Labour Market and Job Polarization: empirical evidence for the Brazilian economy in the period of economic growth with income distribution

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Resumo:

Este artigo contribui para uma melhor compreensão do processo de transformação estrutural nas economias em desenvolvimento de hoje. Em particular, buscamos responder às seguintes perguntas: primeiro, em que medida a economia brasileira seguiu um processo de polarização de empregos? Além disso, se sim, que fatores deram origem a esse fenômeno? Segundo, qual foi a importância relativa dos diferentes padrões de crescimento na contribuição ao crescimento do emprego e à polarização do emprego? Portanto, este artigo investigou as ligações entre padrão de especialização, mudança tecnológica, crescimento setorial e composição ocupacional no nível da indústria para a economia brasileira ao longo dos anos de 2003 a 2014. Apresentamos uma discussão das mudanças no mercado de trabalho brasileiro e uma análise estrutural de decomposição para verificar os componentes da demanda responsáveis pelas mudancas nos padrões do mercado de trabalho brasileiro. Não houve uma polarização típica do emprego, pois o Brasil seguiu um padrão de crescimento econômico baseado em seu mercado doméstico. Encontramos evidências de um processo causalidade cumulativa, em que mudanças na distribuição de renda levaram a mudanças no padrão de consumo brasileiro, que por sua vez criou mais empregos na base da pirâmide social, aumentando o efeito da distribuição de renda. No nível setorial, essa hipótese foi reforçada pelas indústrias de serviços e comércio, que tiveram um impacto importante no crescimento de empregos com baixos salários, e ambos os setores têm um impacto relativo alto do consumo induzido, quando comparados a outras indústrias. Outro resultado importante foi reforçar o vínculo entre crescimento da indústria de transformação e investimentos na geração de empregos mais qualificados.

Abstract:

This paper contributes to a better understanding of the process of structural transformation in today's developing economies. In particular, we aimed to answer the following questions: first, to what extend did the Brazilian economy follow a process of job polarization? In addition, if so, what factors gave rise to this phenomenon? Second, what were the relative importance of different growth patterns in contributing to employment growth, and to job polarization? Therefore, this paper investigated the links among specialization pattern, technological change, sectoral growth and occupational composition at the industry level for the Brazilian economy over the years of 2003-2014. We present a discussion of the changes in the Brazilian labor market and a structural decomposition analysis to verify the demand components that are responsible for the changing patterns in the Brazilian labor market. There was not a typical job polarization, as Brazil followed an economic growth pattern based on its domestic market. We found evidence of a cumulative causation process where changes in income distribution, led to changes in the Brazilian consumption pattern, which in its turn created more jobs at the base of the social pyramid, enhancing the income distribution effect. At sectoral level, this hypothesis was reinforced by the service industries and trade which had an important impact on low-wage jobs growth, and both sector have relative a high impact of induced consumption, when compared to other industries. Another important result was to reinforce the link between manufacturing growth and investments.

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1. Introduction

One of the most central insights of the pioneering literature on economic development is that sustainable economic growth requires structural change. This has raised concerns about the role of capital accumulation and sectoral composition of output and employment as central drivers of structural transformation. Since the early works on economic development, two important issues were addressed: how external trade affects structural change and what are the consequences of structural transformation in terms of occupational structure. In recent years, the new wave of globalization and the polarization of labor markets in developed countries have challenged the linkages between job losses and new patterns of vertical specialization across and within countries.

Recently, there is an increasing number of scholars discussing the polarization of labor markets. Following the work by Autor, Levy, and Murnane (2003), Autor, Katz, and Kearney (2006), Autor and Dorn (2013), this phenomenon is characterized by higher growth wage and employment of both high-wage and low-wage occupations compared to middle-wage occupations. The most common explanation for this phenomenon is the emergence of information and computer technologies substituting middle-skill (*routine*) jobs. Bárány and Siegel (2015) propose a structural change driven explanation to job polarization.

Considering the specific case of Brazil, Machado (2017), Bressan and Hermeto (2009) and Figueiredo *et al.* (2007) show that the job polarization phenomenon takes place in the country. Machado (2017) highlights that total employment increased in both extremes for all sectors of the economy, comparing 1991, 2000 and 2010. Figueiredo *et al.* (2007) argues that job polarization was responsible for the extinction of the country's middle class. Hoffmann (2008) contrast the previous analysis arguing that the polarization captured by Figueiredo *et al.* (2007) is a statistical problem and that this phenomenon does not occur in Brazil.

In fact, one may have relevant insights from the study of the Brazilian labour market in the years 2000s, since it was a period (after 2004 and until 2013) of economic growth, reducing unemployment, increasing wage share and the incorporation of many people into the consumption market, affecting Brazilian consumption patterns. During this period, there was strong growth of households' consumption, especially for those who, directly or indirectly, gained with the minimum wage raise.

Krepsky *et al.* (2019), inspired by other studies (Bielschovsky, 2014; Carvalho; Rugitsky, 2015; Rugitsky, 2017), investigated a possible cumulative causation process, since the changes in consumption patterns led to the growth of sectors whose production demanded a less qualified workforce. This is the case of many service industries and construction, which grew significantly in the period. As they have shown, as these sectors employ less qualified workers, the degree of

formalization and the wages at the base of the pyramid have risen further, reinforcing the process. Analyzing the consumption decomposition, they found that, in the periods of economic expansion (2003-2008 and 2010-2014), structural change in output and consumption reinforced each other, which is compatible with the hypothesis of a cumulative causation process. However, in this analysis the authors did not investigate the actual effects on the labor market.

The aim of this paper is to analyze the Brazilian employment growth and wages in the period between 2004 and 2013 to evaluate whether the phenomenon of job polarization occurred in this economy in the considered period. In doing so, we intend to investigate further the impact of the pattern of economic growth over the structure of employment, highlighting the impacts of the variations of the main final demand components. Besides discussing the changes in the Brazilian labor market, a structural decomposition analysis is further undertaken to verify the demand components that are responsible for the changing patterns in the Brazilian labor market. The hypothesis is that, in Brazil, there was not a typical job polarization, in the sense of that portrayed in the case of developed countries, as Brazil followed an economic growth pattern based on its domestic market. In the one hand, we investigate a possible cumulative causation: changes in income distribution, associated to faster increases of low-wages, leading to changes in the Brazilian consumption pattern, which in its turn created more jobs at the base of the social pyramid, enhancing the income distribution effect. On the other hand, we consider that the impact of changes in international trade, both in terms of imports penetration and exports growth, have impacts over labor market structure.

The paper is organized in four sections, including this introduction. Section two presents the changes of the Brazilian labor market from 2004 to 2013 based on National Sample Household Survey (PNAD). We adapt the International Labor Organization (ILO) recommendations to classify occupations in formal and informal, separating each one by the different positions in each occupation. We also analyzed the labor market by industry and by type of occupation, and further investigate the evolution of wages. Based on that compiled data, we were able to do a Structural Decomposition Analysis in section three, analyzing the increase of jobs in Brazil into four types: informal jobs, and three categories of formal jobs: low, medium and high-wages. We investigated each of type of job by industry decomposing the employment growth according to demand-side growth account. The fourth section presents some concluding remarks.

2. Brazilian Labour Market from 2004 to 2013

The Brazilian labour market changed from 2004 to 2013, when GDP growth was higher compared to the period between 1998 and 2003 (going from 1.6% per year between 1997 and 2003 to 3.8% between 2003 and 2013). The National Sample Household Survey (PNAD) included the rural

region of the North of the Brazil only after 2004. Because of this, the analysis is undertaken comparing 2013 with 2004 instead of 2003, even if 2003 is more appropriate to evaluate the impact of a higher GDP growth on the Brazilian labour market.

Considering employed persons aged 15 and older, total employment increased 12.6% between 2004 and 2013 (Table 1). This is a much lower growth rate compared with the 36.4% increase in GDP. In this sense, total employment is not able to show appropriately what occurred in the Brazilian labour market in the considered period. The data suggests that the increase in GDP per person employed was 2.2% (annual GDP growth of 3.5% and annual growth of employed person of 1.3%). To better understand this detached relationship between GDP growth and employment growth, it is necessary to study the country's occupations, because this relationship is more complex than the increase in productivity.

The International Labour Organization (ILO) recommended in its 17th International Conference of Labour Statisticians in 2003 to classify occupations in formal and informal according to the nature of the units that perform the economic activity and the occupations that are generated by these activities (Hussmanns, 2004). According to the National Accounts System, the units that perform economic activities are classified in formal "company", informal "company" and domicile.

The institutional sector informal "company" groups units that perform economic activities, but they are not legal entities separated from its owners. Because of this, they do not have the full accounting necessary to separate the economic activity from others owners' activities. Informal "company" is not registered according to the national legislation (manufacturing and trade laws, taxes and social security), in contrast with the local licenses to perform the economic activity (Hussmanns, 2004).

On the other hand, formal "company" groups units that perform economic activities that are legal and the full accounting information allows separating the activities from its owners' activities. Formal and informal "companies" account for units that hire paid-employment and self-employment as well as non-paid contributing family workers (Hussmanns, 2004).

Apart from formal and informal "companies" that sell products from its activities, domicile also perform economic activity for own consumption in agricultural activities and construction, and hire domestic work. Other activities performed at the domicile are not considered economic activities.

