Title: Output and Household Consumption Growth in Brazil from 2000 to 2016: a structural decomposition analysis

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Resumo

O objetivo deste trabalho é compreender as trajetórias de consumo doméstico e crescimento econômico no Brasil, entre 2000 e 2016. Objetivamos compreender as fontes da mudança estrutural observada e identificar a presença de processos de causalidade cumulativa entre consumo e estrutura produtiva. Realizamos duas análises de decomposição estrutural (SDA): uma para o crescimento do consumo das famílias e outra para o crescimento da produção bruta. A novidade deste estudo é a aplicação da técnica de análise de decomposição estrutural à variação de consumo das famílias. Também aprimoramos a metodologia utilizada em trabalhos anteriores para endogeneizar o consumo. Utilizamos uma série de matrizes insumo produto (MIP), valoradas a preços constantes, construídas pelo GIC-UFRJ para o período 2000-2016. Também utilizamos dados referentes aos salários e ocupações por setor da Pesquisa Industrial Anual Brasileira (PIA) e várias classificações disponibilizadas pelo IBGE. Constatamos que as mudanças estruturais na produção e no consumo se reforçaram mutuamente nos períodos de expansão econômica e observamos a alta relevância do investimento e dos gastos do governo na determinação do ciclo econômico.

Palavras-chave: Consumo das Famílias, Metodologia Insumo Produto, Mudança Estrutural

Abstract

The objective of this work is to understand the household consumption and economic growth trajectories in Brazil, between 2000 and 2016. We aim to understand the sources of the structural change observed and identify the presence of cumulative causation processes between consumption and production structure. We performed two structural decomposition analysis (SDA): one for households' consumption growth and another for gross output growth. The novelty of this study is the application of the structural decomposition analysis technique to the household's consumption variation. We also improved the methodology used in former works to endogenize consumption. We used a series of I-O matrices valued at constant prices constructed by GIC-UFRJ for the period 2000-2016. We also used data related to the wages and occupations by industry from the Brazilian Annual Industrial Survey (PIA), and several classifications made available by IBGE. We found that structural change in output and consumption reinforced each other in the periods of economic expansion and observed the high relevance of investment and government spending in the determination of the economic cycle.

Key Words: Household Consumption, Input-Output applications, Structural Change

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1. Introduction

The period from 2000 to 2016 comprehended different dynamics of economic growth and consumption patterns in Brazil. The 2000's was a period of economic growth and the incorporation of many people to the consumption market, affecting the consumption patterns. During this decade, there was strong growth of household consumption. The strong economic growth, the increase in the minimum wage and formalization of wage labor allowed the consumption expansion at a fast rate. On top of that, the expansion of government transfers and consumer credit, coupled with the reduction in the cost of living[1] increased the number of households that had sufficient purchasing power to diversify their consumption (Bielschovsky, 2014).

However, the dynamism did not last in the following decade, marked by the deceleration of growth and consumption. Since 2011, the changes in external scenario and some macroeconomic policies help to understand the worsening in the economic result. However, since 2015, a deepening in austerity measures undermined the pillars that sustained growth in the previous decade. During 2015-2017, the government implemented a severe fiscal consolidation with major cuts in public investments and other government spending causing huge impacts on unemployment and public finances.

Important changes in the structure of final consumption took place in the period, with the spreading out of durable goods consumption and consumers spending more on food away from home, private transportation and other services (Medeiros, 2015). These transformations, in turn, have implications for economic growth and consumption patterns. As proposed by Rugitsky (2017), this may lead to a cumulative causation process, when consumption growth leads to change in the employment structure, which feedbacks to consumption patterns.

The objective of this study is to analyze the period from 2000 to 2016, aiming to clarify the sources of structural change observed and, thus, to understand the trajectories of household consumption and economic growth itself. In addition, we seek to understand how changes in patterns of growth and consumption co-determine the productive structure identifying cumulative causation processes between consumption and productive structure.

The study applies a structural decomposition analysis (SDA), which allows the quantification of the impact on the growth of any aggregate by the variations of its components. We carried out two growth decompositions: a) household consumption; and b) gross output. We suppose that final consumption has an exogenous component – associated with factors such as availability and access to credit – and an endogenous component – depending on variables such as propensities to consume, average wages, labor productivity and the shift and share changes of the gross output.

The growth decomposition of household consumption will provide a measure of the contribution of each component by industry. In each sub period, it is possible to identify either the induced or the autonomous components as the most relevant component to explain the trajectory of household consumption. On top of that, we can infer a possible cumulative causation processes between consumption pattern and output growth through the shift and share effect of gross output growth.

Likewise, the growth decomposition of the gross output will measure the contribution of technical change, final demand and trade pattern on the output growth by industry. This will allow us to identify and understand the sources of structural change in the period under study.

In both decompositions, we will also make explicit the change in trade pattern for the relevant variables. It consists in a measure of the effect of the changes in domestic content in the different components of demand. This measurement will provide important information to portrait the economic scenario of the period under study.

[1] In particular, there was a strong reduction of industrial goods prices relative to wages due international price reduction and to the exchange rate appreciation.

Besides this introduction, the paper is divided into three sections. Section 2 presents the methodology to calculate both structural decompositions for output and for household consumption. Section 3 presents the SDA results and its analysis under the light of recent Brazilian economic policy. Section 4 presents the main conclusions and some final remarks.

2. SDA Methodology

In this section, we will explain the two structural decomposition analysis: one of the gross output and the other of final households' consumption, making explicit its endogenous and exogenous components. Instead of using a regular supply-side accounting approach, inspired by the theory of neoclassical growth, we chose a demand-led growth accounting methodology. It is worth noting that the empirical approach was adapted from the structural decomposition analysis developed in the input-output literature, based on the Leontief input-output model. However, this decomposition is compatible with the heterodox theoretical framework for economic growth analysis, since it is based in a demand-led model.

We adapted the methodology to capture the distinction between autonomous and induced variables. Government consumption, total investments and exports are exogenous. With respect to investment expenditures, this version of the SDA overlooks the theoretical findings that take into account that, to some extent, investment decisions are an endogenous process of adjusting productive capacity to meet demand. Therefore, the SDA proposed better represents the aggregate investment that may be considered autonomous such as housing, government and state-owned enterprises investment. The investment will be partially endogenized in later developments of this work. On the other hand, we divided household consumption into autonomous and induced components.

2.1. Endogenization of Household Consumption

In order to split the household consumption into its autonomous and induced components, we used as proxy a distinction between durable and nondurable consumption (including services). Following Freitas and Dweck (2013), we assumed that durable consumption is autonomous since it does not depend on current income but in the availability of credit. On the other hand, the consumption of nondurables depends to a large extent on the purchasing power introduced in the economy by the current production decisions, especially the wages[2].

The amount of credit applied to durable consumption depends on institutional and social factors. The main determinants are: the evolution of durable consumption patterns; the patterns of income distribution; the intensity of competition in the financial system; banking risk policies; taxes structure; the legal framework; the role of the public sector in the credit system; relations between the financial sector and the central bank; and the orientation of monetary and credit policy adopted by the monetary authority, among others. Household debt/income ratio also influences the expansion of consumer credit. However, such influence is quite weak, particularly when longer periods of analysis are considered and, consequently, the institutional and social factors mentioned are subject to significant changes. (Freitas and Dweck, 2013).

In order to separate the induced from autonomous consumption, we constructed a vector v that contains the nondurable consumption goods share by industry. The determination of these shares constitutes one of the innovations of this work. In that effort, we combined the classification of products according to the basic classes of goods of the System of National Accounts (BC-SNA), the Classification by Broad Economic Categories (CGCE- IBGE) (CONCLA-IBGE, 2013) and weights based on products sales from the Annual Industrial Survey[3] (PIA), all made available by the Brazilian Institute of Geography and Statistics - IBGE.

[2] As will be explained in the following subsection, the endogenous households' consumption was constructed as a wage-dependent variable.

[3] We used sales data from the PIA Survey of 2010, because that is the latest reference year of national accounts data and the I-O matrices utilized in this work are valued at 2010's prices.

The methodology to introduce induced consumption into the basic input-ouput model follows the methodology presented by Freitas and Dweck (2010 and 2013) and other works of the GIC / UFRJ research group. We will initially calculate a matrix A_c, of coefficients relative to the induced consumption of households. The matrix A_c is given by the multiplication of the diagonalised vector $\hat{v}$, by the vectors of propensity to consume of total wage, by industry, c_w, and share of wages in the gross output of each industry, w'.

Therefore, we have: $A_c = \hat{v} c_w w' = \begin{bmatrix} v_1 \frac{c_1}{W}\frac{w_1}{x_1} & \cdots & v_1 \frac{c_1}{W}\frac{w_{42}}{x_{42}} \\ \vdots & \ddots & \vdots \\ v_{42} \frac{c_{42}}{W}\frac{w_1}{x_1} & \cdots & v_{42} \frac{c_{42}}{W}\frac{w_{42}}{x_{42}} \end{bmatrix}$, (1)

where:

v is the vector that identifies the percentage of endogenous consumption in the final consumption of each industries production;

c_w is the vector of final consumption of national production by industry (c_i) divided by the mass of wages of the economy ("propensity to consume products of national origin"), $c_w = \begin{bmatrix} \frac{c_1}{W} \\ \vdots \\ \frac{c_{42}}{W} \end{bmatrix}$.

w' is the line vector of wages per industry divided by the total production in each industry (share of wages in the gross output of each activity), $w' = \begin{bmatrix} \frac{w_1}{x_1} & \cdots & \frac{w_{42}}{x_{42}} \end{bmatrix}$.

This way, the multiplication of A_c by the production vector x results in the vector C_{ind} of total induced consumption by industry. Therefore, let f be the vector of final demand for domestic production by industry, we define f^* as the autonomous final demand vector of domestic production:

$C_{ind} = \hat{v} * c_w * w' * x \Leftrightarrow C_{ind} = A_c * x$ (2)

$f^* = f - C_{ind}$ (3)

So, from the I-O matrices identity $x = Ax + f$ and equations (1) and (2), we can write:

$x = Ax + f \Leftrightarrow x = Ax + C_{ind} + f^* \Leftrightarrow x = Ax + A_c x + f^* \Leftrightarrow$

$x = (A + A_c)x + f^* \Leftrightarrow x = (\bar{A})x + f^* \Leftrightarrow x = (I - \bar{A})^{-1} f^* \Leftrightarrow x = \bar{L} f^*$ (4)

Where $\bar{A}$ is the sum of the matrix of the domestic technical coefficients (A) with the matrix A_c:

$\bar{A} = A + A_c$

Thus, the model considers the households' consumption of durable goods as an autonomous component of final demand and of nondurable goods and services as dependent on wages.

