

# **The Contribution of Services to Manufacturing Competitiveness in Brazil**

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## **Summary**

Services are becoming increasingly relevant in economic policy agendas due to their growing importance in explaining the performance of enterprises, the type and form of participation of countries in global value chains, and prospects for sustained growth. New production technologies and production organization, as well as changes in consumption patterns and in the nature of manufactured goods, are bringing industry and services closer together. Empirical evidence suggests that goods and services are merging through an increasingly synergetic and symbiotic relationship to give rise to a third product that is neither a traditional industrial good nor a conventional service. This complementariness between industry and services requires both activities to be competitive for them to benefit from each other.

How is the relationship between manufacturing and services in Brazil? Have services contributed to increasing industrial competitiveness? The purpose of this paper is to answer these questions from an international comparative perspective. We found that (1) The share of the service sector in GDP is disproportionately high in Brazil, reaching levels seen only in advanced economies; (2) Services account for a high and growing share of the value added in manufactured goods; (3) Services are of poor quality and prices are high by international standards; (4) Services have contributed little to enhancing industrial competitiveness; (5) The high share of services in industrial value added was led mainly by changes in relative prices; (6) The low competitiveness of services can be partly explained by the sector's modest labor productivity, high taxation, low competition and low investment; (7) Financial services and industrial and maintenance services provided by third parties account for most industrial spending on services.

It seems that integrating services into the core of industrial, technology, trade and investment policies is a key step to enhance industrial competitiveness in Brazil.

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## 1. Introduction

With effort and sacrifice, Brazil has built a dynamic and integrated industry that helped the country in its transformation into one of the largest economies of the world. More recently, though, the industry has shown signs of losing steam. Basic indicators such as output, employment and exports suggest that the manufacturing sector is growing slowly and is losing ground in the economy.

There are explanations for such pattern, including high costs of production, high tax burden, bureaucracy, overvalued exchange rate and regulatory and macroeconomic uncertainties. However, beyond the conventional factors, others also contribute to explain the recent performance of the Brazilian manufacturing. One of them is associated with changes in the nature of manufactured goods. Goods and services have been combined through an increasingly synergistic and symbiotic relationship to form a third product that is not a traditional industrial good nor a conventional service.

Because of the relationship that unites the manufacturing to the service sector, services have become an increasingly crucial component of industrial competitiveness and a determinant of the integration of countries into the global economy. But the growing complementarity between industry and services requires both activities to be competitive so they can benefit from one another.

How is the relationship between industry and services in Brazil? Have services actually contributed to increase the competitiveness of the industry? The purpose of this chapter is to answer these questions and to compare Brazil to other countries. We initially examine the evolution of the service sector in Brazil starting from the analysis of the national accounts. Then, with data from the Annual Industrial Survey and Annual Survey of Services, both from the Brazilian Institute of Statistics (IBGE), we investigate the relationship between manufacturing and services. Finally, we undertake an international comparative analysis using OECD input-output matrices.

The main empirical findings of the chapter are that first, services are already major components of industrial production with similar levels to those of industrialized countries. Second, services are expensive and of poor quality, which help explain the loss of competitiveness of the industry. Third, industry's performance and Brazil's integration into global value chains require increased competitiveness of the service sector.

The chapter is organized as follows. The next section discusses the theoretical and empirical issues of the relationship between services and industrial competitiveness. The third section deals with the methodological aspects, and presents and discusses the databases employed in the study. The fourth section shows the evolution of the productive structure in Brazil and highlights the growing share of services in output. The fifth section investigates the contribution of services for industrial production. The sixth section examines the impacts of services on industrial competitiveness. The seventh section concludes and suggests public and private policies.

## 2. Theoretical and empirical issues<sup>2</sup>

The increase in the share of services in output is a stylized fact of the economic literature. This increase is due to various factors and among them are those associated with people, firms, technology and trade. The economic structure of a typical developing country is well known: agriculture is prevalent in terms of value added and employment, and manufacturing and services take small portions of the GDP. But, with increasing urbanization and per capita income, agriculture loses dominance giving way to industry and services. The use of more advanced agricultural techniques in farms allows the transition to take place without much trouble.<sup>3</sup>

As income continues to rise and the economy becomes more complex, people and companies begin to demand more services such as education, health, transportation, financial intermediation, professional services, among others. But the growth rate of labor productivity in services does not increase as fast as in agriculture and industry, given that most services are not easy to standardize and are less capital intensive.

The expansion of the GDP per capita and the continued urbanization are followed by the increase in income elasticity of demand for services, a phenomenon known as Engel's Law. This relationship is not linear and the higher the income, the higher will be the demand for services and goods with higher content of services. The aging population, which is already a reality of some emerging countries such as Brazil, China and Russia, tends to be accompanied by an increasing consumption of services such as education, healthcare, welfare and recreation.

The change in the consumer preferences and the shortening of the life cycle of goods associated to globalization also contribute to increase the demand for services. But the increase in the services' output is also connected to productive and technological factors that lead to an increasing share of services in supply chains and in the value added of goods. The development and massification of information and communication technologies (ICT), as well as transport and logistics services have contributed to popularize organizational and production technologies that drive firms to focus on core activities, outsourcing other functions.

The rise of China and other Asian countries as a world center for manufactured goods, also known as "Factory Asia", is a result, but also a cause of such phenomenon. Indeed, the low prices of Chinese manufactured goods have forced competitors to adopt organizational and productive technologies that are increasingly intensive in services.

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<sup>2</sup> In this text, commercial and business services, and manufacturing and industrial sector are synonymous.

<sup>3</sup> For more details on structural transformation, see Chenery (1982) and Syrquin and Chenery (1989) inter alia.

As the patterns of consumption and production have acquired a global character, distribution networks and marketing of products, after-sales support, marketing, design, industrial design and R&D activities are gaining importance as determinants of industrial competitiveness.<sup>4</sup>

### Industrial Development Path

The analysis of industrial development is useful to examine the growth and dynamics of the service sector and its relationship with manufacturing (Arbache 2012). The "Industry-Space" shown in Figure 1 reflects a three-dimension chart that describes the trajectory of industrial development. On the horizontal axis (dimension D1) is the manufacturing share on GDP. On the vertical axis to the left (D2) is industrial density, and to the right is the share of commercial services on GDP (D3).<sup>5</sup>

Each country starts its own industrial development journey in R1 region. In this region, the agriculture share in GDP is high because the food and other commodities account for the bulk of household expenditure, and because most of the population is still rural.

The demand for basic industrial products such as steel, cement, iron, and chemicals required to building homes, factories and highways tend to grow as the economy develops. The R2 region characterizes the phase of industrial development in which basic and light industries expand as well as general services, notably those for final consumption. In this region, the share of industry and services grow at the expense of agriculture.

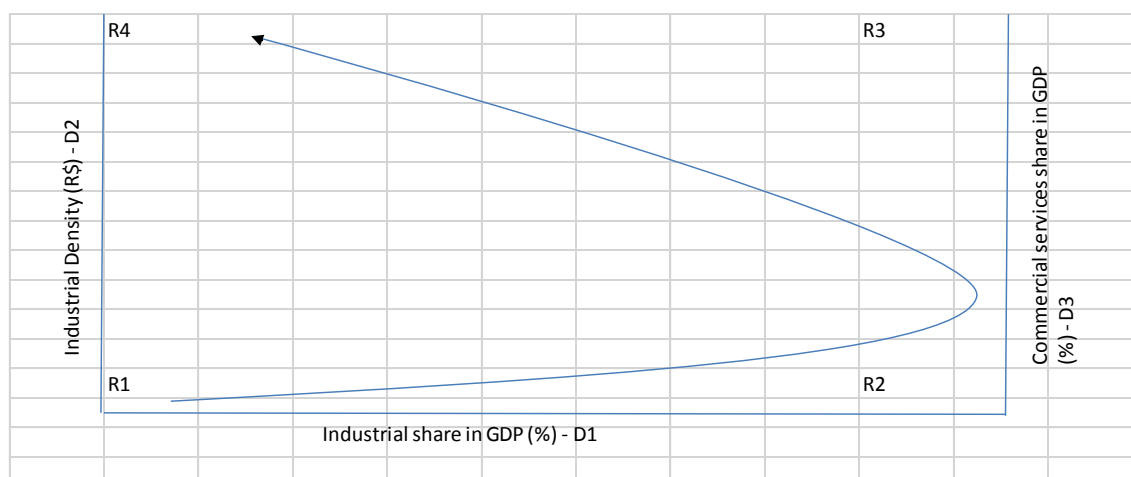
All other things equal, the more the basic and light industries expand, the lower will be their marginal contribution to GDP growth, which stems from the increased diversification of demand in favor of more sophisticated goods and services. Economic strategies such as *export-led* may even extend the "life" of this stage, but higher income will inevitably push the country to the next stage.

Figure 1: Industry-Space - the dynamics of industrial development

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<sup>4</sup> The growing importance of global value chains is followed by a deepening internationalization at the level of activities and tasks. Among the consequences are the increasing trade of inputs, both of goods and services, which already account for at least 60% of the total, and the growing importance of services in foreign direct investment (FDI) – according to UNCTAD (2013), 67% of the world stock of FDI is associated to services. According to the OECD, services account for 22% of world trade in gross terms, but in value added terms, it accounts for 54%. By 2025, it is expected to reach 75%.

<sup>5</sup> The industrial density of a country is calculated as the value added of manufacturing divided by the country's total population. The industrial density reflects the availability of resources and factors that contribute to add value, including human capital, science and technology, market-friendly institutions and infrastructure. It captures the good will of a society to provide resources needed to promote industrial development (Arbache 2012). As it will be discussed shortly, commercial services refer to services typically used as production inputs, such as machinery rental, financial intermediation, R&D, professional services and IT services.



Source: Arbache (2012)

Economies eventually reach a critical point when they enter another stage of industrial development, which corresponds to a more sophisticated stage than R2. The R3 region is characterized by a phase where investments and businesses require increasingly more R&D, financial services, engineering, marketing, among many others services to support the industrial development. At this stage, industrial density starts growing rapidly and is accompanied by the increase in the share of commercial services in output. Meanwhile, the manufacturing share on GDP starts to decline.

The transition from R2 to R3 characterizes the breakup of the middle income trap. At this stage of industrial development, the demand of families for more sophisticated health services, education, social security, leisure, urban mobility, security and connectivity with the world also begins to grow more rapidly.

The R4 region is characterized by the most advanced stage of industrial development. The industrial density continues to expand and is accompanied by a more than proportional demand for business services, while the share of manufacturing on output continues to decline. This stage is also characterized by the high demand as well as participation of manufacturing in the financing and development of sophisticated services needed to add value and differentiate industrial products (Helper et al 2012).

The decline of the manufacturing sector share on GDP does not necessarily mean that the industry lost relevance. In fact, the increasing industrial density features a much more sophisticated and influential stage of manufacturing, which is marked by the changing nature of goods and the way they are produced. The manufacturing sector performs a catalyst role in demanding R&D and other advanced services and in creating wealth and good jobs, but in a much more complex way.

The R3 and R4 regions are characterized by a symbiotic and synergistic relationship between manufacturing and services to create value. Indeed, the manufacturing value added increases when combined with services to form a third product that is not in itself an industrial good and nor a conventional service. They are goods with high content of services, such as smartphones,

products that rely strongly on marketing, branding and/or design, and products sold in packages such as mainframe computers or aircraft jet engines - the marketing of engines, for example, go along with leasing services, insurance, training, engineering and maintenance and other after-sales services and B2B.

The case of the Nokia N95 smartphone is an example of the modern relationship between goods and services. Cost breakdown shows that no less than 81.4% of the final price refers to value added by services such as licenses, software, marketing, branding and distribution, while only 18.6% refers to parts, components and assembly functions.<sup>6</sup>

The changing relationship between manufacturing and services is perhaps one of the main elements of the so-called "*Third Industrial Revolution*". The changing nature of products suggests that the definition and classification of goods in the national accounts based on sectors and activities are obsolete.

