

Investment, aggregate demand and wages: Brazilian economic regimes and the possibility of a regime switch

Lilian Nogueira Rolim*

Abstract

In the 2000s, Brazil experienced a period in which social inclusion took place simultaneously to economic growth, but this was not sustained after the 2007-2008 global financial crisis, despite of the maintenance of the income transfer policies. In a Kaleckian perspective, the economic regime can be either wage- or profit-led and it can change through time. The contribution of this paper is to explore the possibility of a regime switch in the Brazilian economy from 2003 to 2014 by discussing the mechanisms that may have led to such shift and by testing this possibility through a structural vector autoregressive model (SVAR) with an estimated structural break. The results suggest a demand regime switch from wage- to profit-led and an accumulation regime switch from neutral to profit-led after the first quarter of 2010. Thus, the higher wage share had a positive impact on the Brazilian economy, but such effect weakened when the underlying economic conditions changed.

Keywords: Brazil; Economic Growth; Investment; Functional Income Distribution; Kalecki.

JEL classification codes: E12, E22, E25.

1 Introduction

From 2004 to the beginning of the 2010s, Brazil experienced high economic growth with low inflation compared to its reality in the 1980s and 1990s. This took place simultaneously

*Institute of Economics, University of Campinas. The author is grateful to Carolina Baltar, Rosangela Ballini, Rafael Ribeiro and Marc Lavoie for comments. The author acknowledges research funding provided by the Brazilian National Council for Scientific and Technological Development (CNPq). E-mail: lilian.rolim@gmail.com.

to an increase of the wage share that resulted from the better economic scenario, which led to higher formalization and employment rates, and from the income transfer policies, such as the minimum wage adjustment rule, pension benefits to rural workers and cash transfers (Baltar, P., 2015, Biancarelli, 2014). Thus, it is possible to say that Brazil experienced a process of economic growth with social inclusion in this period. However, after the 2007-2008 global financial crisis, Brazil faced a deceleration of consumption, investment and exports, despite the anti-cyclical policies put in place by the government and the maintenance of the income redistribution process.

Thereby, in spite of the persistence of social inclusion between 2004 and 2014, economic growth reacted differently to it before and after the 2007-2008 global financial crisis. In a Kaleckian perspective, one can observe that, in favorable conditions, consumption stimulated the economy and investment reacted accordingly, following the "accelerator effect";¹ however, after the crisis, consumption was not enough to induce investment decisions and, thus, it was not enough to sustain the country's economic growth.

This paper's aim is to analyze the role of wages in the dynamics of the Brazilian economic growth and investment from 2003 to 2014. Taking a Kaleckian perspective, we analyze the factors that might explain why functional income redistribution² might not have been enough to sustain the previous growth and investment rates after the crisis. Additionally, in order to test whether this is indeed the case, we estimate a structural vector auto-regression (SVAR) and characterize the Brazilian demand and accumulation regimes as profit- or wage-led in the periods before and after an estimated structural break.

The paper is organized in five sections besides this introduction. Section 2 discusses the relation between economic growth and income redistribution in Brazil from 2003 to 2014. Section 3 presents the theoretical background. Section 4 discusses the mechanisms that may have led to an economic regime switch. Section 5 presents the estimated model and discusses the results. Finally, section 6 presents our main conclusions.

¹The accelerator effect is the effect of output growth on investment demand.

²Functional income distribution refers to the income distribution between wages and profits.

2 Income redistribution and economic growth in Brazil

The more favorable external scenario, which led to higher commodities prices and external demand, increased Brazilian exports after 2003. This led to a more robust balance of payments, which also benefited from the increase in capital inflows that followed the increase in exports and to the recovery of economic growth in 2004. Indeed, the determinants of the Brazilian economic growth in 2004 were the expressive increase in exports and investment, together with an increase in consumption (Baltar, P., 2015). As exports were the most dynamic aggregate demand component at the time, they were the main responsible for the GDP growth until 2005.

As discussed by Baltar, P. (2015), this favorable external scenario allowed economic growth to take place together with lower inflation (at least to the country's previous levels) due to the appreciation of the Brazilian currency. While lower inflation meant the recovery of the purchasing power of labor income, economic growth led to an increase in employment. These effects, combined with the income transfer policies, led to an income redistribution towards wages, which led to an increase in consumption (further enhanced by increases in consumer credit).

Therefore, despite the negative effect of a lower exchange rate on net exports, economic growth did not decelerate because domestic demand became its main driver from 2006 onwards, when the trade surplus lowered (Baltar, P., 2015, Biancarelli, 2014). Part of this positive economic performance can also be attributed to capital inflows that allowed for the reduction of Brazil's foreign debt while also increasing its international reserves (Arestis et al., 2016). This process is characteristic of the Brazilian economic growth pattern since the liberalizing reforms, in which favorable international circumstances improve the balance of payments (through higher exports and capital inflows) and lead to higher economic growth, lower inflation and an appreciated currency, which stimulates domestic absorption (Baltar, 2013). Indeed, Serrano and Summa (2012) suggest that an appreciated currency stimulates consumption more than it reduces net exports, so the net effect on aggregate demand is positive.

