	-0,54%
Financial sector	-1,57%	0,83%	-4,22%	-0,02%	-0,61%	0,09%
Trade	2,26%	0,90%	1,32%	0,13%	5,31%	4,60%
Construction	1,33%	0,17%	4,71%	-0,13%	-0,01%	0,65%
Mining	0,43%	1,04%	0,04%	2,58%	-0,23%	0,18%
Manufacturing Industries	7,83%	8,39%	7,05%	3,65%	-0,30%	2,03%
Others	1,93%	1,17%	4,78%	1,54%	2,75%	2,45%
Services	5,80%	3,74%	8,63%	1,85%	10,43%	6,68%
Utilities	1,53%	0,70%	2,14%	0,72%	-0,14%	0,03%
Total	23,93%	21,72%	30,78%	13,41%	11,19%	18,27%

In the following tables and figures we took out some of the sectors that tend to distort the analysis: (i) public administration; (ii) financial sectors; and (iii) others – composed by rental and non-market private services. As pointed out above, the share of the bank system in the Brazilian economy was overestimated during the inflationary period, therefore, there was an expected fall in its participation. The other two were removed because they are basically imputed values. As can be seen in Table 1 above, these four sectors represent approximately 20% of output and GDP and one third of occupations.

By removing those sectors, some of the tendencies already observed are emphasized. As can be seen in Table 4, the tendency of declining share of the primary sector was stopped and there is a relative stability of its share in terms of GDP, although there was a decline in terms of occupation. This is an interesting result, in the study by Baer, Fonseca and Guilhoto (1987), it was pointed out that the share of employment in this sector was still high in the previous period, in comparison to

other countries with similar income per capita. Therefore, in Brazil, given its structural heterogeneity, the increase in agriculture productivity associated with the industrialization happened with a greater delay in comparison to other countries, both developed and developing countries. Another important difference in relation to the previous period is the decline of the manufacturing industries, accompanied by construction and trade, compensated by an increase in the share of service sectors.

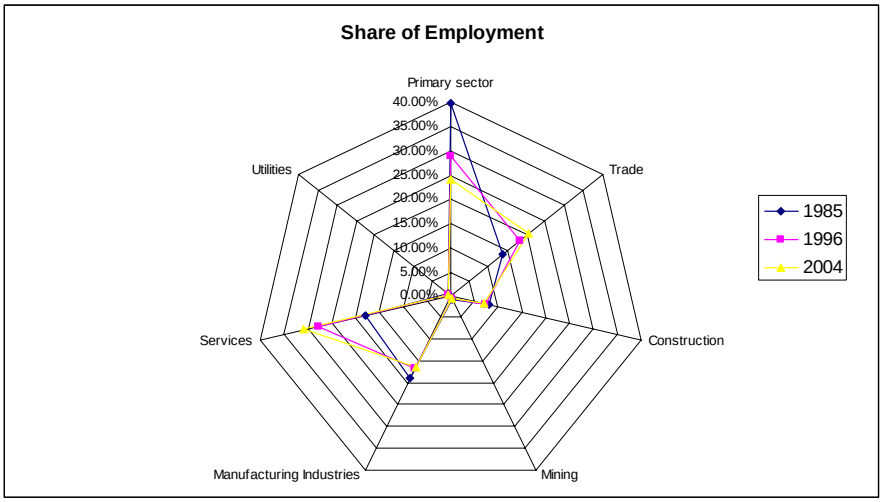
Table 4 – Share in Value Added and Employment and a Productivity Indicator

	Value Added			Employment			VA/Emp		
	1985	1996	2004	1985	1996	2004	1985	1996	2004
Primary sector	12,53%	12,37%	12,48%	39,66%	28,95%	24,18%	0,005	0,008	0,010
Trade	12,47%	12,43%	10,80%	13,65%	18,20%	20,46%	0,014	0,012	0,010
Construction	13,27%	11,97%	10,58%	8,18%	7,33%	6,97%	0,025	0,029	0,030
Mining	4,03%	4,01%	5,65%	0,83%	0,48%	0,60%	0,076	0,149	0,183
Manufacturing Industries	39,71%	35,62%	35,26%	18,90%	16,64%	16,39%	0,033	0,038	0,042
Services	14,29%	18,90%	20,02%	18,07%	27,90%	30,96%	0,012	0,012	0,013
Utilities	3,70%	4,70%	5,21%	0,72%	0,48%	0,45%	0,080	0,175	0,227

Font: For 1985 and 1986 input-output matrices by IBGE, for 2004, updated input-output matrix.

In terms of employment, as can be seen in Figure 2 there was a decrease in the share of most sectors, except trade and services. This could point out to some change in technology, or simply another measure of the contraction of most of the sectors. Indeed, there was an increase in the value added by employment in almost all sectors, especially utilities and the primary sector, except for trade. The increase in the share of employment in this last sector is probably related to the fact that it is one of the sectors absorbing the labor force that is out of the market due to a low growth rate and to the decline in the share of employment by value added in all the other sectors.

Figure 2 – Share of Employment



In any case, the greatest increase occurred in the services sectors. Taking a more disaggregated picture of the SDA in terms of employment for this sector, shown in Table 5 and Table 6, it is possible to observe that in the first period, the most important change is related to services to

business families, indicating a possible increase in disguised unemployment, instead of an increase in outsourcing. However, two observations must be pointed out. First is that outsourcing tends to be related to the decrease in manufacturing employment, but not as much to the increase in the service sector employment, given that services represents a much greater share on total employment. The second observation is that in the second period, 1996-2004, when the shares in total employment were more stable, services to business sector represents a greater share in the SDA of services employment.

Table 5 - SDA Employment – Services – 1985-1996

	Transport	Post & telecom	Services to Families	Services to Business Sector	Total Services
Capital Formation	0.35%	0.02%	0.15%	0.29%	0.82%
Government Consumption	0.04%	0.01%	0.25%	0.22%	0.51%
Household Consumption	1.11%	0.15%	5.39%	0.64%	7.29%
Exports	-0.06%	0.01%	0.17%	0.09%	0.21%
Imports	-0.28%	-0.02%	-0.71%	-0.25%	-1.25%
Technical Change	-0.11%	-0.19%	2.04%	1.14%	2.89%
Stocks	-0.02%	0.00%	-0.02%	0.01%	-0.03%
Total	1.04%	-0.03%	7.28%	2.14%	10.43%

Table 6 - SDA Employment – Services – 1996-2004

	Transport	Post & Telecom	Services to Families	Services to Business Sector	Total
Capital Formation	0,01%	0,00%	0,03%	0,01%	0,05%
Government Consumption	0,05%	0,01%	0,28%	0,40%	0,74%
Household Consumption	0,20%	0,13%	0,16%	1,50%	1,99%
Exports	0,37%	0,03%	1,20%	1,21%	2,82%
Imports	0,07%	0,00%	-0,59%	-0,29%	-0,80%
Tech Change	0,34%	0,01%	1,23%	0,52%	2,11%
Stocks	0,00%	0,00%	-0,05%	-0,17%	-0,22%
Total	1,05%	0,18%	2,27%	3,18%	6,68%

3.2. The Industrial Structure – Manufacturing and Mining Industries

There is a recent debate[9] about deindustrialization in developing countries and the results shown above seem inconclusive in terms of pointing out to a decrease in the share of manufacturing industries, since it depends on the way one measures. In order to better evaluate what might have happened to the Brazilian industry during the last 20 years, it is important to analyze it at a more disaggregated level. The manufacturing and mining sectors[10] were divided into 7 sub-sectors, as

[9] References about deindustrialization: Palma (2005), Pieper (2000), Rowthorn; Ramaswamy (1998), Rowthorn and Wells (1987).