Workers have different positions in each occupation; they can be own-account, employer, family member with no income that help the own-account, and paid employee. The occupation can be formal or informal for each of these positions. For own-account and employer, the occupation is directly related with the unit that perform the economic activity. This means that it is not possible to have informal own-account and employer in a formal "company" or formal own-account and employer in an informal "company". Paid employee can work in a formal or informal "company" or

undertake a paid work in a domicile, the latter with a formal contract or without it. The national labour and social security legislation provide rights and benefits to formal domestic work, such as advance notice, severance pay, 13th salary, paid vacations and health leave. Finally, own-account that produce for own consumption are considered informal and family members that help own-account in activities related to product sales are always considered informal occupation, regardless of the own-account being a unit in a formal or informal "company".

The double dimension of the classification proposed by the *17th International Conference of Labour Statisticians* allows to incorporate a third dimension related to the legal/illegal nature and the hidden/open national regulation for economic activities. The consideration of all these dimensions provide a rich framework for a consistent analysis of the occupations according to the economic activity. The PNAD, in turn, provides information to estimate formal and informal occupation without identifying the formal and informal "companies" that generate that occupation, but it distinguish these two sectors from domicile.

So, for the methodology adopted here, formal employment refers to employees holding formal jobs (contracts according to the labour law – Consolidation of Labour Law, CLT^5 –, military, statutory civil servant), for formal and informal "companies" and domicile (domestic work with a CLT contract), apart from own-account and employer that contribute to social security. Informal employment refers to employees holding informal jobs, domestic work holding informal jobs, own-account and employer that do not contribute to social security, own-account in the production for own consumption, own-account construction for own use and family members without an income that help own-account in their economic activities for formal and informal "companies".

In the case of Brazil from 2004 to 2013, formal employment increased considerably (4.1% per year), while informal employment reduced 12.7%, what corresponds to 1.5% per year (Table 1).

| | 2004 | | 2013 | 3 | Annual Growth Rate | Total Change | |
|----------|------------|-------|------------|-------|---------------------------|---------------------|--|
| | Number | Share | Number | Share | 2004-2013 | 2004-2013 | |
| Formal | 37,149,549 | 45.1 | 53,265,095 | 57.5 | 4.1 | 43.4 | |
| Informal | 45,158,051 | 54.9 | 39,408,074 | 42.5 | -1.5 | -12.7 | |
| Total | 82,307,600 | 100.0 | 92,673,169 | 100.0 | 1.3 | 12.6 | |

Table 1 Brazilian Labour Market

Source: Own elaboration based on PNAD.

Higher GDP growth since 2004 was followed by an intense process of workers' formalization. It is important to highlight that it is not possible to verify whether this occupation's formalization was a result of formalization in the occupations of the three institutional sectors or whether it was a result of formalization in activities related to product sales.

⁵ The Consolidation of the Labour Law (CLT) regulates the Brazilian labour relations, for urban and rural work.

According to the International Labour Organization (ILO), the analysis for the agriculture, forestry and fishing sector should be separated from the analysis for all the other sectors of activity. In the case of Brazil, this is particularly important because the former corresponds to important part of the Brazilian employment (20.4% in 2004 and 18.1% in 2013). Employment in the agriculture, forestry and fishing sector decreased 20.7% in the period (Table 2).

| | | Agric | ultural sector | • | Non-agricultural sector | | | | | | | | |
|----------|------|-------|----------------|--------|-------------------------|--------|--------|------|--|--|--|--|--|
| | | | Total | Annual | | Annual | | | | | | | |
| | 2004 | 2013 | Change | rate | 2004 | 2013 | Change | rate | | | | | |
| Formal | 11.7 | 18.1 | 22.1 | 2.2 | 53.7 | 64.1 | 44.6 | 4.2 | | | | | |
| Informal | 88.3 | 81.9 | -26.4 | -3.3 | 46.3 | 35.9 | -6.1 | -0.7 | | | | | |
| Total | 100 | 100 | -20.7 | -2.5 | 100 | 100 | 21.1 | 2.2 | | | | | |

Table 2 Formal and Informal Employment

Source: Own elaboration based on PNAD.

Note: Agricultural sector corresponds to agriculture, forestry and fishing.

The decrease in the occupation for the agriculture, forestry and fishing sector was followed by an important formalization of the occupations in this sector. However, formal employment in this sector was still very low in 2013 (18.1%). For the non-agricultural sector, employment increased 2.2% per year, reflecting the high GDP growth rate of the period. There was also an important formalization process for the non-agricultural sector (formal occupation increased 4.2% per year and informal occupation decreased 6.1% for the whole period). The share of formal employment for non-agricultural sectors were very low in 2004 (53.7%) and it increased to 64.1% in 2013. This means that one third of the occupations for the non-agricultural sectors were informal occupations.

The information for formal and informal occupation in the agriculture, forestry and fishing sector in 2004 and 2013 shows that the advancements in the agribusiness is only one aspect, and not the most important one, to explain the improvement in productivity that decreased the occupation in this sector between 2004 and 2013. The main effect of the higher productivity on the reduction in the sector's occupation is the decrease in employees holding informal jobs that decreased 28.9% between 2004 and 2013. This suggests that there was a strong effect of harvest mechanization, as already suggested by Kupfer et al. (2013). The speed of this reduction in employees holding informal jobs was intense (3.7% per year), but this decrease correspond to 27% of the reduction in the agriculture, forestry and fishing sector' employment. The main responsible for the reduction in this sector's employment in the period was the decrease of 64.3% in the number of family members that help own-account with no income (unpaid employees), what corresponds to 66.3% of the decrease in the number of employed people in this sector between 2004 and 2013.

| Table 3 A | Agriculture, | forestry | and | fishing s | sector |
|-----------|--|----------|-----|-----------|--------|
| | — • • • • • • • • • • • • • • • • • • • | | | | |

| | 2004 | | 2013 | | Annual Growth Rate | Total change |
|---|-----------|-------|------------|-------|-----------------------|--------------|
| E | mployment | share | Employment | share | 2004-2013 | 2004-2013 |

| Formal Employment | 1,975,654 | | 2,411,744 | | 2.2 | 22.1 |
|---|------------|------|------------|------|--------|--------|
| Employer that contributes to social security | 131,684 | 6.7 | 92,859 | 3.9 | - 3.8 | - 29.5 |
| Own account that contributes to social security | 278,826 | 14.1 | 705,868 | 29.3 | 10.9 | 153.2 |
| Employees holding formal jobs | 1,565,144 | 79.2 | 1,613,017 | 66.9 | 0.3 | 3.1 |
| Informal Employment | 14,852,676 | | 10,937,653 | | - 3.3 | - 26.4 |
| Employer that do not contribute to social security | 410,425 | 2.8 | 157,965 | 1.4 | - 10.1 | - 61.5 |
| Own account that do not contribute to social security | 4,299,765 | 28.9 | 3,105,018 | 28.4 | - 3.6 | - 27.8 |
| Employees holding informal jobs | 3,308,683 | 22.3 | 2,354,055 | 21.5 | - 3.7 | - 28.9 |
| Employment in production for own consumption | 3,245,292 | 21.8 | 4,039,868 | 36.9 | 2.5 | 24.5 |
| Unpaid employees | 3,588,511 | 24.2 | 1,280,747 | 11.7 | - 10.8 | - 64.3 |
| Total | 16,828,330 | | 13,349,397 | | - 2.5 | - 20.7 |

Source: Own elaboration based on PNAD.

Formal employment increased 2.2% per year in this sector due to the formalization of ownaccount. There was an important reduction in formal employer (29.5%) and total formal employment had a slight increase. Informal own-account reduced considerably, but the total own-account for the three institutional sectors (formal, informal and domestic work) is almost the same in 2004 and 2013. While informal own-account reduced 27.8%, formal own-account increased 2.5 times and ownaccount for own consumption increased 24.5%. Notwithstanding, the increase in own-account for own consumption was 86.1% higher than the increase in formal own-account. It is possible that the increase in formal own-account is related to the productive advancements in the agriculture, forestry and fishing sector, but the increase in the number of own-account that produce for own consumption is related to the social policies implemented by the Brazilian government, especially the rural retirement and *Bolsa Familia* program. The latter provided an alternative to sales for the small family production, providing them the necessary monetary income.

The decrease in the number of family members that help own-account with no income also occurred for the non-agricultural sector (38.6%). The formalization of occupations in this sector was higher than in the case of the agriculture, forestry and fishing sector, but with a smaller reduction in informal occupations (Table 4).

| | 2004 | | 2013 | | Annual Growth | Total change |
|-------------------|------------|-------|------------|-------|---------------|--------------|
| | Employment | share | Employment | share | 2004-2013 | 2004-2013 |
| Formal Employment | 35,173,895 | 53.7 | 50,853,351 | 64.1 | 4.2 | 44.6 |
| Employer | 1,800,655 | 4.8 | 2,254,002 | 4.2 | 2.5 | 25.2 |
| Own account | 2,302,643 | 6.2 | 4,094,921 | 7.7 | 6.6 | 77.8 |
| Employees | 23,881,362 | 64.3 | 35,519,047 | 66.7 | 4.5 | 48.7 |
| | | | | | | |

Table 4 Non-agricultural sector

| Military | 256,856 | 0.7 | 329,405 | 0.6 | 2.8 | 28.2 |
|-------------------------|------------|-------|------------|-------|------|-------|
| Statutory civil servant | 5,260,726 | 14.2 | 6,571,448 | 12.3 | 2.5 | 24.9 |
| Domestic Work | 1,671,653 | 4.5 | 2,084,528 | 3.9 | 2.5 | 24.7 |
| Informal Employment | 30,305,375 | 46.3 | 28,470,421 | 35.9 | -0.7 | -6.1 |
| Employer | 1,034,377 | 2.3 | 875,456 | 2.2 | -1.8 | -15.4 |
| Own account | 11,299,769 | 25.0 | 11,094,240 | 28.2 | -0.2 | -1.8 |
| Employees | 11,783,309 | 26.1 | 11,320,960 | 28.7 | -0.4 | -3.9 |
| Domestic Work | 4,716,560 | 10.4 | 4,230,561 | 10.7 | -1.2 | -10.3 |
| Construction worker for | 91,573 | 0.2 | 102,653 | 0.3 | 1.3 | 12.1 |
| own use | | | | | | |
| Unpaid employees | 1,379,787 | 3.1 | 846,551 | 2.1 | -5.3 | -38.6 |
| Total | 65,479,270 | 100.0 | 79,323,772 | 100.0 | 2.2 | 21.1 |

Source: Own elaboration based on PNAD.