2.2. Decomposition of gross output variation

Since the paper Dietzenbacher and Los (1998), it has been agreed in the literature that the decomposition of the growth of any variable, resulting from the product of the two or more elements, can be done as follows. Expression (5) shows de decomposition of the variation in x as it is defined in equation (4).

$$\Delta x = \underbrace{\frac{1}{2}\Delta\bar{L}(f_1^* + f_0^*)}_{\substack{Change\ in\ Technology \\ and\ induced\ consumption}} + \underbrace{\frac{1}{2}(\bar{L}_0 + \bar{L}_1)\Delta f^*}_{\substack{Chang\ \ in\ Autonomous \\ Final\ Demand}} \quad (5)$$

It can be shown that [4]: $\Delta\bar{L} = \bar{L}_1(\Delta\bar{A})\bar{L}_0$ (6). Replacing (6) in (5), we have:

[4] For a demonstration of the expression (6) see Miller and Blair (2009), chapter 13.

$$\Delta x = \frac{1}{2}(\bar{L}_1(\Delta\bar{A})\bar{L}_0)(f_1^* + f_0^*) + \frac{1}{2}(\bar{L}_0 + \bar{L}_1)\Delta f^*$$

Using relation (1) we get (7):

$$\Delta x = \underbrace{\frac{1}{2}(\bar{L}_1\Delta A\bar{L}_0)(f_1^* + f_0^*)}_{Change\ in\ Technology} + \underbrace{\frac{1}{2}(\bar{L}_1\Delta A_c\bar{L}_0)(f_1^* + f_0^*)}_{\text{Change in Induced Consumption Pattern}} + \underbrace{\frac{1}{2}(\bar{L}_0 + \bar{L}_1)\Delta f^*}_{Change\ in\ Autonomous\ Final\ Demand} \quad (7)$$

We can write the vector of change in the autonomous final demand (Δf^*) as a sum of vectors representing the change in each of its components (using the largest number of demand side components available in the database). Let Δf^{C*}, Δf^I, Δf^G e Δf^X be the change in autonomous consumption, investment, government spending and exports, we have:

$$\Delta f^* = \Delta f^{C*} + \Delta f^I + \Delta f^G + \Delta f^X \quad (8)$$

Replacing equation (8) in (7) we have (9):

$$\Delta x = \underbrace{\frac{1}{2}(\bar{L}_1\Delta A\bar{L}_0)(f_1^* + f_0^*)}_{Change\ in\ Technology} + \underbrace{\frac{1}{2}(\bar{L}_1\Delta A_c\bar{L}_0)(f_1^* + f_0^*)}_{Chnage\ in\ Induced\ Consumption\ Pattern} + \underbrace{\frac{1}{2}(\bar{L}_0 + \bar{L}_1)\Delta f^{C*}}_{Change\ in\ Autonomous\ Final\ Consumption} +$$
$$\underbrace{\frac{1}{2}(\bar{L}_0 + \bar{L}_1)\Delta f^I}_{Change\ in\ Investment} + \underbrace{\frac{1}{2}(\bar{L}_0 + \bar{L}_1)\Delta f^G}_{Change\ in\ Government\ Spending} + \underbrace{\frac{1}{2}(\bar{L}_0 + \bar{L}_1)\Delta f^X}_{Change\ in\ Exports} \quad (9)$$

It is worth noting that in the case of induced consumption and technological change, the decomposition captures the contribution of the change in the propensities to consume and production technical coefficients, respectively. In the case of autonomous expenditures, the decomposition captures the contribution in relation to the growth rate of the aggregate itself.

It is also important to notice that, in equation (9), the output change is decomposed into components of the demand for products and services of national origin. Therefore, these components include the effect of the change in the trade pattern. For example, a decrease in some national technical coefficient, might be due to a change in the production technology - the economic activities are demanding less of that specific product to produce one unit of output -, but it could also be reflecting an increase in the imported coefficient of that productive input.

For this reason, it is important to analyze these effects separately. We will call "trade pattern" the effect related to changes in the national content of the aggregates studied in this work, and we will call "total effect" the one related to the total change in the aggregate (considering demand for national and imported products).

To measure the trade pattern, we will construct matrices μ of domestic content coefficient for each component. First, let: $A = \mu^A \otimes A_T$. Where: μ^A is the matrix of domestic content coefficients (demand for domestic inputs as a share of total inputs), A_T is the matrix of total technical coefficients. Also $\otimes$ is the product of Hadamard (multiplication element by element) and the subscript T indicates the variable refers to all origins of goods and services (national and imported). We have:

$$\Delta A = \underbrace{\frac{1}{2}\Delta\mu^A \otimes (A_{T1} + A_{T0})}_{\substack{Chang\ \ in\ Intermediate\ Demand\ Trade\ Pattern}} + \underbrace{\frac{1}{2}(\mu_0^A + \mu_1^A) \otimes \Delta A_T}_{Change\ in\ Technology} \quad (10)$$

Now let: $A_c = \mu^{Ac} \otimes A_{cT}$. Where A_{cT} is a matrix constructed analogously to the matrix A_c, as follows: $A_{cT} = \hat{v} * c_{wT} * w'.\ c_{wT}$. In this expression, c_{wT} is the vector of total final consumption by industry (domestic and imported) divided by the total wages of the economy ("average propensity to consume"). We have:

$$\Delta A_c = \underbrace{\frac{1}{2}\Delta\mu^{Ac} \otimes (A_{cT1} + A_{cT0})}_{\substack{Chang\ \ in \\ Induced\ Consumption \\ Trade\ Pattern}} + \underbrace{\frac{1}{2}(\mu_0^{Ac} + \mu_1^{Ac}) \otimes \Delta A_{cT}}_{\substack{Change\ in\ Induced \\ Consumption\ Pattern}} \qquad (11)$$

Let f_t be the total final demand (by domestic and imported output); $f = \hat{\mu} f_t$ is the final demand for domestic output; $\hat{\mu} = \hat{f}\widehat{f_t^{-1}}$ represents the share of domestic final demand in total final demand. Analogously, we have $\widehat{\mu^*} = \widehat{f^*}\widehat{f_t^{*-1}}$. We can write:

$$\Delta f^* = \underbrace{\frac{1}{2}\Delta\widehat{\mu^*}(f_{t1}^* + f_{t0}^*)}_{\substack{Change\ in \\ Autonomous\ Final\ Demand \\ Trade\ Pattern}} + \underbrace{\frac{1}{2}(\widehat{\mu^*}_1 + \widehat{\mu^*}_0)\Delta f_t^*}_{\substack{Change\ in \\ Autonomous\ Final\ Demand}} \qquad (12)$$

Replacing (10), (11) and expressions analogous to (12) for each component of the final demand in (9), and rearranging, we have:

$$\Delta x =$$

$$\underbrace{\frac{1}{2}\left(\bar{L}_1\left[\frac{1}{2}\Delta \wedge\otimes (A_{t1} + A_{t0})\right]\bar{L}_0\right)(f_1^* + f_0^*)}_{\substack{Change\ in\ Intermediate\ Demand \\ Trade\ Pattern}} + \underbrace{\frac{1}{2}\left(\bar{L}_1\left[\frac{1}{2}(\wedge_0+\wedge_1) \otimes \Delta A_t\right]\bar{L}_0\right)(f_1^* + f_0^*)}_{Change\ in\ Technology} +$$

$$\underbrace{\frac{1}{2}\left(\bar{L}_1\left[\frac{1}{2}\Delta\gamma \otimes (A_{cT1} + A_{cT0})\right]\bar{L}_0\right)(f_1^* + f_0^*)}_{\substack{Change\ in\ Induced\ Consumption \\ Trade\ Pattern}} + \underbrace{\frac{1}{2}\left(\bar{L}_1\left[\frac{1}{2}(\gamma_0 + \gamma_1) \otimes \Delta A_{cT}\right]\bar{L}_0\right)(f_1^* + f_0^*)}_{Change\ in\ Induced\ Consumption} +$$

$$\underbrace{\frac{1}{4}(\bar{L}_0 + \bar{L}_1)\Delta\widehat{\mu^{C*}}\ (f_{t1}^{C*} + f_{t0}^{C*})}_{\substack{Chang\ \ in\ Autonomous\ Final \\ Consumption\ of\ Households \\ Trade\ Pattern}} + \underbrace{\frac{1}{4}(\bar{L}_0 + \bar{L}_1)\left(\widehat{\mu^{C*}}_1 + \widehat{\mu^{C*}}_0\right)\Delta f_t^{C*}}_{\substack{Chang\ \ in\ Autonomous\ Final \\ Consumption\ of\ Households}} + \underbrace{\frac{1}{4}(\bar{L}_0 + \bar{L}_1)\Delta\widehat{\mu^I}\ (f_{t1}^I + f_{t0}^I)}_{\substack{Change\ in\ Investments \\ Trade\ Pattern}} +$$

$$\underbrace{\frac{1}{4}(\bar{L}_0 + \bar{L}_1)\left(\widehat{\mu^I}_1 + \widehat{\mu^I}_0\right)\Delta f_t^I}_{Change\ in\ Investment} + \underbrace{\frac{1}{4}(\bar{L}_0 + \bar{L}_1)\Delta\widehat{\mu^G}\ (f_{t1}^G + f_{t0}^G)}_{\substack{Chang\ \ in\ Government\ Spendings \\ Trade\ Pattern}} + \underbrace{\frac{1}{4}(\bar{L}_0 + \bar{L}_1)(\widehat{\mu^G}_1 + \widehat{\mu^G}_0)\Delta f_t^G}_{Change\ in\ Government\ Spending} +$$

$$\underbrace{\frac{1}{4}(\bar{L}_0 + \bar{L}_1)\Delta\widehat{\mu^X}\ (f_{t1}^X + f_{t0}^X)}_{\substack{Change\ in\ Exports' \\ Trade\ Pattern}} + \underbrace{\frac{1}{4}(\bar{L}_0 + \bar{L}_1)(\widehat{\mu^X}_1 + \widehat{\mu^X}_0)\Delta f_t^X}_{Chang\ \ in\ Exports} \quad (13)$$

2.3. Decomposition of consumption growth

We can write the total final consumption (C) as the sum of an induced (C_{ind}) and an autonomous (C_{aut}) part:

$$C = C_{ind} + C_{aut} \quad (14)$$

Using the relation (2) we can rewrite (14) as follows:

$$C = A_c x + C_{aut} \quad (15)$$

As shown in section 2.1.2, above, we can write $A_c = d_{cw} w'$ where $d_{cw} = \hat{v}\, c_w$. The vector d_{cw} represents the propensities to consume non-durable goods and services of national origin (or "induced" propensities to consume). Let us now decompose w', which is a line vector with elements corresponding to the mass of wages of each industry divided by the output of the same industry. We can write w' as the product of the line vector line w'_l, which represents the industries average wages (its elements are the ratio of the mass of wages to the number of employees in each industry), by the diagonalized vector of the technical coefficients of work $\widehat{l_x}$, (matrix in which the elements of the main diagonal correspond to the inverse of productivity in each activity): $w' = w'_l\, \widehat{l_x}$.