### Services related to costs and services related to value added

Services are associated to manufacturing activities through two families of functions. The first family refers to functions affecting production costs. They include transport and logistics, infrastructure services in general, storage, repairs and maintenance, outsourcing services, general IT, credit and financial services, travel, accommodation, food, and distribution services.

The second family refers to functions that contribute to add value, differentiate and customize products and therefore to increase their market price. They include R&D, design, engineering and architecture projects, consulting, professional technical services, sophisticated IT services, branding, marketing, and sales.

At first, the longer the value chain of a good, the greater the importance of costs services such as logistics for the competitiveness of that good. Cost services may also be relevant to commodities such as corn and soybean, iron ore, and oil, but also for budget cars and cheap clothes in general. On the other hand, the more sophisticated and unique is a good, the greater is the importance of services that add value. However, several goods require increasing portions of the two families of services, such as premium vehicles.

There is not, however, a simple and direct correspondence between types of goods and families of services. Consider the case of the pre-salt oil in Brazil, whose production requires highly sophisticated and advanced scientific and technological services in geology, engineering, physics and chemistry for the identification, development of fields, equipment development, extraction, logistics systems and mitigation of environmental risks. Despite all the sophistication and skilled personnel concerned, those services do not add value because oil is a commodity.<sup>7</sup>

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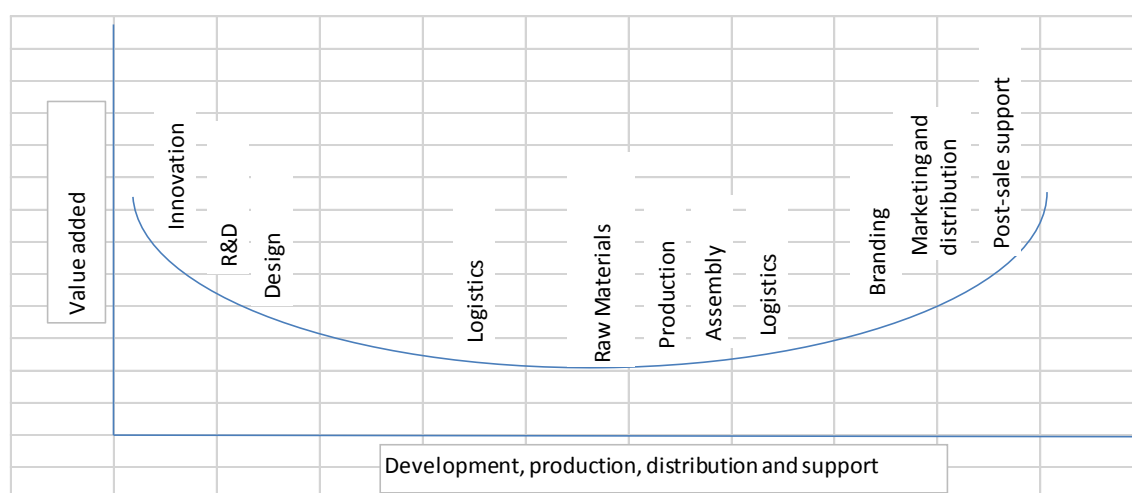
<sup>6</sup> Source: Jyrki Ali-Yrkkö, Petri Rouvinen, Timo Seppälä and Pekka Ylä-Anttila, ETLA, The Research Institute of the Finnish Economy. For the case of iPhone, see Xing and Detert (2010).

<sup>7</sup> The analysis of the correspondence between goods and services should be done on a case-to-case basis.

The smiley face curve organizes the functions of a typical industrial value chain according to value added, as shown in Figure 2. At the two edges are high value added service activities, such as innovation, R&D, design, and branding, while at the center are cost services such as logistics and assembly lines, which typically add little value.

The noblest production activities are usually located in the home countries of multinational companies, which retain control of global value chains and benefit the most from the income generated (UNCTAD 2013). The less noble activities are often outsourced to firms located in developing and emerging countries, which compete with each other for the supply of basic services to attract investment and participate in global value chains. The contribution of these countries to value added is usually residual and of less importance.

Figure 2: Smiley curve in manufacturing



### Relationship between manufacturing and services in developing countries

The relationship between industry and services in developing countries tends to be different from that in most advanced economies, which results from structural constraints and market failures, including the following. First, limited availability of services that cut costs and add value to products. Second, limited access to technology, credit and markets, which helps keeping productivity at low levels. Third, the employment of production and managerial technologies originally developed for the context of industrialized countries, but that require supply of services not often found in developing countries. Fourth, the Baumol's cost disease, which is usually more acute in developing than in developed countries due to the lower availability of human capital and low labor productivity in the service sector.

If the development and modernization of commercial services are linked to industrial development, and if the competitiveness of manufactured goods and services benefit from the synergistic and symbiotic relationship between them, then it is reasonable to assume that at this stage of the global economic integration countries in regions R1 and R2 will have the greatest challenges to

upgrade in global value chains and to become competitive in goods of higher value.<sup>8</sup>

In fact, the large and growing gap in productivity between developed and developing countries, together with the lack of conditions for progress in industrial development, suggest that the challenge of countries who wish to cross the barrier that separates R2 from R3 will be ever more difficult.

Because of the growing importance of technology in the determination of income distribution and segregation of countries among those who participate in the world economy through cost services and value-added services, one could expect that the income gap between those countries will increase over the coming years as well as the constraints to sustained growth in developing countries.

Therefore, much more than ports, roads, energy, cheap labor, tax breaks and subsidies, developing countries need strategies that strengthen the provision of services to increase industrial density and to allow them to upgrade in global value chains.

Unlike what it was argued until recently that income inequality between countries could be explained, at least in part, by modest industrialization and limited participation in global value chains, developing countries today receive sizeable industrial investments and are fundamental components of those chains. The problem is that this participation takes place increasingly by cost functions, while the value added and customization functions are increasingly concentrated in developed countries. So it is likely that the gap between developed and developing countries will increase further.

This new dynamics of the capitalism brings additional challenges for developing countries associated with the need for them to design strategies that allow the break away from the income trap they are into, and to grow in a more sustained manner.

The increasing pressure from developed countries in favor of the liberalization of services, especially those embedded in industrial products, may inflate the asymmetries discussed above, with implications for the prospects of development in spite of the fact that developing countries are participating more and not less in global value chains.

### *Empirical Evidence*

If industrial development is characterized by the advanced relationship between industrial density and commercial services, then we should find a positive relationship between these indicators. Figure 3 support this hypothesis.

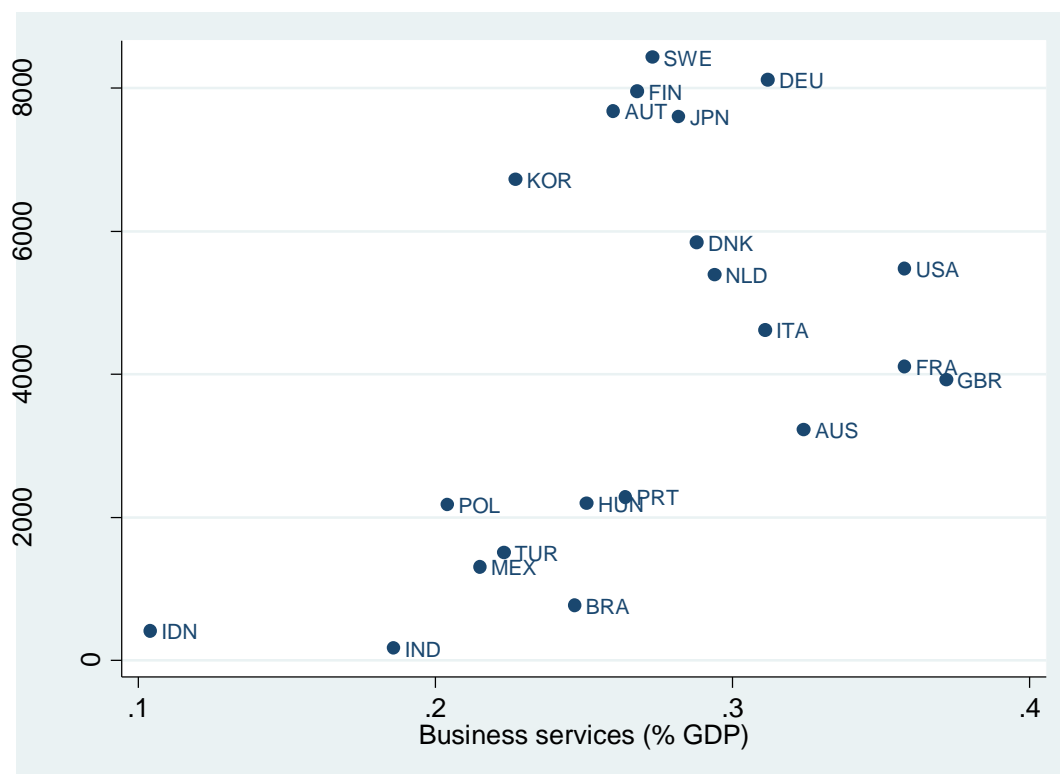
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<sup>8</sup> The trade with China has also contributed to the dismal performance of the manufacturing sector in many developing countries in recent years. In the one hand, the increasing exports of commodities have changed incentives and relative prices. On the other hand, imports of (cheap) manufactured goods have substituted nationally produced products. These factors together help explain the drop of the manufacturing share in GDP.



Exercises with cross-section data and with data in first differences identify a positive and statistically significant relationship between the indicators. Countries at the top right are those found in R3 and R4, while countries at the bottom left are lying in R1 and R2.<sup>9</sup>

Figure 3: Industrial density and commercial services – 2011



Source: Elaboration by the author on the basis of data from World Development Indicators (WDI) and OECD Input-output dataset.

Note: The industrial density is the value added of manufacturing divided by the country's total population. Commercial services are the following sectors of ISIC Rev. 3: post and telecommunications (I64), financial intermediation (J), commercial real estate, machinery leasing and equipment, IT and related activities, R & D and other business activities (K).

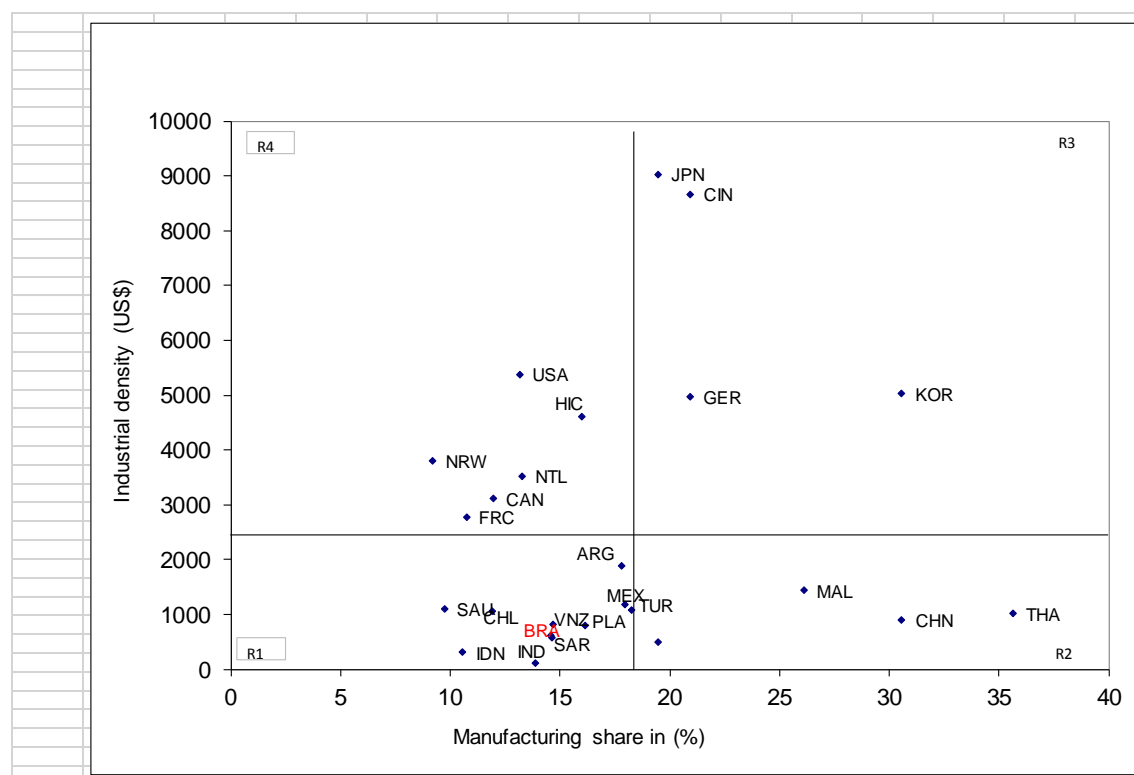
Table 1 shows the share of commercial services in gross output in advanced and emerging economies. It is observed that first, the share of commercial services increases with technological intensity. The aerospace industry, computers, electrical equipment and communication – which are high-technology intensive sectors - have a higher share of commercial services than food, beverages, tobacco, textiles, clothing and wood products – which are low technology intensive industries. Second, the share of commercial services in gross output in advanced countries is higher than in emerging ones.