This suggests that the positive stimulus given by the external scenario, combined with a small shift towards a more expansionary macroeconomic policy, allowed for the recovery of consumption and this higher demand stimulated investment, which was also positively impacted by an increase in public investment (Arestis et al., 2016, Serrano and Summa, 2012). Because

this higher consumption was associated with the process of income redistribution towards the lower class that took place since 2004, some interpretations suggest that the better position of workers led to higher economic growth as well.

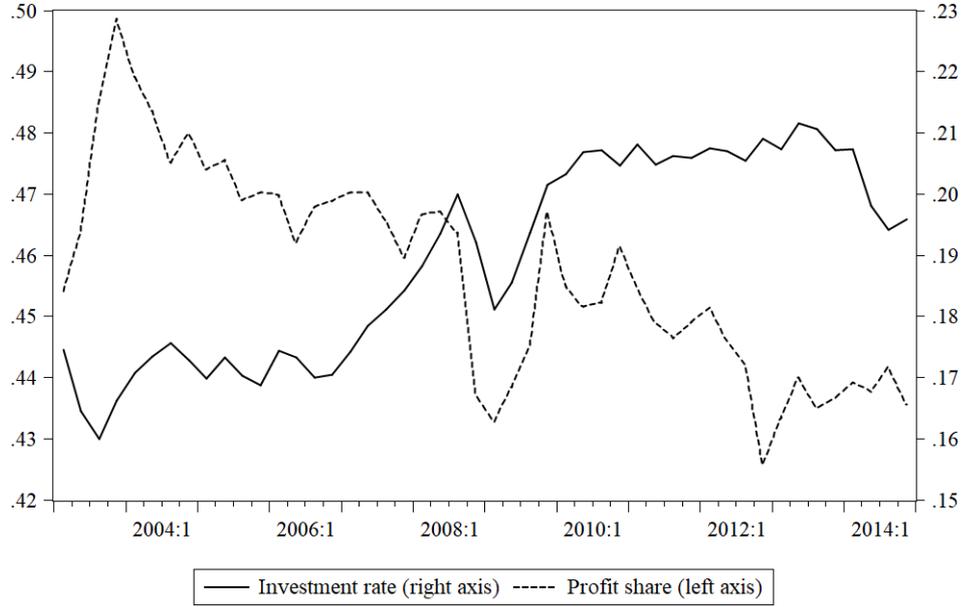
However, the global financial crisis of 2007-2008 had a negative effect on Brazilian exports and led to a deceleration of consumption and to a decrease of investment. Despite the recovery that took place in 2010, the external scenario was of more international competition as there was more idle capacity in other countries, imposing a more challenging scenario to the Brazilian economy (Hiratuka and Sarti, 2015). Because the process of functional income redistribution continued, consumption continued to grow (at lower rates), but this was accompanied by raising imports at rates higher than exports growth. Indeed, the unfavorable international scenario from 2009 to 2013 enhanced the negative effects of the appreciated domestic currency on GDP growth because imports responded more intensively to it (Arestis et al., 2016).

Thus, despite of the counter-cyclical policy answer to the crisis by the government, the uncertainty related to the crisis had a negative effect on investment, consumption decelerated and the domestic production of manufactured goods was negatively affected by the greater international competition in this market, which, combined with the overvalued domestic currency, had a negative effect on the trade balance (Arestis et al., 2016). Thus, the positive impact of the income transfer policies after the Great Recession was transferred to other countries through higher imports, having a lower inducement effect on investment (Arestis and Baltar, 2017). This scenario then led to the lower growth rates of GDP and investment from 2011 to 2016.

Therefore, the analysis of the Brazilian economy from 2003 to 2014 suggests that there was a period in which economic growth took place simultaneously to income redistribution towards the lower classes and a period in which the higher wage share was not enough to sustain the previous growth rates. Indeed, figure 1 shows that the investment rate grew until 2008 despite of the lower profit share, so the decrease of the latter variable did not prevent the investment boom. On the other hand, the investment rate stagnated after 2010, possibly because the lower profit share became a stronger restriction to it (as suggested, for instance, by Carvalho and Rugitsky (2015)). With respect to the relation between demand and income distribution, figure 2 suggests that the behavior of the growth rate was rather insensitive to changes in the profit share until the