[10] We had to combine manufacturing and mining industries because there was a change in the way the IBGE measured the oil sector.

shown in Table 7. The objective of this section is not a complete examination of the Brazilian industry, but to highlight some features that can be captured by the data.

We obtained the SDA of manufacturing and mining sectors (Table 7) by disaggregating the two corresponding rows of Table 3. As can be seen, it is very important to evaluate manufacturing and mining industries from different perspectives. Each sector contributes differently for the changes in output, value added and employment. For instance, if we look at the traditional consumer goods sector, its role in terms of output and value added is the weakest, while in terms of employment still is the most important, given its large share, shown in Table 8.

Table 7 - SDA - Manufacturing and Mining Industries

	Output		Value Added		Employment	
	1985-1996	1996-2004	1985-1996	1996-2004	1985-1996	1996-2004
Primary Commodities	1,13%	1,47%	0,55%	1,16%	0,17%	0,07%
Industrial Commodities	1,36%	1,52%	0,42%	2,92%	-0,30%	0,21%
Electric-Electronic Diffusers	0,82%	0,11%	0,47%	-0,31%	-0,08%	-0,02%
Mechanical Diffusers	0,92%	2,17%	1,20%	1,03%	-0,33%	0,57%
Oil (refined and extraction)	1,76%	2,38%	3,27%	1,86%	-0,08%	0,08%
Traditional Consumer Goods	0,91%	0,89%	-0,01%	-0,63%	0,19%	0,73%
Traditional Input Goods	1,36%	0,89%	1,19%	0,20%	-0,10%	0,56%
Total	8,26%	9,43%	7,09%	6,23%	-0,53%	2,21%

As a result, as can be seen in Table 8, there was a great decrease in the share of traditional consumer goods in terms of value added, counterbalanced by the increase share in commodities and mechanical diffusers. The former sector, however, continues to be the main source of employment in the industrial sector, with almost 50% of the total.

Table 8 - Share of Sectors in value added and employment and their ratio

	Value Added			Employment			VA/Emp		
	1985	1996	2004	1985	1996	2004	1985	1996	2004
Primary Commodities	5.52%	5.83%	7.64%	4.34%	5.59%	5.24%	0.044	0.043	0.069
Industrial Commodities	19.95%	20.68%	22.93%	12.45%	10.93%	10.72%	0.055	0.079	0.101
Electric-Electronic Diffusers	3.29%	4.53%	3.13%	3.50%	3.09%	2.55%	0.032	0.061	0.058
Mechanical Diffusers	13.77%	14.02%	15.18%	10.45%	8.62%	11.01%	0.045	0.067	0.065
Oil (refined and extraction)	22.70%	22.75%	22.35%	1.53%	1.07%	1.45%	0.510	0.883	0.725
Traditional Consumer Goods	17.02%	14.07%	11.69%	46.48%	49.36%	47.13%	0.013	0.012	0.012
Traditional Input Goods	17.75%	18.12%	17.07%	21.24%	21.33%	21.89%	0.029	0.035	0.037

Another important remark in relation to the sectors value added is how it evolved along the years, as can be seen in Figure 3, the electric-electronic diffusers, the sector with one of the greatest increase in "productivity", as can be seen in Figure 4, remained practically stagnated during 1996 – 2004, which seems at odds with international patterns.

Figure 3 – Evolution of the Value Added

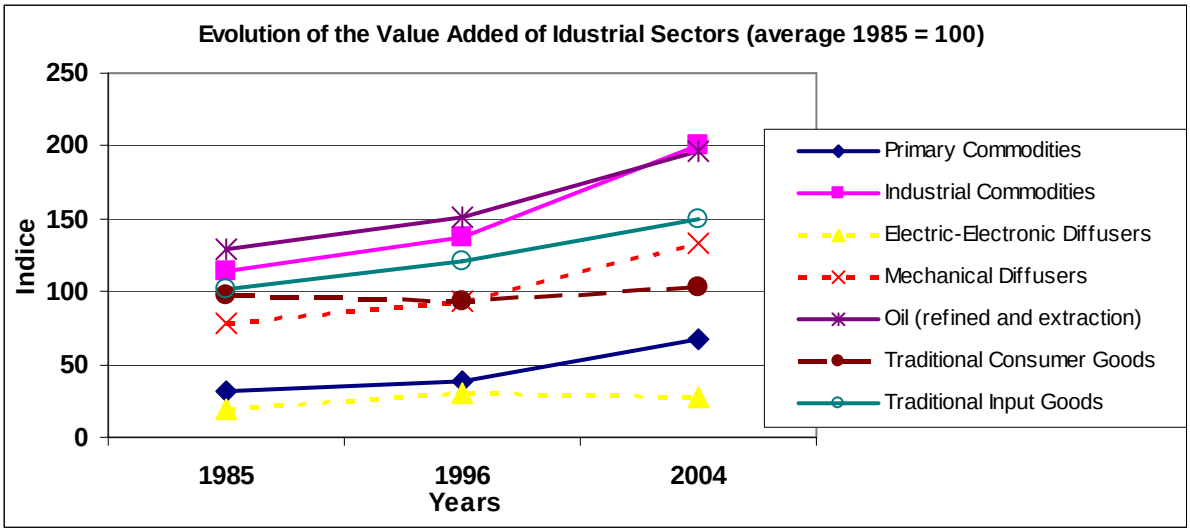
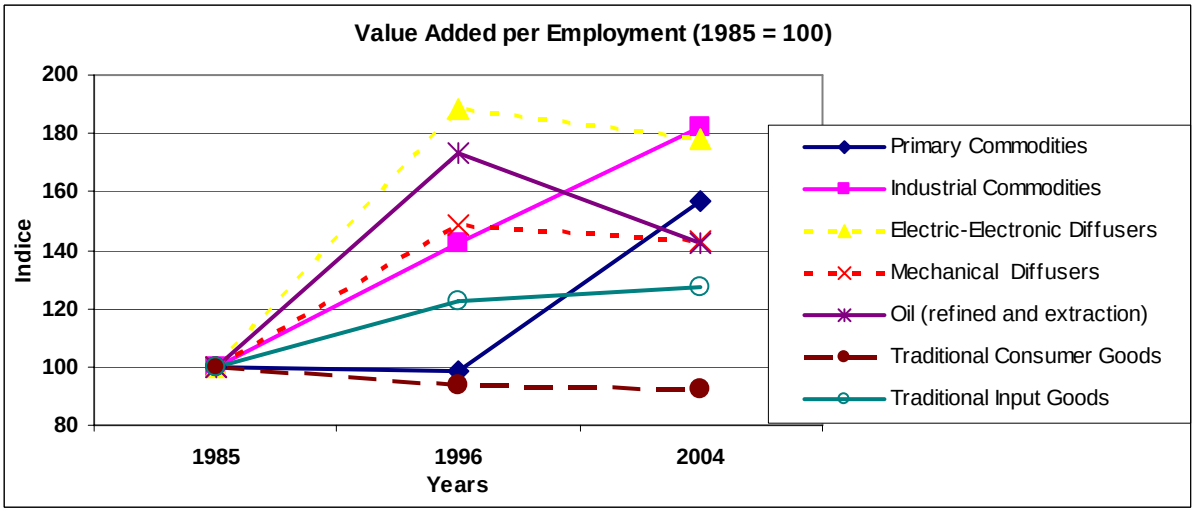