<sup>9</sup> The countries in the sample are: Austria, Australia, Brazil, Denmark, Finland, France, Germany, Hungary, India, Indonesia, Italy, Japan, Mexico, Netherlands, Poland, Portugal, South Korea, Sweden Turkey, United Kingdom and United States. The inclusion of countries in the sample was based on data availability in the OECD input-output matrices and on WDI.

There is a large empirical evidence correlating services to export performance, prices, productivity and investment. Nordås and Kim (2013) perform exercises with a large sample of countries and find evidence that 1% increase in the share of commercial services in output is associated with an increase between 6% and 7.5% in export prices. Lodefalk (2013, 2014) finds evidence that the probability of exporting is associated with the availability and quality of services. Lodefalk (2014) also finds evidence that the availability of services is associated with the share of firms that export. Nordås and Kim (2013) find that the availability and quality of services are associated with the attractiveness of FDI and investment decisions. OECD (2014) finds a strong positive correlation between labor productivity in manufacturing and commercial services. UNCTAD (2013) finds evidence that provision, quality and costs of services determine the participation and the type of participation of countries in global value chains. This last analysis included various services such as quality and availability of transport and logistics, electricity, water services, design clusters, R&D and marketing skills.

In order to analyze the Brazilian case, we first compare Brazil with the United States. On one hand, both countries had similar shares of manufacturing in GDP of around 13% in 2011. What set them apart was industrial density – Brazil accounted for only 14% of the US`, and share of commercial services in GDP - while Brazil's was 24%, the US` was 36%. Not surprisingly, the countries are in R1 and R4, respectively (Figure 4).

Figure 4: Industry-Space 2011



Source: Arbache (2012)

Note: Industrial density is the value added of manufacturing divided by the country's total population.

Table 1: Intermediate consumption of services in the gross value of production (%), 2005

	Food, beverages and tobacco	Textile, clothing, leather and shoes	Wood and wood products	Paper, pulp, paper products, edition and printing	Oil products and nuclear fuels	Chemicals, except pharmaceuticals	Pharmaceuticals	Plastic and rubber	Other non-metallic minerals	Iron and steel	Non-ferrous metals	Metal products, except machinery and equipment	Machine and equipments	Computers and office machines	Equipamentos elétricos	Communication Equipment	Medical and precision instruments	Vehicles	Building and ship repair	Aerospace	Rail-road equipment	Recycling
United States	14,70	6,71	4,71	13,93	4,69	12,47	nd	8,19	8,04	4,46	nd	9,44	11,06	17,82	8,28	16,61	15,98	7,69	9,59	nd	nd	10,72
Brazil	3,93	3,32	2,49	7,38	2,70	6,90	12,08	4,63	5,41	6,72	3,90	3,96	7,22	8,58	7,40	12,36	4,84	6,79	7,19	nd	nd	2,41
France	12,21	13,57	8,22	16,14	5,95	16,75	nd	11,13	11,34	11,53	nd	8,53	13,39	13,36	10,58	21,72	15,26	10,79	12,21	nd	nd	11,88
Germany	12,85	6,33	7,88	15,46	7,05	16,03	nd	11,95	12,48	7,16	nd	8,11	11,10	15,06	13,13	15,93	11,09	9,14	10,47	nd	nd	10,76
China	3,25	3,99	3,82	3,27	1,31	3,47	nd	5,58	4,43	1,85	nd	4,55	4,33	4,95	4,78	4,39	3,65	4,32	4,24	nd	nd	3,32
South Korea	4,29	6,16	3,62	9,72	1,59	3,65	15,86	4,24	5,29	3,18	3,54	4,03	6,02	7,16	6,15	9,87	10,96	4,39	5,14	7,30	nd	5,16
India	3,78	5,38	3,69	3,44	2,71	3,67	1,95	3,10	2,63	2,68	4,28	4,42	7,93	10,20	6,50	14,35	10,64	10,52	8,24	32,34	5,89	nd
Turkey	1,60	3,21	3,52	5,18	1,58	7,13	nd	5,74	4,35	1,99	nd	3,15	3,02	5,45	3,44	2,94	4,80	2,23	5,85	nd	nd	2,91
Sweden	8,80	10,70	4,99	10,65	2,48	17,61	nd	10,21	8,95	6,30	nd	9,62	13,29	17,12	25,35	nd	11,92	15,67	9,73	nd	nd	11,40
Indonesia	2,03	3,15	3,67	3,26	0,40	2,83	6,99	3,13	3,72	2,73	1,52	5,92	1,77	nd	6,62	6,11	5,49	3,66	2,49	1,25	3,21	3,03
Average	6,74	6,25	4,66	8,84	3,05	9,05	9,22	6,79	6,67	4,86	3,31	6,17	7,91	11,08	9,22	11,59	9,46	7,52	7,51	13,63	4,55	6,84

Note: Commercial services are the following sectors of ISIC Rev. 3: post and telecommunications (I64), financial intermediation (J), commercial real estate, machinery leasing and equipment, IT and related activities, R&D and other business activities (K).

Source: OECD input-output dataset

We then perform another comparison exercise, now between Brazil and Turkey, which has been implementing active sectoral policies. Figure 5A shows that while the share of business services remained stagnant in Brazil between 1995 and 2011, in Turkey it rose substantially from 14% to 22%. Figure 5B shows that industrial density in Turkey rose from US\$ 940 in 1995 to US\$ 1,500 in 2011, while in Brazil it remained almost stagnant, ranging from \$720 to \$770.<sup>10</sup> Therefore, as expected, the increase of business services share in Turkey was accompanied by the increase of industrial density.<sup>11</sup>

Figure 5: Business services, manufacturing and industrial density in Brazil and Turkey - 2011

Figure 5A

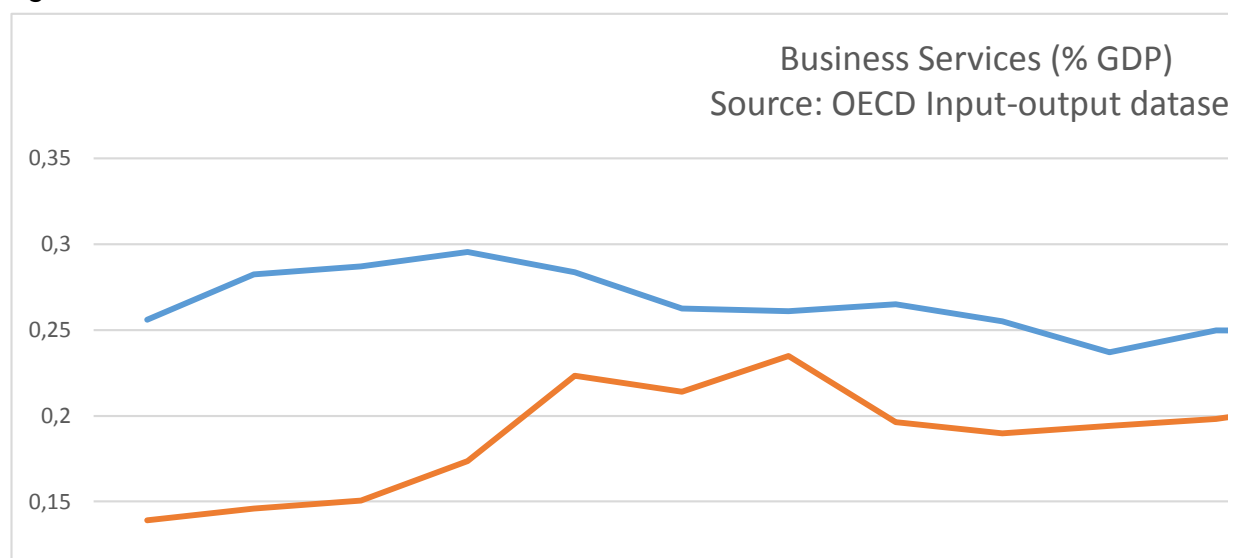
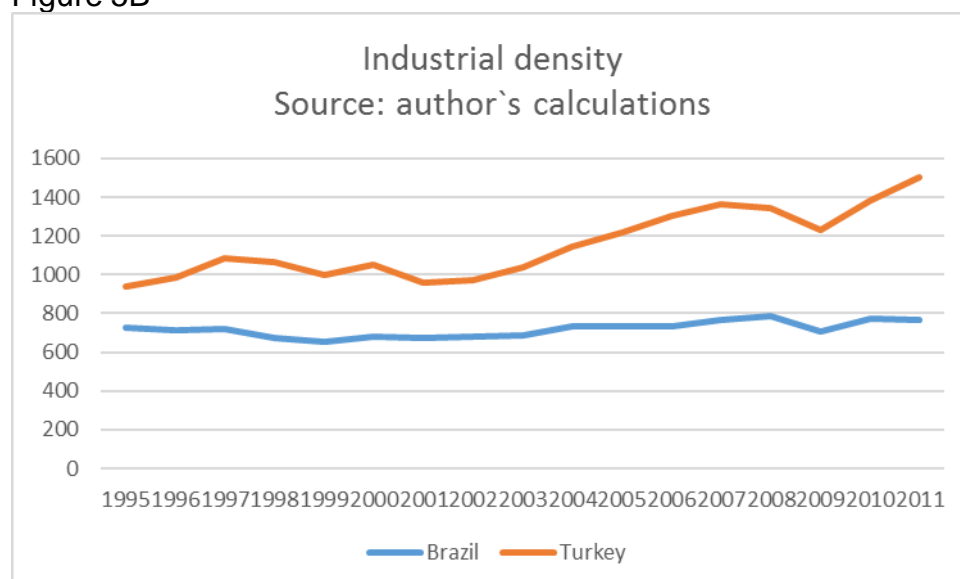


Figure 5B



<sup>10</sup> Constant Dollars from 2005. Source: WDI.

<sup>11</sup> The same correlation holds for developed countries for the period 1995-2011. Cases that attract special attention are those of Germany and Japan.

### 3. Methodology

This study employed the following databases for empirical analyses:

For Brazil:

- National Accounts - IBGE
- Annual Industrial Survey - PIA, IBGE
- Annual Survey of Services - PAS, IBGE
- National Household Survey - PNAD, IBGE
- Annual Report of Social Information - RAIS, Ministry of Labour

For various countries:

- Input-Output Dataset – WIOD, OECD
- Doing Business and Enterprise Survey - World Bank
- World Competitiveness Report - World Economic Forum
- Total Economy Database - Groningen Growth and Development Centre

The chapter examines the service sector from 1947 to 2013. However, the investigation of the relationship between the service sector and manufacturing in Brazil focused on the period 1996-2011, which corresponds to the data availability for PIA, the database that we deemed the most suitable for the analysis. The choice of PIA was due to its detailed annual coverage of the industrial consumption of services. Comparative analysis of the relationship between manufacturing and services was based on the OECD input-output matrices.<sup>12</sup>

Table 2 shows the time coverage of the main databases used in the study. The large variance in temporal coverage has imposed analytical limitations to the work. As an example, the last IBGE's input-output matrix for Brazil is of 2005, a period prior to the global financial crisis.