Where $w'_l = \begin{bmatrix} \frac{w_1}{l_1} & \cdots & \frac{w_{42}}{l_{42}} \end{bmatrix}$ and $\widehat{l_x} = \begin{bmatrix} \frac{l_1}{x_1} & 0 & 0 \\ 0 & \ddots & 0 \\ 0 & 0 & \frac{l_{42}}{x_{42}} \end{bmatrix}$.

Therefore, we can write $A_c = d_{cw} w'_l\, \widehat{l_x}$. Substituting this expression into (15) we have: $C = d_{cw} w'_l\, \widehat{l_x} x + C_{aut}$ (16). We will start from the equation (16) and use the same methodology[5] applied for the decomposition of the output to write an expression for ΔC. The resulting expression for the decomposition of the final consumption of the families will look like this:

$$\Delta C = \underbrace{\frac{1}{2}\Delta d_{cw}(w'_{l0}\, \widehat{l_{x0}} x_0 + w'_{l1}\, \widehat{l_{x1}} x_1)}_{Change\ in\ Iduced\ Consumption\ Pattern} + \underbrace{\frac{1}{2}\left(d_{cw0}(\Delta w'_l)\widehat{l_{x1}} x_1 + d_{cw}\ (\Delta w'_l)\widehat{l_{x0}} x_0\right)}_{Change\ in\ Average\ Wages}$$

$$+ \underbrace{\frac{1}{2}\left(d_{cw0} w'_{l0}(\Delta \widehat{l_x}) x_1 + d_{cw}\ w'_{l1}(\Delta \widehat{l_x}) x_0\right)}_{Chang\ \ in\ the\ Inverse\ of\ Productivity} + \underbrace{\frac{1}{2}\left(d_{cw0} w'_{l0}\, \widehat{l_{x0}} + d_{cw1} w'_{l1}\, \widehat{l_{x1}}\right)\Delta x}_{Chang\ \ in\ Output} +$$

$$\underbrace{\Delta C_{aut}}_{Chang\ \ in\ Autonomous\ Consumption} \quad (17)$$

As noted before, in equation (9), the output change is decomposed into components of the demand for products and services of national origin. In the same way, the variation of the consumption, expressed by equation (17), also regards to consumption of domestic origin. Therefore, these components include the effect of the change in the trade pattern. To analyze this effect separately in the consumption decomposition we will use the same strategy applied to the output decomposition:

Let: $d_{cw} = \hat{\mu}^d d_{cwT}$ (18), where d_{cwT} is the vector of propensities to consume non-durable goods of domestic origin of wages; d_{cwT} is the vector of propensities to consume non-durable goods of all origins (domestic and imported) of wages; and $\hat{\mu}^d$is a diagonal matrix, that represents the share of domestic propensities to consume in total propensities to consume, as shown in equation (18). The matrix $\hat{\mu}^d$ will allow us to measure the change in trade pattern of endogenous consumption. From equation (18) we get:

[5] For a detailed explanation for the decompositions of variables that result from the product of more than two others see Miller and Blair (2009) pages 598 and 599.

$$\Delta d_{cw} = \underbrace{\frac{1}{2}\Delta\widehat{\mu^{d}}(d_{cwT1} + d_{cwT0})}_{\substack{Change\ in \\ Endogenous\ Consumption \\ Trade\ Pattern}} + \underbrace{\frac{1}{2}(\widehat{\mu^{\mathrm{d}}}_1 + \widehat{\mu^{\mathrm{d}}}_0)\Delta d_{cwT}}_{\substack{Chang\ \ in\ Total \\ Propensities\ do\ consume \\ non\ durable\ goods}} \quad (19)$$

We can apply the same procedure to $C_{aut}$to obtain ΔC_{aut} as a function of $\hat{\mu}^{Caut}$ as follows: $C_{aut} = \hat{\mu}^{Caut} C_{autT}$. So, we can write:

$$\Delta C_{aut} = \underbrace{\frac{1}{2}\Delta\widehat{\mu^{Caut}}(C_{autT1} + d_{cwT}\ )}_{\substack{Cha\ \ \ in \\ Autonomous\ Consumption \\ Trade\ Pattern}} + \underbrace{\frac{1}{2}(\widehat{\mu^{Caut}}_1 + \widehat{\mu^{\mathrm{Caut}}}_0)\Delta C_{autT}}_{\substack{Change\ in\ Total \\ Autonomous\ Consumption}} \quad (20)$$

Replacing equations (19) and (20) in equation (17) we get:

$$\Delta C = \underbrace{\frac{1}{4}\Delta\widehat{\mu^{d}}(d_{cwT1} + d_{cwT0})(w'_{l0}\,\widehat{l_{x0}}x_0 + w'_{l1}\,\widehat{l_{x1}}x_1)}_{Chang\ \ in\ Iduced\ Consumption\ Trade\ Pattern} + \underbrace{\frac{1}{4}(\widehat{\mu^{\mathrm{d}}}_1 + \widehat{\mu^{\mathrm{d}}}_0)\Delta d_{cwT}(w'_{l0}\,\widehat{l_{x0}}x_0 + w'_{l1}\,\widehat{l_{x1}}x_1)}_{Cha\ \ \ in\ Total\ Iduced\ Consumption\ Pattern} +$$
$$\underbrace{\frac{1}{2}\left(d_{cw0}(\Delta w'_l)\widehat{l_{x1}}x_1 + d_{cw1}(\Delta w'_l)\widehat{l_{x0}}x_0\right)}_{Change\ in\ Average\ Wages} + \underbrace{\frac{1}{2}\left(d_{cw}\ w'_{l0}(\Delta\widehat{l_x})x_1 + d_{cw1}w'_{l1}(\Delta\widehat{l_x})x_0\right)}_{Change\ in\ the\ Inverse\ of\ Productivity} +$$
$$\underbrace{\frac{1}{2}\left(d_{cw0}w'_{l0}\,\widehat{l_{x0}} + d_{cw1}w'_{l1}\,\widehat{l_{x1}}\right)\Delta x}_{Change\ in\ Output} + \underbrace{\frac{1}{2}\Delta\widehat{\mu^{caut}}(C_{autT1} + C_{autT0})}_{\substack{Change\ in\ Autonomous\ Consumption \\ Trade\ Pattern}} + \underbrace{\frac{1}{2}(\widehat{\mu^{\mathrm{caut}}}_1 + \widehat{\mu^{\mathrm{caut}}}_0)\Delta C_{autT}}_{\substack{Change\ in\ Total \\ Autonomous\ Consumption}} \quad (21)$$

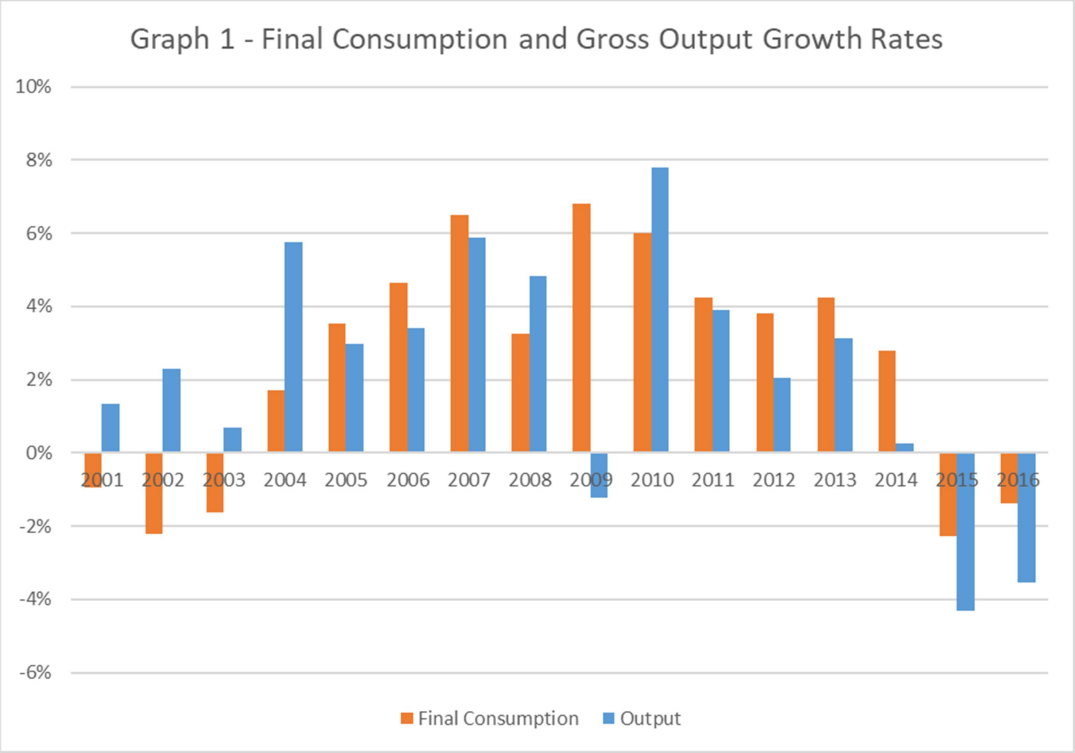
3. Empirical Results

In this study we use data from the Brazilian Input-Output Matrices at constant 2010 prices, constructed by GIC-UFRJ based on the methodology presented by Passoni and Freitas (2018). These input-output matrices harmonize the official data of the Brazilian I-O matrices offering a series compatible with the most updated manual of National Accounts, SNA 2008, for the period 2000-2016. These are square matrices, offering a breakdown of 42 activities.

The choice of the period between 2000 and 2016 for the analysis was due to the historical importance of the period, the presence of different patterns of economic growth and the availability of data. We chose to divide the 2000-2016 period into four main subperiods, according to the growth pattern observed. The first period comprises the years of 2000 to 2003 and is characterized as a **low growth** period. As we can see in Graph 1, until 2003 the output growth was weak, and consumption contracted in real terms. The period between 2004 and 2008 was characterized by acceleration of consumption and production growth, we will call it the **growth acceleration** period. The third subperiod is between 2010 and 2014, we can see in Graph 1 a **growth deceleration** of both aggregates in this period. The last period comprises the years of 2015 and 2016, when both aggregates had a strong slowdown, characterizing a **recession period**, with contraction of household consumption. The smaller subperiod: from 2008 to 2009 will be analyzed separately.