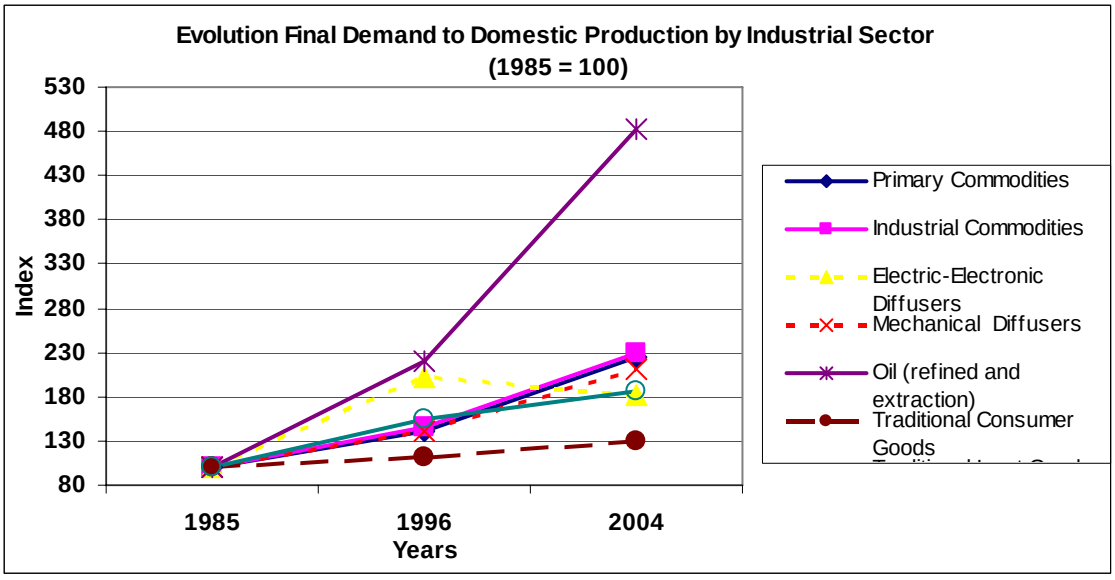
Figure 4 – Value Added per Employment



3.2.1. Final Demand Structure

It is important to look for clues on the role that changes in the composition of final demand might play in generating structural transformations. It is interesting to notice that there was actually a decline of final demand to the domestic production of the Electric-Electronic Diffusers (Figure 5), compensated by a large increase in imported final demand. The low performance of Traditional Consumer Goods is probably also related to final demand, since it had the smallest accumulated rate of growth among all industrial sectors (Figure 5). This is an important contrast with the earlier period, before 1985, where textiles industry has played a major role.

Figure 5 – Evolution of the Final Demand



Nevertheless, in this section we try to explore one fact that was highlighted above, the increased role of exports as the driving force of the economy in the second period analyzed. As can be seen in Table 9, the manufacturing industry is responsible for over 70% of the Brazilian exports, and if we add the mining industry it comes up to almost 80%. Therefore, we will concentrate the analysis in changes related to these industries. But before we move to this, it is worthy mentioning that from 1996-2004 there was an increase in the share of primary sector exports, compensated by a decrease of manufacturing industry. Although this is not going to be done in this paper, this result needs to be investigated further, in order to evaluate if there was a worsening in the Brazilian exports structure.

Table 9 - Share of Exports

	Share of Total		
	1985	1996	2004
Public Administration	0,7%	0,9%	0,7%
Primary sector	5,9%	3,0%	5,9%
Financial sector	0,2%	0,6%	0,4%
Trade	5,5%	3,9%	3,3%
Construction	0,0%	0,0%	0,0%
Mining	6,0%	6,0%	6,7%
Manufacturing Industries	68,9%	74,5%	71,2%
Others	0,0%	0,0%	0,0%
Services	12,9%	11,2%	11,7%
Utilities	0,0%	0,0%	0,1%

The change in the driving force of the economy can also be captured by comparing how the total output of each sector was divided among house consumption and exports along the three years (Table 10). From 1996 to 2004 there was a decrease in the share of household consumption and an increase in exports.