Table 2: Main databases used and time coverage

PIA	Input-output matrices	PAS	RAIS	PNAD	National accounts	Groningen Growth Database
1996-2011	1995, 2000, 2005	2007-2011	1995-2012	2002-2012	1947-2013	1950-2005

A methodological limitation of our study is the absence of direct correspondence between the variables employed in the databases. A second limitation is that PAS does not cover financial intermediation. This segment is especially important for the manufacturing sector, as discussed below. A third limitation is that it is inappropriate to compare indicators produced from different databases, which are due to methodological differences in construction and sampling of those databases. The stratum of PIA that we use is representative of industrial

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<sup>12</sup> The international comparison included major OECD economies, Chile, South Korea, Mexico and other emerging countries such as Argentina, Colombia, China, India, Indonesia, Malaysia, Thailand, Turkey and Vietnam.

firms with five or more employees, leaving out firms with four or fewer employees. On the other hand, the input-output matrices capture activities of firms of all sizes. Therefore, more important than comparing the absolute value of an indicator is comparing their trends over time.

In this paper, we follow the literature and use the term "commercial services" to designate the following sectors of ISIC Rev. 3: post and telecommunications (I64), financial intermediation (J) and commercial real estate activities, machinery leasing and equipment, IT and related activities, R&D and other business activities (K). The other activities, i.e. electricity, gas and water supply (E), construction (F), wholesale and retail trade (G), hotels and restaurants (H), transport services (I60 to I63), public services and defense (L), education (M), health (N) and other community social and personal services (O) are classified as "traditional services".

As it is well known, services are usually intangible, cannot be stored, have unstable quality, bear the characteristic of inseparability between production and consumption, are highly heterogeneous and are generally less standardizable than manufactured products.<sup>13</sup> That is why measuring prices and volumes of services is a huge challenge, which affects the results of research pieces like this one. Derived variables, such as productivity, are subject to those limitations, because they can carry deviations and non negligible measurement errors. In addition, international comparison of service sectors is also challenging due to not uncommon differences in market structures, technologies and input costs.

To further complicate the investigation into the services sector, the increasing integration of goods and services in the organization of production, and the increasing content of services in manufactured goods create difficulties to identify where a manufactured artifact ends and where a service begin. Therefore, the classification of sectors in the national accounts appear to be increasingly inadequate for the modern production.

Finally, the higher incidence of informality in the service sector also impacts the measurement of output and price setup, highlighting some other sources of errors of measurement of prices, volumes and sectoral output.<sup>14</sup>

#### **4. Brazil – already a service economy**

Figure 6 shows the contribution of services to the GDP of emerging and advanced countries. We observe that the share of services is positively correlated with per capita income. But the case of Brazil seems to be an anomaly. This is because the share of services in GDP of nearly 70% is similar to that of countries with much higher per capita income. In China, services are of the order of 44%; South Korea, whose GDP per capita is at least 2.5 times

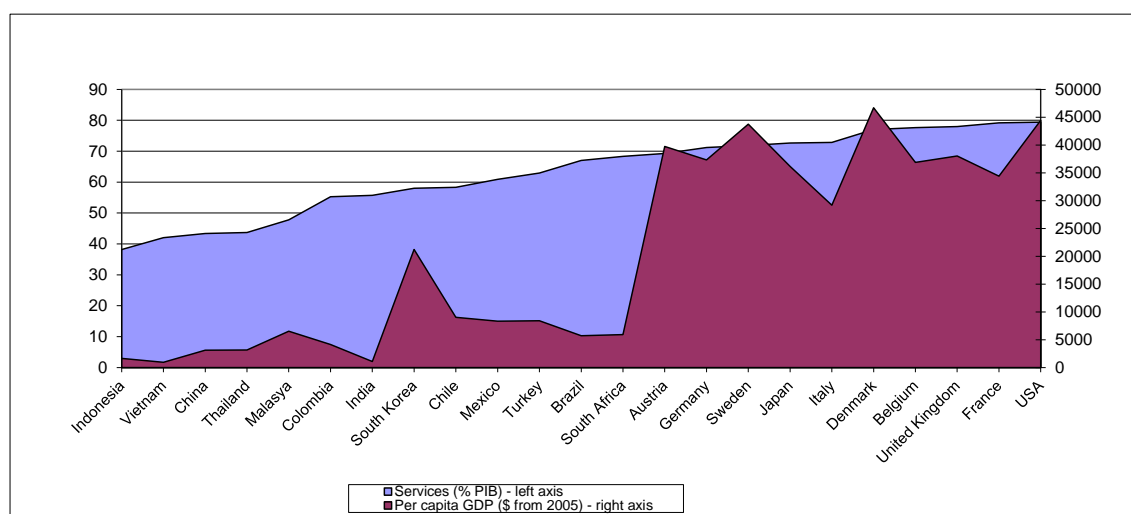
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<sup>13</sup> With the emergence of ICT, several of those characteristics apply less. For example, software can be stored and can be produced independently of the consumer.

<sup>14</sup> Informality is concentrated in traditional services, in particular in retail trade and personal services; it is relatively small in commercial services.

larger than that of the Brazil, services account for 58% of the output. The only developing country in a situation comparable to that of Brazil is South Africa.

Figure 6: Per capita income and participation of services in the GDP – 2011



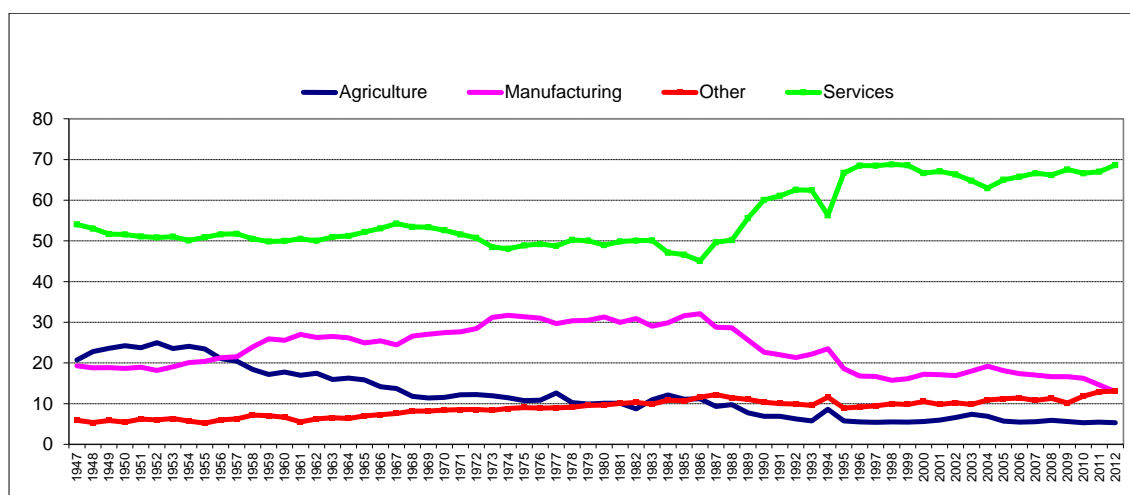
Source: Elaboration by the author on the basis of data from World Development Indicators

Figure 7 shows that the share of services in GDP remained relatively stable, of around 50% between 1947 and 1985. But since then, the sector's share has never stopped growing. It is interesting to notice that until the mid-1980s the increase in the manufacturing industry was accompanied by an almost symmetrical decline of agriculture. Since then, there has been significant change in the economic structure. Services have taken a prominent role and have grown rapidly at the expense of manufacturing. The industry's share of total output peaked in the mid-1980s, with 32%; from then on, it started an almost monotonic decrease, reaching less than 13% in 2013. On the other hand, agriculture went from 25% at the beginning of the series to 5.3% in 2013.

The services participation in the economy does not seem to result from the increase in average income or improvement of income distribution, factors that could have triggered at least part of the growth of consumer services and industrial density. In fact, GDP per capita grew on average only 1.18% annually between 1980 and 2013, and inequality indicators would only improve from the mid-2000s on. The industrial density actually worsened in the 1990s and 2000s (Arbache 2012). The high share of the service sector in the economy resulted from the increasing demand for retail services, changes in relative prices that favored services at the expense of manufacturing, and stagnation of the manufacturing output.



Figure 7: Sectoral participation in GDP (%)



Source: Elaboration by the author on the basis of the national accounts.

Note: The category "others" is composed by construction, mining and mineral extraction industry, and electricity, gas and water.

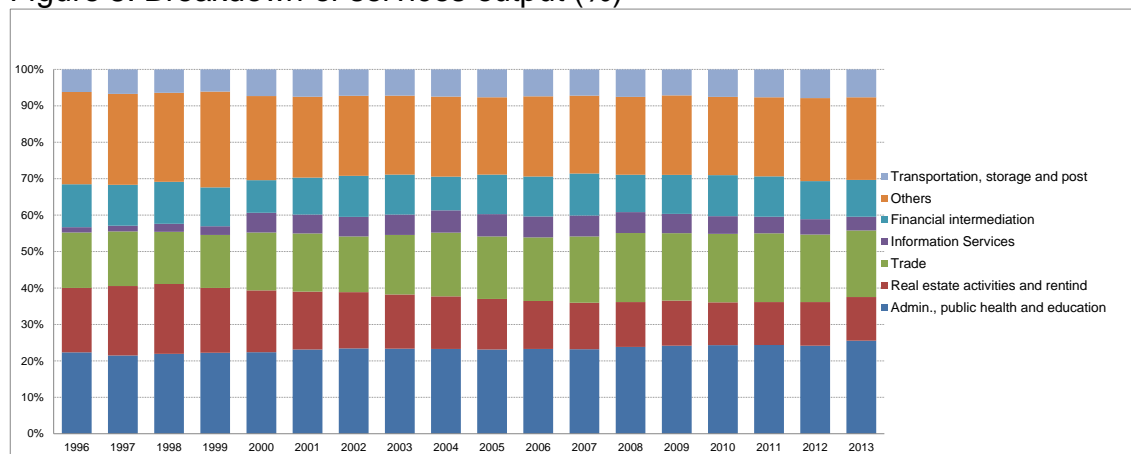
The share of services in Brazilian household expenditure is 62%. This percentage is high for emerging countries standards and helps to explain the high share of services in GDP. In China, the consumption of services in total household consumption is 55%; in India, 50%; in Russia, 52%; and in Indonesia, 45%. Brazil also differs from other emerging countries in the consumption of financial services, which accounts for 7% of household expenditure. In China, they account for 4% and in India, for 2%. The largest share of services in the consumption basket are wholesale, retail trade, restaurants, education, health and renting (source: OECD Input-output dataset).<sup>15</sup>

Figure 8 shows the composition of services over time. We observe that first, the share of public services such as health and education grew significantly.<sup>16</sup> Second, while the contribution of retail remains high, the sector has lost participation. Third, other services gained participation. Fourth, information services showed significant growth. Fifth, the share of financial intermediation recorded growth from the early 1970s to around the mid-1990s, which probably reflects the effects of the national financial system reform in the late 1960s and the benefits of the inflation tax for the sector.

<sup>15</sup> The high share of financial services in Brazil is in part due to the high inflation and high banking market concentration, together with high interest rates.

<sup>16</sup> The tax burden in Brazil is much higher than in countries with similar per capita income. This allows Brazil to employ proportionally a lot of teachers, doctors, nurses and civil servants.

Figure 8: Breakdown of services output (%)



Source: Elaboration by the author on the basis of data from National Accounts.