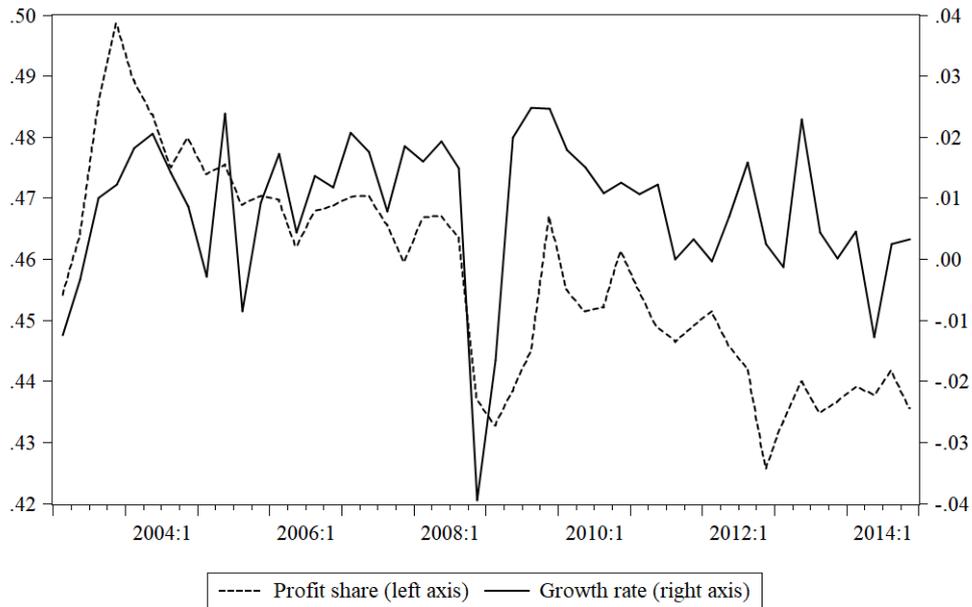
economic crisis. After the crisis, however, a decrease of this variable was simultaneous to the decrease of the profit share, which may be interpreted as a profit-led regime.

Figure 1: Accumulation Regime (% of GDP)



Source: [IBGE \(2017a,b,c\)](#). Seasonally adjusted series. Own elaboration.

Figure 2: Demand Regime (%)



Source: [IBGE \(2017a,b,c\)](#). Seasonally adjusted series. Own elaboration.

Therefore, there is a contrast between the period before and after the 2007-2008 crisis, which has led a number of authors to question what is the role of wages in the Brazilian economy. To some authors, income distribution towards the lower class always stimulates the economy, so the deceleration of the Brazilian economy after the crisis is explained by other aspects, such as the world scenario and the shift in public policies (Arestis et al., 2016, Serrano and Summa, 2012). In a different perspective, some authors consider that the process of increase in the wage share combined with economic growth was doomed to fail because it relied on foreign savings and, thus, was not a sustainable process (Bresser-Pereira, 2012, Oreiro et al., 2012). Finally, to a third group of authors, it is possible that the reduction in income inequality stimulated economic growth mostly due to the reduction in personal income inequality (mainly a better distribution of labor income), rather than due to the redistribution from profits to wages³ (Carvalho and Rugitsky, 2015). Thus, the deceleration of the reduction in personal income inequality might have led to the deceleration of aggregate demand.

This latter group of authors also suggests the possibility of a non-linear response of investment and consumption to the profit share. Indeed, Carvalho and Rugitsky (2015) argue that the reduction of the profit share, while beneficial to economic activity until 2010 (so the economy would be wage-led at the time), became so low after 2011 that it prevented investment growth, so the economy may have become profit-led. The argument in this paper is similar to this rationale, but it explores other mechanisms that might have played a role in the period. In order to do so, the next section explores the Kaleckian models and the following one discusses the possibility of a regime switch through this theoretical background.

3 Theoretical background

The Kaleckian economic growth and income distribution models offer a relevant theoretical background to the analysis of the Brazilian economy since the 2000s, as they bespeak the mechanisms by which changes in functional income distribution affect each aggregate demand component. The first models by Dutt (1987) and Rowthorn (1981) show a positive relation between economic activity and the wage share, defining a wage-led regime. However, when an

³For a discussion on the relation between personal income inequality and the demand regime, see Carvalho and Rezai (2016).

open economy (Blecker, 1989) or a different investment function (Bhaduri and Marglin, 1990) are considered, the possibility of a wage-led regime becomes less likely and it is possible to have a profit-led regime (in which increases in the profit share lead to higher economic activity).

The basic logic behind these models is that a redistribution of income towards wages will boost consumption (due to an expected higher marginal propensity to consume out of wages than profits), diminish the competitiveness of national products (reducing net exports) and lessen profits, which are an incentive for private investment. The sum of these particular effects will determine whether demand is wage- or profit-led (Blecker, 2016). Similarly, the response of investment will define the accumulation regime. As the theoretical models open the possibility of the regimes being either wage- or profit-led, it is an empirical question and a multitude of econometric studies test whether the demand or accumulation regimes of various countries are wage- or profit-led.⁴

However, the more recent literature on these models goes beyond these mechanisms and suggests that there are other economic relations taking place and influencing how the economy and employment respond to changes in income distribution. A contribution of part of this more recent literature is to question the likelihood of having stable economic regimes, both in terms of a long time period and of the type of exogenous shocks on the economy (Nikiforos, 2016, Skott, 2017).