Table 10 – Share of Output – Household Consumption and Exports

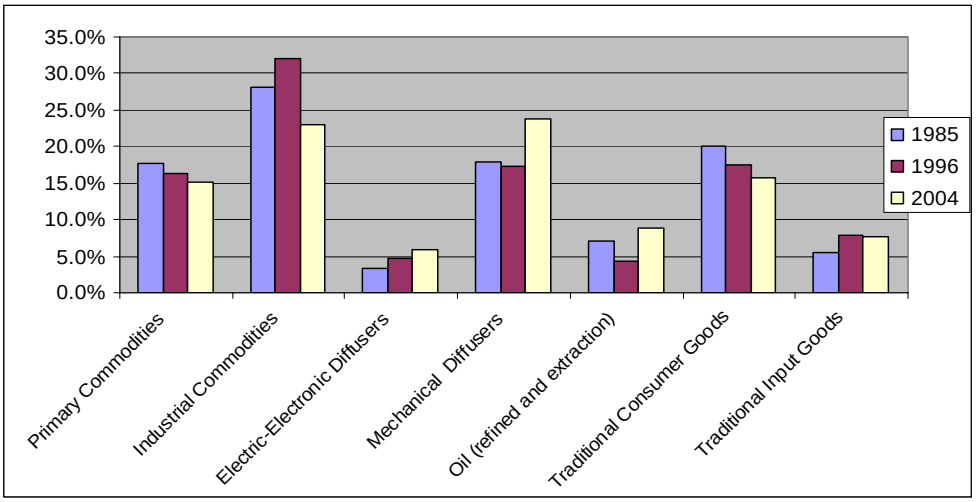
	Household Consumption			Exports		
	1985	1996	2004	1985	1996	2004
Primary Commodities	34,1%	39,7%	36,0%	17,3%	15,8%	25,5%
Industrial Commodities	6,3%	7,1%	4,1%	11,2%	14,5%	21,1%
Electric-Electronic Diffusers	30,4%	47,8%	29,8%	7,3%	8,9%	25,2%
Mechanical Diffusers	12,6%	22,4%	13,1%	11,8%	12,8%	29,4%
Oil (refined and extraction)	1,0%	3,2%	1,6%	3,3%	2,0%	8,0%
Traditional Consumer Goods	48,4%	50,2%	43,8%	7,7%	8,1%	15,7%
Traditional Input Goods	13,7%	17,2%	15,3%	2,5%	3,9%	8,4%

As expected the structure of household consumption tends to be different from the export structure, therefore, it is expected that sectors that played a greater role in the previous period, when household consumption was the major driving force, will be different from those of the second period. This is supported by the results shown in Table 11. In the first period, "oil" and "traditional input sectors" were the two sectors that contributed the most for the increase in household consumption. In the second period, the two main sectors responsible for the increase in exports were "mechanical diffusers" and "industrial commodities", which are the two larger export sectors (Figure 6). It is interesting to notice that there was a decrease in the share of the later sector, partially compensated by an increase in the former.

Table 11 - SDA Output - Manufacturing and Mining Industries

	Household Consumption		Exports	
	1985-1996	1996-2004	1985-1996	1996-2004
Primary Commodities	0,98%	0,33%	0,07%	0,91%
Industrial Commodities	1,11%	-0,23%	0,58%	2,07%
Electric-Electronic Diffusers	0,69%	-0,06%	0,09%	0,45%
Mechanical Diffusers	1,21%	-0,15%	0,12%	2,13%
Oil (refined and extraction)	1,51%	0,05%	-0,84%	1,76%
Traditional Consumer Goods	1,26%	-0,24%	0,12%	1,04%
Traditional Input Goods	1,44%	0,06%	0,21%	1,30%
Total	8,21%	-0,23%	0,35%	9,66%

Figure 6 - Share of Exports by Manufacturing and Mining Sectors



The trade liberalization process that started in Brazil in 1990 was intensified after 1994, when there was a strong appreciation of the Brazilian currency, which followed the stabilization plan. One of the results of this process, already discussed above, was the increase in productivity, represented by the decrease in the employment coefficient. However, there was also another important impact over imports, both in terms of final and intermediate demand. This could be seen at the aggregate level in the SDA shown in Table 2, in which the imports contribution is always negative, point to a import penetration throughout both periods. In Table 12, the share of imported final demand and the imported technical coefficients are shown ate a disaggregated level for manufacturing and mining sectors. For almost all sectors there was an increase in both variables, in fact the share and the coefficient more than doubled, except for oil sector. This result tends to increase the rigidity of the average import coefficient for the whole economy, which might compromise the future import capacity. Given the specific result on the Electric-Electronic Diffusers, both in terms of intermediate and final demand, it seems that the country stopped internalizing, in a significant way, the production of intermediate and capital goods associated to the new technological paradigm.

Table 12 – Imports

	Share over total final demand			imported technical coefficient		
	1985	1996	2004	1985	1996	2004
Primary Commodities	0,4%	1,1%	0,5%	1,5%	1,6%	1,1%
Industrial Commodities	0,9%	3,4%	-3,0%	4,2%	5,5%	7,1%
Electric-Electronic Diffusers	9,8%	22,9%	35,7%	6,2%	14,7%	15,1%
Mechanical Diffusers	7,0%	17,4%	12,9%	2,9%	7,0%	11,2%
Oil (refined and extraction)	-23,1%	11,0%	10,7%	23,8%	11,0%	10,6%
Traditional Consumer Goods	0,8%	4,0%	3,7%	1,9%	4,5%	4,9%
Traditional Input Goods	2,1%	7,7%	16,1%	4,2%	6,1%	9,3%

3.2.2. Key Sectors

There are many criteria to identify key sectors and, as explained above, they usually are complementary. We have calculated two types of linkage indicators: the traditional Hirschman-Rasmussen indexes and the Pure Indexes[11]. Both of them were calculated for deflated and current values and some comparisons are shown below. In Table 13, the first three columns show, for each index, the correlation between the ranking of the manufacturing and mining sectors index related to the current and the deflated values. As can be seen, for pure indexes, the correlation is almost one; therefore, we can choose either deflated or current values to be the representative pure index.

In terms of the Hirschman-Rasmussen index, the correlation is lower for the "sensibility of dispersion", which measures how much the output of the sector is affected by an increase in all

[11] In Table 16 and Table 17 of the appendix II, the disaggregated results for those indexes for the deflated values are shown, together with the sector ranking. In these tables all sectors are shown, in the analysis above, only the manufacturing and mining sectors are discussed.

sectors final demand. This result suggests that the structure of use of each sector, that is, how much it buys from other sectors, is more concentrated, in average, than the structure of the demand it receives from other sectors. If we look at more disaggregated results, that is, directly to the inverse Leontief Matrix, the major changes in the ranking, which imply this lower correlation, are associated to a few sectors.

Table 13 – Index Correlations

	Current x Deflated Values			Deflated			Current		
	1985	1996	2004	1985-1996	1996-2004	1985-2004	1985-1996	1996-2003	1985-2003
PD	0.89	0.86	0.97	0.89	0.90	0.78	0.89	0.89	0.83
SD	0.69	0.75	0.81	0.97	0.95	0.94	0.96	0.92	0.93
PBL	0.99	0.98	0.98	0.90	0.94	0.86	0.90	0.94	0.88
PFL	0.99	0.98	0.99	0.98	0.97	0.95	0.97	0.97	0.95
PTL	0.98	0.96	0.99	0.96	0.97	0.93	0.93	0.93	0.93

As already pointed out by the authors who have proposed the pure index (Guilhoto et al., 1994), the results from both type of indexes tend to be very divergent. This is supported by the correlations between the ranking of the manufacturing and industrial sectors according to each type of index shown in Table 14. It is interesting to notice that correlations among the backward indexes are much lower than among the forward indexes. Indeed, the correlations among the ranking for the current value forward indexes are quite high, very close to one.

