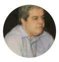
Backward Linkages without Forward Linkages: the Incipient Diffusion of ICT in the Brazilian Economy



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Backward Linkages without Forward Linkages:
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Towards the end of twentieth century, various works pointed out the important influence of ICT diffusion on the resurgence of GDP and productivity growth in the US economy. However, there are some doubts about the extent to which the US experience has been replicated by other countries, which has lead to a research agenda on the impact of ICT diffusion in various countries. The present work is a contribution to this agenda, aiming to evaluate the size and the structural characteristics of the ICT producing sectors in the Brazilian economy for the year 2003. Using an Input-Output methodology we found that there is an incipient ICT diffusion in the Brazilian economy. This is the case either in terms of the small shares of ICT producing sectors in total gross output, value added and employment, as well as, in the case of ICT shares in final demand components. In contrast, the share of ICT in total imports is significant, although the forward linkages of the ICT industries in Brazil are remarkably low when compared to the United States, and also to the average forward linkage in the Brazilian economy.

Ao final do século XX, vários artigos apontaram para a importante influência da difusão das TICs para a retomada do crescimento do PIB e da produtividade da economia norte-americana. Entretanto, há dúvidas sobre até que ponto as demais economias obtiveram a mesma trajetória dos EUA, o que levou a uma agenda de pesquisa voltada para avaliar o impacto da difusão das TICs nos demais países. O presente trabalho é uma contribuição a essa agenda ao procurar mensurar o tamanho e as características estruturais dos setores produtores de TICs na economia brasileira no ano de 2003. Utilizando uma metodologia de insumo-produto, foi constatado que há uma incipiente difusão das TICs na economia brasileira. Isto é evidenciado tanto pela pequena participação dos setores produtores de TICs tanto no total do valor da produção, do valor adicionado e do emprego como nos componentes de demanda final. Por outro lado, a parcela de TICS na importação total é significativa, muito embora os indicadores de encadeamento para frente sejam relativamente baixos tanto em comparação com os da economia dos EUA como quando comparados ao indicador médio de encadeamento para frente da economia brasileira.

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1. INTRODUCTION

Information and communication technologies (ICT) are considered to be pervasive or general purpose technologies. Until the mid-1990s, however, the economic impact of ICT diffusion was generally considered to be small. This perspective underlies Solow's famous observation that "we see computers everywhere except in the statistics on productivity growth". Opinions began to change in the second half of the 1990s, and various works have since pointed out the important influence of ICT diffusion on the resurgence of GDP and productivity growth in the United States economy.[1]

Some doubts remain about the generality of the positive effect of ICT on growth currently observed in United States economy. These doubts relate to the exact role that ICT can play in countries that don't show the same structural features of the United States economy. This questioning inspired the construction of a research agenda on the impact of ICT diffusion in various countries and regions of the world. The present work is a contribution to this agenda. It aims to analyse the impact of ICT diffusion on the Brazilian economy. We accomplish this by developing and applying an input-output (hereafter IO) methodology, which involved the following tasks:

1) Updating the last official IO matrix available (IBGE, 1996) with partial information from the Brazilian System of National Accounts (mainly from the 2003 make and use tables);
2) Disaggregating the IO matrix obtained in order to detach the ICT-producing sectors; and
3) the application of the disaggregated data set and the corresponding IO model to the analysis of the ICT producing industries.

The paper is organized as follows. The next section deals with the definition of the Brazilian ICT producing sector. In the third section the IO methodology applied in this work is presented and carried out. The results of the analysis of the ICT producing sector are discussed at the fourth section. The last section of the paper presents some brief concluding remarks.

2. DEFINING THE BRAZILIAN ICT PRODUCING INDUSTRIES

In order to identify the Brazilian ICT producing industries we have adopted the OECD definition of the ICT sector witch characterizes such a sector as "a combination of manufacturing and services industries that capture, transmit and display data and information electronically" (OECD, 2002, p. 81).[2] Although the last definition involves the combination of manufacturing and services industries, its practical implementation required separate examination of the two kinds of ICT industries.

2.1. ICT MANUFACTURING INDUSTRIES

According to OECD (ibid., p. 81), to be classified as an ICT manufacturing industry the goods produced by a manufacturing activity should: (a) be intended to fulfill the function of information processing and communication including transmission and display; and (b) use electronic processing to detect, measure and/or record physical phenomena or control a physical process. Based on the ISIC Rev. 3, the same OECD document (ibid.) suggests manufacturing activities that fulfill requirements (a) and (b). They are presented in Table 1 below with the corresponding concordance with the Brazilian activities classification (CNAE).

[1] On this matter see, for instance, Jorgenson & Stiroh, (2000), Oliner & Sichel (2000), Stiroh, (2002), Jorgenson (2005), and Jorgenson, Ho, Samuels & Stiroh (2006).

[2] The OECD definition was originally approved in 1998 and amended slightly in 2002 to reflect the international standard industry classification (ISIC) Rev 3.1 changes to Wholesale (OECD, 2003, p. 1).

TABLE 1 – ISIC/CNAE CONCORDANCE TABLE FOR ICT MANUFACTURING

ISIC code	Description	CNAE code
3000	Office, accounting and computing machinery	30
3130	Insulated wire and cable	31.30
3210	Electronic valves and tubes and other electronic components	32.10
3220	Television and radio transmitters and apparatus for line telephony and line telegraphy	32.21 and 32.22
3230	Television and radio receivers, sound or video recording or reproducing apparatus and associated goods	32.30
3312	Instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process equipment	33.20
3313	Industrial process equipment	33.30

Source: Own elaboration based on OECD (2002).

The above OECD definition of ICT manufacturing activities is complemented by the definition of ICT goods presented in OECD (2003, pp. 8 – 13). The list of ICT goods is classified in accordance with the Harmonized System (HS), witch is compatible with the MERCOSUL foreign trade classification (NCM). For its turn, there is a correspondence between the NCM and the IBGE list of products (PRODLIST) utilized in the Brazilian Annual Industrial Survey (PIA) for products. Using this last correspondence we have managed to measure the share of gross output of ICT goods in the corresponding total gross output of the ICT manufacturing CNAE activities shown in Table 1. The results are presented in Table 2 below.

TABLE 2 - ICT GOODS SHARE IN TOTAL ICT MANUFACTURING ACTIVITIES GROSS OUTPUT

CNAE code	Description	Share ICTs/Total (%)
30.1	Manufacture of Office Machinery Production	1,70%
30.2	Manufacture of equipment and Machinery of electronic systems for data processing	100,00%
31.3	Manufacture of Insulated wire, cable and electric conductors;	12,70%
32.1	Manufacture of basic electronic components	82,80%
32.2	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	99,70%
32.3	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods	100,00%
33.2	Instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process equipment	85,70%
33.3	Manufacture of electronic systems machinery, instruments and equipments related to industrial process control and automation	100,00%

Source: Own elaboration based on Annual Industrial Survey for products (2003).