Therefore, not only the regime is uncertain, but it can change from time to time. This means that a country should not be characterized uniquely as wage- or profit-led. Indeed, the analysis of the Brazilian economy between 2003 and 2014 suggests that there was not a stable relation between the profit share and demand or investment. Thus, the next section explores the possibility of a regime switch by analyzing the main parameters that are crucial to the determination of the regime and may have altered in the period.

4 The possibility of a regime switch

As the economic regime of an economy can change with time, it is possible that even within a wage-led demand regime (or a profit-led), the continuation of the functional income redistribution process becomes a weaker stimulus to aggregate demand and investment, de-

⁴See, for instance, Onaran and Galanis (2014).

creasing its wage-ledness (or increasing its profit-ledness). In this section we explore how the responsiveness of each aggregate demand component to an income redistribution might have changed in the Brazilian economy between 2003 to 2014.

4.1 Consumption

In terms of the consumption dynamics, besides the increase in the wage share and the better wage income distribution, a central aspect of the 2000s was the increase in household borrowing since 2004. This was driven by financial innovations (such as *crédito consignado*, a modality in which interest payments are deducted directly from the debtor's payroll) and by the better situation in the labor market in terms of higher wages and higher formalization rates, allowing more people to access the financial market (Arestis et al., 2016, Baltar, P., 2015, Biancarelli, 2014, Rugitsky, 2017). Such process was further enhanced by the response to the 2007-2008 crisis, as it involved increasing the grant of credit to households (Paula et al., 2015).

This led to an increase in household indebtedness rates. Consequently, after 2011, households were reluctant to take on new loans despite the looser monetary policy between 2011 and 2013 (Paula et al., 2015). Therefore, data from the Brazilian Central Bank (2017) shows that the increase in the ratio of household debt to income decelerates around the middle of 2012 and, if mortgage loans are not considered, this ratio actually started to decrease around the same time. Additionally, around the beginning of 2011 there was an increase in all indicators of household debt service ratio, with a further increase in 2013, when the Brazilian monetary authorities started to increase the interest rates.

Thus, with a larger share of households' income committed to debt services and a reversal of their debt ratios (excluding mortgage loans), they postponed consumption expenditures. Consequently, not only consumption decelerated due to the exhaustion of the credit boom (Rugitsky, 2017, Paula et al., 2015), but the financial relations undertaken by households might have led to a decrease in their propensity to consume by the end of the period, reducing the likelihood of a wage-led regime.

4.2 Investment

Regarding investment dynamics, because it responds to the accelerator effect, it is reasonable to assume that the weaker stimulus from the wage share to consumption also had an impact on the responsiveness of investment to the wage share. Additionally, a reduction in public investment since 2011 ([Rugitsky, 2017](#)), related to cuts in public expenditure and the more complicated international markets for Brazilian exports had a negative effect on total investment. Yet, its relation to income distribution might also have changed due to financial aspects related to this expenditure that changed during the period and led to its deceleration.

The main question concerns, then, the role of profitability on investment decisions. Despite of the lower profit share during the whole period, it is not straightforward that the reduction in retained resources had a negative effect on investment because it restricted available cash to investment plans. Indeed, [CEMEC \(2017\)](#) shows that there was some compensation between the three most important sources of investment finance (own funds, foreign investment and loans from the Brazilian Development Bank, BNDES) between 2004 and 2014.

Thus, there is not a clear link from the lower profit share to the decrease in investment due to the lack of financial resources. Additionally, one should bare in mind that retained profits also decreased in the period because the share of dividend payments relative to gross operating surplus increased since 2009 ([Rezende, 2016](#)). While this might have occurred from pressures from the transnational companies in order to compensate for their lower profits abroad with the crisis, as remittances increased around 2011 ([Rezende, 2016](#)), it does not seem that this restricted investment because there were lower funds available to it.

Yet, within [Kalecki's \(1990\)](#) theory, the role of profits is also to signal the ability of firms to meet their debt commitments. As firms' indebtedness ratios were increasing from 2010 to 2016 ([CEMEC, 2016](#)) and the liquidity preference of banks increased after the European crisis, which, together with a higher risk perception, led to the exhaustion of the credit boom in the country ([Paula et al., 2015](#)), profits might have become increasingly more important as a signal that firms were creditworthy. The harsher financial conditions, which partially resulted from the global crisis, would then have implied a larger dependence on profitability.