In the case of the non-agricultural sector, the number of employers increased 10.4%, a different outcome compared to the agricultural sector. The share of formal employer increased from 63.5% to 72% in the considered period. A similar outcome is verified for own-account that increased 11.7%, followed by a decrease in informal own-account (1.8%) and a high increase in formal own-account (77.8%). Notwithstanding, although formal own-account has increased from 16.9% to 27%, their share is still very low. The data suggests that a formalization process occurred in units that perform economic activity, but the low share of formal own-account indicate that important part of informal own-account corresponds to disguised wage employment and not establishments that perform economic activity.

The main responsible for the increase in formal employment in the non-agricultural sector was the increase in formal employee that corresponded to 83% of the increase in formal occupation and 94.1% of the increase in total occupation for non-agricultural sectors. The share of formal employee (employee, military and statutory civil servant) in total employment for the non-agricultural sector increased from 71.4% to 78.9%. The increase in the share of formal employment was also high for domestic service work that increased from 26.2% to 33%.

Thus, the increase in formal occupations in non-agricultural activities was an important aspect of the performance of the labour market after the resumption of GDP growth. The increase in the share of formal occupation occurred in almost all sectors of activities, except for real estate activities and public administration (Table 5). Formal employment decreased for many sectors, but in the case of sectors that had a low occupation in 2004 and a high increase in occupation between 2004 and 2013. In this case, informal employment increased. Real estate activities and public administration were again an exception, but total occupation for these sectors did not increase much and the increase in informal employment was higher than the case of formal employment.

| | | 2004 | | 2013 | | | Employmont |
|--|------------|-------|----------------------------------|------------|-------|----------------------------------|---------------------|
| | Employment | share | Share of Formal Employment | Employment | share | Share of Formal Employment | Growth Rate p.y. |
| Extractive industry | 324,491 | 0.5 | 68.2 | 355,894 | 0.4 | 81.8 | 1.0 |
| Manufacturing industry | 11,465,690 | 7.5 | 64.6 | 11,691,699 | 14.7 | 74.3 | 0.2 |
| Electricity and gas | 597,112 | 0.9 | 82.7 | 598,894 | 0.8 | 87.0 | 0.0 |
| Construction | 5,298,982 | 8.1 | 28.3 | 8,551,084 | 10.8 | 44.3 | 5.5 |
| Commerce and repair of vehicles | 14,195,897 | 21.7 | 47.2 | 16,374,302 | 20.6 | 63.1 | 1.6 |
| Ground transportation and others | 3,314,620 | 5.1 | 55.7 | 4,655,337 | 5.9 | 68.0 | 3.8 |
| Accomodation and food | 2,929,313 | 4.5 | 40.5 | 4,252,473 | 5.4 | 54.0 | 4.2 |
| Post and telecommunications | 497,074 | 0.8 | 82.3 | 536,672 | 0.7 | 89.5 | 0.9 |
| Financial intermediation, insurance | 964,472 | 1.5 | 83.1 | 1,243,606 | 1.6 | 87.8 | 2.9 |
| Real state activities | 708,519 | 1.1 | 75.9 | 910,863 | 1.1 | 72.4 | 2.8 |
| Service to firms | 3,875,561 | 5.9 | 67.0 | 5,589,763 | 7.0 | 79.6 | 4.2 |
| Health and social services | 2,783,016 | 4.3 | 76.9 | 4,001,513 | 5.0 | 81.1 | 4.1 |
| Cultural and sporting activities | 1,049,287 | 1.6 | 45.1 | 1,014,535 | 1.3 | 54.1 | - 0.4 |
| Associative activities and personal services | 2,167,812 | 3.3 | 22.6 | 2,428,358 | 3.1 | 36.8 | 1.3 |
| Domestic service | 6,388,213 | 9.8 | 26.2 | 6,315,089 | 8.0 | 33.0 | - 0.1 |
| Public administration | 4,177,478 | 6.4 | 78.8 | 5,185,020 | 6.5 | 77.6 | 2.4 |
| Education | 4,522,455 | 6.9 | 74.7 | 5,561,818 | 7.0 | 76.9 | 2.3 |
| Not defined activities | 219,278 | 0.3 | 13.9 | 56,852 | 0.1 | 26.1 | -13.9 |
| Total | 65,479,270 | 100.0 | 53.7 | 79,323,772 | 100.0 | 46.3 | 2.2 |
| a a 11 | | | | | | | |

Table 5 Brazilian occupation for the non-agricultural sector in 2004 and 2013

Source: Own elaboration based on PNAD.

The main sectors responsible for the increase in formal occupation in the non-agricultural sector were extractive industry, construction, commerce, ground transportation, accommodation and food, service to firms, health and social services and associative activities and personal services. The share of formal occupations for these sectors increased from 47.4% to 56.1%. In many of these sectors, such as construction, ground transportation, accommodation and food and health and social service, informal occupation increased, an outcome that also occurred for real state activities, public administration and education. It is important to highlight the increase in informal occupation in health and social service, public administration and education that are mainly public sector. This increase in informal employment in public administrative and social activities contrast with the outcome of

increasing formalization in the non-agricultural activities. However, some sectors of activities still present a low share of formal employment in 2013, such as construction (44.3%), accommodation and food (54%), associative activities and personal services (36.8%) and paid domestic work (33%).

Following Kalleberrg (2011), it is possible to classify the occupation according to the level of income. For all non-agricultural sectors, services and sales' occupations have the lowest medium income, together with agricultural activities that have a very low share in the occupation outside the agricultural sector (Table 6). Occupations in the production of goods and administrative services are occupations with intermediate income. And occupations such as technicians, science and arts and managers, together with the armed forces, are occupation with the highest medium income.

| Tuble of occupation for the non-ugricul | ital al sector | | | | | |
|--|----------------|----------|-----------|----------|-------|--------|
| | Medium | income | Share Oce | cupation | Growt | h Rate |
| | 2004 | 2013 | 2004 | 2013 | Total | Annual |
| Occupations not defined | 700.00 | 1,000.00 | 0.1 | 0.0 | -31.1 | -4.1 |
| Service workers | 379.00 | 850.00 | 20.4 | 19.3 | 36.4 | 3.5 |
| Agricultural workers | 400.00 | 920.00 | 0.3 | 0.2 | -19.0 | -2.3 |
| Sellers and service providors for commerce | 475.00 | 990.00 | 8.2 | 9.3 | 64.8 | 5.7 |
| Workers of goods production and services | 520.00 | 1,200.00 | 26.2 | 26.3 | 45.5 | 4.3 |
| Administrative service workers | 520.00 | 1,000.00 | 14.7 | 15.5 | 53.2 | 4.9 |
| Middle level technicians | 750.00 | 1,500.00 | 10.9 | 9.0 | 19.6 | 2.0 |
| Members of the armed forces | 1,067.00 | 2,700.00 | 1.7 | 1.3 | 7.3 | 0.8 |
| Science and Arts | 1,300.00 | 2,500.00 | 9.7 | 12.1 | 80.4 | 6.8 |
| Managers | 1,500.00 | 3,000.00 | 7.9 | 7.0 | 27.7 | 2.8 |
| Total | 550.00 | 1,200.00 | 100.0 | 100.0 | 44.6 | 4.2 |

Table 6 Occupation for the non-agricultural sector

Source: Own elaboration based on PNAD.

In the case of developed countries, occupational polarization under globalization and financial capitalism occurred with a reduction in the share of occupations with intermediate medium income and an increase in the share of occupations with low and high medium income (Kalleberg, 2011). This outcome did not occur in the case of Brazil between 2004 and 2013 when there was an increase in occupation and formalization. The share of occupations related to goods' production and administrative services increased from 40.9% to 41.8% in the period. The increase in formal occupation of medium income was less intense, despite the fact that the increase in sales' occupations was higher than the occupations related to the production of goods and service and administrative service. The increase in formal employment in occupations with high medium income was less intense than the medium income occupations, despite the high increase in the occupation of Science and arts.

The formal medium income occupation increased faster than domestic inflation in the period 2004 to 2013 (formal medium income occupation increased 9.1% and inflation, based on INPC, was on average 5,5%). All occupational groups presented an increase in the purchasing power of medium

wages, but the increases were relatively lower in Science and arts, administrative service and sales. These were the groups with the higher occupational increase, indicating that this increase probably occurred in occupations with income inferior to the medium in these occupational groups.

In short, the intense formalization process in occupational activities in Brazil between 2004 and 2013 does not seem to have generated an occupational polarization. The medium income increased, income inequality for formal occupation decreased and there was no reduction on the share of intermediate medium income in total formal occupation.