Graph 2 displays the results of the decomposition of gross outputs average growth into six components: change in technology (technical coefficients), change in the endogenous consumption pattern (propensities to consume), change in autonomous consumption, change in investment, change in government spending and change in exports. The bars represent the contribution of each component to growth, and the line, the total output variation. Graph 3 is analogous to Graph 2 but representing the decomposition of the average growth of final consumption of households. The change in consumption is disaggregated into five components: change in autonomous consumption, change in endogenous consumption pattern, change in average wages, change in the inverse of labor productivity and change in output. Graphs 2 and 3 represent, respectively, the results to equations (9) and (17), the output and

households' consumption decompositions regarding goods and services of national origin. Therefore, the components presented in the graphs include the effect of the change in the trade pattern[6].



Source: Passoni and Freitas (2018). Author's elaboration.

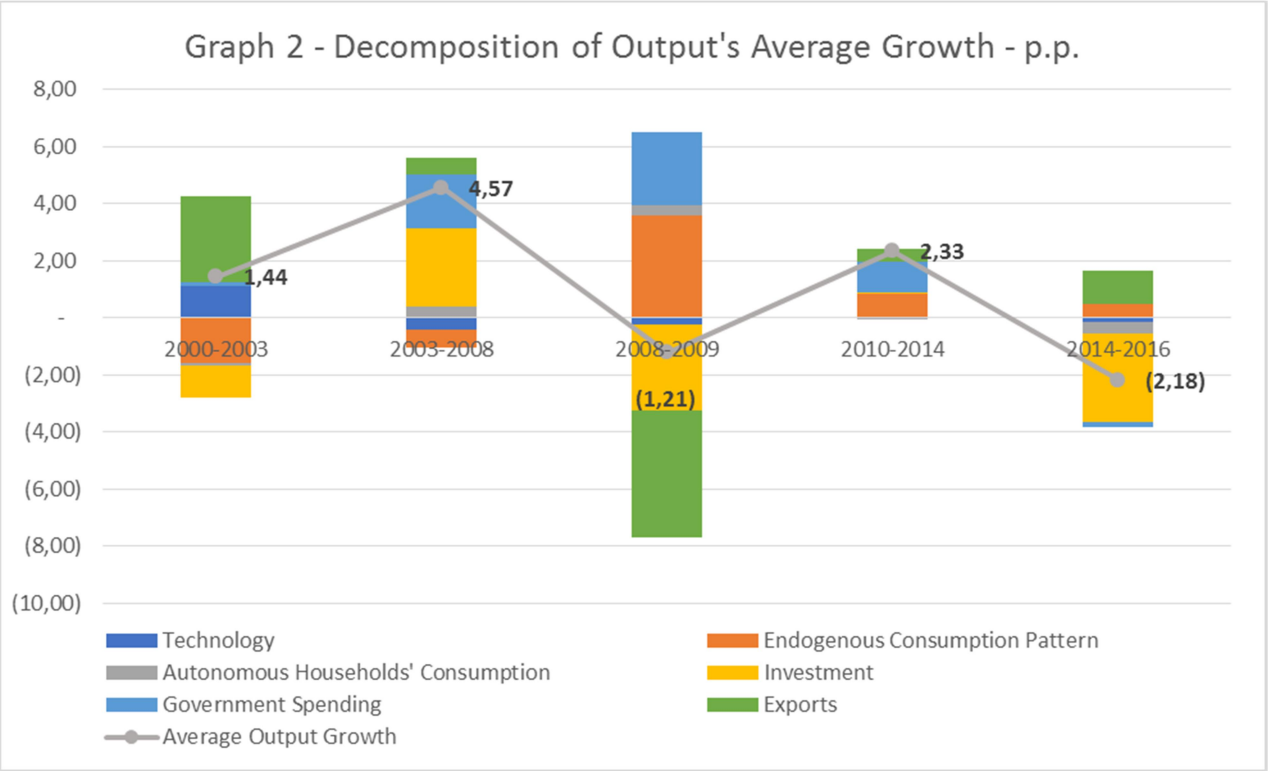
Analyzing graphs 2 and 3, we can see that in the **low growth period (2000-2003)** exports had an important role in explaining change in gross output. The average growth rate of output was of modest 1,44% per year, we can say that the growth regime of the period characterizes an "export-led stagnation" regime[7]. The contribution of exports was followed by the change in technology, these two components compensated the negative contribution of investment and endogenous households' consumption pattern. In the same period, the component that explains most of the contraction of consumption is the one related to average wages. The inverse of productivity was responsible for the more important positive contribution in the period. This means productivity decreased, in other words, the use of workers to produce a certain amount of output increased, and an increase in occupations had positive effects on economic growth.

There is a relative consensus that the rise in the price of commodities and the increase in Chinese demand for Brazilian exports represented a positive shock to the country's economy. However, the performance in the 2000s was also due to the domestic policies practiced in the period. At the turn of the 1990s to the 2000s, in most Latin American countries, candidates critical of the neoliberal recipe were elected. In Brazil it was not different, and this represented a change in the orientation of economic policy (Carvalho and Rugitsky, 2015).

A few years after the election of Lula for president in 2002, the government changed its orientation and adopted a more expansive strategy. Since 2006, it can be said that the government assumed responsibility for ensuring the growth of investment, consumption and formal employment (Serrano and Summa, 2011). From the measures taken in President Lula's second term, export growth lost influence and the domestic market began to grow faster, thanks to the expansion of household consumption and investment (Barbosa and Souza, 2010).

[6] In order to facilitate the analysis, in the following graphs, the 42 industries were aggregated into 12, although results were obtained in the larger breakdown.

[7] This expression was used by Medeiros and Serrano (2001) to describe the 1980's growth pattern in Brazil, we believe it also fits in the 2000-2003 period.



Source: Passoni and Freitas (2018). Author's elaboration.

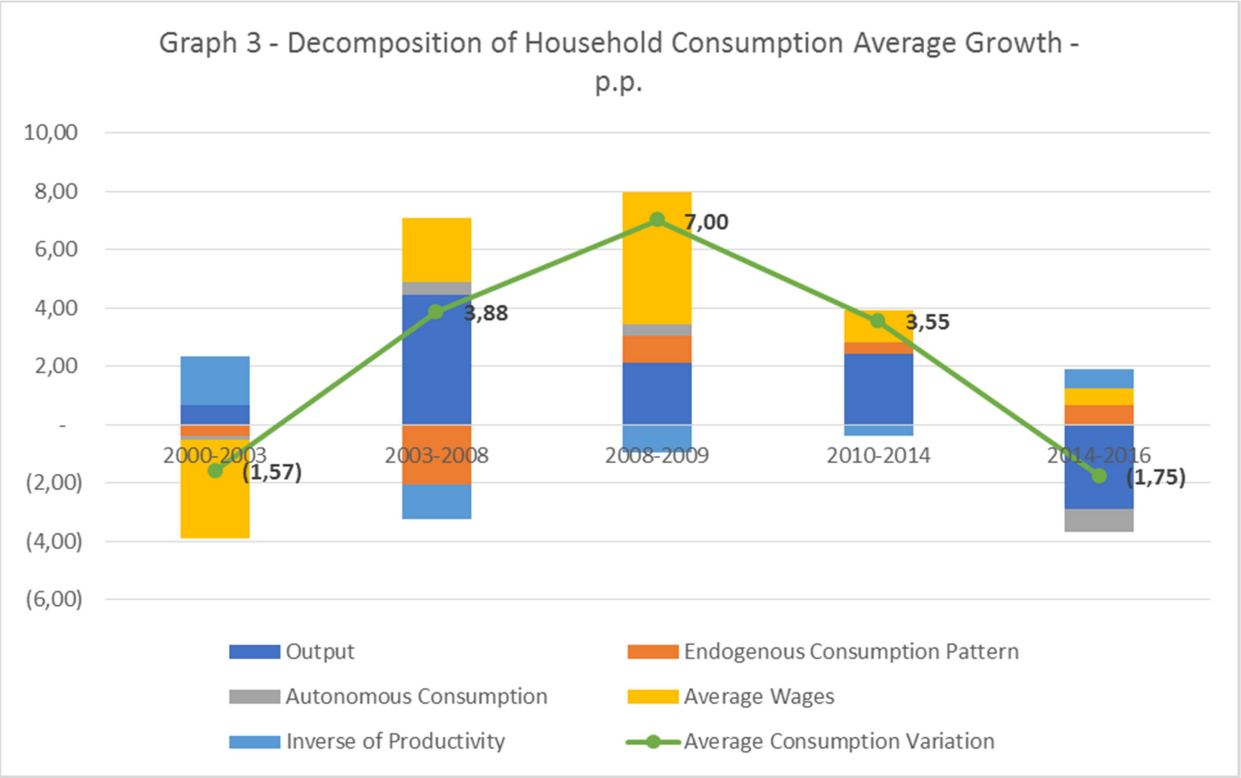
In the period, the government carried out, in the field the fiscal policy, an expansion of social transfers, minimum wage increases and higher expenditures on social housing, infrastructure, health and education. An active credit policy was also implemented through the national development bank (BNDES), which financed a growing volume of private investment at subsidized interest rates, and public commercial banks (Caixa Econômica Federal and Banco do Brasil), which increased the credit supply for housing, agriculture and consumption (Carvalho and Rugitsky, 2015). According to Serrano and Summa (2011), this combination of good external conditions and domestic policies allowed the rapid growth of domestic demand and, in particular, of private consumption, which after a while induced a more rapid and sustained expansion of private investment.

We can see this movement in Graph 2: in the **accelerating growth period (2003-2008)** the components considered autonomous in our model had positive impacts on gross output growth, with special importance of investment and government spending. On the other hand, the endogenous components (technology and consumption pattern) had negative contributions. In other words, in this period, the average technical coefficients and average propensities to consume wages got lower. In the case of technology, it means national industries are using less inputs from national suppliers to make a certain amount of output. It indicates a decreasing in densification of national production chains. The articulation between the macroeconomic regime, the prices structure, government policies aimed at poverty reduction[8], and the raising of the minimum wage[9], elevated the income of the bottom of the pyramid in relation to the mean income, allowing the decline in the concentration of income on personal,

[8] The expansion of social transfers (pensions, retirement, Bolsa Família Program, unemployment benefits, etc.) contributed significantly to the reduction of poverty in the 2000s. In particular, the expansion of the Bolsa Família and rural pension have had a major impact in the Northeast region, the historical nucleus of poverty in the country (Medeiros, 2015). It can be said that the per capita product growth itself has also aided in combating poverty through the generation of employment and income and because of the rule of minimum wage readjustment (depends on GDP growth with two years of lag and inflation of the previous year).