Additionally, it is also possible that there is an asymmetric non-linear response of investment to the profit share. Building on [Bhaduri and Marglin \(1990, Appendix B\)](#), one can assume,

as they do, that an increase in the profit share will have a weaker effect on investment if capacity utilization is at a low level. However, it is also plausible that this effect is asymmetric: in such a situation, a decrease in the profit share may lead to an even larger decrease in investment as it strengthens the negative animal spirits, already weakened by the low capacity utilization - this might have been the case of the Brazilian economy after the crisis.

4.3 Net exports

The 2007-2008 crisis may also have altered the responsiveness of Brazilian exports and imports to shifts in the profit share. On the one hand, the stronger international competition as a result of idle capacity in industrialized countries (Hiratuka and Sarti, 2015) may have increased the sensitiveness of exports to income distribution in the country. On the other hand, the stronger effect of currency appreciations on imports growth (Arestis et al., 2016) meant that the increases in domestic demand were transferred abroad in a stronger intensity.

5 Brazilian economic regime from 2003 to 2014

Previous studies have tested the demand and accumulation regimes of the Brazilian economy, but they do not lead to a consensus on whether it is wage- or profit-led as they use different methods and cover different time periods.⁵ Additionally, most of them assume a stable relation between the variables throughout the period of estimation.⁶ The contribution of our study is to explicitly consider the possibility of a change in the demand and accumulation regimes when the underlying economic conditions change. In order to investigate this possibility, we estimate a structural vector auto-regressive (SVAR) model for the period between the first quarter of 2003 (2013Q1) to the last quarter of 2014 (2014Q4).⁷ The SVAR method has only been applied for the Brazilian economy by Feijó, Lamonica and Bastos (2015), who do not include a structural break in their model. A SVAR model has the advantage of avoiding the simultaneity bias that

⁵See, for instance, Bruno (2003), Araújo and Gala (2012), Oreiro and Araújo (2013), Feijó, Câmara and Cerqueira (2015), Feijó, Lamonica and Bastos (2015), Morrone (2015), Gonçalves (2016), Tomio (2016) and Jesus et al. (2017).

⁶Except for Oreiro and Araújo (2013) and Bruno (2003).

⁷Therefore, the sample has 44 observations. The main restriction to the sample size is given by the data on the income shares in Brazil, leading us to a sample size close to that of most of the other studies on the Brazilian demand and accumulation regimes.

may be present in the ordinary least squares (OLS) estimates and imposing restrictions on the structural parameters that are coherent with the economic theory.⁸

5.1 Empirical model

The estimated SVAR model is inspired by [Onaran and Stockhammer \(2005\)](#) and includes the growth rate ($GY = Y_t/Y_{t-1}$) as a proxy to capacity utilization, the investment rate ($IY = I_t/Y_t$) and the profit share of value added ($ps = P_t/VA_t$) as endogenous variables. Additionally, the real exchange rate ($REER$), world GDP (Yf) and real interest rate (r) are included as exogenous variables. In the second specification, an interaction dummy for the lagged profit share is also added as an exogenous variable.

For econometric reasons, a SVAR model is estimated without the contemporaneous relation between the endogenous variables (reduced form). In order to retrieve the contemporaneous effects (structural form), some restrictions must be added to the A or B (or both) matrices, which relate the residuals from the structural (ϵ) and the reduced (e) forms ([Lütkepohl, 2005](#)):

$$B\epsilon_t = Ae_t \quad (1)$$

Thus, short-run restrictions are applied by restricting the A (contemporaneous relation between the variables) and B (standard deviations of the structural shocks) matrices, as follows:

$$A = \begin{bmatrix} 1 & \alpha_{GY_IY} & \alpha_{GY_PS} \\ 0 & 1 & 0 \\ \alpha_{PS_GY} & 0 & 1 \end{bmatrix}, B = \begin{bmatrix} \beta_{GY} & 0 & 0 \\ 0 & \beta_{IY} & 0 \\ 0 & 0 & \beta_{PS} \end{bmatrix} \quad (2)$$

Therefore, we assume that capacity utilization is contemporaneously affected by the investment rate and by the profit share; that investment is not contemporaneously affected by either capacity utilization or the profit share (there is a lag between investment decisions and expenditure); and that the profit share is contemporaneously affected by capacity utilization (reflecting the immediate effect of a lower share of overhead labor with increases in capacity utilization, as discussed by [Lavoie \(2014, ch. 3\)](#)) but not by the investment rate.

⁸For a more detailed discussion on the methods applied in the empirical Kaleckian economic growth and income distribution models, see [Blecker \(2016\)](#).