3. Structural decomposition Analysis

3.1. Database and Methodology

The study uses data from the Brazilian input-output (IO) Matrices at constant 2010 pricess, constructed by GIC-UFRJ based on the methodology presented by Passoni and Freitas (2018), at basic prices. These input-output matrices harmonize the official data of the Brazilian IO matrices offering a series compatible with the most updated manual of National Accounts, SNA 2008, for the period 2000-2017. These matrices offer a breakdown of 42 activities and 91 products. However, in the decompositions that will be descripted in the next sections we use the matrices with products already aggregated in the 42 activities by the multiplication of market share matrices.

In this section, we will explain the structural decomposition analysis of the employment (jobs) growth rates performed in this work, making explicit its endogenous and exogenous components. The empirical approach was adapted from the structural decomposition analysis developed in the inputoutput literature, based on the Leontief open input-output model. The structural decomposition analysis is a method that allows us to disaggregate the total amount of change (variation) in one variable into contributions made by its components between two years. (Dietzenbacher and Los, 1998; Miller and Blair, 2009).

We adapted the methodology to capture the distinction between autonomous and induced variables. Government consumption, investment and exports are considered exogenous. On the other hand, we divided household consumption into autonomous and induced components. To facilitate analysis, non-profit institutions serving households (NPISHs) spending is aggregated with autonomous household consumption and change in inventories is aggregated with gross fixed capital formation under the investment category in all decompositions. Following Freitas and Dweck (2013) and Krepsky et al. (2019), we assumed that durable consumption is autonomous since it does not depend on current income but in the availability of credit and personal wealth. On the other hand, the consumption of nondurables depends largely on the purchasing power introduced in the economy by

the current production decisions, especially by wages. Therefore, we incorporate both the Leontief matrix multiplier analysis and the multiplier process via consumption function that is usually found in Keynesian models as initially proposed by Miyazawa (1976).

Hence, from the classical IO matrices identity x = Ax + f, we can write:

$$x = Ax + f = Ax + f^{C_{ind}} + f^{aut} = Ax + A_c x + f^{aut} = (A + A_c)x + f^{aut}$$
$$\Leftrightarrow x = (\bar{A})x + f^{aut} = (I - \bar{A})^{-1}f^{aut} = \bar{L}f^{aut}$$
(1)

Where A is the technical coefficient matrix; x is the total output vector; f the total final demand for domestic production by industry; $f^{C_{ind}}$ is the vector of total induced consumption by industry; f^{aut} as the autonomous final demand vector of domestic production; A_c is the matrix of coefficients relative to the induced consumption of households and \overline{L} is the augmented Leontief inverse, with partially endogeneized consumption.

Pre-multiplying both sides of equation (1) by \hat{l} , a diagonalized vector of employment by output per industry we have an equation for the total employment by activity vector (N):

$$N = \hat{l}x = \hat{l}\bar{L}f^{\text{aut}} \tag{2}$$

However, we can separate N into four components, represented by the superscript (i), N^i , where *i* can be: the informal jobs (I), and three categories of formal jobs – high wage (H), medium wage (M) and low wage (L):

$$N = (N^{H} + N^{M} + N^{L} + N^{I})$$
(3)

$$\hat{l} = \hat{l}^H + \hat{l}^M + \hat{l}^L + \hat{l}^I \tag{4}$$

$$N = (N^{H} + N^{M} + N^{L} + N^{I}) = (\hat{l}^{H} + \hat{l}^{M} + \hat{l}^{L} + \hat{l}^{I})x$$

= $\hat{l}^{H}\bar{L}f^{aut} + \hat{l}^{M}\bar{L}f^{aut} + \hat{l}^{L}\bar{L}f^{aut} + \hat{l}^{I}\bar{L}f^{aut}$ (5)

Considering $f^{aut} = f^{Caut} + f^I + f^G + f^X$, we can also re-write each employment vector as a function of each autonomous consumption:

$$N^{i} = \hat{l}^{i}\bar{L}f^{aut} = \hat{l}^{i}\bar{L}(f^{Caut} + f^{I} + f^{G} + f^{X})$$
(6)

Based on Dietzenbacher and Los (1998), the decomposition of the growth of any variable, resulting from the product of the two or more elements is a weighted average of two types of decompositions. Also, considering that⁶:

$$\Delta \bar{L} = \bar{L}_1 (\Delta \bar{A}) \bar{L}_0 = \bar{L}_1 (\Delta A + \Delta A_c) \bar{L}_0 \tag{7}$$

The change in each employment vector can be measured by the following equation:

$$\Delta N^{i} = \underbrace{\frac{1}{2}}_{Change in Employment}} \underbrace{\Delta \hat{L}_{0} \hat{L}_{1}^{aut} + \bar{L}_{0} \hat{L}_{0}^{aut}}_{Change in Employment}} + \underbrace{\frac{1}{2}}_{Change in technical coeficients}} \underbrace{\frac{1}{2}}_{Change in technical coeficients}} + \underbrace{\frac{1}{2}}_{Change in Induced Consumption}} + \underbrace{\frac{1}{2}}_{Change in Autonomous}} + \underbrace{\frac{1}{2}}_{Change in Autonomous}} + \underbrace{\frac{1}{2}}_{Change in Autonomous}} + \underbrace{\frac{1}{2}}_{Change in Investment}} + \underbrace{\frac{1}{2}}_{Change in Government}} + \underbrace{\frac{1}{2}}_{Change in Exports}} + \underbrace{\frac{1}{2}}_{Change in Exports} + \underbrace{\frac{1}{2}}_{Change in Exports}} + \underbrace{\frac{1}{2}}_{Change in Exports}} + \underbrace{\frac{1}{2}}_{Change in Exports} + \underbrace{\frac{1}{2}}_{Change in Exports}} + \underbrace{\frac{1}{2}}_{Change in Exports} + \underbrace{\frac{1}{2}}_{Change in Expo$$

To better understand the growth in employment, we will evidence in equation (8) the effect of the change in the trade pattern in each demand component. Let: $= \wedge \bigotimes A_t$. Where: A_t is the matrix of the total technical coefficients and \bigotimes is the Hadamard product (multiplication element by element). Consequently, \wedge is the matrix of domestic technical coefficients as a proportion of the total technical coefficients. We have:

$$\Delta A = \underbrace{\frac{1}{2} \Delta \wedge \otimes (A_{t1} + A_{t0})}_{Trade \ Pattern \ Change} + \underbrace{\frac{1}{2} (\Lambda_0 + \Lambda_1) \otimes \Delta A_t}_{Total \ Technology \ Change}$$
(9)

We can apply the result of equation (9) to the other variables in "deltas" of equation (8) using the following relations: $A_c = \gamma \otimes A_{cT}$ (where A_{cT} is a matrix constructed analogously to the matrix A_c ; $f^i = \hat{\mu}^i f_t^i$ (where f_t^i is the total final demand (for domestic and foreign production) from each component of final demand). Therefore, we have:

 $^{^{66}}$ For a demonstration of expression (7) and instructions on how to perform the decomposition of a variable resulting of the product of three factors – as expression (8) - see Miller and Blair (2009), chapter 13.

$$\Delta N^{i} = \underbrace{\frac{1}{2} \Delta \hat{l}^{i} (\bar{L}_{1} f_{1}^{aut} + (\bar{L}_{0} f_{0}^{aut}) + \underbrace{\frac{1}{Change in Employment}}_{by output by Activity}} + \underbrace{\frac{1}{2} (\hat{l}_{0}^{i} L_{1} \left[\frac{1}{2} \Delta \wedge \otimes (A_{t1} + A_{t0})\right] \bar{L}_{0} f_{1}^{aut} + \hat{l}_{1}^{i} L_{1} \left[\frac{1}{2} \Delta \wedge \otimes (A_{t1} + A_{t0})\right] \bar{L}_{0} f_{0}^{aut}) + \underbrace{\frac{1}{2} (\hat{l}_{0}^{i} L_{1} \left[\frac{1}{2} (\Lambda_{0} + \Lambda_{1}) \otimes \Delta A_{t}\right] \bar{L}_{0} f_{1}^{aut} + \hat{l}_{1}^{i} L_{1} \left[\frac{1}{2} (\Lambda_{0} + \Lambda_{1}) \otimes \Delta A_{t}\right] \bar{L}_{0} f_{0}^{aut}) + \underbrace{\frac{1}{2} (\hat{l}_{0}^{i} L_{1} \left[\frac{1}{2} \Delta \gamma \otimes (A_{cT1} + A_{cT0})\right] \bar{L}_{0} f_{1}^{aut} + \hat{l}_{1}^{i} L_{1} \left[\frac{1}{2} \Delta \gamma \otimes (A_{cT1} + A_{cT0})\right] \bar{L}_{0} f_{0}^{aut}) + \underbrace{\frac{1}{2} (\hat{l}_{0}^{i} L_{1} \left[\frac{1}{2} (\gamma_{0} + \gamma_{1}) \otimes \Delta A_{cT}\right] \bar{L}_{0} f_{1}^{aut} + \hat{l}_{1}^{i} L_{1} \left[\frac{1}{2} (\gamma_{0} + \gamma_{1}) \otimes \Delta A_{cT}\right] \bar{L}_{0} f_{0}^{aut}) + \underbrace{\frac{1}{2} (\hat{l}_{0}^{i} L_{1} \left[\frac{1}{2} (\gamma_{0} + \gamma_{1}) \otimes \Delta A_{cT}\right] \bar{L}_{0} f_{0}^{aut} + \hat{l}_{1}^{i} L_{1} \left[\frac{1}{2} (\gamma_{0} + \gamma_{1}) \otimes \Delta A_{cT}\right] \bar{L}_{0} f_{0}^{aut}) + \underbrace{\frac{1}{2} (\hat{l}_{0}^{i} L_{1} \left[\frac{1}{2} (\gamma_{0} + \gamma_{1}) \otimes \Delta A_{cT}\right] \bar{L}_{0} f_{0}^{aut} + \hat{l}_{1}^{i} L_{1} \left[\frac{1}{2} (\gamma_{0} + \gamma_{1}) \otimes \Delta A_{cT}\right] \bar{L}_{0} f_{0}^{aut}) + \underbrace{\frac{1}{4} (\hat{l}_{1}^{i} L_{1} + \hat{l}_{0}^{i} \bar{L}_{0}) (\hat{\mu}_{c}^{i} L_{1} + \hat{\mu}_{c}^{i} L_{0}) \Delta f_{c}^{i} L_{1} + \hat{\mu}_{c}^{i} L_{0} +$$