Table 14 – Hirschman-Rasmussen and Pure Indexes Correlations

	Deflated			Current		
	1985	1996	2004	1985	1996	2004
PD x PBL	0.21	0.16	0.31	0.33	0.24	0.31
SD x PFL	0.72	0.79	0.74	0.92	0.88	0.91

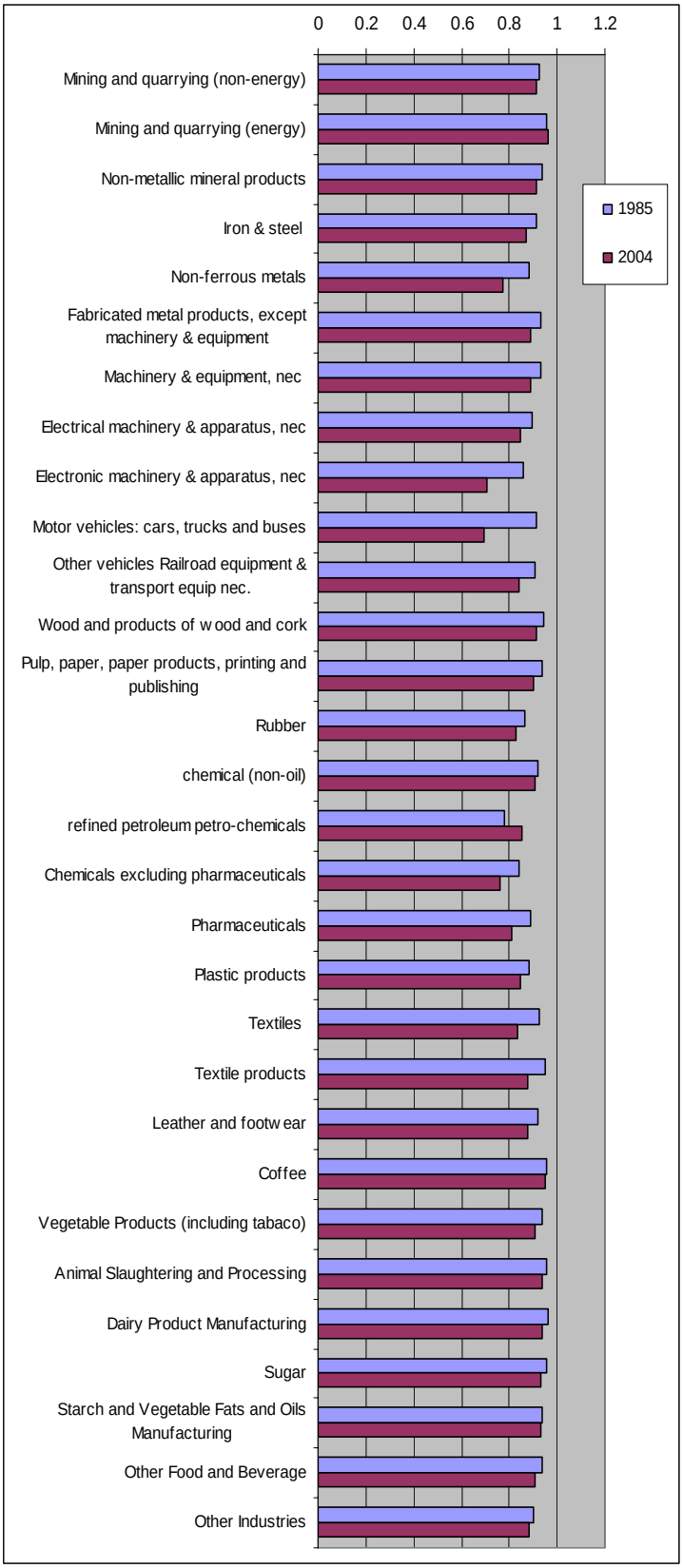
Even accounting for these differences, there is a robust result concerning all indexes: there seems to be a very low change among sectors ranking along the years, which indicates another sign of slow structural change in the economy. The last six columns of Table 13, are the correlations among two different years of the sectors ranking by index. The most significant changes are related to the backward indexes comparing 1985 and 2004, although this is true for both indexes, the correlations of the Hirschman-Rasmunsen Backward Linkages between this two periods are lower.

Looking closer to these linkages, we can observe two important results. In Figure 7, we have plotted first the ratio of the domestic index over the total index, where this last includes the imports since it accounts for the total supply. It is possible to observe that in general there was an increase in the imports leakage[12]. In spite of that, in the second plot, we can see that domestic index for

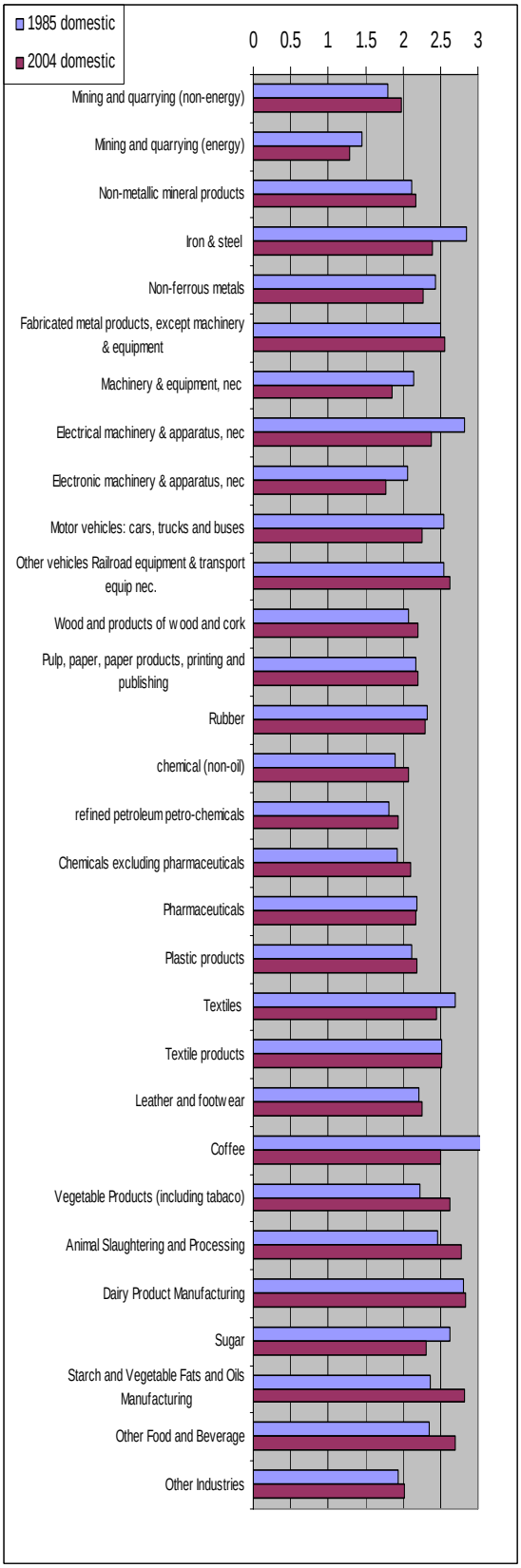
[12] There are many ways to measures these leakages, here we are using an approximate measure. If there was no leakage the ration of domestic index over total would be one, so the leakage can be measured by one minus the ratio.

different sectors had distinct performance, and there were some important changes in the sectors ranking.