5.2 Empirical results

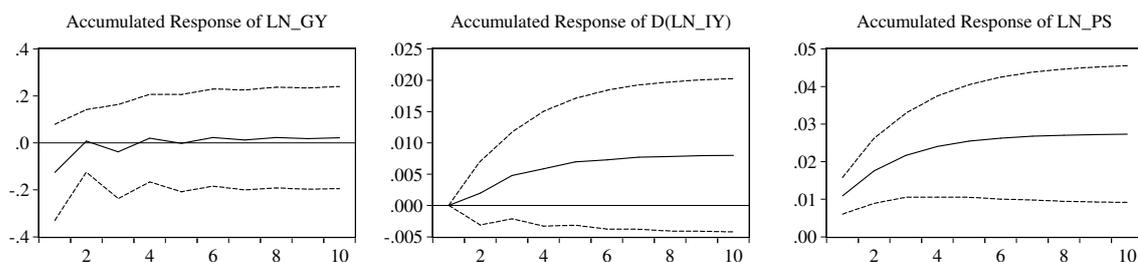
This section reports the empirical results. Three different specifications are estimated to identify whether there has been an economic regime switch. The database and model outputs are reported in the Appendix section. All variables are seasonally adjusted⁹ and taken in logarithm. Except for the investment rate and the world GDP, which are taken in first difference, all variables are stationary.¹⁰ All reported models have well behaved residuals.

5.2.1 First specification: baseline SVAR model

A first approximation to our research question consists on analyzing the demand and accumulation regimes for the whole period between 2003 and 2014. Thus, we are concerned with the overall effect without considering the possibility that a change in the relation between the variables has taken place.

Figure 3 reports the accumulated effect of a shock in the residual associated with the profit share, which leads to an increase in this variable. In the first period, there will be a decrease in the capacity utilization rate and, as time goes by, the accumulated effect will be close to zero. The accumulated effect on the investment rate is positive but also close to zero.

Figure 3: Accumulated responses to a shock on the profit share - Specification 1



Note: Accumulated Response to Structural One S.D. Innovations \pm 2 S.E. Confidence level of 95%.

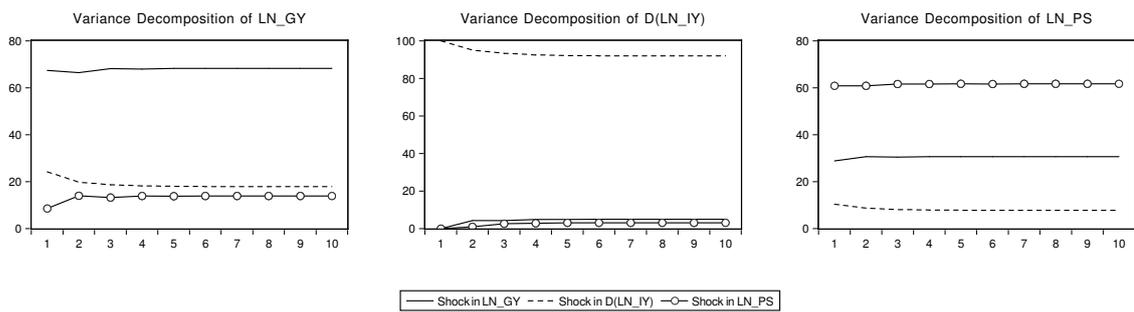
Figure 4 reports the variance decomposition for each variable, showing the percentage of the variance of one variable explained by each structural shock over 10 periods. For all the variables, the variance decomposition is fairly stable through time. The variance of capacity utilization is approximately 68% explained by itself, approximately 18% explained by a shock in the investment rate and approximately 14% explained by a shock in the profit share after 10

⁹The Census-X12 filter has been applied.

¹⁰Due to space constraints the unit root tests results have been omitted, but are available upon request.

periods, suggesting that the investment rate is more important than the profit share to explain the variance of capacity utilization. The variance of the investment rate is predominantly due to itself (approximately 92%), with little participation of the accelerator effect (approximately 5%) and of the profit share (approximately 3%) after 10 periods. Finally, the profit share is mostly explained by itself (approximately 62%) and by capacity utilization (approximately 31%), indicating a low participation of the investment rate (approximately 8%) after 10 periods.

Figure 4: Variance Decomposition - Specification 1



Note: Structural factorization.

Therefore, this SVAR model suggests a profit-led demand regime, but the effect of a shock in the profit share is not significant at the 10% significance level and just 14% of the variance of capacity utilization is explained by the profit share. The accumulation regime is also profit-led and the effect of the profit share on the investment rate is significant at the 10% significance level; but both the accelerator effect and the income distribution effect determine surprisingly little of the variance of the investment rate, so investment dynamics is mainly determined by its own dynamics.

5.2.2 Second specification: testing for a structural break

The second SVAR model tests a structural break in the relationship between the profit share, capacity utilization and accumulation rate by including an interaction dummy for the lagged profit share,¹¹ which is included as an exogenous variable.

The structural break is estimated by the Chow and the Quandt-Andrews breakpoint tests (table 1). The Quandt-Andrews test suggests that there is no breakpoint in the capacity utilization equation; but, considering a significance level of 11%, there is evidence of a breakpoint in

¹¹There is no break in the contemporaneous parameter.

the investment rate equation in 2010Q1. We then test the possibility of a break in 2010Q1 by applying the Chow test, which confirms the break in 2010Q1 for the investment rate equation (at the 5% significance level).