This procedure allows the investigation of the actual ICT content of the OECD ICT industries. As can be verified in Table 2, the ICT goods have a very low share in two industries: manufacture of office machinery production (30.1), with a value of 1.7% and manufacture of insulated wire, cable and electric conductors (31.3), with a value of 12.7%. Because of this revealed small ICT content, the last two activities were excluded from the definition of the Brazilian ICT sector. Therefore, the Brazilian ICT sector investigated in the present work comprises only the five remaining ICT manufacturing activities (codes 30.2, 32.1, 32.2, 32.3, and 33.3).

2.2. ICT SERVICES INDUSTRIES

The ICT services industries are defined as those activities whose produced services are "intended to enable the function of information processing and communication by electronic means" (OECD, 2002, p. 81). The ISIC Rev. 3 classes covered by this definition according to OECD (ibid., p. 81) and their corresponding CNAE activities are shown in Table 3 below.

TABLE 3 - ISIC/CNAE CONCORDANCE TABLE FOR ICT SERVICES

ISIC code	Description	CNAE code
5150	Wholesaling of machinery, equipment and supplies (if possible only the wholesaling of ICT goods should be included)	51.65-9
7123	Renting of office machinery and equipment (including computers)	71.33-1
642	Telecommunications	64.2
72	Computer and related activities	72

Source: Own elaboration based on OECD (2002).

It should be noted that the first two services industries in Table 3 are defined at a 4-digit CNAE classification level, the third one at a 3-digit CNAE level, and the last service activity at a 2-digit CNAE level. On the other side, the Brazilian annual surveys for services (PAS) and trade (PAC) activities present related information only up to a maximum disaggregation corresponding to a 3-digit CNAE classification level. Thus, for the first two services industries above, the relevant information can only be encountered together with other information related to non-ICT services activities according to the OECD definition.[3] Consequently, we've decided to leave these two services industries out of the Brazilian ICT sector.[4]

2.3. THE BRAZILIAN ICT SECTOR

Hence the Brazilian ICT sector is comprised by five manufacturing and two services industries. The resulting ICT industries with the corresponding CNAE code are presented in Table 4.

[3] For instance, at the Annual Trade Survey (PAC) the CNAE group 51.6 we find the CNAE ICT activity 51.65-9 together with the activity of wholesaling of machineries, appliances and equipments involving non-ICT goods. Analogously, the CNAE ICT activity 71.33-1 can be encountered in the Annual Services Survey (PAS) in CNAE group 71.3 together with non-ICT goods renting activities.

[4] It must be highlighted that we could not verify the ICT content of the remaining ICT services industries, as we have done in the case of the ICT manufacturing industries, because there is no established ICT services list.

TABLE 4 – BRAZILIAN ICT INDUSTRIES

CNAE code	Description
30.2	Manufacture of equipment and Machinery of electronic systems for data processing
32.1	Manufacture of basic electronic components
32.2	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
32.3	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods
33.3	Manufacture of electronic systems machinery, instruments and equipments related to industrial process control and automation
64.2	Telecommunications
72	Computer and related activities

Source: Own elaboration.

3. IO UPDATING AND DISAGGREGATION METHODOLOGIES

In order to assess the structural characteristics of the ICT producing industries by the use of an IO model, it was necessary to apply a disaggregation methodology. However, the application of this type of methodology presupposes the existence of a detailed IO statistical database. The last official IO matrix and related data for the Brazilian economy compiled by the Brazilian statistical office (IBGE) is based on 1996 data. Nevertheless, IBGE has published the Make and Use tables of the SNA (System of National Accounts) with 2003 data at the same level of aggregation as the 1996 IO matrix. Thus it was possible to apply an updating methodology to obtain an IO matrix and related data for 2003, by the combination of the incomplete information from the 2003 Make and Use tables with the more detailed information coming from the 1996 IO matrix database.

3.1. Updating methodology

The updating methodology applied in this work was proposed by Grijó and Bêrni (2005). The main task involves the transformation of the use table measured in the System of National Accounts at consumers' prices into the domestic supply use table measured at basic prices. To transform consumer prices into basic prices, one must first exclude trade and transportation margins,[5] then exclude indirect taxes collected and remitted by producers and finally isolate the domestic demand from imports. We therefore combined information from the last official IO database, which contains 1996 data for the margins, taxes and imports by using industries, with the available information from Brazilian SNA for 2003, witch comprises: (a) the use table at consumer prices; and (b) the values obtainable from the Make table for the production at basic prices, for the trade and transportation margins, for the indirect taxes and for the imports by commodities.

The basic methodology consists of four steps:

a) Define a mark-down matrix for the use of domestic supply at basic prices and mark-up matrices for indirect taxes, trade and transportation margins and imports, based on the official 1996 IO database;
b) Given those mark-down and mark-up matrices, obtain a first estimation of the use table at basic prices, as well as the commodity-by-industry tables of indirect taxes, trade and transportation

[5] These margins are treated separately as commodities that are produced by industries and purchased by intermediate and final users.

margins and imports for 2003;

c) In the case of structural changes in production, trade and transportation margins, imports or taxes from 1996 to 2003, make adjustments to fill possible blanks in the 1996 structure; and
d) Use the RAS method[6] to reconcile the two sources of information, aiming to balance all five tables given the known 2003 values of the make and use tables of the System of National Accounts.

The results of the application of the updating methodology are indirectly presented in the next part, when we discuss the disaggregation of the updated matrix.

3.2. DISAGGREGATION METHODOLOGY

The calculated Brazilian IO matrix is composed of 42 activities. However, this level of aggregation is not detailed enough to identify the ICT-producing sectors. To isolate both the direct and indirect effects of those sectors, we need to disaggregate the IO matrix. The methodology proposed here is derived from Wolsky (1984). The original method consists of two steps for disaggregating the technical coefficient matrix:

- Step 1: Simple disaggregation, based on the share of the sub-industries in the total gross output of the industry; and
- Step 2: Distinguishing matrix, based on additional information about sub-industries.[7]

This methodology presents two limitations given the current availability of data for the Brazilian economy and the complete IO model used below. First, the direct disaggregation of the technical coefficient matrix prevents the use of additional information in terms of the flow data related to the make and use tables. Second, the disaggregation is only applied to intermediary consumption and not to the other components of the IO model (namely, value added, final demand and employment). We therefore use a methodology that tries to overcome both limitations and is explained in more details in the appendix below.

This methodology disaggregates the flow data present in the make and use tables to obtain the technical coefficient matrix and the other components of the IO model. It is an indirect disaggretaion method with regard to the IO model, because it is done at the commodity-by-industry structure rather than directly at the industry-by-industry relations, as in the Wolsky method. This methodology is implemented in four stages.