[9] The increase in the real minimum wage, which was more intense between 2006 and 2009, had a major impact on reducing poverty and income inequality through the benefits of social security and its influence on the basic salary of non- qualified workers. In addition, other wages (associated with higher qualification) increased proportionately less than the minimum wage in the period, contributing to the reduction of labor income inequality (Medeiros, 2015).

family and wage levels, as well as the increase in the share of wages in income. These conditions allowed the inclusion of a significant part of the Brazilian population in the consumer market and a change in the consumption pattern of Brazilian families. This contributed to a great expansion of domestic consumption, which, played an important role in determining the growth cycle of the 2000's decade, especially the consumption of households whose main income is somehow linked to the minimum wage (Medeiros, 2015).



Source: Passoni and Freitas (2018). Author's elaboration.

In the case of consumption pattern, in Graphs 2 and 3, it is worth noting that in both periods analyzed in the decade of 2000 the contribution of household induced consumption was negative. Given that growth over the course of the 2000s, especially after 2005, was accompanied by a significant reduction in poverty, extreme poverty and inequality, we could expect a positive contribution of induced consumption, since the lower income strata of the population have higher propensities to consume. However, this effect was not strong enough to compensate the increase in the propensity to save that accompanies generally increases in income, as Charles, Dallery and Marie (2015) point out: "*It is known that the propensity to consume varies with the economic cycle: as incomes increase, the savings rate also rises, which reduces the propensity to consume and thus the multiplier*." In addition, in the empirical model, the propensities to consume consider only wages as income, and wages had strong growth in the period, higher than growth of households' final consumption of non-durable goods and services.

Observing Graph 3, we can see that the components that more importantly contributed to growth of consumption in the accelerating growth period were the gross output growth and wages growth. That indicate a strong endogenous behavior of consumption, and corroborates the above explanations of why propensities to consume got lower.

In the **International Crisis years (2008-2009)**, as we can see in Graph 2, investments and exports contributions to growth dropped. Change in technology also had a negative impact. The fall in exports reflects the sudden deceleration in international trade market, and the fall in investment was probably due to the fact that many companies were recuperating of financial losses during the crises and decided not to invest. Also, the outflow of international capital in a movement of selling positions in "risky markets" to cover losses in the central economies may have led national firms less prone to invest in that period. In the period, the change in consumption (mainly endogenous) and government spending prevented a

stronger fall in economic activity, demonstrating the important role played by the government anti-cyclical fiscal policy. Observing Graph 3, we can see that the consumption growth in the period was mainly endogenous, and responded to higher average wages and propensities to consume. Autonomous consumption also had a positive contribution, as it had in the preceding period, responding to government measures to stimulate consumption.

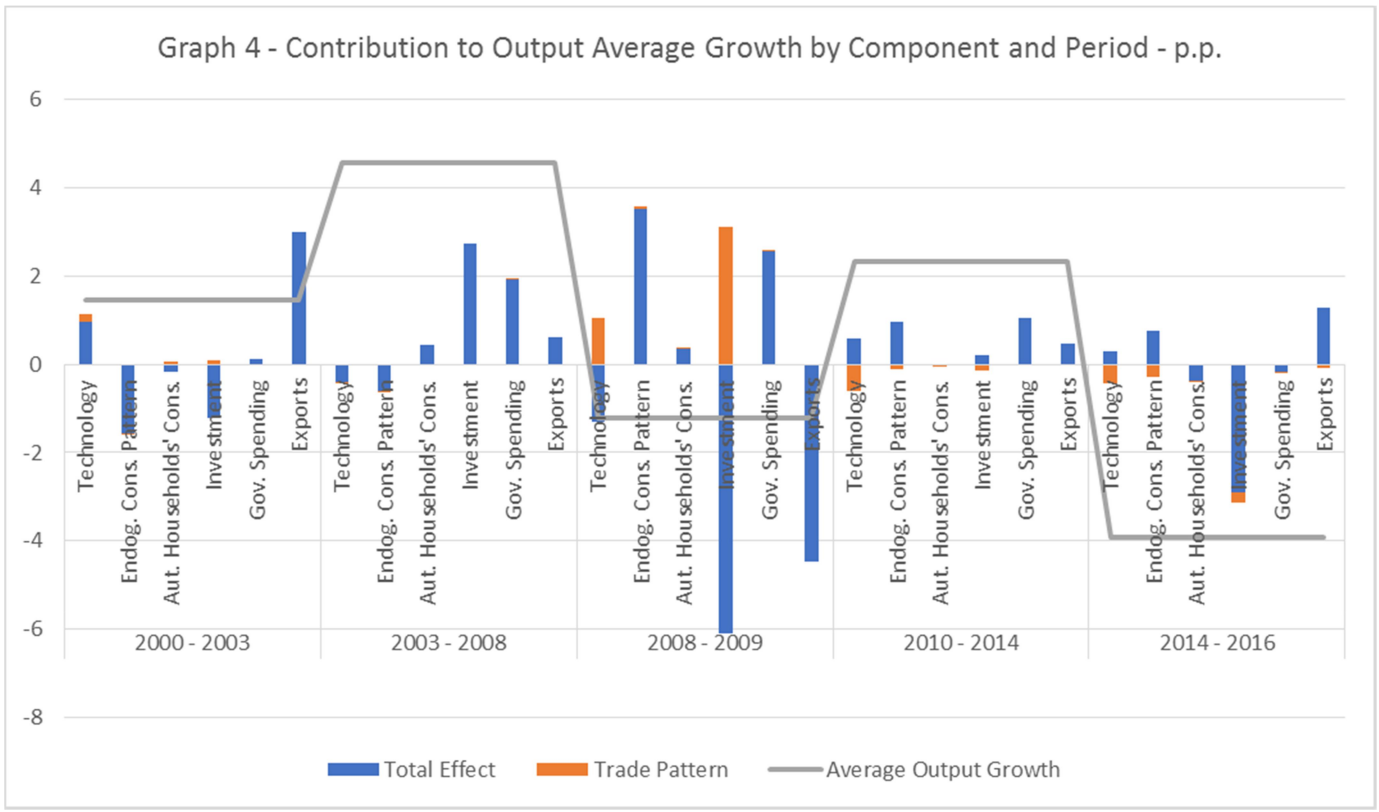
Although the country recovered from the 2009's crisis very fast, presenting high growth rates in 2010, the following years presented slightly lower growth rates, accompanying a broad slowdown movement of the world's economy. The slowdown of the Brazilian economy since 2011 however, was, according to Serrano and Summa (2015), a result of the contraction of domestic demand, rather than the drop in exports. Since 2010, the Central Bank has initiated a cycle of increases in the nominal interest rate and tightened macroprudential measures, reducing the growth of credit supply. To some extent this has helped to break the consumer boom, especially of durable goods. The government also reduced government spending and public investment. The contractionary policies also led to a contraction in private investment. According to the authors, the adoption of a contractionary macroeconomic policy was responsible for reducing product growth rates and private investment from 2011.

Graph 2 shows us that in the **decelerating period (2010-2014)** endogenous consumption started to contribute significantly to output growth, this means that the propensities to consume increased. Autonomous consumption and investment had negligible contributions to production growth. Of the autonomous expenditures only government spending and exports have relevant positive contributions. Government spending was the most important component to explain production growth in this period, as we can see in Graph 2, its contribution is of smaller magnitude in the decelerating period than in the previous ones, showing the high stimulating capacity of this demand category. From Graph 3, we see that the consumption in the period was mainly endogenous, with positive contributions derived from propensities to consume, average wages and gross output growth. Autonomous consumption, that had a positive contribution in the former periods had almost no impact in the final consumption growth.

During the 2014 elections, the debate about fiscal policy in Brazil gained momentum. This debate led to a major change in economic policy and, since 2015, a set of austerity measures became constant in Brazil, especially through expenditure cuts. In the second administration of President Dilma a mainstream economist became the new finance minister and he conducted a major fiscal consolidation, representing a drastic change in the economic policy. The government promoted the largest block in the budget authorization, since 2000, which led to a review of schedules of infrastructure projects and government programs and suspended any hiring for new public positions. Public investment plummeted, reinforcing the vicious cycle, as investment is the most important element in aggregate demand to explain short-term economic fluctuations. Consequently, the economy that was decelerating, but kept positive growth rates since 2010, entered into a deep recession.

In the **recession period (2015-2016)**, as it is evident in Graph 2, there was a major contraction of investment contribution to output growth. The other two domestic autonomous components, autonomous consumption and government spending, also had negative contributions. These results reflect the drastic austerity measures adopted by the government since 2015 with severe cuts in public investment and government spending causing huge impacts on unemployment and public finances.

The consumption in the period, as we can see in Graph 3, kept its endogenous character, with the contraction of consumption being mainly explained by the fall in output. Autonomous spending also had a negative impact, and the components that had positive contributions to growth do not represent a positive scenario: the growth in propensities to consume reflect that consumption is compromising a bigger share of wages even when consumption is decreasing. That shows the mass of wages fell even more than consumption. In the same way, the positive impact of average wages is due to a fall in occupations even bigger than to one of the mass of wages. Finally, the positive impact of inverse of productivity shows us that the fall in production was even stronger than the fall in occupations. In other words, these three components constructed as fractions had positive variations because of stronger decreases in the denominators, and not because of increase in the numerators.



Source: Passoni and Freitas (2018). Authors' elaboration.

Graphs 4 and 5 represent the results regarding equations (13) and (21) respectively. They allow us to see the contribution of changes in the trade pattern of the components to the growth of output and households' consumption. The sum of the trade pattern and the total effect bars for each component and period gives us the result presented in Graphs 2 and 3. In this two graphs, when the trade pattern has a positive value it represents an increase in the national content of the respective category of demand, and when it is negative, it means that the imported content increased.

Analyzing Graph 4, we can see that in the first two periods, low growth period (2000-2003) and accelerating growth period (2003-2008), the change in trade pattern had very little importance in explaining output growth. Therefore, it doesn't change the conclusions obtained in Graph 2. It's only notable a positive effect in the technology in the low growth period, indicating the firms did some imports substitution in favor of national inputs. During the International Crisis years (2008-2009), on the other hand, the change in trade pattern played an important hole counterbalancing part of the negative contributions of investment and technology to output growth. Despite having suffered a strong contraction, the investment carried out in the period was strongly directed to investment goods of national origin. Technology presented a similar movement, while the change in technical coefficients did not favor the output growth, a strong process of substitution of imports avoided an even deeper deceleration of the economy.