Table 1: Breakpoint tests for the $LN_PS(-1)$ variable

| OLS equation | Quandt-Andrews | | Chow (2010Q1) | |
|--------------|-----------------|-------|---------------|---------------|
| | Max. LR F-Stat. | Prob. | F-stat | Prob. F(1,35) |
| LN_U | 4.52 | 0.26 | 0.70 | 0.41 |
| D(LN_IY) | 6.49 | 0.11 | 6.49 | 0.02 |

Note: Quandt-Andrews breakpoint test null hypothesis: no breakpoints within 20% trimmed data. Identified breaks by the Quandt-Andrews breakpoint test: 2008Q4 for the LN_U equation and 2010Q1 for the $D(LN_IY)$ equation. Chow breakpoint test null hypothesis: no breaks at specified breakpoints.

Therefore, the model includes a structural break in 2010Q1 (LN_PS_BK), which is defined as follows:

$$LN_PS_BK = \begin{cases} 0, & \text{if } t < 2010Q2; \\ LN_PS, & \text{otherwise.} \end{cases} \quad (3)$$

The main difference of this model including the structural break with respect to the baseline model is in terms of the parameters associated with the lagged value of the profit share ($LN_PS(-1)$), which becomes higher for the capacity utilization equation (from 4.95 to 5.67) and lower for the investment rate equation (from 0.26 to 0.12). The interaction dummy variable ($LN_PS_BK(-1)$) suggests a weaker effect of the lagged profit share on capacity utilization after the break and a stronger effect on the accumulation rate. Thus, the model suggests a more profit-led capacity utilization before the break and a more profit-led accumulation after the break - still, the analysis of the capacity utilization equation would also have to consider its contemporaneous effect, so such conclusion is further inquired in the next section.

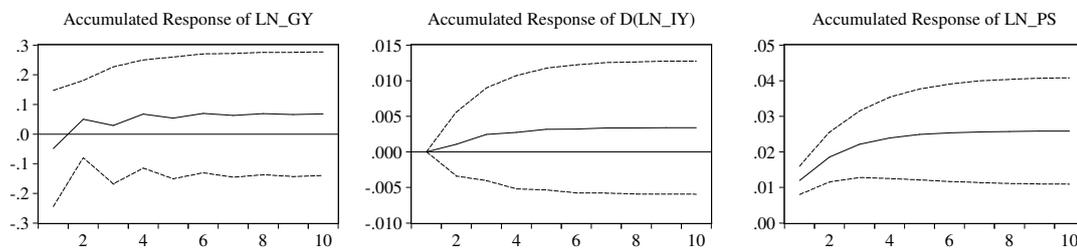
The significance of the structural break is assessed in table 2. In the capacity utilization equation, the break is not significant; but, in the investment rate equation, the lagged LN_PS_BK variable is significant at the 10% significance level, suggesting that there might have been a change in the accumulation regime but not in the demand regime.

Table 2: Significance of the $LN_PS_BK(-1)$ variable

| Equation | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|-------|
| LN_U | - 0.13 | 0.30 | - 0.44 | 0.66 |
| D(LN_IY) | 0.03 | 0.01 | 1.93 | 0.06 |

The accumulated responses to a shock in the residual related to the profit share (figure 5) once again show a positive effect on the accumulation rate and on capacity utilization. The difference with respect to the previous model is a higher increase in capacity utilization following an increase in the profit share and a lower increase in the accumulation rate.

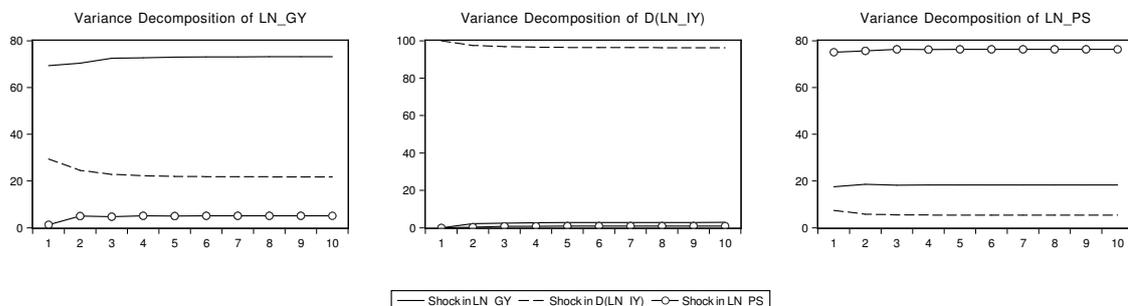
Figure 5: Accumulated responses to a shock on the profit share - Specification 2



Note: Accumulated Response to Structural One S.D. Innovations \pm 2 S.E. Confidence level of 95%.