Figure 7 - Total Backward Linkages



(a) Domestic over Total



(b) Domestic Backward Linkages

4. Final Comments and Further Analysis

Comparing to the period previous to 1985 the structural changes captured by our work were of a different nature. While the previous period was marked by diversification of the industrial sector and an increase in the links in the economy, in the later period this process seems to have come to a stop. The major changes are related to the impact of the openness process on the productive structure of the Brazilian economy with sectors gaining and losing in this process. The industrial sector became more dependable on imported inputs for its production process, with a reduction in its level of employment. The developments in the agricultural sector continued the process started at the previous period, loosing its share mainly in terms of its capacity of generate employment, which was pretty much reduced by a modernization process. The workers freed or not absorbed by the other sectors were absorbed mainly by the service sector.

The data available are limited which restricts the structural change analysis. As was pointed out by Hewings et al. (1989), the structural changes are not concentrated in the production sectors alone, changes in the patterns of consumption and the distribution of income are of equal importance. The input-output framework has been extended to accommodate some of these concerns. For example, social accounting structure (SAM) which provides for a more complex set of interrelationships, involving production, institution and factor accounts. Therefore, there are two basic lines in which we pretend to continue this work. The first one is to evaluate how is the newer structure of Brazil's industrial economy in comparison to international benchmarks based on cross-section studies. The other is to develop the social accounting matrix for Brazil.

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6. Appendix I – Structural Dynamics Indicators

6.1. Structural Decomposition Analysis (SDA)

This method can be used as a type of growth accounting from the demand side, trying to capture the contribution of final demand components, as well as, import penetration/substitution and technical change to growth of production, employment and value added. This approach contest the framework of the usual growth accounting methodologies that try to separate the contribution of capital input, labor input and total factor productivity (TFP) to economic growth, considered as immediate sources of growth.

This later type of growth accounting exercises has been performed at macroeconomic[13] and at sectoral levels of aggregation. From the viewpoint of this theory, economic growth is characterized as a supply constrained process – mainly a labor constrained one in fact.[14] Hence more capital accumulation and more productivity growth are always directly conducive to GDP and per capita GDP growth. However, this vision of the growth process[15] doesn't seem to be appropriate for economies whose expansion is not normally constrained by the availability of resources in general and labor in particular. This has been the case of the Brazilian economy in which a systematically high level of underutilization of the labor force is observed.

There are many ways to implement a SDA, the one chosen here starts from the basic equation of the input-output framework:

$$g^d = \left(\mathbf{1} - \mathbf{A}^d\right)^{-1} f^d$$
$$\mathbf{A}^D = \mathbf{A} - \mathbf{A}^{\mathbf{M}} \qquad f^d = f - f^M \text{,}$$

where g is the vector of output by industry, $\mathbf{A}$ is the technical coefficient matrix and f is the final demand vector. The superscripts M and d represent imported and domestic values, while the variables without superscripts account for the total value. Therefore, given the firs equation any change in the level of output can be decomposed on a variation of the domestic technical coefficients or of the domestic final demand. Then again, these two variations can be partially explained by a change in the total value to an increase or decrease in imports. For employment (L) and value added (VA), there is a slight change:

[13] See, in this respect, Jorgenson & Stiroh, (2000), Oliner & Sichel (2000) and Jorgenson (2001).
[14] This is the case because the price system is supposed to convey information on the relative scarcity of resources that is transmitted to consumers and producers and governs their choices in the direction of the full utilization of the available resources.
[15] This type of growth accounting methodologies also share with core neoclassical theory other strong assumptions such as perfect competition, high price flexibility and technical efficiency.

$$VA = vg$$
$$L = lg$$

where, v and l are, respectively, the ratio of value added to output and the ratio of employment to output. Therefore, a change in both can be also explained by a change in these coefficients. Any change in the coefficients (including the technical coefficient) is referred to as technical change.

6.2. Key-Sectors Indicators: backward and forward Linkages

Another possible indicator of structural dynamics is the relative importance of sectors in terms of its internal linkages. These indicators, in general, decompose the linkages effects into two types: (a) backward linkages – which indicate the effect of a specific sector on the demand of all the sectors, including itself or not (direct and indirect effects); and (b) forward linkages – which indicate the effect of all the sectors in the demand of a specific sector. This division allows one to evaluate the multiplier potential of certain sectors with strong backward linkages, but also to highlight the key sectors to avoid bottle-necks in the process of economic growth and development, in the case of sectors with strong forward linkages.

In the specialized literature, the first indicators of the industrial linkages, also known as the Rasmunssen-Hirschman indexes, were proposed by Rasmussen (1956) and refined by Hirschman (1958). Although these indicators have contributed to strengthen the idea of the existence of key-sectors in the economy, they were much criticized and many different indicators were proposed. Therefore we also present another type of indicator, the *Pure Indexes*, which contrary to the first type take into account the different output levels of each sector.

6.2.1. Rasmunssen-Hirschman Linkage Indicators

The *backward linkages* are calculated as the total sum of each column of the Leontief inverse matrix. This indicator measures in some sense what Hirschman called the input-provision or derived demand by that activity. The basic idea is that it measures the total output variation related to an increase in one unit of final demand of the sector, that is, the multiplier effect on the economy of the sector's final demand. Alternatively, the *forward linkages* measure the output utilization, that is, how much the output of the sector is affected by an increase in one unit of all sectors final demand. It is calculated as the sum of each row of the Leontief inverse matrix. These indicators, however, are sensible to the level of disaggregation of the matrix, more precisely, to the number of sectors encompassed.