In the first stage, the market share matrix[8] is disaggregated in two steps similar to those proposed by Wolsky. The first step is a simple disaggregation based on the share of the sub-industries in the total gross output of the original industry. The second uses additional information about sub-industries to adjust the results subject to some re-aggregation conditions. These two steps can be applied directly to market share matrix or to the make matrix, depending on the information available.

The second stage is also a two-steps disaggregation, but now they are applied on the commodity-by-industry flow data contained on the intermediate transactions portion of the Use table.[9] The steps are

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[6] UN (1999); Bulmer-Thomas (1982); Miller and Blair (1985); Kurz, Dietzenbacher and Lager (1998); Bacharach (1970).
[7] An important remark on this methodology is that both steps must fulfill some re-aggregation conditions.

[8] A matrix in which entries in each column show, for a given commodity, the proportion of the total output of that commodity produced in each industry. Each commodity is assumed to be produced by the various industries in fixed proportions (industry technology assumption).
[9] In this table each column shows, for a given industry, the amount of each commodity it uses, matrix in terms of values.

the same as in the first stage, with some additional re-aggregation conditions.[10] In this stage, the commodity-by-industry tables of indirect taxes, trade and transportation margins and imports are also disaggregated to guarantee the total value of production by sub-industries. We thus obtain the disaggregated tables of domestic and imported output separately, of indirect taxes by industry and of total value added and its components by industry.

Once we have determined both the disaggregated market share and the disaggregated commodity-by-industry use table, we can calculate the disaggregated technical coefficient matrix.[11] As for the regular industry-by-industry direct technical coefficient matrix, the third stage obtains the disaggregated matrix by pre-multiplying the input coefficients table by the market share matrix, both disaggregated. We obtain the later one from the intermediate transaction data available at the commodity-by-industry Use table

In the final stage, we disaggregate the other components of the IO model. The value added was disaggregated in the second stage, so only the final demand and employment are disaggregated in the fourth stage. The information about these components is available in the use table either by commodity, as in the case of final demand components, or by industry, as in the case of employment. The procedure for disaggregating the final demand portion of the use matrix is similar to the approach used in the third stage. That is, the final demand matrix was pre-multiplied by the disaggregated market share matrix. The components that are usually available by industry, such as employment, were disaggregated directly using specific information on the sub-industries.

3.3. IMPLEMENTATION OF THE DISAGGREGATION

As described above, in the Brazilian economy, it is possible to identify seven ICTs sub-industries, of which, five are manufacturing and two are services. As shown in Table 5, ICTs sub-industries are incorporated in three of the 42 industries of the IO Matrix. The manufacturing sub-industries are all incorporated in one: “manufacture of electronic products equipment and machinery”. The services industries are incorporated in two different aggregated industries: “communications” and “services to business sector”.

[10] According to the type of additional information available, the two steps could be also conveniently applied on the commodity-by-industry direct input coefficient matrix.
[11] In these matrix entries in each column show the amount of a commodity used by an industry per dollar of output of that industry.

TABLE 5 - DISAGGREGATED ACTIVITIES

Aggregated Industries		Disaggregated industries
SNA (SCN)	Description	
11	Manufacture of electronic products equipment and machinery	30.2 32.1 32.2 32.3 33.3 Others
37	Communications	64.2 Others
40	Services to business sector	72 Others

The data used for the disaggregation method were obtained from the Brazilian Annual Industrial Survey[12] (PIA) and the Brazilian Annual Survey for Services (PAS). The first data necessary for the simple disaggregation are shares of each sub-industry in total gross output, which are shown in Table 6 and Table 7. As described in section 6, these shares were used in the simple disaggregation of both Make and Use tables, but they are not sufficient to complete the process. Additional data were used to distinguish the use table, value added and employment coefficient. The results of the disaggregation are presented at the end of section 6.

[12] Information is available in block II: Economic Information of Firms – item C: annual costs and expenses.

4. RESULTS

The share of ICT sectors in the Brazilian economy in 2003 are presented in tables 8, 9, and 10. Table 8 highlights the low participation of ICT sectors in the Brazilian economy in terms of either output or value added and an even lower share in terms of employment, in which the ICT sectors represent only 1.90%. Among the ICT sectors, services sectors represent a larger share than manufactures, with telecom having the greatest share in terms of gross output and value added. This does not imply a high employment share, however: almost 80% of ICT employment is in computer and related activities, which represents less than 30% in terms of value added or gross output.

Table 9 focuses on the ICT shares in final demand components, for both domestic and imported goods. The share of households' final consumption is the greatest, followed by exports. However, the share of ICT in final demand imports is quite high at almost 19%, compared to it's a 4% share in total final demand.

The highest imports share of total final demand imports is related to television and radio transmitters and apparatus for line telephony, which is the most important component in gross fixed capital formation. This indicates a high ICT investment-related propensity to import, which is underscored by the results for the share of ICT sectors in total imports by demand component (see table 10). ICT commodities represent 25.3% of investment-related imports, which correspond to 27.9% of total ICT imports. As a simple comparison, both indicators for households' final consumption are almost half of the investment indicators. On the other hand, the share of ICT in total imports, 12.03%, is smaller than the weight in final demand, owing to the low share of intermediate demand, at only 5.03%. Nevertheless, intermediate goods imports represent more than half of total ICT imports.

The next two tables are related to static impact analysis. Table 11 and 12 present the results of a 1% increase in the exogenous final demand of each sector, instead of the usual backward and forward linkages related to the same absolute variation in each sector. Table 11 considers consumption to be part of exogenous demand, while non-durable consumption is endogenous in table 12, as explained above. As expected, the integration of the usual Keynesian-Kaleckian multiplier with the Leontief multiplier increases the multiplier and consequently the indirect effect of an increase in autonomous expenditures.

In table 13, we compare the usual backward and forward linkages of ICT sectors in Brazil with the United States. The data show some relevant differences in the penetration pattern of ICT in the two economies. The backward linkages, which indicate the effect of an increase in a specific sector's final demand, show a similar order of magnitude among Brazilian and American economies, particularly for ICT manufacturing and information services. Conversely, the forward linkages, which measure the impact on a specific sector of an increase in total exogenous final demand, present a divergent pattern in the two countries. Although ICT manufacturing and telecommunications show a very high forward linkage index in the United States economy, they are both below average in Brazil. This last result reveals the incipient nature of the ICT diffusion in the Brazilian economy. The low forward linkages points to the small penetration ICT goods and services in demand pattern of the Brazilian economy.

5. CONCLUDING REMARKS

Despite its narrow scope, the present study constitutes a first step towards the analysis of the impact of ICT diffusion on the Brazilian economy. The results presented above shows an overall low ICT diffusion in the Brazilian economy. This is observed either in terms of the small shares of ICT producing sectors in total gross output, value added and employment, as well as, in ICT shares in final demand components. In contrast, the share of ICT in total imports and even more so in final demand imports is quite significant, consistently with the small share of the ICT producing industries in Brazil, as indicated before. It is important to highlight, however, that the high import coefficient is not due to a high use of ICT in the Brazilian economy. As was pointed out, the forward linkages of the ICT industries in Brazil are remarkably low when compared to the United States, and also to the average forward linkage of the Brazilian economy.