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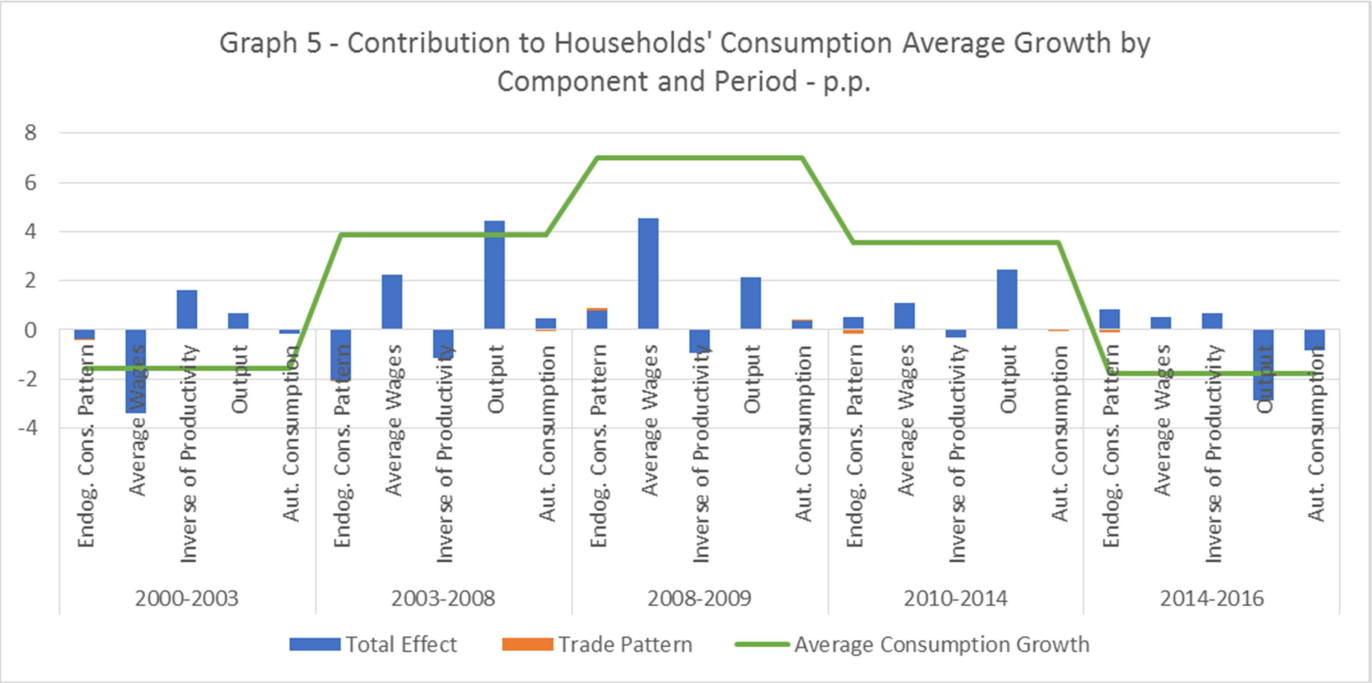

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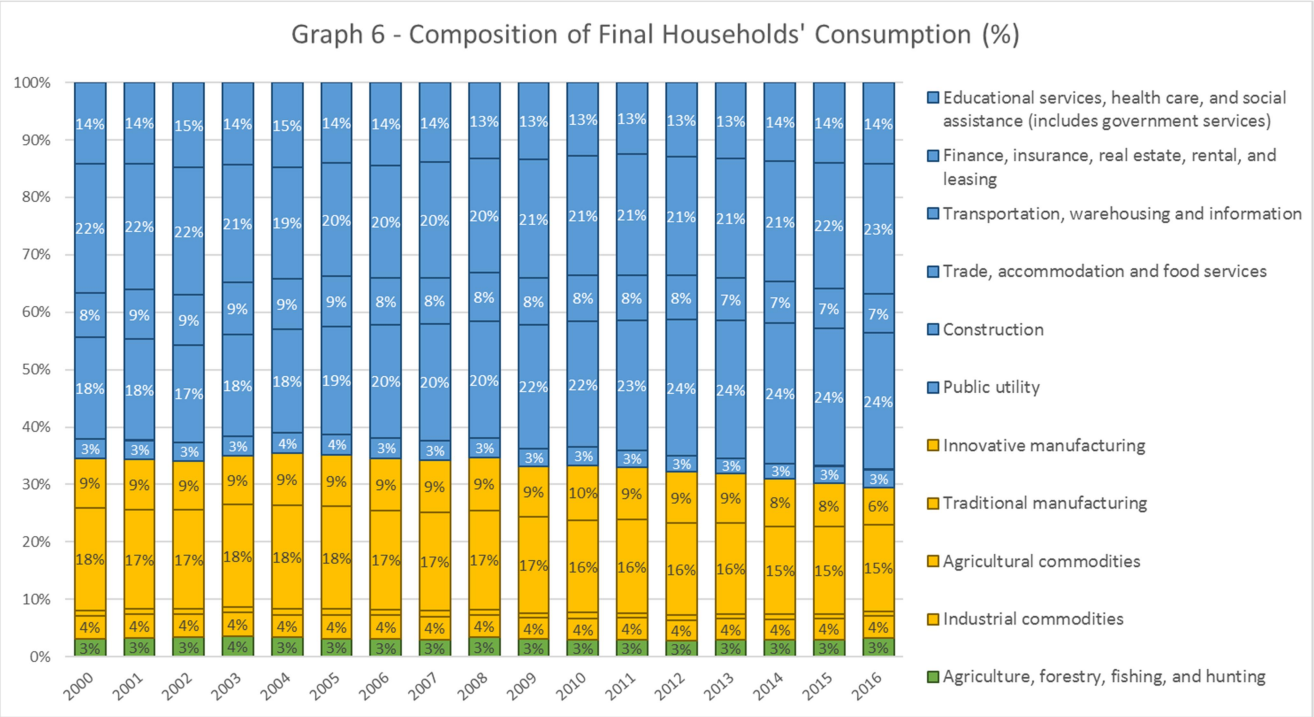
In the next two periods, the decelerating (2010-2014) and recession period (2015-2016), the change in trade pattern contributed negatively to output growth in all components of demand, in special in the endogenous (technology and endogenous consumption pattern). In the case of technology, the decrease in the national content was so strong that it compensated entirely the positive effect of the technological change in the period. This effect can be associated with the increased international competition, especially the diffusion of Chinese products.

Analyzing now Graph 5, we can see that the change in trade pattern did not have a relevant impact in households' consumption in any of periods under study. It shows that there was no major leakage of demand. The penetration of imports occurred more importantly only in intermediate consumption.

Graph 6[10] displays the composition of the total households' consumption (national and imported origin) for the period under study. It is notable the increase of the share of trade, accommodations and food services and the reduction of the manufacturing industries share. It must be noted that the consumption of manufactured products grew in real terms in the studied period until 2014. Until this year

[10] In Graph 6 and in the following Graphs concerning sectorial decompositions of households' consumption, we aggregated the industries "11 Private educational services, health care, and other personal services" and "12 Government Services (education, health care, defense, social security and public administration)" in one single industry aiming to facilitate visualization. The government services represent a considerably lower share of households' consumption than the other industries. That is because most of the government services are offered for free to the families by the government, so it is not registered as a households' expense in national accounts, but as a government's expense. The I-O tables doesn't have information on effective households' consumption (it considers all goods and services consumed by households, even if they do not pay for them).

the lost in share is more due to the more rapid increase of services consumption and to relative prices changes[11].



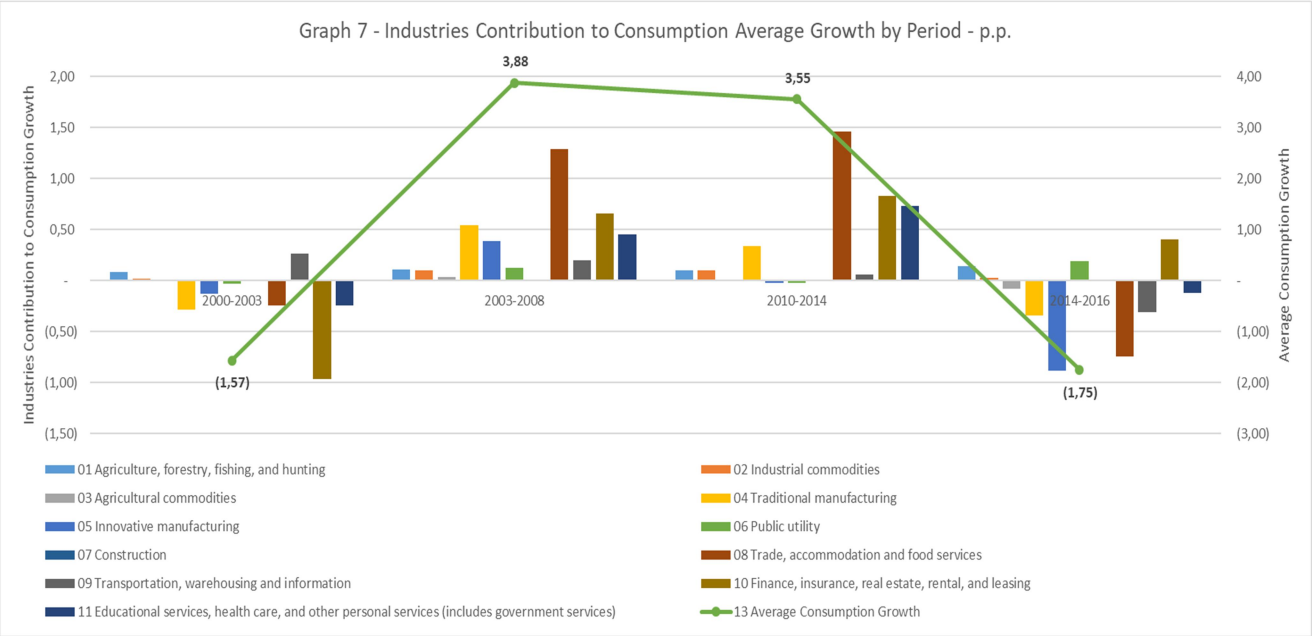
Source: Passoni and Freitas (2018). Author's elaboration.

The appreciation of the exchange rate, the most important change in relative prices in the 2000's decade, played an important role in the expansion of consumption. It allowed the minimum wage to increase relatively to the basic basket and also to industrial prices, as it neutralized the price pressures of both agriculture and imported raw materials and allowed the containment of administered prices. The price containment of strategic wage goods reduced the cost of living of families, which together with the increase of the basic minimum wage and the expansion of credit opened space for the expansion of the consumption of non-essential industrial goods, allowing a large shift of the consumption pattern at the base of the pyramid. The massification of durable consumer goods, including electronics, and the expansion of both, the low-medium class segments of the automotive market

Graph 7 displays the sectorial composition of the consumption variation. In the **low growth period**, consumption fell in almost all activities, except for agriculture, forestry, fishing and hunting and transportation warehousing and information. The major negative contribution to consumption occurred in the financial services and consumption of food outside the home, are expression of the change in lifestyle (Medeiros, 2015).