Note: The category others is composed by construction, mining and mineral extraction industry, and electricity, gas and water.

The service sector is by far the one that employs more formal and informal workers. In 2012 it accounted for no less than 72.3% of total formal workers. On the other hand, the manufacturing sector went from 20.8% in 1995 to 17.1% in 2012. With such participation in employment, the services sector virtually dictates the contours of the Brazilian labor market and whatever happens in this sector likely spills over into the entire economy.

In recent years, 8.3 of every 10 new formal jobs created were originated in the services sector. CAGED dataset, from the Ministry of Labor, shows that the turnover in the service sector comes to be about four times higher than in the rest of the economy. The high turnover discourages investment in human capital both by the employee side, as well as by the employer side, which is, therefore, a powerful source of low productivity.

Table 3 presents characteristics of service sector firms. It shows that, first, the value added per month per firm is R\$ 45,600. Second, the value added per worker per month is R\$ 4,326. Third, firms are relatively small, employing 10 workers.<sup>17</sup> Fourth, wages are relatively high for the value added per worker. And fifth, real wages rose more than value added per worker. It seems reasonable to infer that the wage determination is influenced by factors other than just the market. Two potential candidates are the minimum wage, which has grown significantly more than inflation, and the deceleration of the working age population combined with the stagnation of the labor force participation, which might have constrained the pool of workers seeking employment.<sup>18</sup>

<sup>17</sup> OECD (2014) shows evidence for Brazil and other countries that the smaller the service firm is, the lower their total factor productivity. The sample of PAS employed in this chapter considered firms with five or more workers only. The average number of workers per firm in the original sample of PAS is 5.26.

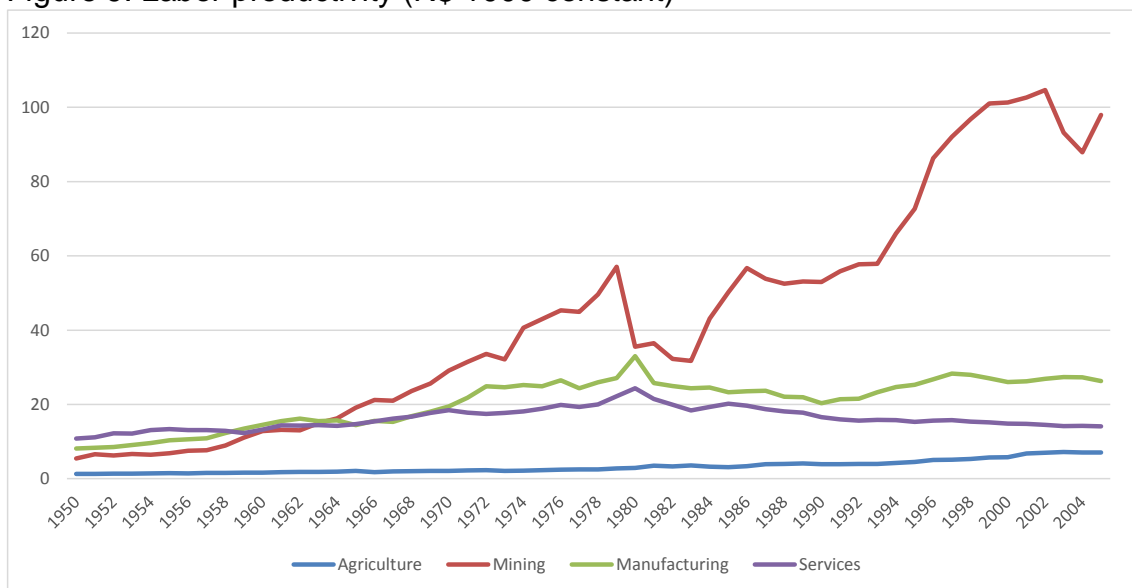
<sup>18</sup> For a detailed study of the service sector's productivity in Brazil, see Arbache (2015).

Table 3: Characteristics of firms in the service sector - average - R\$ constant		
	2011	Growth rate 2007-11
Value added by firm (R\$ monthly)	45,600	10.79
Value added by worker (R\$ monthly)	4,326	11.53
Size (Number of workers)	10.5	-0.7
Wage (R\$ monthly)	1,368	13.04
Source: PAS-IBGE		

PAS data show a high diversity of characteristics between the service segments. Firms providing business services had on average twice more workers than those providing services to families. The data also confirm that the service sector is probably the most diverse in the economy. Very high and very low-tech firms co-exist in the same segment and market as well as high and low-skilled workers and high and low productivity firms. Distinctions continue through geographic regions and states. Because of this feature, the formulation of effective policies for the service sector is a major challenge for the government and the private sector alike.

Figure 9 shows that the service sector productivity is particularly low in a comparative and long-term perspectives. However, the popularization of technology intensive services, such as IT and telecommunications, the average rate of growth of productivity in the service sector is likely to increase over the coming years.

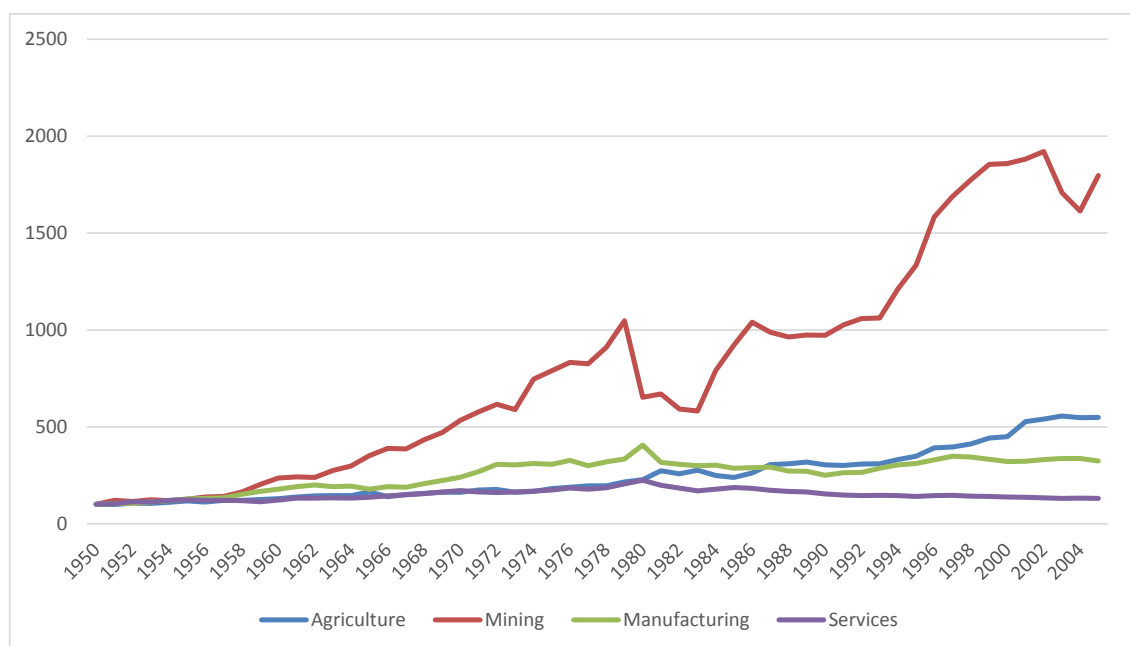
Figure 9: Labor productivity (R\$ 1000 constant)



Source: Elaboration by the author on the basis of data from Groningen Growth and Development Centre

Figure 10 shows the growth rate of labor productivity over time. The growth rate of services is not only low, but has decreased since the beginning of the 1980s. Considering the sector size and its importance for employment, it seems reasonable to say that the service sector is the single most important factor to explain the stagnation of productivity in Brazil.

Figure 10: Labor productivity 1950=100



Source: Elaboration by the author on the basis of data from Groningen Growth and Development Centre

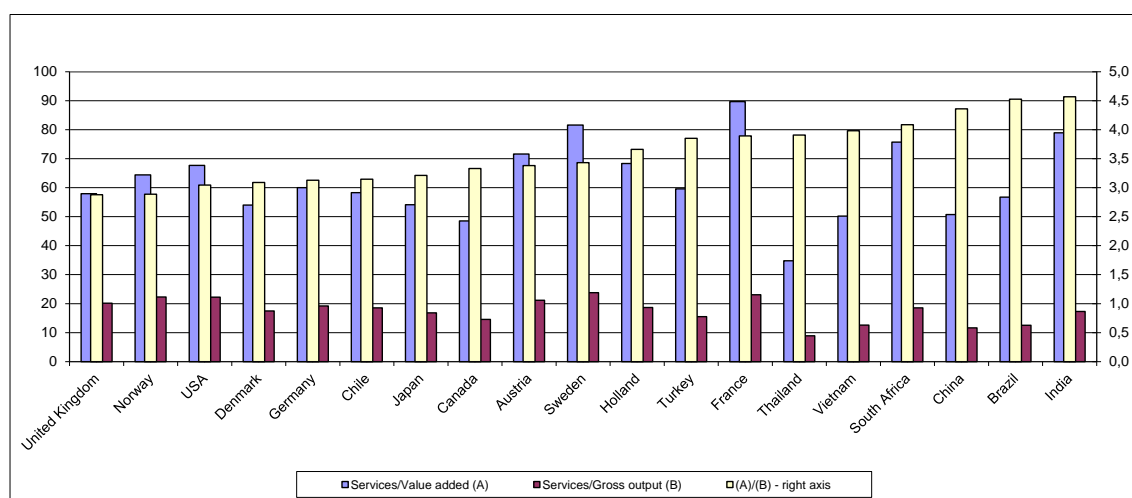
## 5. Contribution of services to manufacturing

Figure 11 compares the ratio of service inputs to manufacturing value added for developed and emerging economies. With 57%, Brazil's ratio can be considered as moderate – this ratio is higher than in many emerging and developed countries such as Canada, Denmark and Japan. The other ratio, service inputs to manufacturing gross output, is 12.5% and can be regarded as low to medium. The gap between the two ratios is relatively high in Brazil. The reasons of that are changes in relative prices that favored services, and loss of value added in manufacturing. As one could expect, emerging countries are generally more to the left of the distribution, while advanced countries are generally more to the right.

The strong growth in imports of manufactured goods since the mid-2000s and the reduction or stop of production lines of more sophisticated products in the country, such as special steel, seem to be associated with the evidence on the decrease of value added in Brazilian manufacturing. In fact, recent newspaper reports suggest that many Brazilian industrialists began to import and resell the goods that they once produced domestically.<sup>19</sup>

<sup>19</sup> For a detailed study on the loss of industrial competitiveness in Brazil, see Bonelli et al (2013).

Figure 11: Intermediate consumption of services in manufacturing - 2005 or the closest year



Source: Elaboration by the author on the basis of data from OECD Input-output dataset

Table 4 shows the ratio of services to manufacturing value added and of services to gross output between 1996 and 2011. In line with the data from the input-output matrices, there is an upward trend in the contribution of services to manufacturing, but at a relatively faster pace in value added than in gross output. The first indicator moved from 44.8% in 1996 to 64.5% in 2011; the second indicator moved from 14.8% to 17.6%.