TABLE 6 – SHARE OF TOTAL GROSS OUTPUT VALUE FOR ICTS MANUFACTURING

SNA (SCN)	Disaggregated activities	Description	Share of TGO
11	30.2	Manufacture of Equipment and Machinery of electronic systems for data processing	21,4%
	32.1	Manufacture of basic electronic components	10,5%
	32.2	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	39,7%
	32.3	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods	23,0%
	33.3	Manufacture of electronic systems machinery, instruments and equipments related to industrial process control	1,3%
		Others	4,1%

TABLE 7 – SHARE OF TOTAL GROSS OUTPUT VALUE FOR ICTS SERVICES

SNA (SCN)	aggregated activities	Disaggregated activities		Share of TGO
37	Communications	64.2	Telecommunications	90,8%
		Others		9,2%
40	Services to business sector	72	Computer and related activities	29,2%
		Others		70,8%

TABLE 8 - SHARE OF ICT SECTORS IN BRAZIL (2003)

ICT Sectors	Gross Output	Value Added	Employment
Machinery of electronic systems for data processing	0.13%	0.10%	0.04%
Basic electronic components	0.07%	0.05%	0.06%
Television and radio transmitters and apparatus for line telephony	0.25%	0.19%	0.03%
Television and radio receivers, sound or video recording	0.14%	0.11%	0.04%
Electronic systems machinery, instruments and equipments related to industrial process control and automation	0.01%	0.01%	0.01%
Telecommunications	**2.11%**	**2.65%**	0.20%
Computer and related activities	0.88%	1.20%	**1.51%**
Total ICT	**3.60%**	**4.30%**	**1.90%**

TABLE 9 - SHARE OF ICT SECTORS IN BRAZIL (2003) - II

ICT Sectors	Gross Fixed Capital Formation	Exports	Households Final Consumption	Total Final Demand	Total Final Demand Imports
Machinery of electronic systems for data processing	0.83%	0.55%	0.28%	0.35%	3.98%
Basic electronic	0.40%	0.27%	0.14%	0.17%	1.94%

components					
Television and radio transmitters and apparatus for line telephony	1.53%	1.02%	0.51%	0.66%	**7.35%**
Television and radio receivers, sound or video recording	0.89%	0.59%	0.30%	0.38%	4.26%
Electronic systems machinery, instruments and equipments related to industrial process control and automation	0.05%	0.03%	0.02%	0.02%	0.25%
Telecommunications	0.04%	0.60%	4.08%	2.08%	0.23%
Computer and related activities	0.29%	1.42%	0.07%	0.29%	0.43%
Total ICT	**4.02%**	**4.48%**	**5.39%**	**3.96%**	**18.44%**

TABLE 10 - SHARE OF ICT ON TOTAL IMPORTS BY DEMAND COMPONENT

ICT Sectors	Gross Fixed Capital Formation	Exports	Households Final Consumption	Total Final Demand Imports	Total intermediate goods imports	Total Imports
Machinery of electronic systems for data processing	5.46%	4.76%	2.68%	3.98%	1.04%	1.89%
Basic electronic components	2.66%	2.32%	1.31%	1.94%	0.51%	0.92%
Television and radio transmitters and apparatus for line telephony	10.10%	8.80%	4.96%	7.35%	1.93%	3.50%
Television and radio receivers, sound or video recording	5.86%	5.10%	2.87%	4.26%	1.12%	2.03%
Electronic systems machinery, instruments and equipments related to industrial process control and automation	0.34%	0.30%	0.17%	0.25%	0.07%	0.12%
Telecommunications	0.29%	0.00%	0.19%	0.23%	0.20%	0.71%
Computer and related activities	0.57%	0.00%	0.34%	0.43%	0.16%	2.86%
Total ICT	**25.29%**	**21.27%**	**12.52%**	**18.44%**	**5.03%**	**12.03%**
Share on ICT imports[a]	**27.91%**	**0.23%**	**14.74%**	**44.26%**	**55.74%**	**100.00%**

a – Share of ICT imports by demand component on total ICT imports.

TABLE 11 - STATIC IMPACT ANALYSIS - EXOGENOUS CONSUMPTION

ICT Sectors	Gross Output	Value Added	Employment
Machinery of electronic systems for data processing	40,400	14,677	160
Basic electronic components	19,692	7,363	285
Television and radio transmitters and apparatus for line telephony	74,723	27,621	146

Television and radio receivers, sound or video recording	43,329	16,696	187
Electronic systems machinery, instruments and equipments related to industrial process control and automation	2,522	1,156	41
Telecommunications	639,812	388,919	885
Computer and related activities	267,589	176,047	6,655
Total ICT	**1,088,067**	**632,479**	**8,358**
Total	**30,261,669**	**14,702,650**	**439,867**

TABLE 12 - STATIC IMPACT ANALYSIS - ENDOGENOUS CONSUMPTION

ICT Sectors	Gross Output	Value Added	Employment
Machinery of electronic systems for data processing	76,022	27,618	301
Basic electronic components	37,054	13,855	536
Television and radio transmitters and apparatus for line telephony	140,608	51,975	276
Television and radio receivers, sound or video recording	81,532	31,417	351
Electronic systems machinery, instruments and equipments related to industrial process control and automation	4,746	2,175	77
Telecommunications	776,774	472,173	1,075
Computer and related activities	373,982	246,043	9,301
Total ICT	**1,490,718**	**845,256**	**11,915**
Total	**36,849,117**	**17,663,707**	**515,104**

TABLE 13 - BACKWARD AND FORWARD LINKAGES – BRAZIL X USA

Brazil (2003)				
ICT sectors	**Backward linkages (Average)**	**Backward linkages (Index)**	**Forward linkages (Average)**	**Forward linkages (Index)**
ICT manufactures	0.050	1.030	0.027	0.558
Telecommunications	0.035	0.722	0.047	0.959
Information Services	0.035	0.708	0.038	0.785
US (2003)				
ICT sectors	**Backward linkages (Average)**	**Backward linkages (Index)**	**Forward linkages (Average)**	**Forward linkages (Index)**
ICT manufactures	0.035	1.144	0.038	1.240
Telecommunications	0.031	1.035	0.050	1.644
Information Services	0.028	0.913	0.024	0.796