3.2. Main findings

This subsection shed light on the main findings of the SDA discussed above. For the sake of simplicity, first, we present the aggregate results and then we look into more details at the industry level. Tables 7⁷ and 8 allow us to identify some relevant patterns of employment growth over the period analyzed from complementary perspectives. In Table 7, we present the decomposition of the employment growth concerning each type of jobs (*informal, low-wage, medium-wage*, and *high-wage*); therefore, the column "Total" represents the growth rate of each type. As can be seen, the high-wage jobs category has the strongest growth (31.1%), followed by medium-wage (28,1%) and both, low-wage and informal jobs, had a much slower growth, 16.9% and 10.1% respectively. Each line decomposes these growth rates. For instance, if we look at the informal jobs growth, the fall in employment coefficient contributed with a reduction of 30 percentage points (p.p.) to the overall growth, while the total investment contributed with 20.6 p.p..

For all types of jobs and for every component of the SDA, the domestic content was reduced, which means that the import penetration was a factor that contributed to a reduction of jobs. Proportionally, the highest impact of import penetration was in the technical coefficients, i.e. the

⁷ The results in this section differ from the previous section as they are based on National Accounts. In order to be able to analyze formal and informal occupations by economic sector, the proportion by type of employment (informal, formal low, medium and high wage jobs) was used, calculated from PNAD data, on the total number of occupations by economic sector extracted from National Accounts.

demand for inputs generating an overall negative impact. Among final demand components, the import penetration had the highest relative (negative) impact on induced consumption. Based on domestic content, we find a 1.1 p.p. reduction in the total impact of 5.8 p.p., that is, the import penetration reduced almost 20% of the total impact. In contrast, in autonomous consumption, there is a reduction of only 0.3 p.p. from the total impact of 2.7 p.p., that is, the equivalent of about 10%.

Government consumption and total investments have the highest impacts on employment growth, in terms of total impact, whereas it should be compared to the other autonomous consumption. Other significant findings are the considerable low impact of exports as well as its negative impact on medium wage jobs. As we explained later, these findings are related to the reduction of manufacturing exports. Finally, when we look at induced consumption, it is important to highlight that a positive impact does not mean a simple growth of induced consumption, as in the other final demand components, but an increase in propensity to consume. Therefore, it is expected to have a lower impact on employment growth. Even so, it has an important positive impact that may be related to changes in income distribution.

| | | Employm | n. Tech Coeficient | | Induced Co | onsumpt. | Aut. Consu | umption | Investi | ment | Gov | |
|----------|-------|---------|--------------------|-------|------------|----------|------------|---------|---------|------------|-------|---------|
| | Total | Coof | Dom. | Total | Dom. | Total | Dom. | Total | Dom. | Total Cons | | Exports |
| | | coer. | Cont. | TOLAI | Cont. | TOLAI | Cont. | TOLAI | Cont. | TOLAI | cons. | |
| Informal | 10,1% | -30,0% | -2,9% | -1,5% | -1,2% | 5,5% | -0,3% | 2,6% | -1,8% | 20,6% | 17,1% | 2,1% |
| Low | 16,9% | -31,1% | -3,4% | 1,6% | -1,2% | 8,9% | -0,3% | 3,0% | -1,9% | 17,5% | 22,2% | 1,5% |
| Medium | 28,1% | -13,5% | -3,1% | -1,2% | -1,2% | 5,7% | -0,4% | 2,8% | -2,4% | 24,9% | 18,7% | -2,2% |
| High | 31,1% | -18,6% | -2,4% | 0,1% | -0,6% | 4,0% | -0,3% | 2,3% | -1,6% | 15,0% | 33,1% | 0,1% |
| Total | 16,6% | -26,1% | -3,0% | -0,8% | -1,1% | 5,8% | -0,3% | 2,7% | -1,9% | 20,1% | 20,1% | 1,1% |

Table 7 Decomposition of employment growth by type of job

Source: Own calculations based on PNAD/IBGE, Passoni e Freitas (2018).

In order to address the impact over the total growth of jobs during this period, 16,6%, Table 8 presents the contribution of each type of job, by each component of the SDA to it. From the first column, we can see that informal jobs contributed with 5.7 p.p. to the total growth, while formal jobs with 10.9 p.p.. Looking at the impact of each autonomous demand component over the growth of formal jobs, *induced consumption* and *exports* have a higher impact on the rate of growth of *low-wage jobs*, while *autonomous consumption* and *investment* have a greater effect on *medium-wage jobs*. Finally, *government consumption* is more related to *high-wage jobs*.

 Table 8 Decomposition of Employment Growth by type of job (contribution to total)

| | | Employm | Tech Coe | eficient | Induced Co | onsumpt. | Aut. Cons | umption | Investi | ment | Gov | |
|----------|-------|-----------------|---------------|----------|---------------|----------|---------------|---------|---------------|-------|-------|---------|
| | Total | Coef. | Dom. Cont. | Total | Dom. Cont. | Total | Dom. Cont. | Total | Dom. Cont. | Total | Cons. | Exports |
| Informal | 5,7% | -17,0% | -1,7% | -0,9% | -0,7% | 3,1% | -0,2% | 1,5% | -1,0% | 11,6% | 9,7% | 1,2% |
| Low | 2,5% | -4,6% | -0,5% | 0,2% | -0,2% | 1,3% | 0,0% | 0,4% | -0,3% | 2,6% | 3,3% | 0,2% |
| Medium | 4,5% | -2,2% | -0,5% | -0,2% | -0,2% | 0,9% | -0,1% | 0,5% | -0,4% | 4,0% | 3,0% | -0,4% |
| High | 3,9% | -2,3% | -0,3% | 0,0% | -0,1% | 0,5% | 0,0% | 0,3% | -0,2% | 1,9% | 4,1% | 0,0% |
| Total | 16,6% | - 26, 1% | -3,0% | -0,8% | -1,1% | 5,8% | -0,3% | 2,7% | -1,9% | 20,1% | 20,1% | 1,1% |

Source: Own calculations based on PNAD/IBGE, Passoni e Freitas (2018).

Looking at the sectoral level, Figure 1 presents the contribution of each industry to the total employment growth of each type of job. As can be seen, the agriculture sector is the only sector that contributed negatively to the growth of all type of jobs, especially to informal and low-wage jobs. Figure 1 illustrates that the total growth of 10.1% of informal jobs, shown in Table 7, was negatively impacted by 8 p.p. in the case of *Agriculture* but positively impacted by other sectors. Another general result is that *Mining* has the lowest contribution to each type of jobs. *Trade* and other services had an considerable positive effect, in every type of job, although higher in low-wage jobs. *Manufacturing, Construction,* and *Transports* affected more medium-wage jobs, and *Public administration, Education* and *Health*, high-wage jobs.



Figure 1 Decomposition of employment growth by type of job by industry in p.p.

Source: Own calculations based on PNAD/IBGE, Passoni e Freitas (2018).

Finally, we analyze the components of the SDA by industry. In the Appendix, we present two Tables (Tables 10 and 11) with the results aggregated among 10 industries. Table 10 (Appendix) is equivalent to Table 7 above, and it presents the results of the SDA of Employment Growth by type of employment. In Table 10 (Appendix), as in Figures 2 and Figure 3, we can see the contribution of each industry, by component of the SDA, to the total growth of each type of job (informal, low-wage, medium-wage and high-wage). In the table below, we show four sectors that have markedly patterns in the SDA.



Figure 2 SDA of Employment Growth by type of employment – contribution of each component by industry to the growth of each type of job - Services

The first two sectors that we present in Figure 2 and Figure 3 are related to the discussion of cumulative causation discussed in Krepsky *et al.* (2019). The main idea is that changes in consumption patterns led to the growth of sectors whose production demanded a less qualified workforce. This is the case of *Service industries* and *Trade* (Figures 2 and 3, respectively), which had an important impact on low-wage jobs growth. Reinforcing the findings in Krepsky *et al.* (2019), we can see that both sectors have relative high impact of induced consumption, when compared to other industries. Hence, our findings may support the hypothesis that an increase in low-wage jobs changed the income distribution (Carvalho; Rugitsky, 2015; Rugitsky, 2017), which led to an increase in propensity to consume to those sectors, which increased the demand for *Services* and *Trade*, increasing again low-wage jobs and completing the cumulative causation. In *Trade* (Figure 3), even though we expect the induced consumption to have a relative smaller contribution than autonomous consumption.