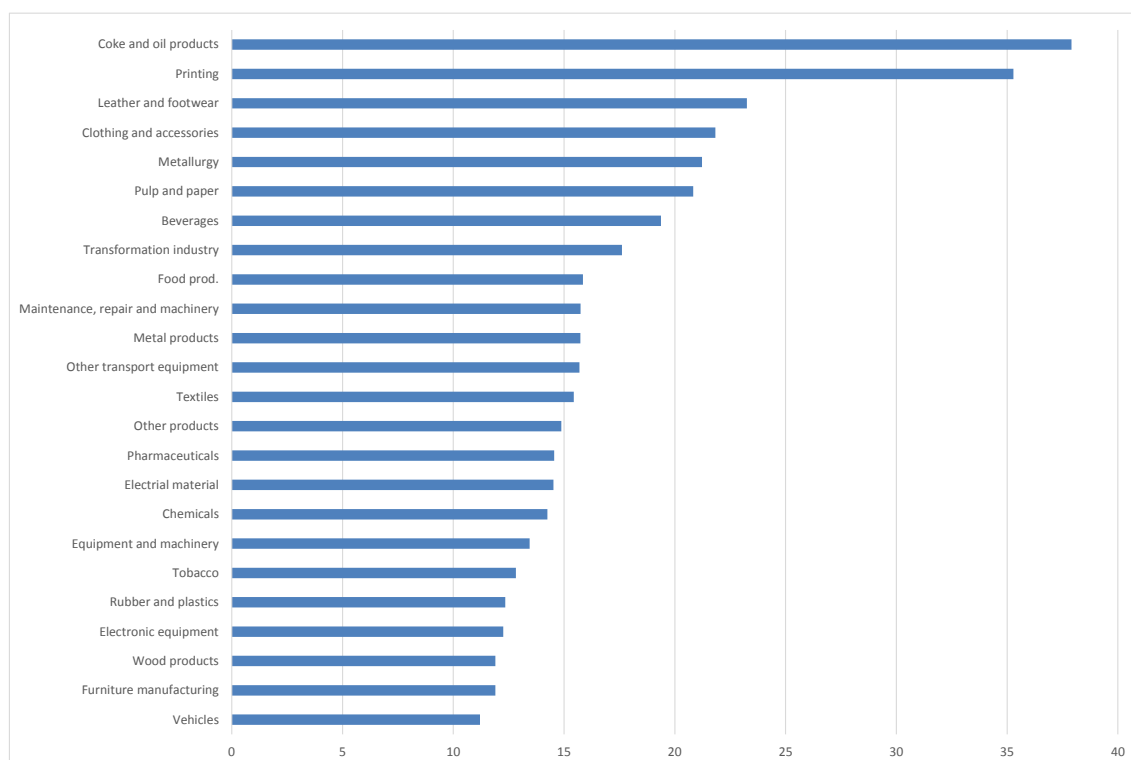
Table 4: Intermediate consumption of services in the industry (%)

	Gross production value						Added value					
	1996	1999	2002	2005	2008	2011	1996	1999	2002	2005	2008	2011
Manufacture	14,83	18,07	18,58	16,66	17,71	17,61	44,78	61,77	67,76	61,67	67,51	64,47
Food products	15,01	17,52	17,70	16,77	18,69	15,85	55,03	77,73	88,73	82,71	107,71	74,90
Beverages	nd	nd	nd	nd	24,07	19,37	nd	nd	nd	nd	67,01	55,91
Tobacco	16,66	22,03	11,51	16,03	19,31	12,83	42,09	49,13	31,00	67,84	60,13	35,69
Textiles	14,01	14,95	14,78	14,46	15,62	15,44	42,21	48,07	49,75	47,13	51,71	51,68
Clothing and accessories	15,24	18,73	18,89	16,05	16,78	21,83	45,70	59,86	56,91	47,56	47,47	55,92
Leather and footwear	17,45	15,08	14,54	17,02	19,84	23,25	55,55	56,18	49,93	59,88	64,90	70,37
Wood products	14,71	16,44	16,83	17,68	16,80	11,90	39,73	42,31	44,83	57,94	49,15	33,62
Pulp and paper	20,89	18,35	19,72	20,31	25,13	20,83	55,30	55,38	51,49	64,34	81,40	66,23
Printing	22,23	28,38	34,52	26,15	17,44	35,28	50,16	88,14	110,61	73,50	50,32	97,02
Coke, oil products	14,23	21,90	35,41	26,35	33,19	37,90	41,98	47,24	111,16	64,84	84,65	111,99
Chemicals	15,59	18,65	17,81	16,33	14,53	14,25	46,08	62,73	70,89	66,52	86,39	67,09
pharmaceutical products	nd	nd	nd	nd	18,95	14,56	nd	nd	nd	nd	51,62	38,41
Rubber and Plastics	13,30	14,91	14,28	13,90	13,24	12,34	35,41	48,04	51,80	51,35	52,46	45,24
Non-metallic mineral products	17,58	21,07	14,70	19,12	18,25	15,78	46,86	63,77	34,77	55,42	56,55	46,20
metallurgy	14,86	15,96	16,87	12,75	16,78	21,23	43,03	47,63	49,86	39,12	56,44	91,34
Metal products	15,02	17,01	17,49	14,74	15,87	15,74	39,46	49,86	55,08	48,12	53,14	44,50
Electronic equipment	14,63	19,24	16,48	16,80	14,51	12,26	48,42	103,42	73,41	85,25	93,75	57,76
Electric materials	12,52	14,39	16,14	15,59	15,05	14,52	34,19	43,64	55,08	56,83	56,09	53,70
Machines and equipment	12,36	17,10	15,49	13,72	12,88	13,45	31,52	50,71	50,90	46,38	47,00	43,48
Vehicles	10,37	19,46	15,50	12,42	9,96	11,20	35,44	86,92	72,10	63,81	42,26	44,62
Other transportation equipment	ui	8,84	13,18	12,71	10,77	15,69	68,58	37,47	41,12	56,48	45,91	59,72
Furniture manufacturing	14,26	15,49	13,73	13,79	10,83	11,90	41,84	53,40	43,84	47,38	44,28	40,91
Miscellaneous products	nd	nd	nd	nd	17,64	14,87	nd	nd	nd	nd	46,22	35,98
Maintenance, repair and machinery	nd	nd	nd	nd	14,93	15,74	nd	nd	nd	nd	31,50	30,07

Source: Author's calculations based on data from PIA.

In spite of the general upward trend in the share of services in manufacturing, significant variation is observed between industries, as reflected in Figure 12. While the contribution of services to the motor vehicle output was 11%, in the oil and gas industry it was 38%.

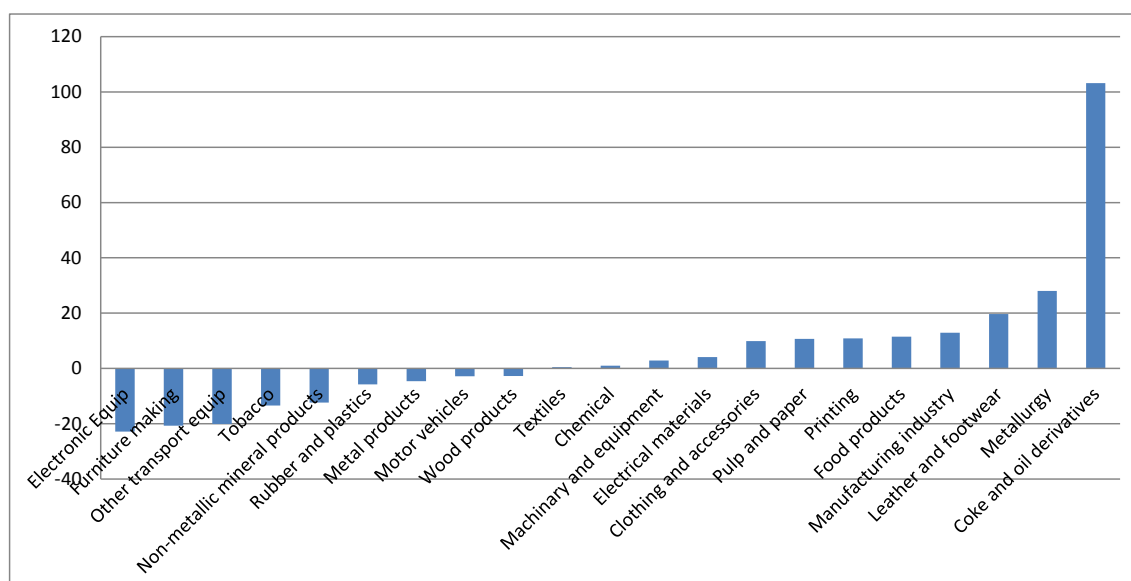
Figure 12: Intermediate consumption of services in manufacturing gross output (%) - 2011



Source: Elaboration by the author on the basis of data from PIA – IBGE

Figure 13 shows the growth rates of the services contribution to manufacturing gross output. There is no uniformity even in the direction of rates - there was a decrease in the consumption of services in some industries, such as transportation equipment, furniture and clothes, while in others such as oil and gas, metallurgy and chemistry, there was a substantial increase. The different rates may reflect, among other potential explanations, a change in relative prices, production technologies, organization of production, management and market structure.

Figure 13: Intermediate consumption of services in manufacturing gross output - growth rate between 1996-68 and 2009-11

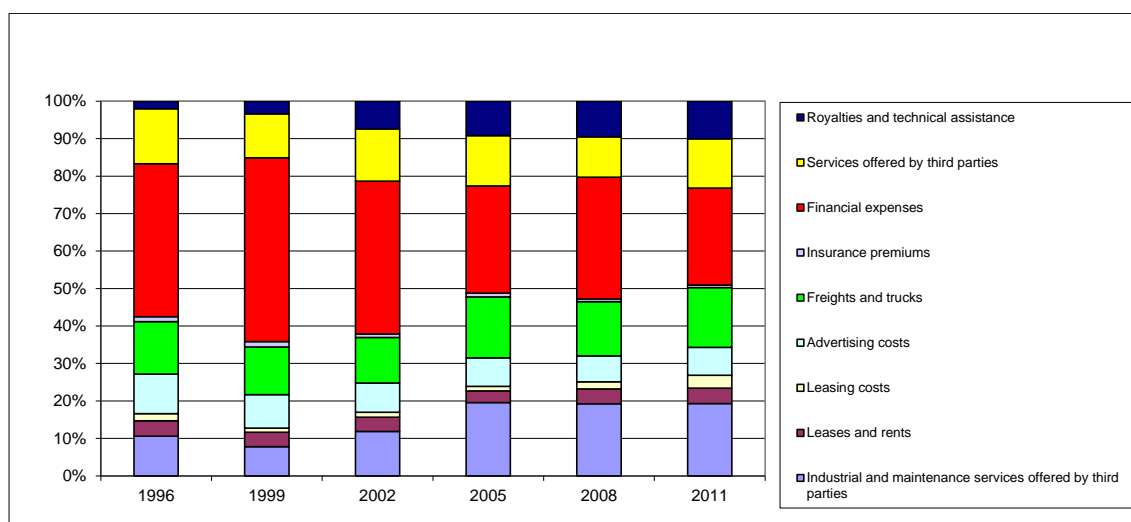


Source: Elaboration by the author on the basis of data from PIA - IBGE

#### Major services consumed by the industry

Figure 14 examines the decomposition of services demanded by the industry. Although the overall structure remains almost intact over time, significant changes are noticed such as the higher participation of royalties and technical assistance, leasing expenses and freight and truck services.

Figure 14: Decomposition of services demand by the industry

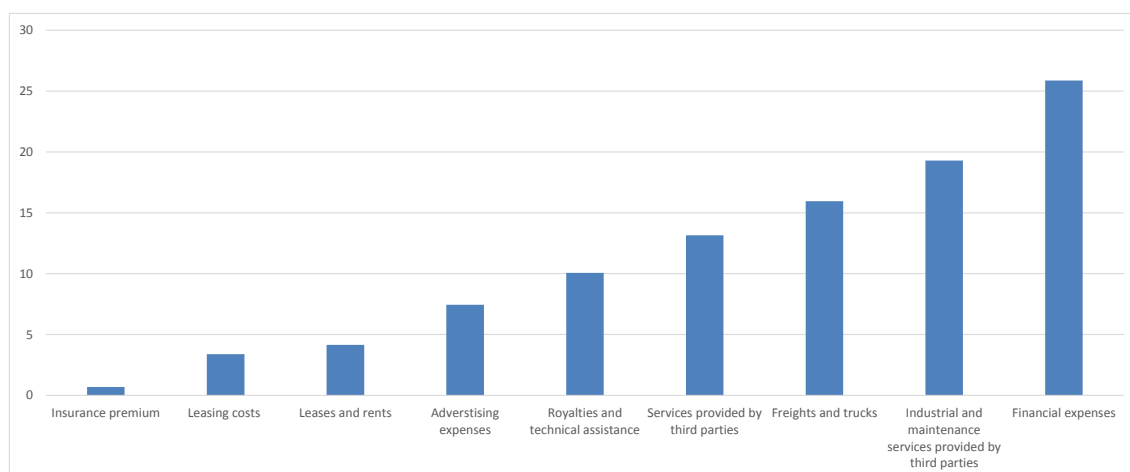


Source: Elaboration by the author on the basis of data from PIA – IBGE

Figure 15 shows the share of each service in total services demanded by manufacturing. Financial expenses are by far the most important one, accounting for 26% of the total. This portion is high for international standards

and is probably due to the very high Brazilian interest rates. Royalty, technical assistance and marketing expenses together represent 17.5% of the total. Financial expenses, freight and industrial services provided by third parties make up about 60% of total services demanded by the industry. So, manufacturing demands a lot more cost services then value added services.