In order to allow for comparison among IO matrix of different dimensions, the indicators are normalized by calculating simple means. There is an even more interesting pair of indicators

derived from these averages that allow for a direct comparison among the sectors identifying those with above or below average performance. The first one is called *power of dispersion* (PD), because it measures the impact of the sector in its suppliers, that is, how much its demand spreads in the economy. It is calculated dividing the normalized backward linkage indicator by the average of all coefficients in the inverse matrix. The other indicator is called *sensibility of dispersion* (SD), since it represents the sensibility of the sector to the increase in the final demand of all sectors. It is calculated in an analogous form by dividing the normalized forward linkage indicators by the total average. For both index, a value above one implies an above average impact, and therefore can be used to identify key sectors as it was explained in section 3.2.2.

6.2.2. Pure Industrial Linkages Indices

The indicators described above were criticized by not taking into account the size of the sector; sectors diverge in terms of output levels and, therefore, the power of demand by each sector is different. A possible way to deal with this problem is by measuring the effect of an increase in one percent of final demand, instead of one unit and still use the indicator above. However, some authors[16] have proposed another group of indicators called Pure Indices of Industrial Linkages, based on an improvement of the approach proposed by Cella e Clements.[17]

The basic idea of the Cella-Clements index was to measure the total linkage effect of each sector in the economy by calculating the difference between the total output of the economy and the possible output if the sector would not buy inputs from the economy and neither sell its output. Guilhoto et al (1994) propose some modifications in order to improve the measure, and start by a different decomposition of the technical coefficient matrix in two matrices. The first represents the specific sector isolated from the rest of the economy and the other the rest of the economy. The *Pure Backward Linkages* measure the impact on the rest of the economy of the production of the sector analyzed. Given the direct demand from the specific sector to the rest of the economy, which can be seen as a final demand vector to the rest of the economy, the *Pure Backward Linkages* (PBL) is calculated by summing up the direct and indirect impact of this vector over the total output of the rest of the economy. The *Pure Forward Linkages* (PFL) measure the impact of the rest of the economy on the production of the sector, in an analogous way. The sum of PBL and PFL is called *Total Pure Industrial Linkage* (PTL), sectors with the highest are usually identified as key sectors.

[16] Guilhoto et al (1994)
[17] Cella (1984) and Clements (1990).

7. Appendix II - Tables

Table 15 - Classification

Code	Sectors SNA	Aggregated Sectors	Disaggregated Industry
01	Agriculture, hunting, forestry and fishing	Primary Sector	Primary Sector
02	Mining and quarrying (non-energy)	Mining	Industrial Commodities
03	Mining and quarrying (energy)		Oil (Refined and Extraction)
04	Non-metallic mineral products	Manufacturing Industries	Traditional Inputs
05	Iron & steel		Industrial Commodities
06	Non-ferrous metals		
07	Fabricated metal products, except machinery & equipment		Traditional Inputs
08	Machinery & equipment, nec		Mechanical Diffusers
10	Electrical machinery & apparatus, nec		Electric-Electronic Diffusers
11	Electronic machinery & apparatus, nec		
12	Motor vehicles: cars, trucks and buses		Mechanical Diffusers
13	Other vehicles Railroad equipment & transport equip nec.		
14	Wood and products of wood and cork		Traditional Consumer Goods
15	Pulp, paper, paper products, printing and publishing		Industrial Commodities
16	Rubber		
17	chemical (non-oil)		
18	refined petroleum petro-chemicals		
19	Chemicals excluding pharmaceuticals		Traditional Inputs
20	Pharmaceuticals		
21	Plastic products		
22	Textiles		Traditional Consumer Goods
23	Textile products		
24	Leather and footwear		
25	Coffee		Primary Commodities
26	Vegetable Products (including tabaco)		Traditional Consumer Goods
27	Animal Slaughtering and Processing		Primary Commodities
28	Dairy Product Manufacturing		Traditional Consumer Goods
29	Sugar		Primary Commodities
30	Starch and Vegetable Fats and Oils Manufacturing		
31	Other Food and Beverage		Traditional Consumer Goods
32	Other Industries		Traditional Inputs
33	Idustrial Services Utilities	Utilities	Industrial Services
34	Construction	Construction	
35	Wholesale & retail trade	Trade	Trade
36	Transport	Services	Services
37	Post & telecommunications		
38	Finance & insurance	Financial Sector	Financial Sector
39	Services to Families	Services	Services
40	Services to Business Sector		
41	Rental and leasing	Others	Others
42	Public administration	Public Administration	Public Administration
43	Non-market private services	Others	Others

Table 16 - Hirschman-Rasmussen

		Power of Dispersion				Sensibility of Dispersion			
		1985		2004		1985		2004	
01	Agriculture, hunting, forestry and fishing	0.83	34	0.91	29	3.69	1	3.45	1
02	Mining and quarrying (non-energy)	0.84	32	0.95	27	0.78	22	0.65	29
03	Mining and quarrying (energy)	0.68	38	0.62	40	1.06	13	1.26	10
04	Non-metallic mineral products	0.99	22	1.04	21	0.91	17	0.83	19
05	Iron & steel	1.33	2	1.14	11	2.05	3	1.42	6
06	Non-ferrous metals	1.14	12	1.08	15	1.08	12	0.87	18
07	Fabricated metal products, except machinery & equipment	1.17	10	1.22	7	1.23	10	1.19	11
08	Machinery & equipment, nec	1.00	20	0.88	32	1.28	8	1.11	13
10	Electrical machinery & apparatus, nec	1.32	3	1.14	12	0.64	31	0.65	27
11	Electronic machinery & apparatus, nec	0.97	25	0.85	33	0.61	35	0.52	39
12	Motor vehicles: cars, trucks and buses	1.19	7	1.08	17	0.52	40	0.51	40
13	Other vehicles Railroad equipment & transport equip nec.	1.19	8	1.26	5	0.93	15	0.78	21
14	Wood and products of wood and cork	0.97	24	1.05	19	0.68	28	0.62	33
15	Pulp, paper, paper products, printing and publishing	1.02	19	1.05	18	1.18	11	1.18	12
16	Rubber	1.09	15	1.10	14	0.86	18	0.88	17
17	chemical (non-oil)	0.89	29	0.99	25	0.96	14	0.91	16
18	refined petroleum petro-chemicals	0.85	31	0.93	28	3.17	2	3.35	2
19	Chemicals excluding pharmaceuticals	0.90	28	1.00	24	1.48	5	1.27	9
20	Pharmaceuticals	1.02	18	1.04	22	0.54	39	0.51	41
21	Plastic products	0.99	21	1.04	20	0.81	19	0.75	22
22	Textiles	1.26	5	1.17	10	1.31	7	1.03	14
23	Textile products	1.18	9	1.21	8	0.49	41	0.63	30
24	Leather and footwear	1.03	17	1.08	16	0.61	34	0.54	38
25	Coffee	2.21	1	1.20	9	0.58	37	0.59	37
26	Vegetable Products (including tabaco)	1.04	16	1.26	6	0.63	32	0.65	26
27	Animal Slaughtering and Processing	1.15	11	1.33	3	0.60	36	0.62	32
28	Dairy Product Manufacturing	1.32	4	1.36	1	0.62	33	0.62	34
29	Sugar	1.23	6	1.11	13	0.66	29	0.70	24
30	Starch and Vegetable Fats and Oils Manufacturin	1.11	13	1.35	2	0.77	23	0.79	20
31	Other Food and Beverage	1.10	14	1.29	4	0.70	26	0.72	23
32	Other Industries	0.91	27	0.96	26	0.70	25	0.65	28
33	Idustrial Services Utilities	0.84	33	0.82	35	1.40	6	1.63	4
34	Construction	0.88	30	0.84	34	0.66	30	0.60	36
35	Wholesale & retail trade	0.75	35	0.89	31	1.68	4	1.62	5
36	Transport	0.98	23	1.01	23	1.23	9	1.28	8
37	Post & telecommunications	0.69	37	0.70	38	0.57	38	0.95	15
38	Finance & insurance	0.57	40	0.67	39	0.78	21	2.00	3
39	Services to Families	0.94	26	0.89	30	0.78	20	0.61	35
40	Services to Business Sector	0.71	36	0.72	36	0.91	16	1.29	7
41	Rental and leasing	0.54	41	0.52	42	0.74	24	0.69	25
42	Public administration	0.61	39	0.72	37	0.68	27	0.62	31
43	Non-market private services	0.54	42	0.55	41	0.47	42	0.48	42