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7. APENDIX

7.1. DISAGGREGATING THE DIRECT INPUT COEFFICIENTS MATRIX

We can write the industry-by-industry direct input coefficients matrix as:

$$\mathbf{A} = \mathbf{SB}$$

where $\mathbf{S}$ is an industry-by-commodity *market-share* matrix in which entries in each column show, for a given commodity, the proportion of the total output of that commodity produced in each industry; and **B** – direct input coefficients matrix – is a commodity-by-industry matrix in which entries in each column show the amount of a commodity used by an industry per dollar of output of that industry. Therefore, the $\mathbf{A^d}$ matrix can be obtained by disaggregating both **S** and **B** matrix, in such a way that:

$$\mathbf{A^d} = \mathbf{S^d B^d}$$

Disaggregating the market-share matrix

The market share table is basically an algebraic transformation of the Make table (**Q**) of the National accounts system. The disaggregation of the make table consists of two-steps: First it is done a simple disaggregation based on the share of the sub-industries in the total gross output of the original industry. These are incorporated into a (*m* x *m*+1) disaggregation matrix $\mathbf{\Omega}$[13]:

$$\mathbf{\Omega} = \left[\begin{array}{ccc|cc} 1 & \cdots & 0 & 0 & 0 \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & \cdots & 1 & 0 & 0 \\ \hline 0 & \cdots & 0 & \omega_1 & \omega_2 \end{array}\right]$$

where ω_1 and ω_2 are the estimates of the sub-sectors share in the output value of the original system. By post-multiplying the original make table by the disaggreation matrix we obtain the (*n* x *m*+1) augmented-make table $\tilde{\mathbf{Q}}$:

$$\tilde{\mathbf{Q}} = \mathbf{Q\Omega} = \left[\begin{array}{ccc|cc} q_{11} & \cdots & q_{1,m-1} & \omega_1 q_{1m} & \omega_2 q_{1m} \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ q_{n1} & \cdots & q_{n,m-1} & \omega_1 q_{nm} & \omega_2 q_{nm} \end{array}\right]$$

Then, using additional information about sub-industries, the results are adjusted subject to some re-aggregation conditions. This information, when available is represented in the (n x m+1) production structure distinction matrix $\mathbf{\Gamma_p}$:

$$\mathbf{\Gamma_P} = \left[\begin{array}{ccc|cc} 1 & \cdots & 1 & \left(1+\gamma_{1,m}\right) & \left(1+\gamma_{1,m+1}\right) \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ 1 & \cdots & 1 & \left(1+\gamma_{nm}\right) & \left(1+\gamma_{n,m+1}\right) \end{array}\right]$$

By mutiplying each entry of the augmented-make table by the correspondent[14] element of the distinction matrix we obtain the disaggregated make table $\mathbf{Q^d}$:

$$\mathbf{Q^d} = \tilde{\mathbf{Q}} * \mathbf{\Gamma_P} = \left[\begin{array}{ccc|cc} q^d_{11} & \cdots & q^d_{1,m-1} & q^d_{1,m} & q^d_{1,m+1} \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ q^d_{n1} & \cdots & q^d_{n,m-1} & q^d_{nm} & q^d_{n,m+1} \end{array}\right] = \left[\begin{array}{ccc|cc} q_{11} & \cdots & q_{1,m-1} & \omega_1 q_{1m}\left(1+\gamma_{1,m}\right) & \omega_2 q_{1m}\left(1+\gamma_{1,m+1}\right) \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ q_{n1} & \cdots & q_{n,m-1} & \omega_1 q_{nm}\left(1+\gamma_{nm}\right) & \omega_2 q_{nm}\left(1+\gamma_{n,m+1}\right) \end{array}\right]$$

[13] Without loss of generality, we are assuming that the last sector will disaggregated in two sectors, this result could be easily generalized to disaggregating any number of sector into any different parts.

[14] The simble "*" is used for the Hadamard product or **entrywise product**. The Hadamard product of two *m*-by-*n* matrices *A* and *B*, denoted by $A * B$, is an *m*-by-*n* matrix given by $(A \bullet B)_{ij} = a_{ij}b_{ij}$. (Rao, 1973, p. 30).

subjet to some re-aggregating conditions:

$$q_{ij} = q^d_{ij} \quad \forall i = 1,...,n; \quad j = 1,...,m-1.$$

$$q_{im} = q^d_{im} + q^d_{i,m+1} \quad \forall i = 1,...,n$$

In order to be consistent with the second condition, it is possible to demonstrate that the distinction coefficients must but related in the following way:

$$\gamma_{im} = -\frac{\omega_2}{\omega_1}\gamma_{i,m+1}$$

Once obtained the disaggregated make table, the usual procedure can be aplied to obtain the disaggregated market-share table:

$$\mathbf{S^d} = \mathbf{Q'^d}\left(\hat{\mathbf{q}}\right)^{-1} = \begin{bmatrix} s_{11} & \cdots & s_{n1} \\ \vdots & \ddots & \vdots \\ s_{1,m-1} & \cdots & s_{n,m-1} \\ \hline \omega_1 s_{1m}(1+\gamma_{1m}) & \cdots & \omega_1 s_{nm}(1+\gamma_{nm}) \\ \omega_2 s_{1m}(1+\gamma_{1,m+1}) & \cdots & \omega_2 s_{nm}(1+\gamma_{n,m+1}) \end{bmatrix}$$

where $\left(\hat{\mathbf{q}}\right)^{-1}$ is the (n x n) diagonal inverted matrix of the commodities' output and $s_{ij} = q_{ij}/q_i$ is the coefficient of the original market-share matrix.

An analogous procedure can also be applied directly to the market-share matrix. We first obtain the augmented-market-share matrix $\tilde{\mathbf{S}}$, using the same disaggregation matrix $\mathbf{\Omega}$:

$$\tilde{\mathbf{S}} = \mathbf{\Omega}'\mathbf{S} = \begin{bmatrix} s_{11} & \cdots & s_{1n} \\ \vdots & \ddots & \vdots \\ s_{m-1,1} & \cdots & s_{m-1,n} \\ \hline \omega_1 s_{m1} & \cdots & \omega_1 s_{mn} \\ \omega_2 s_{m1} & \cdots & \omega_2 s_{mn} \end{bmatrix}$$

In order to obtain the disaggregated market-share matrix we must add to this augmented matrix a distinction matrix containing the additional information. It is important to notice that this procedure of disaggregating the coefficients is closer to the one proposed by Wolsky.

$$\mathbf{S^d} = \tilde{\mathbf{S}} + \mathbf{\Delta_p} = \begin{bmatrix} s_{11} & \cdots & s_{1n} \\ \vdots & \ddots & \vdots \\ s_{m-1,1} & \cdots & s_{m-1,n} \\ \hline \omega_1 s_{m1} + \lambda_1 & \cdots & \omega_1 s_{mn} + \lambda_n \\ \omega_2 s_{m1} - \lambda_1 & \cdots & \omega_2 s_{mn} - \lambda_n \end{bmatrix} \text{ where, } \mathbf{\Delta_p} = \begin{bmatrix} 0 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & 0 \\ \hline \lambda_1 & \cdots & \lambda_n \\ -\lambda_1 & \cdots & -\lambda_n \end{bmatrix},$$

and λ_j is the distinction coefficient of the production of the sub-sector in relation to commodity j.