Figure 15: Decomposition of services demanded by manufacturing (%) - 2011



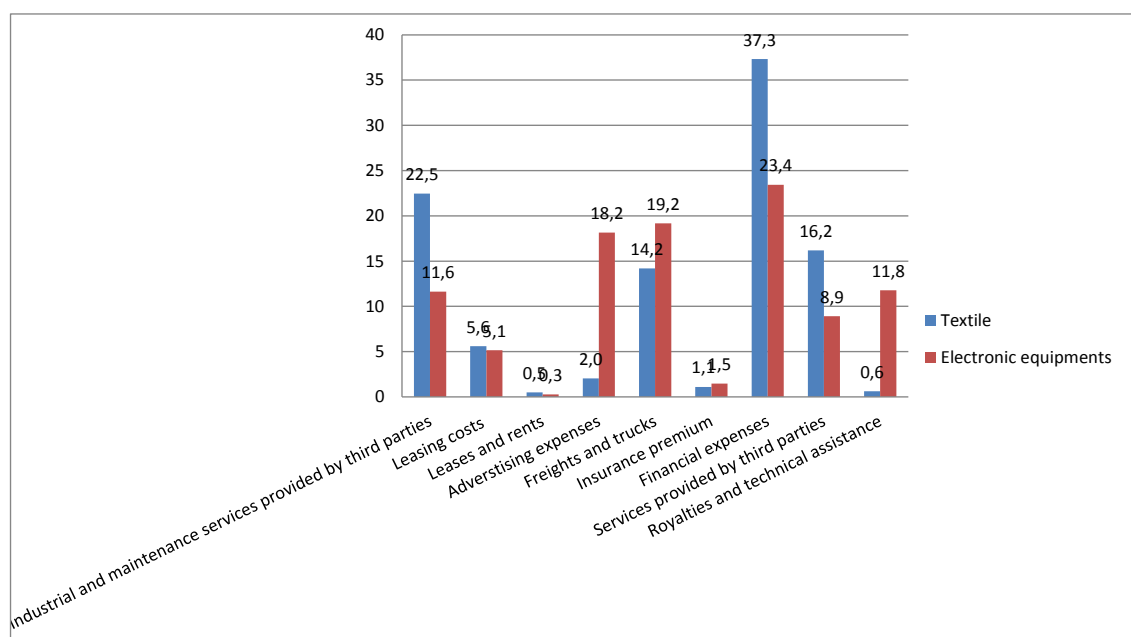
Source: Elaboration by the author on the basis of data from PIA – IBGE

The share of royalties and technical assistance in the total expenditure increased by almost 300% between 1996-98 and 2009-11. Industrial services provided by third parties increased by a rate of 91% and leasing by 61%. In order to balance out those changes, financial expenses, advertising expenses and services provided by third parties faced contractions significant contractions in their share in total expenses.

Figure 16 compares two industries with different technological profiles and market structures. The electronic equipment industry, which is high tech content and is more concentrated, employs more value-added services than the textile industry, which is poorer in technological content and is more fragmented. As it might be expected, the difference between the two is especially relevant in royalties and technical assistance services - the electronics industry allocates 12% of its spending on those services, while the textile industry spends less than 1% on it. On the other hand, the textile industry is more dependent on financial services and services provided by third parties than the electronics industry.



Figure 16: Decomposition of services consumed (%) – selected industries - 2011



Source: Elaboration by the author on the basis of data from PIA – IBGE

## 6. Large share, poor contribution

As previously discussed, in order to increase industrial density, attract foreign investment and participate in global value chains the industry requires quality services at competitive prices. This section discusses quality indicators and price of services in Brazil.

Research such as the Doing Business and the Enterprise Survey, and the Global Competitiveness Report point to several unfavorable factors for doing business in Brazil. From poor logistics services, going through public healthcare services, slowness of the courts and unstable supply of electricity, services can be identified as one of the main factors behind the meagre competitiveness of the Brazilian economy.

Table 5 shows the position of Brazil in global rankings of infrastructure. The infrastructure in general, and the transportation in particular, are poorly placed, suggesting that those services have contributed little, if any, to reduce production and marketing costs. The infrastructure quality is of special concern: Brazil occupies the 114th position among 148 countries surveyed.

High transportation costs have particularly significant impacts on industries that are more dependent on logistics, such as metallurgy, food, beverage, printing, publishing, rubber, plastic products, wood, pulp and paper and other natural resources intensive industries.

Table 5: Competitiveness indicators - Ranking position (out of 148 countries)

Infrastructure quality	114
Road quality	120
Railway quality	103
Port quality	131
Airport quality	123
Power supply quality	76
Cell phone subscriber /100 pop.	45

Source: Global Competitiveness Report 2013-2014 - World Economic Forum

But Brazil is also poorly ranked in other public services. Power for industrial purpose is particularly costly even when compared to other emerging and developed countries, with implications for industrial competitiveness in general and for energy intensive sectors in particular, such as cellulose, oil refining, chemical and basic metals. To put it in perspective, in 2011 the price of power in China was about half of Brazil's, while America's was about a third.

Gas for industrial purpose, which is a basic input for many industries, is also costly compared to international standards, including large gas importers such as China and India. With the development of the shale gas fields in the United States, China, Argentina and other countries, it is likely that the relative price of gas in Brazil will further increase over the coming years, with additional negative implications for industrial competitiveness.<sup>20</sup>

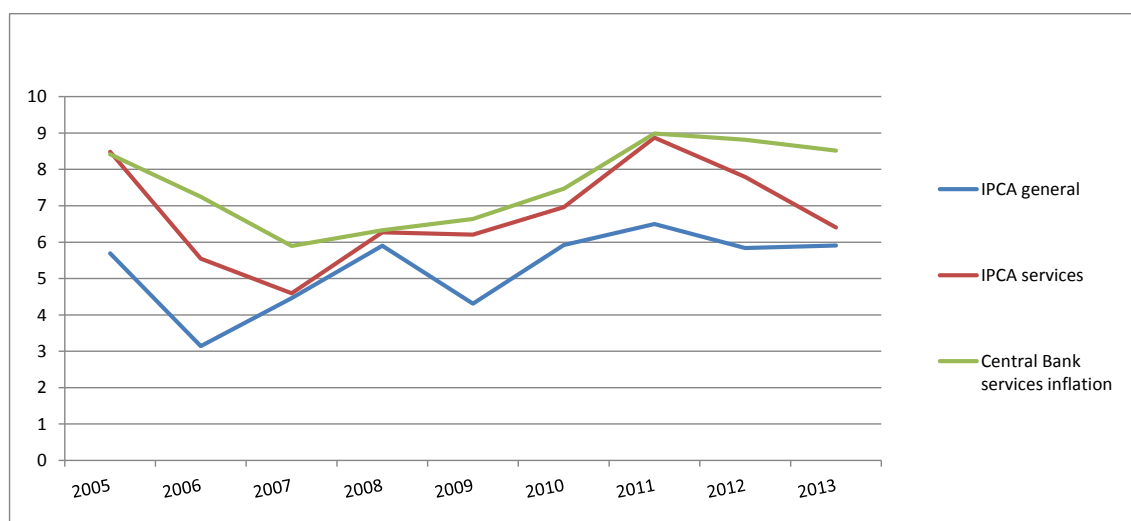
The average cost of Internet access is much higher than in Mexico, Taiwan and Colombia, for example. The average cost of a 20 feet sea container service is also very high by international standards, or over US \$ 2,200, which is almost three times higher than in China's, a burden on the shoulders of the exporting industries. When combined with long average transit time and clearance of goods in ports, the relative costs of export services become even more dramatic.

Figure 17 compares the inflation of services to CPI inflation in the period 2005-2013, when the prices of services were particularly upward. The IPCA-services rose 28% more than the headline index, while the Central Bank services inflation rate was 43% larger than that.

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<sup>20</sup> With the increase of about 45% in energy prices in Brazil in the year of 2015 alone, and the reduction in energy prices in the United States and other countries because of the falling oil and gas prices, the energy price gap between Brazil and other countries has probably increased further.

Figure 17: Services inflation rate (%)



Source: Elaboration by the author on the basis of data from IBGE and Central Bank

The acceleration of services inflation could be credited to many factors, including the following:

- Increasing demand for services, especially for final consumption associated with the expansion of the middle class and the aging population;
- Rising labor costs associated with the slow growth of the working age population;
- Stagnation of the labor force participation;
- Growing shortage of skilled labor;
- Significant rise of the minimum wage, which is especially important for the service sector;
- Increasing share of imported manufactured goods in total consumption, which has disciplined the domestic price formation of industrial goods;
- Stagnation of the service sector labor productivity; and
- Rising taxes.

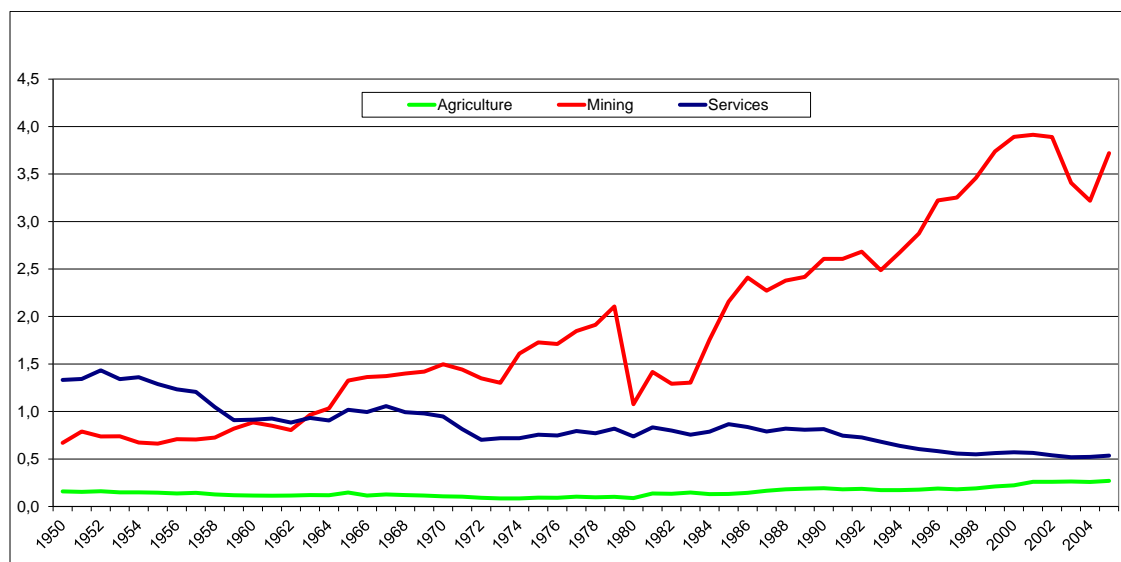
According to CNS (2013), the tax burden on services is heavier than in other sectors. In 2013, the non-financial private services collected 24% of its total revenue, being the largest part consisting of taxes on income and property. Also according to CNS, while the average IVA in goods and services is 19.4%, it is 16.9% in healthcare services, 18.6% in education, 20.1% in accommodation and food services, 23.5% in transport, storage and postal services, 23.6% in business services, 27.3% in IT services and 30.4% in electricity.<sup>21</sup>

Therefore, the high inflation in services seems to result from demand factors joint with institutional factors, demographic changes and the Baumol cost disease.