Although to a smaller intensity, these two sectors also contributed to the increase of both medium and high-wage, which helps to explain why both medium and high-wage jobs grew more (28,1 % and 31,1%, respectively) than low-wage (16,9%) and informal jobs (10,1%). These two sectors also show another important result, when compared to other sectors which are associated to higher wage jobs. As can be seen in Table 10 (Appendix) and Figures 2 and 3, the highest impact in absolute terms in these sectors are the negative effect of the reduction of employment coefficient.

Source: Own calculations based on PNAD/IBGE, Passoni e Freitas (2018).

This component can be seen as *proxy* of productivity growth. Therefore, *ceteris paribus*, these two sectors may present an increase in productivity, requiring less employees to produce each unit of output.



Figure 3 SDA of Employment Growth by type of employment – contribution of each component by industry to the growth of each type of job - Trade

Source: Own calculations based on PNAD/IBGE, Passoni e Freitas (2018).

This finding is contrasting with the case of other two other relevant sectors: *Construction* and *Manufacturing*. As can be seen in Table 10 (Appendix), and Figures 4 and 5, in the case of *Construction*, the absolute contribution of employment coefficient is much smaller than the positive contribution of investments. In the case of *Manufacturing*, an even more intriguing result appears. Manufacturing is the only industry in which there was an increase in employment coefficient (Table 9), leading to the idea of what may be interpreted as a reduction of productivity in this sector.

Analysing the *Construction* sector (Figure 4), we can see that the sector generated mainly two kinds of jobs: informal and formal medium-wage jobs. As expected, the only two components of the SDA, which are relevant for construction sector, are the employment coefficient and the total investment. Since construction is still mainly a non-tradable sector, the domestic component and exports are not so relevant.

In contrast, *Manufacturing* is one of the main tradable sectors, and both exports and import penetration contributed negatively to job creation within this industry. Manufacturing contributed mainly to the creation of medium-wage formal jobs and the most important component of the SDA is investments, followed by government consumption. These findings reinforce the link between manufacturing growth and investments discussed by Serrano and Summa (2015). In a different context, discussing the slowdown of manufacturing industry after 2011, the authors contested the

broad consensus in Brazil that manufacturing industry was not growing, mainly because of the overvalued real exchange rate. They argued that "the main cause of the fall in manufacturing output growth was the large reduction in investment growth, especially investment in machinery and equipment, both from private and state-owned enterprises" (Serrano; Summa, 2015, pp. 825-826).





Source: Own calculations based on PNAD/IBGE, Passoni e Freitas (2018).

The negative contribution associated to technical coefficients for *Manufacturing* industry can be a sign of changes in relative prices. As can be seen in Table 9, while Manufacturing contributed negatively in this component, *Trade, Transport and other Services* contributed positively. Although it requires further investigation, as shown in Passoni (2019), there was a fall of relative prices of manufacturing in relation to services sectors in this period, which affects the technical coefficients and de SDA.

Among all the ten sectors investigated so far, *Manufacturing* is one of the most diverse sector and is the one the encompass more industries of the original sectoral decomposition of both the System of National Accounts as published by IBGE or in the tables presented by Passoni e Freitas (2018). Therefore, following industries classification developed by GIC-UFRJ we split the manufacturing sector into four subgroups: a) *Traditional industries*; b) *Agricultural commodities*; c) *Industrial commodities*; and d) *Innovative industries*.⁸

⁸ *Traditional industries* (a) comprises production of low technological content goods, industries with few requirements of productive scale; production of wage goods, inputs, industrial parts and complements, and manufactured consumer goods; *Agricultural commodities* (b) includes industries intensive in natural resources and energy, and are generally associated with agribusiness and homogeneous products of high tonnage; *Industrial Commodities* (c) comprehends natural resource intensive activities related to mineral extractive industry, metallurgy, and basic chemistry; and *Innovative manufacturing* (d) comprehends more sophisticated activities in terms of technology and organization of the production process.





■ Informal ■ Low ■ Medium ■ High

Source: Own calculations based on PNAD/IBGE, Passoni e Freitas (2018).

The results are presented in Figure 6 and show different patterns of employment growth among different subgroups. Only *Agriculture commodities* had a negative total effect, which is mainly explained by the external sector. Both the reduction of exports and of domestic content had the highest absolute impact compensating the positive impact of investments. *Traditional industries* is the only subgroup in which government consumption has a significant impact, while both *Industrial commodities* and *Innovative industries* are mainly affected by investments. Autonomous consumption plays a key role in both *Traditional industries* and, in a greater extent, to *Innovative industries*.



Table 9 presents the results of the SDA of total employment by the ten industries. As can be seen, *Public Administration, Education and Health* are mainly explained by government consumption. In the case of *Education*, there is an interesting result when we compare the induced consumption, which have a negative impact, indicating a fall in propensity to consume private education and a very large positive impact of government consumption. *Mining* has an overall considerable small contribution to job creation and *Transport* sector, the second least important, is more affected by investments followed by government consumption.

Table 9 -

| | Total | Employm. | Tech Coe | eficient | Induced Co | onsumpt. | Aut. Cons | umption | Investi | ment | Gov. | Evenante |
|---------------|-------|----------|----------|----------|------------|----------|-----------|---------|---------|-------|-------|----------|
| | TOLAI | Coef. | Dom. | Total | Dom. | Total | Dom. | Total | Dom. | Total | Cons. | exports |
| Agriculture | -5,1% | -7,8% | -0,4% | -2,4% | -0,2% | -0,3% | 0,0% | 0,3% | -0,4% | 1,9% | 2,7% | 1,4% |
| Mining | 0,1% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,1% | 0,0% | 0,0% |
| Manufacturing | 2,9% | 1,5% | -0,4% | -1,0% | -0,3% | 0,1% | -0,1% | 0,4% | -0,4% | 2,7% | 1,6% | -1,0% |
| Construction | 3,4% | -1,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 4,2% | 0,1% | 0,0% |
| Trade | 3,4% | -9,0% | -0,5% | 1,2% | -0,2% | 3,7% | -0,1% | 0,5% | -0,4% | 4,6% | 3,4% | 0,1% |
| Transport | 1,0% | -1,1% | -0,2% | 0,4% | -0,1% | 0,3% | 0,0% | 0,1% | -0,1% | 0,9% | 0,8% | 0,1% |
| Services | 5,5% | -7,3% | -1,3% | 1,0% | -0,4% | 2,3% | -0,1% | 1,2% | -0,5% | 5,1% | 5,1% | 0,4% |
| Public Adm. | 1,2% | -0,6% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,1% | 1,7% | 0,0% |
| Education | 2,5% | -0,7% | -0,1% | -0,1% | 0,0% | -0,4% | 0,0% | 0,1% | 0,0% | 0,4% | 3,3% | 0,0% |
| Health | 1,6% | 0,0% | 0,0% | -0,1% | 0,0% | 0,1% | 0,0% | 0,1% | 0,0% | 0,3% | 1,3% | 0,0% |
| Total | 16.6% | -26.1% | -3.0% | -0.8% | -1.1% | 5.8% | -0.3% | 2.7% | -1.9% | 20.1% | 20.1% | 1.1% |

Source: Own calculations based on PNAD/IBGE, Passoni e Freitas (2018)

4. Concluding remarks

This paper contributes to a better understanding of the process of structural transformation in today's developing economies. In particular, we aimed to answer the following questions: first, to what extend did the Brazilian economy follow a process of job polarization? In addition, if so, what factors gave rise to this phenomenon? Second, what were the relative importance of different growth patterns in contributing to employment growth, and to job polarization? Therefore, this paper investigated the links among specialization pattern, technological change, sectoral growth and occupational composition at the industry level for the Brazilian economy over the years of 2003-2014.

From the analysis of the Brazilian labor market, we observed an intense formalization process in occupational activities in Brazil between 2004 and 2013, which does not seem to have generated an occupational polarization. The medium income increased, income inequality for formal occupation decreased and there was no reduction on the share of intermediate medium income in total formal occupation.

In order to investigate this finding we used a methodology to decompose the employment growth in four major effects: (a) changes in employment coefficient (proxy to labor productivity); (b) changes in technical coefficient (intermediate demand); (c) changes in propensity to consume and (d) changes in autonomous components of final demand – autonomous consumption, investments, government consumption and exports. This methodology allows determining the contribution of each demand component to employment growth aggregated and by sector, separating the effect of changes in the domestic content of the aggregates with what we could call the "total effect" (i.e. the total change of demand, including domestic and imported products). We discussed these results by type of jobs (informal and low, medium and high-wages formal jobs) and by industries.

Based on this methodology, we were able to find some patterns concerning the jobs growth. For all type of jobs and for every component of the SDA the domestic content was reduced, which means that the import penetration was a factor that contributed to a reduction of jobs. However, only for the intermediate demand, the import penetration effect was higher than the total effect. Looking at the impact of final demand over formal jobs, induced consumption and exports explains more the growth of low-wage jobs, while autonomous consumption and investment have a higher impact over medium-wage jobs. Finally, government consumption is more related to high wage jobs.

Looking more closely to the sectoral patterns, manufacturing sector contributed mainly to the creation of medium-wage formal jobs and the most important component of the SDA is investments, followed by government consumption. These findings reinforce the link between manufacturing growth and investments discussed by Serrano and Summa (2015). The service industries and trade had an important impact on low wage jobs growth, and both sector have relative a high impact of induced consumption, when compared to other industries. These results suggest more evidence of the cumulative causation discussed in Krepsky, et al. (2019). These findings reinforce the importance of looking into to greater details the changes in the Brazilian labor market and the variety of outcomes observed among developing countries.