The choice of disaggregation method of the market-share matrix depends on the availability and quality of the additional information. If there is enough information for both procedures, they can be combined in order to guarantee a better result. In order to compare both it is possible to assume that:

$$\lambda_i = \omega_1 s_{im}\gamma_{im} = -\omega_2 s_{im}\gamma_{i,m+1}$$

Disaggregating of the commodity-by-industry direct input coefficients

Correspondingly, it is possible to obtain the disaggregated commodity-by-industry direct input coefficients table directly or indirectly. The indirect method consists on disaggregating first the Use table of input flows in two steps similar to the ones described above. First, by using the same disaggregation matrix $\mathbf{\Omega}$ we obtain the augmented use table:

$$\tilde{\mathbf{U}} = \mathbf{U}\boldsymbol{\Omega} = \left[\begin{array}{ccc|cc} u_{11} & \cdots & u_{1,m-1} & \omega_1 u_{1m} & \omega_2 u_{1m} \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ u_{n1} & \cdots & u_{n,m-1} & \omega_1 u_{nm} & \omega_2 u_{nm} \end{array}\right]$$

The additional information about the use structure, when available, can be represented into another (n x m+1) distinction matrix $\boldsymbol{\Gamma}_{\mathbf{U}}$:

$$\boldsymbol{\Gamma}_{\mathbf{U}} = \left[\begin{array}{ccc|cc} 1 & \cdots & 1 & \left(1+\vartheta_{1,m}\right) & \left(1+\vartheta_{1,m+1}\right) \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ 1 & \cdots & 1 & \left(1+\vartheta_{nm}\right) & \left(1+\vartheta_{n,m+1}\right) \end{array}\right]$$

The disaggregated use table is obtained by the entrywise product of the augmented table and the distinction matrix:

$$\mathbf{U^d} = \tilde{\mathbf{U}} * \boldsymbol{\Gamma}_{\mathbf{U}} = \left[\begin{array}{ccc|cc} u_{11}^d & \cdots & u_{1,m-1}^d & u_{1,m}^d & u_{1,m+1}^d \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ u_{n1}^d & \cdots & u_{n,m-1}^d & u_{nm}^d & u_{n,m+1}^d \end{array}\right] = \left[\begin{array}{ccc|cc} u_{11} & \cdots & u_{1,m-1} & \omega_1 u_{1m}\left(1+\vartheta_{1m}\right) & \omega_2 u_{1m}\left(1+\vartheta_{1,m+1}\right) \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ u_{n1} & \cdots & u_{n,m-1} & \omega_1 u_{nm}\left(1+\vartheta_{nm}\right) & \omega_2 u_{nm}\left(1+\vartheta_{n,m+1}\right) \end{array}\right]$$

subject to the following re-aggregation conditions[15]:

$$u_{ij} = u_{ij}^d \quad \forall i = 1,\dots,n; \quad j = 1,\dots,m-1.$$

$$u_{im} = u_{im}^d + u_{i,m+1}^d \quad \forall i = 1,\dots,n$$

Now, it is possible to obtain the disaggregated domestic direct input coefficient matrix:

$$\mathbf{B^d} = \mathbf{U^d}\left(\hat{\mathbf{g}}^{\mathbf{d}}\right)^{\mathbf{-1}} = \left[\begin{array}{ccc|cc} \alpha_{11} & \cdots & \alpha_{1,m-1} & \alpha_{1m}\left(1+\vartheta_{1,m}\right) & \alpha_{1m}\left(1+\vartheta_{1,m+1}\right) \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ \alpha_{n1} & \cdots & \alpha_{n,m-1} & \alpha_{nm}\left(1+\vartheta_{nm}\right) & \alpha_{nm}\left(1+\vartheta_{n,m+1}\right) \end{array}\right]$$

where $\left(\hat{\mathbf{g}}^{\mathbf{d}}\right)^{\mathbf{-1}}$ is the (*m+1* x *m+1*) diagonal inverted matrix of the sectors' or sub-sectors's output and $\alpha_{ij} = u_{ij} / g_j^d$.

The direct method for disaggregating the **B** matrix is basically the same of the one used with the market share matrix, that is, adding to the augmented coefficient matrix $\tilde{\mathbf{B}}$ a distinction matrix $\boldsymbol{\Delta}_{\mathbf{U}}$:

$$\mathbf{B^d} = \tilde{\mathbf{B}} + \boldsymbol{\Delta}_{\mathbf{u}} = \left[\begin{array}{ccc|cc} \alpha_{11} & \cdots & \alpha_{1,m-1} & \alpha_{1m} + \omega_2\partial_1 & \alpha_{1m} - \omega_1\partial_1 \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ \alpha_{n1} & \cdots & \alpha_{n,m-1} & \alpha_{nm} + \omega_2\partial_n & \alpha_{nm} - \omega_1\partial_n \end{array}\right]$$

where:

$$\tilde{\mathbf{B}} = \left[\begin{array}{ccc|cc} \alpha_{11} & \cdots & \alpha_{1,m-1} & \alpha_{1m} & \alpha_{1m} \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ \alpha_{n1} & \cdots & \alpha_{n,m-1} & \alpha_{nm} & \alpha_{nm} \end{array}\right] \quad e \quad \boldsymbol{\Delta}_{\mathbf{U}} = \left[\begin{array}{ccc|cc} 0 & \cdots & 0 & \omega_2\partial_1 & -\omega_1\partial_1 \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & \cdots & 0 & \omega_2\partial_n & -\omega_1\partial_n \end{array}\right]$$

and ∂_i is the distincion coefficient of the use of product i by the sub-sectors. Once again, the choice of the disaggregation method, either direct or indirect, depends on the quality of the available data. It is also possible to combine[16] both methods.