<sup>21</sup> For a detailed study on taxes on imported services, see CNI (2013).

Figure 18 shows the ratio of productivity in agriculture, mining and services to the productivity in manufacturing. The ratio fell in almost the entire period, suggesting that services have indeed constrained the industry competitiveness.

Figure 18: Productivity ratio – in relation to manufacturing



Source: Elaboration by the author on the basis of data from Groningen Growth and Development Centre

### What are the most critical services for industry competitiveness?

There is no single answer to this question because, as we have seen, the composition of services varies widely across industries and over time. We can say that the most critical services to manufacturing are those that are most heavily used, namely, financial services, industrial services provided by third parties and transportation, as indicated in Figure 15 above.

An alternative answer would be that the most critical services are those that, despite departing from low levels, demand is growing rapidly. Royalties and technical assistance, which have seen an increase of almost 300% in its share in total service costs, as well as industrial services provided by third parties, with a 92% rise, and leasing, with 61%, fit the criterion.

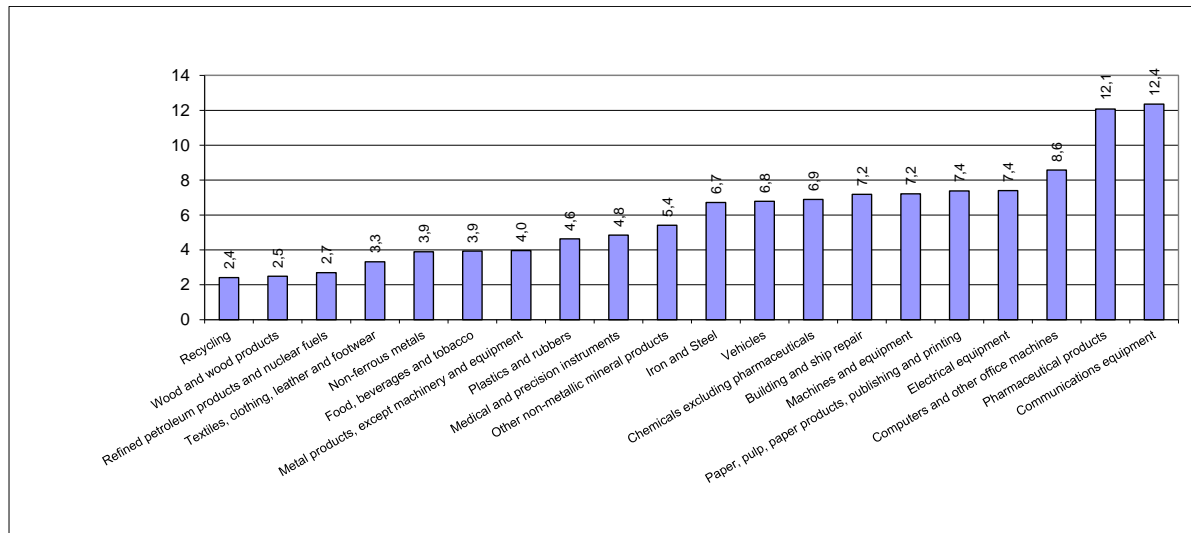
Industrial services provided by third parties thus appear on both criteria, suggesting that they could be considered one of the most critical services to manufacturing.

### Which sectors are more sensitive to increased competitiveness of services?

There is more than one possible criterion to answer this question. One of them is the ratio of intermediate consumption of services to value added, as shown in Figure 19. Judging by this metric, the sectors most sensitive to increases in the competitiveness of services would be coke and oil refining, printing, metallurgy, food products, leather and footwear, and chemicals. Apart from the case of oil

and gas and their specificities, the top ranking has industries with low, medium and high technological intensity.

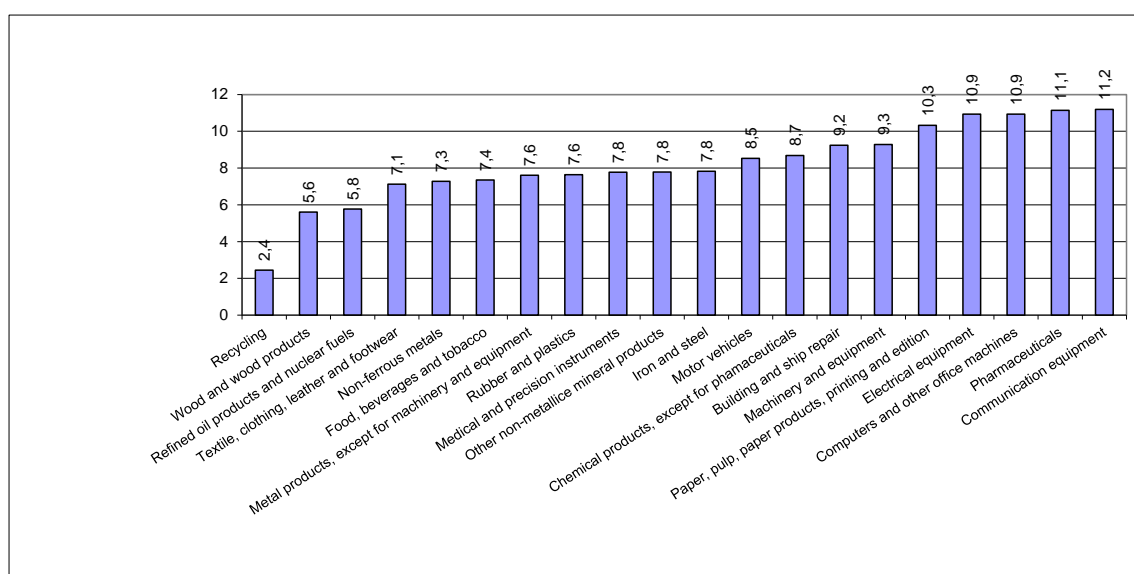
Figure 19: Ranking of industries with the highest ratio services input to manufacturing gross output (%) - 2011



Source: Elaboration by the author on the basis of data from PIA - IBGE

A second criterion is the sectors with the greatest sensitivity to value-added services, which would point more promising areas of investment returns. By this criterion, the top ranking (Figure 20) include sectors such as communications equipment, pharmaceuticals, computers and electrical equipment, which are all industries with high technological content.

Figure 20: Ranking of industries with the highest ration of value added services input to manufacturing gross output (%) - 2011

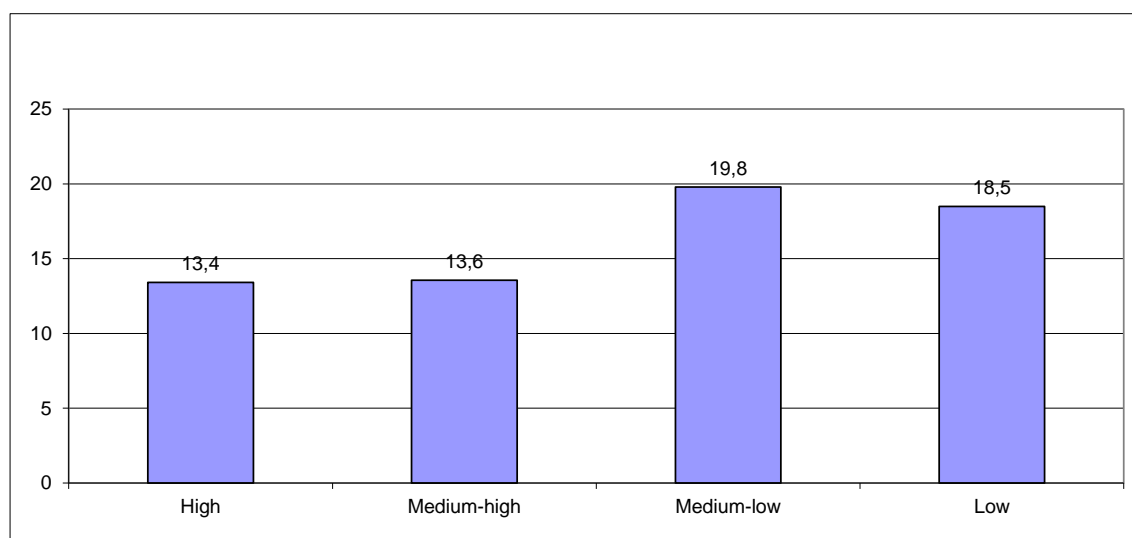


Source: Elaboration by the author on the basis of data from PIA - IGE

Finally, Figure 21 shows the ratio of services input to manufacturing gross output according to technology intensity. Industries with medium-low and low technology levels seem to be more sensitive to changes in the service sector.

These indicators suggest that the improvement in the quality and prices of services can increase competitiveness especially of industries in which the country has comparative advantages, i.e. natural resources intensive industries.

Figure 21: Ratio of services input to manufacturing gross output by technology intensity (%)



Source: Elaboration by the author on the basis of data from PIA – IBGE and using the technology intensity criteria by OECD

## 7. Conclusions

This study has examined the contribution and impact of services in the Brazilian manufacturing sector. We found the following evidence:

*Industry and services go together* - Following the pattern of developed countries, industry and services also have a close relationship in Brazil as intermediate consumption of services is similar to that of advanced economies.

*But there is little evidence that services contribute to increase the industrial density and improve competitiveness* – We found that services are relatively costly and of low quality, inflating artificially their participation in manufacturing costs and impacting its international competitiveness. This evidence suggests that the improvement of services is a determining factor for the recovery of the Brazilian manufacturing sector.

*There is no common pattern in the relationship between services and industry* - Although the industry in general has been consuming more services, we identified a high heterogeneity in terms of level and type of services consumed.

*Financial services and industrial and maintenance services provided by third parties lead industrial spending on services* – We found evidence of changes in the set of services consumed by manufacturing, which can be explained by technological and consumer preferences changes. The most demanded services by the industry are financial expenses, industrial and maintenance services provided by third parties and freight and truck services - together they account for over 60% of total costs with services. However, the services whose participation has grown the most are royalties and technical assistance.

*Consumption of services is associated with the technological profile of the industry* – Technology-intensive industries consume more sophisticated services such as royalties, technical assistance and marketing. Natural resources intensive industries consume more financial and transport services and services provided by third parties.

For Brazil to break with the low growth trap, raise industrial density and get into the world economy on the "front door", it will be necessary to invest more on commercial services and in value added services particular.

But we should recognize that, given the discrepancies in science and technology between Brazil and advanced countries and the current rules that govern trade, investment, services and intellectual property, it is likely that Brazil will face additional challenges to pursue the conventional trajectory of industrial development, i.e. R1 -> R2 -> R3 -> R4. At this point, it seems that this trajectory is not as attainable as it was until recently, as illustrated by some Asian countries. Moreover, considering the current stage of globalization of markets and technological changes, and the need for Brazil to resume growth and to respond to the growing social demands, it seems reasonable to assume that the country will have to seek a "shortcut" to shorten the path from R1 to R3.

A promising path for Brazil is to integrate more into the world economy so that it can benefit more from the many opportunities still available like access to technologies, knowledge, investment and markets. The size of the domestic market and the potential for industrialization of the comparative advantages also count in favor of Brazil. But a greater integration strategy will only work if it is part of a more ambitious development strategy that aims at increasing the industrial density.

Investing in human capital, improving conditions for scientific and technological development, shortening the gap between universities and industries, fostering competition and integrating services to the nuclei of industrial, technological, trade and investment policies will be important steps for services to contribute more to the economic and social development.

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