Table 17 - Pure Indices of Industrial Linkages

		PBL				PFL				PTL			
		1985		2004		1985		2004		1985		2004	
01	Agriculture, hunting, forestry and fishing	98,949	3	149,093	3	122,626	3	204,112	2	221,576	3	353,205	2
02	Mining and quarrying (non-energy)	13,513	39	17,855	35	18,905	23	14,327	32	32,418	32	32,182	36
03	Mining and quarrying (energy)	13,735	37	15,408	38	65,575	5	134,222	5	79,310	14	149,631	10
04	Non-metallic mineral products	25,848	24	27,943	25	31,854	17	33,527	18	57,702	20	61,470	25
05	Iron & steel	33,695	16	61,109	14	48,774	11	67,825	11	82,469	11	128,934	13
06	Non-ferrous metals	16,643	32	22,254	29	20,871	20	22,183	22	37,514	29	44,438	30
07	Fabricated metal products, except machinery & equipment	53,054	8	70,131	11	52,615	8	70,657	9	105,669	9	140,788	11
08	Machinery & equipment, nec	50,111	10	63,984	12	48,715	12	69,444	10	98,826	10	133,428	12
10	Electrical machinery & apparatus, nec	27,957	22	37,829	20	10,480	32	16,265	31	38,437	28	54,094	26
11	Electronic machinery & apparatus, nec	15,500	34	16,392	36	2,587	37	3,774	36	18,087	39	20,166	38
12	Motor vehicles: cars, trucks and buses	42,607	12	59,358	15	3,069	36	3,504	37	45,676	24	62,862	24
13	Other vehicles Railroad equipment & transport equip nec.	40,046	13	61,379	13	26,561	18	23,904	21	66,606	18	85,283	20
14	Wood and products of wood and cork	22,785	27	26,865	27	11,453	28	11,264	33	34,238	31	38,128	33
15	Pulp, paper, paper products, printing and publishing	28,045	21	41,424	18	40,280	14	57,895	13	68,325	17	99,319	17
16	Rubber	10,878	40	14,407	40	14,498	27	20,101	25	25,377	34	34,508	35
17	chemical (non-oil)	30,130	20	32,699	22	40,480	13	52,374	15	70,610	15	85,073	21
18	refined petroleum petro-chemicals	64,561	7	93,691	8	169,164	2	265,187	1	233,725	2	358,877	1
19	Chemicals excluding pharmaceuticals	30,559	19	47,339	17	50,898	9	67,510	12	81,458	12	114,850	16
20	Pharmaceuticals	20,034	30	31,672	23	4,141	35	4,007	35	24,175	37	35,679	34
21	Plastic products	20,066	29	19,959	32	23,626	19	25,134	20	43,692	26	45,093	29
22	Textiles	32,111	17	30,177	24	20,765	21	19,178	28	52,877	22	49,356	27
23	Textile products	35,425	15	19,264	34	1,529	39	615	40	36,953	30	19,879	39
24	Leather and footwear	16,417	33	12,295	41	1,832	38	1,098	39	18,249	38	13,393	41
25	Coffee	24,133	25	16,296	37	362	41	518	41	24,495	35	16,815	40
26	Vegetable Products (including tabaco)	44,314	11	75,319	10	11,337	31	19,590	26	55,652	21	94,909	19
27	Animal Slaughtering and Processing	39,056	14	88,736	9	5,234	34	8,256	34	44,290	25	96,992	18
28	Dairy Product Manufacturing	14,925	36	21,351	30	1,484	40	2,431	38	16,409	41	23,782	37
29	Sugar	15,005	35	21,036	31	9,419	33	20,318	24	24,424	36	41,355	31
30	Starch and Vegetable Fats and Oils Manu	27,901	23	52,908	16	11,380	30	17,590	30	39,281	27	70,497	23
31	Other Food and Beverage	52,276	9	99,355	6	17,111	26	25,455	19	69,387	16	124,810	14
32	Other Industries	13,645	38	19,616	33	18,015	24	20,976	23	31,661	33	40,592	32
33	Idustrial Services Utilities	17,707	31	26,253	28	48,829	10	96,724	7	66,536	19	122,978	15
34	Construction	151,125	1	141,411	4	18,992	22	19,570	27	170,117	5	160,982	7
35	Wholesale & retail trade	110,147	2	179,126	1	101,352	4	140,902	4	211,499	4	320,028	3
36	Transport	71,981	6	97,979	7	55,255	7	82,915	8	127,235	7	180,894	6
37	Post & telecommunications	6,530	41	27,640	26	11,385	29	56,832	14	17,915	40	84,472	22
38	Finance & insurance	31,058	18	32,914	21	240,081	1	171,711	3	271,139	1	204,625	4
39	Services to Families	94,911	4	117,647	5	37,504	15	34,787	16	132,415	6	152,434	9
40	Services to Business Sector	23,036	26	38,762	19	58,382	6	120,545	6	81,418	13	159,308	8
41	Rental and leasing	20,632	28	14,683	39	32,215	16	33,933	17	52,846	23	48,616	28
42	Public administration	94,791	5	163,421	2	17,400	25	18,270	29	112,191	8	181,690	5
43	Non-market private services	3,707	42	3,036	42	0	42	0	42	3,707	42	3,036	42