In the **next two subperiods**, when Brazil saw higher rates of consumption growth, the major contributions came from trade, accommodations and food services, financial services and private educational and health care services. Specially in the accelerating growth period, traditional and innovative manufacturing and transportation also had important positive contributions to consumption growth, as shows Graph 7. This reflects the change in consumption patterns and the incorporation of previously excluded people to the consumer market. With regard to transportation, the increase in the minimum wage increased the purchasing power of the population in terms of urban transportation tariffs, and formalization increased the number of users of transportation vouchers. Thus, there was an increase in the number of passengers and, at the same time, reduced the parceling income committed to urban transportation.

[11] In further developments of this work, we will measure the effect of the changes in relative prices.



Source: Passoni and Freitas (2018). Author's elaboration.

The changes in consumer patterns also led to the mass consumption of household appliances, computers and internet use, a service that expanded mainly in the lower levels of income distribution and of health care services (medicines and health insurance). The intense process of formalization of labor and increase in wages contributed to the expansion of consumption not only through the expansion of income, but also because they were the basis for the large diffusion of consumer credit (Medeiros, 2015). This expansion is reflected in the positive contribution of the financial services we can see in Graph 7.

In the recession period consumption contracted. The main negative contributions came from manufactured products, trade, accommodations and food services, and transportation warehousing and information services. The negative contributions of these last two industries reflect directly the major increase in unemployment, what can be associated to a reduction of demand for food away from home and transportation (in particular because formal occupations generally provide transportation vouchers).

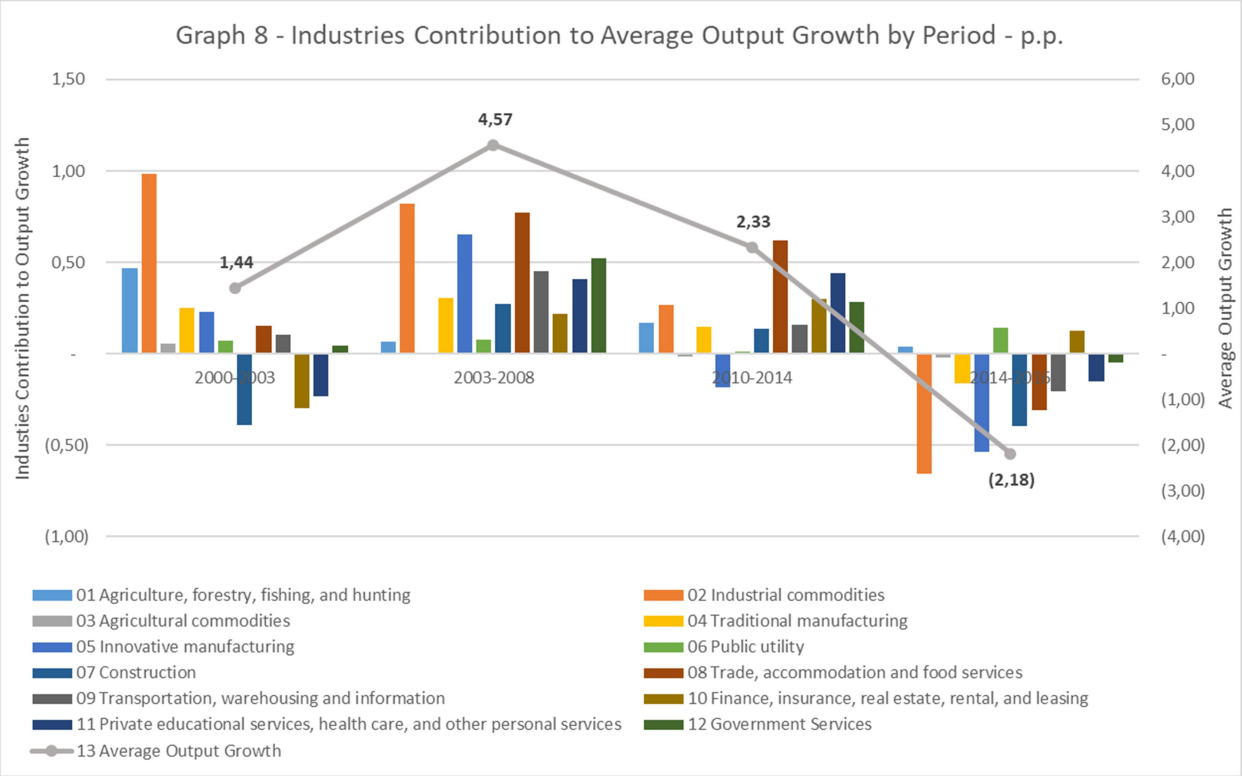
In Graph 8[12] we can see the contribution of each industry to output growth in the four main sub-period studied. In the **low growth period**, the major contributions to growth came from industrial commodities, agriculture, traditional and innovative manufacturing. The industrial commodities industry is essentially composed of natural resources, extractive mineral, metallurgy and basic chemistry industries, and its production is largely associated to exports. Construction, finance, insurance, real estate, rental and leasing, and educational and health care services had negative contribution to growth. In the period, services had, in general, minor or negative contributions to growth, reflecting the weak performance of the domestic market characteristic of the "export led stagnation" of the period.

In the **growth acceleration period** all industries had positive contributions to growth (Graph 8). Industrial commodities remained as the biggest contribution, although it was smaller than in the previous period and lost participation in the total growth. Other industries more oriented to domestic markets increased notably their contribution to growth. This is the case of trade accommodation and food services, innovative manufacturing, transportation, warehousing and information and educational and health care services. The increase in the contribution to growth of these industries reflects the structural change in the productive structure that came along with the process of expansion and diversification of consumption patterns in Brazil in the period.

The expansion and diversification of consumption in the period 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 these sectors employ many less qualified

[12] Industry "12 Government Services" includes education, health care, defense, social security and public administration.

workers, the degree of formalization and the wages at the base of the pyramid have risen further, reinforcing the process (Carvalho, 2018).



Source: Passoni and Freitas (2018). Author's elaboration.

In the **deceleration period**, the sectorial composition of growth contrasts with the low growth one. In this period, the industries related to exports like agriculture and industrial commodities have relatively smaller contributions to growth, while others oriented to internal markets – mainly services - have the most important contributions. Trade, accommodation and food services, educational and health services and financial services are the most dynamic in the period. This reflects not only the deceleration in international markets but also some resilience of domestic market in sustaining some dynamism.

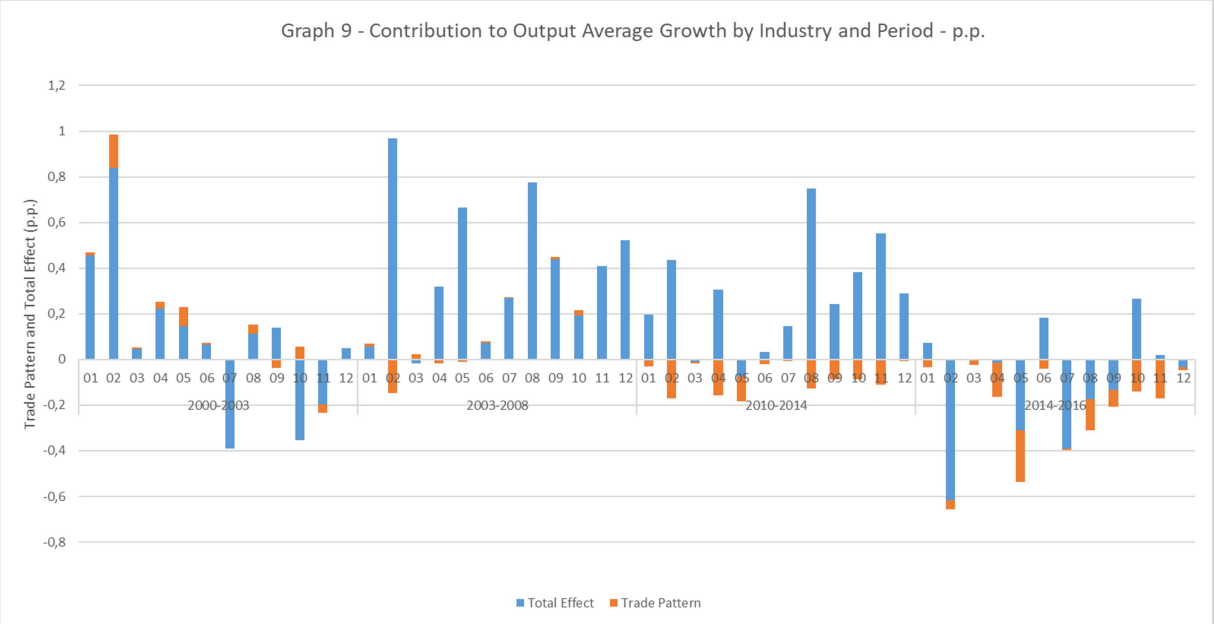
In the **recession period,** almost all industries had negative contributions to growth. Industrial commodities, innovative manufacturing and construction followed by trade, accommodation and food services, transportation, warehousing and information and public and private educational and health services. It is notable that the government services had negative contribution in this period, evidencing how deep was the fiscal consolidation performed by the government and how inopportune. As most other industries were also in retraction, this pro-cyclical policy contributed to deepen the recession. Graph 7 also suggests that the government services and construction have strong positive relation, indicating that government spending and government investment have strong capacity to boost economic growth.

Rugitsky (2017) stresses that the dynamics observed in the 2000s characterizes a circular and cumulative causation process involving income distribution and productive structure. The decline in wage inequality, as well as the increase in the share of wages in income, led to changes in the composition of aggregate demand, due to the diffusion of consumption habits previously restricted to the richer groups to those in the lower part of the distribution of income. At least part of the compatibility of supply to this change in the composition of demand occurred through changes in the productive structure, while part of the new demands were met through imports.

The increase in the share of services in value added and the decline of the manufacturing industry seem, at least in part, to be attributable to this movement. The change in the productive structure, in turn, led to a transformation of the jobs structure, with a growing share of low productivity jobs (especially in the service sector). This transformation finally deepened the decline of wage inequality, restarting the cycle (Rugitsky, 2017).

Graphs 9 and 10 represent the results regarding equations (13) and (21) respectively, but this time, evidencing the sectorial contribution to output and households' consumption growth. The sum of the trade pattern and the total effect bars for each industry and period gives us the result presented in Graphs 7 and 8.