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[15] In order to attend the second re-aggregation conditions, the distinction coefficients must attend the rule: $\vartheta_{im} = -\dfrac{\omega_2}{\omega_1}\vartheta_{i,m+1}$

[16] In this case, the results obtained by the two different procedures are related in the followin manner:

7.2. EMPLOYMENT COEFFICIENT DISAGGREGATION

The disaggregation of the labor coefficients vector (**l**) follows the same procedure used to obtain the disaggregated direct input coefficients matrix. Given the original vector with employment level at each sector we obtain the augmented vector:

$$\tilde{\mathbf{n}} = \mathbf{\Omega}'\mathbf{n} = \begin{bmatrix} n_1 \\ \vdots \\ n_{m-1} \\ \hline \omega_1 n_m \\ \omega_2 n_{m+1} \end{bmatrix}.$$

and with additinal information translated into a distinction vector $\boldsymbol{\theta}$ we obtain the disaggregated vector ($\mathbf{n^d}$):

$$\mathbf{n^d} = \tilde{\mathbf{n}} * \boldsymbol{\theta} = \begin{bmatrix} n_1^d \\ \vdots \\ n_{m-1}^d \\ \hline n_m^d \\ n_{m+1}^d \end{bmatrix} = \begin{bmatrix} n_1 \\ \vdots \\ n_{m-1} \\ \hline \omega_1 n_m (1+\theta_m) \\ \omega_2 n_m (1+\theta_{m+1}) \end{bmatrix} \text{ where } \boldsymbol{\theta} = \begin{bmatrix} 1 \\ \vdots \\ 1 \\ \hline 1+\theta_m \\ 1+\theta_{m+1} \end{bmatrix}.$$

subject to the re-aggregating conditions:

$$n_j = n_j^d \qquad (\forall j = 1,\ldots,m-1)$$

$$n_m = n_m^d + n_{m+1}^d$$

The employment coefficient vector follows directly:

$$\mathbf{l^d} = \hat{\mathbf{n}}^{\mathbf{d}} \left(\hat{\mathbf{g}}^{\mathbf{d}}\right)^{-1} \mathbf{i}_{m+1} = \begin{bmatrix} l_1^d \\ \vdots \\ l_{m-1}^d \\ \hline l_m^d \\ l_{m+1}^d \end{bmatrix} = \begin{bmatrix} l_1 \\ \vdots \\ l_{m-1} \\ \hline l_m (1+\theta_m) \\ l_m (1+\theta_{m+1}) \end{bmatrix}$$

This vector will attend the re-aggregation conditions as long as:

$$\theta_m = -\frac{\omega_2}{\omega_1}\theta_{m+1}$$

7.3. FINAL DEMAND DISAGGREGATION

In the use table we obtain the final demand vector by commodity $\boldsymbol{\varphi}$, however, in the input-output model, the relevant vector is the industry-by-one final demand **f**. This last one can be easily obtained by pre-multiplying it by the market-share matrix:

$$\mathbf{f} = \mathbf{S}\boldsymbol{\varphi} = \begin{bmatrix} f_1 \\ \vdots \\ f_m \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{n} s_{1i}\varphi_i \\ \vdots \\ \sum_{i=1}^{n} s_{mi}\varphi_i \end{bmatrix}$$

$\partial_i = \alpha_{im}\vartheta_{im} / \omega_2 = -\alpha_{im}\vartheta_{i,m+1} / \omega_1$

Since the vector of final demand by commodity is not affected by the disaggregation, this same method (pre-multiplying by the S^d matrix) can be applied to obtain the disaggregated final demand vector by sector or sub-sector $\mathbf{f^d}$:

$$\mathbf{f^d} = \mathbf{S^d}\boldsymbol{\varphi} = \begin{bmatrix} f_1^d \\ \vdots \\ f_{m-1}^d \\ \hline f_m^d \\ f_{m+1}^d \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{n} s_{1i}\varphi_i \\ \vdots \\ \sum_{i=1}^{n} s_{m-1,i}\varphi_i \\ \hline \omega_1 \sum_{i=1}^{n} s_{mi}\varphi_i + \sum_{i=1}^{n} \lambda_i\varphi_i \\ \omega_2 \sum_{i=1}^{n} s_{mi}\varphi_i - \sum_{i=1}^{n} \lambda_i\varphi_i \end{bmatrix}$$

We can define $\sigma_f = \sum_{1=1}^{n} \lambda_i\varphi_i$ as the distinction coefficient of final demand and re-write the disaggregated final demand vector by sectors in the following way:

$$\mathbf{f^d} = \begin{bmatrix} f_1^d \\ \vdots \\ f_{m-1}^d \\ \hline f_m^d \\ f_{m+1}^d \end{bmatrix} = \begin{bmatrix} f_1 \\ \vdots \\ f_{m-1} \\ \hline \omega_1 f_m + \sigma_f \\ \omega_2 f_m - \sigma_f \end{bmatrix}$$

It is possible to verify that the disaggregated final demand vector meets the re-aggregation conditions.