References

- BRESSAN, G.S AND HERMETO, A.M. (2009) "Polarização do Mercado de trabalho sob viés tecnológico e impactos sobre diferenciais salariais por gênero". *Encontro Nacional de Economia*, ANPEC, Economia do Trabalho.
- CARVALHO, L.; RUGITSKY, F. (2015) Growth and distribution in Brazil the 21st century: revisiting the wage-led versus profit-led debate. University of São Paulo (FEA-USP), Working Paper 2015_25.
- DIETZENBACHER, E.; LOS, B. (1998) Structural decomposition techniques: sense and sensitivity. Economic Systems Research, v. 10, n. 4, p. 307-324.
- FIGUEIRÊDO, E.A.; SILVA NETTO JR., J. L.; PORTO JR., S. (2017) "Distribuição, mobilidade e polarização de renda no Brasil: 1987 a 2003". *Revista Brasileira de Economia*, v. 61, n.1, pp. 7-32.
- FREITAS, F.; DWECK, E. (2013) The Pattern of Economic Growth of the Brazilian Economy 1970-2005: A Demand-Led Growth Perspective, in LEVRERO, E., PALUMBO, A. &

STIRATI, A. (Eds.) Sraffa and the Reconstruction of Economic Theory - Vol. II: Aggregate Demand, Policy Analysis and Growth. London: Palgrave Macmillan.

- HOFFMANN, R. (2008) "Polarização da distribuição de renda no Brasil". *Econômica*, vol. 10, n. 2, pp. 169-186.
- HUSSMANNS, R. (2004) "Measuring the informal economy: From employment in the informal sector to informal employment", *Working Paper n. 53*, Geneva: International Labour Office.
- KALLEBERG, A. L. (2011) Good Jobs, bad jobs. The rise of polarized and precarious employment systems in the United States, 1970s to 2000s. New York: Russell Sage Foundation.
- KREPSKY, C. U.; DWECK. E. FREITAS, F. N. P.. (2019) Output and Household Consumption Growth in Brazil from 2000 to 2016: A Structural Decomposition Analysis 47° Encontro Nacional de Economia
- KUPFER, D.; CASTILHO. M.; DWECK E. NICOLL, M. (2013). "Different Partners, Different Patterns: Trade and Labour Market Dynamics in Brazil's Post-Liberalisation Period," OECD Trade Policy Papers 149, OECD Publishing.
- MACHADO, A (2017) "Existe polarização no Mercado de trabalho brasileiro?" Radar, IPEA.
- MILLER, Ronald E.; BLAIR, Peter D. Input-Output Analysis: Foundations and extensions. Cambridge University Press, 2009
- MIYAZAWA, Kenichi. Interindustry Analysis and the Structure of Income Distribution. In: Input-Output Analysis and the Structure of Income Distribution. Springer, Berlin, Heidelberg, 1976. p. 1-21.
- PASSONI, P; FREITAS, F. Metodologia para estimação de uma série de matrizes insumoproduto para o Brasil de 2000 a 2015. 2018. Mimeo.
- PASSONI, Patieene Alves. Deindustrialization and regressive specialization in the brazilian economy between 2000 and 2014: a critical assessment based on the input-output analysis. Tese (Doutorado em Economia) Instituto de Economia, Programa de Pós-Graduação em Economia da Indústria e Tecnologia. Universidade Federal do Rio de Janeiro. 2019
- RUGITSKY, Fernando. The rise and fall of the Brazilian economy (2004-2015): the economic antimiracle. University of São Paulo (FEA-USP), Working Paper 2017_29, 2017.
- SERRANO, F.; SUMMA, R. (2015) Aggregate Demand and the Slowdown of Brazilian Economic Growth from 2011-2014. Nova Economia v.25 n.especial p.803-833

Appendix

| | | Total | Employm. Coef. | Tech Induced | Aut. | Investment | Cov Conc | Funerate | Domestic | |
|-------------|----------|--------|-------------------|--------------|-----------|-------------|------------|------------|----------|---------|
| | | | | Coeficient | Consumpt. | Consumption | investment | Gov. cons. | Exports | Content |
| Agriculture | Informal | -7,93% | -12,15% | -3,72% | -0,40% | 0,43% | 2,96% | 4,27% | 2,19% | -1,52% |
| | Low | -3,70% | -5,66% | -1,73% | -0,19% | 0,20% | 1,38% | 1,99% | 1,02% | -0,71% |
| | Medium | -0,12% | -0,18% | -0,05% | -0,01% | 0,01% | 0,04% | 0,06% | 0,03% | -0,02% |
| | High | -0,22% | -0,34% | -0,10% | -0,01% | 0,01% | 0,08% | 0,12% | 0,06% | -0,04% |
| - | Informal | 0,03% | -0,01% | -0,02% | 0,00% | 0,00% | 0,04% | 0,01% | 0,02% | -0,01% |
| βuing | Low | 0,03% | 0,00% | 0,00% | 0,00% | 0,00% | 0,02% | 0,01% | 0,01% | 0,00% |
| Mir | Medium | 0,34% | 0,00% | 0,01% | -0,01% | 0,01% | 0,16% | 0,05% | 0,16% | -0,04% |
| | High | 0,17% | 0,01% | 0,02% | 0,00% | 0,01% | 0,06% | 0,03% | 0,07% | -0,01% |
| t. | Informal | 2,18% | 1,02% | -0,72% | 0,03% | 0,31% | 1,94% | 1,23% | -0,77% | -0,87% |
| ufa | Low | 1,33% | 0,68% | -0,49% | -0,15% | 0,13% | 0,97% | 0,83% | -0,22% | -0,41% |
| Manı | Medium | 8,56% | 4,56% | -3,21% | 0,07% | 1,14% | 7,85% | 4,50% | -2,97% | -3,37% |
| | High | 2,61% | 1,47% | -1,11% | -0,08% | 0,33% | 2,28% | 1,37% | -0,60% | -1,04% |
| ÷ | Informal | 4,25% | -1,33% | 0,06% | -0,01% | 0,02% | 5,30% | 0,19% | 0,04% | -0,03% |
| truc | Low | 0,26% | -0,08% | 0,00% | 0,00% | 0,00% | 0,32% | 0,01% | 0,00% | 0,00% |
| .suc | Medium | 4,91% | -1,54% | 0,07% | -0,01% | 0,02% | 6,13% | 0,22% | 0,05% | -0,03% |
| ŭ | High | 0,97% | -0,30% | 0,01% | 0,00% | 0,00% | 1,21% | 0,04% | 0,01% | -0,01% |
| | Informal | 3,19% | -8,36% | 1,16% | 3,47% | 0,47% | 4,32% | 3,16% | 0,07% | -1,09% |
| de | Low | 4,60% | -12,06% | 1,67% | 5,01% | 0,67% | 6,23% | 4,56% | 0,10% | -1,58% |
| Tra | Medium | 3,49% | -9,14% | 1,26% | 3,80% | 0,51% | 4,72% | 3,45% | 0,07% | -1,19% |
| | High | 2,95% | -7,73% | 1,07% | 3,21% | 0,43% | 3,99% | 2,92% | 0,06% | -1,01% |
| ť | Informal | 0,75% | -0,79% | 0,30% | 0,19% | 0,10% | 0,63% | 0,55% | 0,05% | -0,29% |
| Transpor | Low | 0,63% | -0,66% | 0,25% | 0,16% | 0,08% | 0,53% | 0,46% | 0,04% | -0,24% |
| | Medium | 2,64% | -2,76% | 1,06% | 0,68% | 0,34% | 2,22% | 1,93% | 0,18% | -1,00% |
| | High | 0,77% | -0,80% | 0,31% | 0,20% | 0,10% | 0,65% | 0,56% | 0,05% | -0,29% |
| | Informal | 5,39% | -7,82% | 1,45% | 2,35% | 1,21% | 5,04% | 5,05% | 0,46% | -2,35% |
| ices | Low | 8,05% | -11,87% | 2,00% | 4,24% | 1,71% | 7,27% | 7,65% | 0,58% | -3,52% |
| eZ | Medium | 3,67% | -3,19% | -0,30% | 1,27% | 0,64% | 3,14% | 3,07% | 0,25% | -1,21% |
| S | High | 4,06% | -5,59% | 0,26% | 1,95% | 0,89% | 3,89% | 3,91% | 0,39% | -1,64% |
| Ŀ. | Informal | 0,46% | -0,23% | 0,02% | 0,01% | 0,01% | 0,03% | 0,65% | 0,00% | -0,01% |
| Adr | Low | 1,44% | -0,73% | 0,05% | 0,02% | 0,02% | 0,08% | 2,02% | 0,01% | -0,04% |
| .d | Medium | 1,64% | -0,83% | 0,05% | 0,03% | 0,02% | 0,09% | 2,31% | 0,01% | -0,04% |
| P | High | 3,98% | -2,02% | 0,13% | 0,06% | 0,05% | 0,22% | 5,59% | 0,04% | -0,10% |
| Education | Informal | 1,11% | -0,34% | -0,03% | -0,16% | 0,03% | 0,17% | 1,47% | 0,00% | -0,04% |
| | Low | 2,19% | -0,66% | -0,05% | -0,32% | 0,06% | 0,33% | 2,91% | 0,01% | -0,09% |
| | Medium | 1,17% | -0,35% | -0,03% | -0,17% | 0,03% | 0,18% | 1,55% | 0,00% | -0,05% |
| | High | 10,79% | -3,26% | -0,25% | -1,58% | 0,28% | 1,64% | 14,34% | 0,03% | -0,42% |
| Health | Informal | 0,65% | -0,01% | -0,04% | 0,03% | 0,03% | 0,12% | 0,55% | 0,00% | -0,04% |
| | Low | 2,04% | -0,02% | -0,12% | 0,09% | 0,10% | 0,38% | 1,73% | 0,00% | -0,12% |
| | Medium | 1,81% | -0,02% | -0,10% | 0,08% | 0,09% | 0,34% | 1,54% | 0,00% | -0,11% |
| | High | 4,99% | -0,05% | -0,28% | 0,21% | 0,24% | 0,94% | 4,25% | -0,01% | -0,30% |
| Total | Informal | 10,07% | -30,01% | -1,54% | 5,50% | 2,60% | 20,56% | 17,14% | 2,07% | -6,25% |
| | Low | 16,87% | -31,07% | 1,58% | 8,86% | 2,97% | 17,51% | 22,18% | 1,55% | -6,70% |
| | Medium | 28,10% | -13,46% | -1,23% | 5,72% | 2,80% | 24,87% | 18,69% | -2,21% | -7,06% |
| | High | 31,07% | -18,62% | 0,06% | 3,97% | 2,35% | 14,95% | 33,13% | 0,09% | -4,86% |
| Total | | 16,60% | - 26,09 % | -0,83% | 5,85% | 2,66% | 20,10% | 20,13% | 1,06% | -6,28% |
| Informal | | 5,70% | -16,98% | -0,87% | 3,11% | 1,47% | 11,63% | 9,70% | 1,17% | -3,54% |
| Formal | | 10,90% | -9,11% | 0,04% | 2,73% | 1,18% | 8,47% | 10,43% | -0,11% | -2,74% |