From Graph 9 we can see that in the low growth period (2000-2003) the change in trade pattern was generally in the direction of an increase of national content specially in the industrial sectors. We noted, on Graph 8, that in the growth acceleration period (2003-2008) the "Industrial commodities" contribution was smaller than in the previous period and it lost participation in the total growth. Observing Graph 10, we can see that this structural change is not only a result of the performance of the other industries, that increased notably their contribution to growth. The reduction in the contribution to output growth of the industrial commodities in the growth acceleration period, is due to a change in the trade pattern, that represented a strong negative contribution. The other industries were not severely affected by the change in trade pattern in the period.



Source: Passoni and Freitas (2018). Author's elaboration.

In the deceleration (2010-2014), as well as in the recession period (2014-2016), the change in trade pattern represented negative contributions to output growth in all industries, but specially in the industrial and services sectors. It shows that the penetration of imports in the intermediate consumption affected almost all economic activities in a generalized way.

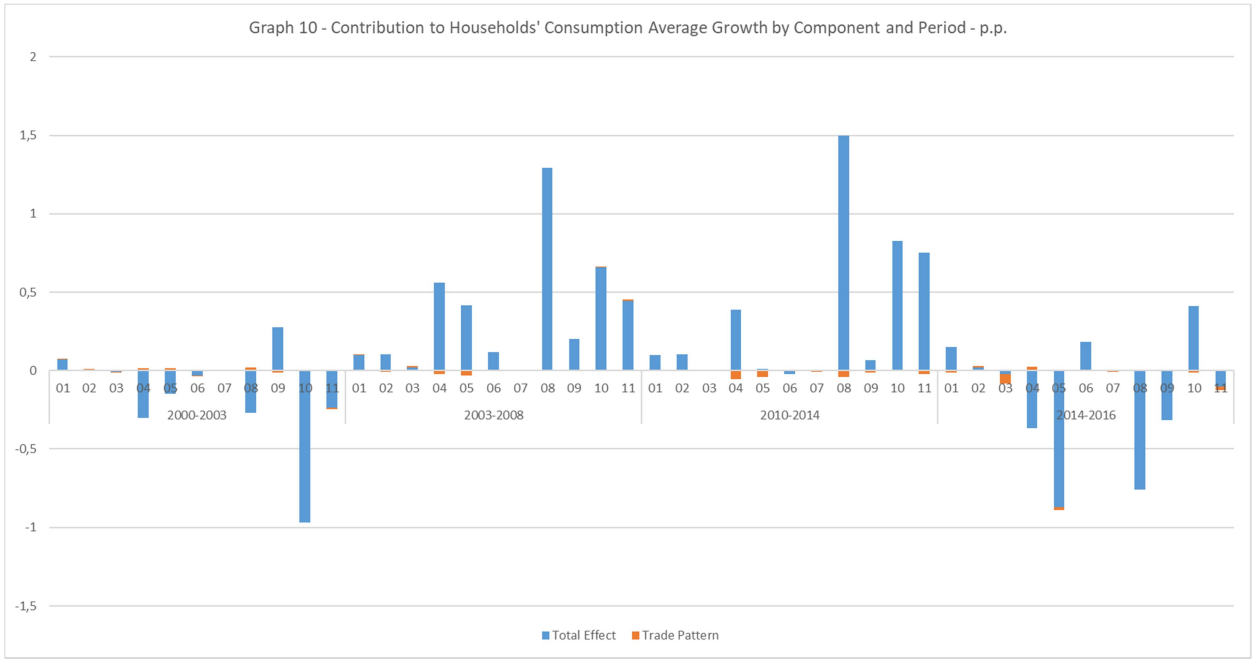
As well as we saw in Graph 5, in the sectorial analysis (Graph 10), the change in trade pattern did not have a relevant impact in households' consumption in any of periods under study, indicating that there was no major leakage of households' demand to imports in the period. As we can see in Graph 10 the contributions of trade pattern are small compared to the total contribution of each industry. Therefore, this further disaggregation doesn't change the conclusions obtained from Graph 5.

Graph 11 provides us a disclosure of the contribution of output to consumption growth[13] (blue bars in Graph 3), making explicit the influence of the change in output's sectorial composition and of its scale (total aggregate output growth). With this information we can investigate the occurrence of cumulative causation processes, as suggested by Rugitsky (2017), in each period.

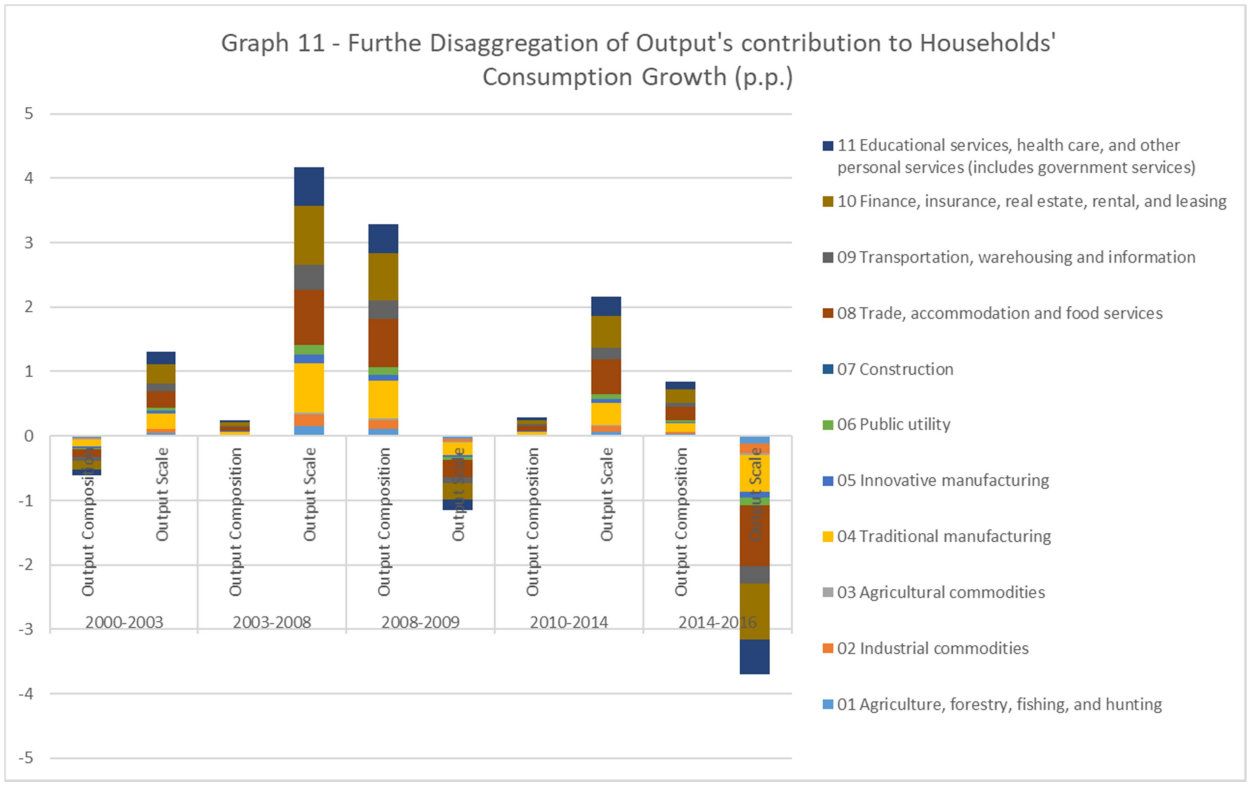
A positive composition effect implies that sectors more labor-intensive increased their share in consumption, what reinforces the cumulative causation process. This effect was positive in all periods, except for the first. This result suggests that in the low growth period the cumulative causation process as described above did not happen. On the contrary, the positive contribution of output to consumption

[13] To do this disaggregation, we wrote the vector x from equation (11) as follows: $x = x(i'x)^{-1}(i'x)$ and used the same methodology applied to obtain equation (12). Where i is a 1x42 vector of 1s.

growth came from its scale effect, which overcompensated the negative contribution of the change in sectorial composition. In the two periods with positive consumption growth rates, we had positive contributions for both effects. It is compatible with the hypothesis of a cumulative causation process from productive structure to consumption. However, the scale effect was more important than the composition one. In the recession period we also had a positive contribution of output composition, as it was a period of negative growth rates, this suggests that the retraction was less intense in industries intensive in labor. This effect compensated part of the strong negative effect produced by output scale in the period.



Source: Passoni and Freitas (2018). Author's elaboration.



Source: Passoni and Freitas (2018). Author's elaboration.

In short, the results did not deny the hypothesis of occurrence of a cumulative process between productive and consumption structures in the periods 2003-2008 and 2010-2014[14]. Also, the structural change avoided an even bigger contraction of consumption in the recession period (2015-2016).

4. Final Remarks

In this work we tried to capture the effects of expansion and diversification of consumption to the structural change in the Brazilian Economy. Our main hypothesis was that there was a cumulative causation, since consumption 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 we have shown, in fact, as these sectors employ many less qualified workers, the degree of formalization and the wages at the base of the pyramid have risen further, reinforcing the process. We can say a change in income and consumption structure led a change in production structure, which by its turn reinforced the change in income by transforming the job structure. The increase in the share of services in value added and the decline of the manufacturing industry seem, at least in part, to be related to this movement.

Analyzing the consumption decomposition, we found that, in the periods of economic expansion (2003-2008 and 2010-2014), structural change in output and consumption reinforced each what is compatible with the hypothesis of a cumulative causation process. This process was not perceived in the low growth period (2000-2003). In the recession period (2015-2016) the sectorial change in the output's contribution to consumption growth was positive, indicating the possible presence of a cumulative causation process, however, the contraction of output was so strong that it over compensated its effect. From this decomposition we could also see that the components that more importantly explained consumption variation were the gross output growth and average wages growth. That indicates a strong endogenous behavior of consumption.

We could also see that the change in trade pattern did not have relevant impact in households' consumption in any of periods under study, showing that there was no major leakage of households' demand. The penetration of imports occurred more importantly only in intermediate consumption, in special in 2010's decade.

The output decomposition performed in this work allowed us to observe that investment and government spending had high relevance in the determination of the economic cycle. In this sense, it becomes clear that the fiscal police is an important instrument that could be used to revert the recession situation and promote a new resumption of economic growth. That is a matter that awakens concern as far as since 2017 it is prohibited, in Brazil, any real growth of federal public expenditure, for at least 10 years.

5. References

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[14] It is still necessary to analyze the jobs and income structures to assure the occurrence of cumulative causation processes. That will be done in further developments of this work.

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