		11						37		40	
		30.2	32.1	32.2	32.3	33.3	outros	64.2	outros	72	outros
101	Café em coco	0	0	0	0	0	0	0	0	0	0
102	Cana-de-açúcar	0	0	0	0	0	0	0	0	0	0
103	Arroz em casca	0	0	0	0	0	0	0	0	0	0
104	Trigo em grão	0	0	0	0	0	0	0	0	0	0
105	Soja em grão	0	0	0	0	0	0	0	0	0	0
106	Algodão em caroço	0	0	0	0	0	0	0	0	0	0
107	Milho em grão	0	0	0	0	0	0	0	0	0	0
108	Bovinos e suínos	0	0	0	0	0	0	0	0	0	0
109	Leite natural	0	0	0	0	0	0	0	0	0	0
110	Aves vivas	0	0	0	0	0	0	0	0	0	0
199	Outros produtos agropecuários	0	0	0	0	0	0	0	0	0	0
201	Minério de ferro	0	0	0	0	0	0	0	0	0	0
202	Outros minerais	10,079	4,634	21,772	11,924	430	1,696	0	0	0	0
301	Petróleo e gás	0	0	0	0	0	0	0	0	0	0
302	Carvão e outros	0	0	0	0	0	0	0	0	0	0
401	Produtos minerais não-metálicos	61,312	28,186	132,441	72,534	2,614	10,316	64,763	4,713	0	0
501	Produtos siderúrgicos básicos	0	0	0	0	0	0	0	0	0	0
502	Laminados de aço	49,120	22,581	106,105	58,110	2,094	8,265	0	0	0	0
601	Produtos metalúrgicos não-ferrosos	83,529	38,399	180,430	98,816	3,561	14,054	25,713	1,871	0	0
701	Outros produtos metalúrgicos	148,780	68,396	321,380	176,010	6,342	25,032	424,212	30,868	10,023	22,426
801	Fabricação e manutenção de máquinas e equipamentos	301,485	29,029	38,494	35,268	3,423	21,758	633,723	46,114	139,285	311,652
802	Tratores e máquinas de terraplanagem	0	0	0	0	0	0	0	0	0	0
1001	Material elétrico	130,540	60,011	281,978	154,431	5,565	21,963	771,868	56,166	15,755	35,252
1101	Equipamentos eletrônicos	44,651	20,527	96,451	52,823	1,903	7,513	501,432	36,487	10,003	22,381
1201	Automóveis, caminhões e ônibus	0	0	0	0	0	0	0	0	0	0
1301	Outros veículos e peças	1,373	631	2,965	1,624	59	231	161,136	11,725	0	0
1401	Madeira e mobiliário	66,102	30,388	142,787	78,200	2,818	11,122	0	0	0	0
1501	Papel, celulose, papelão e artefatos	49,439	22,728	106,793	58,487	2,108	8,318	556,152	40,469	2,516,036	5,629,641
1601	Produtos derivados da borracha	7,407	3,405	16,000	8,763	316	1,246	32,693	2,379	0	0
1701	Elementos químicos não-petroquímicos	5,194	2,388	11,220	6,145	221	874	0	0	0	0
1702	Álcool de cana e de cereais	114	52	246	135	5	19	276,717	20,136	0	0
1801	Gasolina pura	0	0	0	0	0	0	0	0	0	0
1802	Óleos combustíveis	4,222	25,341	6,785	10,094	1,272	10,152	7,684	21,137	68,607	397,989
1803	Outros produtos do refino	5,171	2,377	11,170	6,117	220	870	14,594	1,062	37,736	84,436
1804	Produtos petroquímicos básicos	7,610	3,498	16,438	9,003	324	1,280	0	0	0	0
1805	Resinas	27,657	12,714	59,741	32,718	1,179	4,653	0	0	0	0
1806	Gasoálcool	824	379	1,781	975	35	139	158,915	11,564	135,728	303,693
1901	Adubos	0	0	0	0	0	0	0	0	0	0
1902	Tintas	9,932	4,566	21,454	11,750	423	1,671	0	0	0	0
1903	Outros produtos químicos	5,576	2,563	12,045	6,597	238	938	0	0	0	0
2001	Produtos farmacêuticos e de perfumaria	0	0	0	0	0	0	0	0	0	0
2101	Artigos de plástico	101,648	46,729	219,571	120,252	4,333	17,102	298,212	21,700	6,867	15,366
2201	Fios têxteis naturais	0	0	0	0	0	0	0	0	0	0
2202	Tecidos naturais	0	0	0	0	0	0	0	0	0	0
2203	Fios têxteis artificiais	0	0	0	0	0	0	0	0	0	0
2204	Tecidos artificiais	333	153	720	395	14	56	0	0	0	0
2205	Outros produtos têxteis	2,450	1,127	5,293	2,899	104	412	0	0	0	0
2301	Artigos do vestuário	388	178	838	459	17	65	43,607	3,173	403	902
2401	Produtos de couro e calçados	70	32	152	83	3	12	35,090	2,553	0	0
2501	Produtos do café	0	0	0	0	0	0	0	0	0	0
2601	Arroz beneficiado	0	0	0	0	0	0	0	0	0	0
2602	Farinha de trigo	0	0	0	0	0	0	0	0	0	0
2603	Outros produtos vegetais beneficiados	0	0	0	0	0	0	0	0	0	0
2701	Carne bovina	0	0	0	0	0	0	0	0	0	0
2702	Carne de aves abatidas	0	0	0	0	0	0	0	0	0	0
2801	Leite beneficiado	0	0	0	0	0	0	0	0	0	0
2802	Outros laticínios	0	0	0	0	0	0	0	0	0	0
2901	Açúcar	0	0	0	0	0	0	0	0	0	0
3001	Óleos vegetais em bruto	0	0	0	0	0	0	0	0	0	0
3002	Óleos vegetais refinados	0	0	0	0	0	0	0	0	0	0
3101	Outros produtos alimentares inclusive rações	1,080	496	2,332	1,277	46	182	0	0	0	0
3102	Bebidas	0	0	0	0	0	0	0	0	0	0
3201	Produtos diversos	9,909	4,555	21,404	11,722	422	1,667	122,156	8,889	1,035,610	2,317,181
3301	Serviços industriais de utilidade pública	10,534	63,219	16,926	25,183	3,173	25,328	578,300	58,705	178,072	703,501
3401	Produtos da construção civil	7,018	3,226	15,159	8,302	299	1,181	511,777	37,240	73,550	164,567
3501	Margem de comércio	129,871	59,704	280,535	153,640	5,536	21,851	313,422	22,806	225,435	504,412
3601	Margem de transporte	65,817	30,257	142,172	77,863	2,806	11,074	1,526,731	111,094	336,923	753,867
3701	Comunicações	85,818	39,452	185,375	101,524	3,658	14,439	2,899,091	47,780	642,445	1,961,304
3801	Seguros	1,096	504	2,367	1,297	47	184	43,305	1,323	4,108	28,579
3802	Serviços financeiros	53,145	24,431	114,798	62,871	2,266	8,942	1,124,124	81,798	209,371	468,469
3901	Alojamento e alimentação	1,995	917	4,309	2,360	85	336	547,019	39,804	20,886	46,732
3902	Outros serviços	9	4	19	10	0	1	765,245	55,684	155	347
3903	Saúde e educação mercantis	0	0	0	0	0	0	0	0	0	0
4001	Serviços prestados às empresas	88,364	111,226	84,964	81,870	27,419	34,657	3,709,972	83,085	1,697,455	3,861,738
4101	Aluguel de imóveis	29,778	11,186	28,873	16,516	4,497	7,147	1,284,225	62,720	225,314	768,524
4102	Aluguel imputado	0	0	0	0	0	0	0	0	0	0
4201	Administração pública	0	0	0	0	0	0	0	0	0	0
4202	Saúde pública	0	0	0	0	0	0	0	0	0	0
4203	Educação pública	0	0	0	0	0	0	0	0	0	0
4301	Serviços privados não-mercantis	0	0	0	0	0	0	0	0	0	0
Valor Total das Importações		899,128	425,441	1,884,590	1,041,654	43,676	154,808	4,233,809	189,929	675,923	1,523,887
Margem de Transporte		0	0	0	0	0	0	0	0	0	0
Margem de Comércio		0	0	0	0	0	0	0	0	0	0
Impostos sobre a produção		56,253	27,243	111,351	62,563	3,051	10,220	3,423,658	136,385	888,507	2,155,202
Salários		308,171	190,229	354,246	237,057	50,982	98,338	5,620,849	3,750,302	5,959,713	16,677,071
Previdência oficial/FGTS (Contribuições sociais efetivas)		104,879	69,554	133,658	89,876	18,955	31,938	2,092,907	994,967	2,601,644	5,672,548
Previdência privada (Contribuições sociais efetivas)		7,323	4,479	10,563	5,341	227	1,196	157,973	11,495	12,163	27,214
Contribuições sociais imputadas		0	0	0	0	0	0	0	0	0	0
Rendimento de autônomos		0	0	0	0	0	0	0	0	1,966,327	4,399,667
Excedente operacional bruto (EOB)		901,800	414,569	1,947,977	1,066,847	38,443	151,729	27,871,923	464,639	6,455,849	12,740,858
Outros impostos sobre a produção		145,538	57,464	315,680	270,500	6,993	31,173	3,210,685	44,343	608,979	3,368,305
Outros subsídios à produção		0	0	0	0	0	0	-62,477	-6,356	0	0
Valor da produção		**4,032,535**	**1,969,172**	**7,472,346**	**4,332,885**	**252,202**	**776,148**	**63,981,204**	**6,508,750**	**26,758,874**	**64,967,709**