Table 10 SDA of Employment Growth by type of employment – contribution of each industry to the growth of each type of job

Source: Own calculations based on PNAD, Passoni e Freitas (2018)

| | | Employm. | | Tech Induced | | Aut. | | | | Domestic |
|-------------|----------|----------|---------|--------------|-----------|-------------|------------|------------|---------|----------|
| | | Total | Coef. | Coeficient | Consumpt. | Consumption | Investment | Gov. Cons. | Exports | Content |
| Agriculture | Informal | -4,49% | -6,87% | -2,10% | -0,23% | 0,24% | 1,67% | 2,42% | 1,24% | -0,86% |
| | Low | -0,55% | -0,84% | -0,26% | -0,03% | 0,03% | 0,21% | 0,30% | 0,15% | -0,11% |
| | Medium | -0,02% | -0,03% | -0,01% | 0,00% | 0,00% | 0,01% | 0,01% | 0,01% | 0,00% |
| | High | -0,03% | -0,04% | -0,01% | 0,00% | 0,00% | 0,01% | 0,01% | 0,01% | -0,01% |
| Mining | Informal | 0,02% | -0,01% | -0,01% | 0,00% | 0,00% | 0,02% | 0,01% | 0,01% | -0,01% |
| | Low | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% | 0,00% |
| | Medium | 0,05% | 0,00% | 0,00% | 0,00% | 0,00% | 0,03% | 0,01% | 0,03% | -0,01% |
| | High | 0,02% | 0,00% | 0,00% | 0,00% | 0,00% | 0,01% | 0,00% | 0,01% | 0,00% |
| Manufact. | Informal | 1,23% | 0,58% | -0,41% | 0,02% | 0,18% | 1,10% | 0,70% | -0,44% | -0,49% |
| | Low | 0,20% | 0,10% | -0,07% | -0,02% | 0,02% | 0,14% | 0,12% | -0,03% | -0,06% |
| | Medium | 1,38% | 0,73% | -0,52% | 0,01% | 0,18% | 1,26% | 0,73% | -0,48% | -0,54% |
| | High | 0,32% | 0,18% | -0,14% | -0,01% | 0,04% | 0,28% | 0,17% | -0,08% | -0,13% |
| ruct. | Informal | 2,40% | -0,75% | 0,04% | -0,01% | 0,01% | 3,00% | 0,11% | 0,02% | -0,02% |
| | Low | 0,04% | -0,01% | 0,00% | 0,00% | 0,00% | 0,05% | 0,00% | 0,00% | 0,00% |
| nst | Medium | 0,79% | -0,25% | 0,01% | 0,00% | 0,00% | 0,99% | 0,04% | 0,01% | -0,01% |
| ပိ | High | 0,12% | -0,04% | 0,00% | 0,00% | 0,00% | 0,15% | 0,01% | 0,00% | 0,00% |
| | Informal | 1,80% | -4,73% | 0,65% | 1,97% | 0,26% | 2,44% | 1,79% | 0,04% | -0,62% |
| Trade | Low | 0,69% | -1,80% | 0,25% | 0,75% | 0,10% | 0,93% | 0,68% | 0,01% | -0,23% |
| | Medium | 0,56% | -1,47% | 0,20% | 0,61% | 0,08% | 0,76% | 0,56% | 0,01% | -0,19% |
| | High | 0,37% | -0,96% | 0,13% | 0,40% | 0,05% | 0,50% | 0,36% | 0,01% | -0,13% |
| ť | Informal | 0,43% | -0,44% | 0,17% | 0,11% | 0,05% | 0,36% | 0,31% | 0,03% | -0,16% |
| Transpor | Low | 0,09% | -0,10% | 0,04% | 0,02% | 0,01% | 0,08% | 0,07% | 0,01% | -0,04% |
| | Medium | 0,43% | -0,44% | 0,17% | 0,11% | 0,05% | 0,36% | 0,31% | 0,03% | -0,16% |
| | High | 0,10% | -0,10% | 0,04% | 0,02% | 0,01% | 0,08% | 0,07% | 0,01% | -0,04% |
| | Informal | 3,05% | -4,42% | 0,82% | 1,33% | 0,69% | 2,85% | 2,86% | 0,26% | -1,33% |
| ices | Low | 1,20% | -1,77% | 0,30% | 0,63% | 0,25% | 1,08% | 1,14% | 0,09% | -0,52% |
| erv | Medium | 0,59% | -0,51% | -0,05% | 0,20% | 0,10% | 0,51% | 0,49% | 0,04% | -0,20% |
| S | High | 0,50% | -0,69% | 0,03% | 0,24% | 0,11% | 0,48% | 0,49% | 0,05% | -0,20% |
| Ľ. | Informal | 0,26% | -0,13% | 0,01% | 0,00% | 0,00% | 0,01% | 0,37% | 0,00% | -0,01% |
| Pub. Adr | Low | 0,21% | -0,11% | 0,01% | 0,00% | 0,00% | 0,01% | 0,30% | 0,00% | -0,01% |
| | Medium | 0,26% | -0,13% | 0,01% | 0,00% | 0,00% | 0,01% | 0,37% | 0,00% | -0,01% |
| | High | 0,49% | -0,25% | 0,02% | 0,01% | 0,01% | 0,03% | 0,69% | 0,00% | -0,01% |
| Education | Informal | 0,63% | -0,19% | -0,01% | -0,09% | 0,02% | 0,10% | 0,83% | 0,00% | -0,02% |
| | Low | 0,33% | -0,10% | -0,01% | -0,05% | 0,01% | 0,05% | 0,43% | 0,00% | -0,01% |
| | Medium | 0,19% | -0,06% | 0,00% | -0,03% | 0,00% | 0,03% | 0,25% | 0,00% | -0,01% |
| | High | 1,34% | -0,40% | -0,03% | -0,20% | 0,04% | 0,20% | 1,78% | 0,00% | -0,05% |
| alth | Informal | 0,37% | 0,00% | -0,02% | 0,02% | 0,02% | 0,07% | 0,31% | 0,00% | -0,02% |
| | Low | 0,30% | 0,00% | -0,02% | 0,01% | 0,01% | 0,06% | 0,26% | 0,00% | -0,02% |
| Hea | Medium | 0,29% | 0,00% | -0,02% | 0,01% | 0,01% | 0,05% | 0,25% | 0,00% | -0,02% |
| | High | 0,62% | -0,01% | -0,04% | 0,03% | 0,03% | 0,12% | 0,53% | 0,00% | -0,04% |
| Total | Informal | 5,70% | -16,98% | -0,87% | 3,11% | 1,47% | 11,63% | 9,70% | 1,17% | -3,54% |
| | Low | 2,51% | -4,63% | 0,24% | 1,32% | 0,44% | 2,61% | 3,31% | 0,23% | -1,00% |
| | Medium | 4,53% | -2,17% | -0,20% | 0,92% | 0,45% | 4,00% | 3,01% | -0,36% | -1,14% |
| | High | 3,86% | -2,31% | 0,01% | 0,49% | 0,29% | 1,86% | 4,11% | 0,01% | -0,60% |
| Total | | 16,60% | -26,09% | -0,83% | 5,85% | 2,66% | 20,10% | 20,13% | 1,06% | -6,28% |
| Informal | | 5,70% | -16,98% | -0,87% | 3,11% | 1,47% | 11,63% | 9,70% | 1,17% | -3,54% |
| Formal | | 10,90% | -9,11% | 0,04% | 2,73% | 1,18% | 8,47% | 10,43% | -0,11% | -2,74% |

Table 11 SDA of Employment Growth by type of employment – contribution of each industry to the total growth of jobs

Source: Own calculations based on PNAD, Passoni e Freitas (2018)