Variance decomposition is reported in figure 6. The main difference of this specification with respect to the baseline model is the higher dependence of capacity utilization and investment on their own behavior and a smaller dependence on the profit share (without considering the dummy variable). The contribution of capacity utilization to investment variance also decreases.

Figure 6: Variance Decomposition - Specification 2



Note: Structural factorization.

Overall, the model suggests a stronger profit-led demand regime and a smaller contribution of the profit share to capacity utilization variance than the previous model, but there is no strong

evidence of a change in the demand regime as the break is not significant. However, a more accurate analysis would require testing whether the contemporaneous coefficient also suffered a break. On the other hand, the model supports the hypothesis of a stronger effect of the profit share on the accumulation rate after the break. This suggests an accumulation regime switch, so the continuation of the decreases in the profit share meant stronger restrictions to investment after the first quarter of 2010, which is in line with the analysis of figure 1.

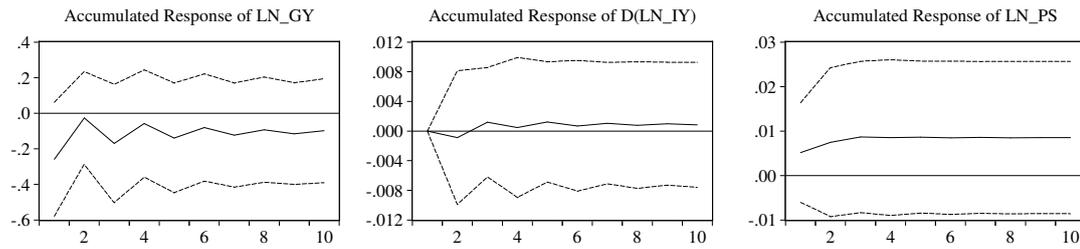
5.2.3 Third specification: robustness of the structural break

In order to verify whether there has indeed been a stronger effect of the profit share on the accumulation rate after the break, we reestimate the baseline specification for a smaller period that goes from 2003Q1 to 2010Q1. Despite the lower number of observations of such model, which leads to higher standard errors, it has the advantage of also allowing the estimation of the structural parameters, enabling us to compare them with the baseline specification. Therefore, the identification of a regime switch is given by the comparison of both the lagged and contemporaneous parameters associated with the profit-share.

The lagged profit share parameter is smaller for the investment equation and higher for the capacity utilization equation if compared to the baseline model. However, the contemporaneous parameter of the profit share on capacity utilization (α_{GY_PS}) is higher than in the baseline model, so that the contemporaneous effect of the profit share on capacity utilization is considerably lower than in the first specification, possibly altering the overall conclusion.

The accumulated response functions of a shock related to the profit share are reported in figure 7. They suggest a wage-led demand regime and a profit-led or neutral accumulation regime in the period prior to 2010Q1. If compared to the accumulated impulse response function in the baseline specification (figure 3), they suggest a lower responsiveness of the investment rate to the profit share before 2010Q1.

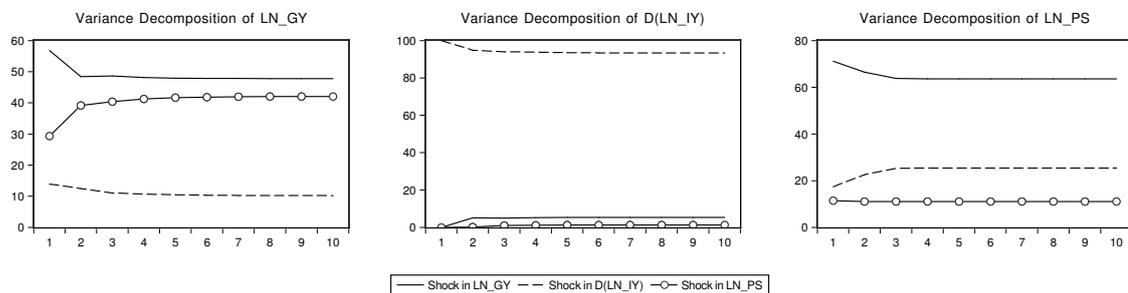
Figure 7: Accumulated responses to a shock on the profit share - Specification 3



Note: Accumulated Response to Structural One S.D. Innovations \pm 2 S.E. Confidence level of 95%.

Variance decomposition, reported in figure 8, shows that the contribution of the profit share to capacity utilization variance was considerably higher until the break than it was when the whole period was included in the model (respectively, 42.04% and 13.88% at the tenth period). Additionally, it shows that the contribution of the profit share to the variance of the investment rate was lower in the period until the break than in the whole period (respectively, 1.31% and 3.09% at the tenth period).

Figure 8: Variance Decomposition - Specification 3



Note: Structural factorization.

Therefore, the comparison between the baseline and the third specifications supports the results of the second specification by showing an increase in the sensitiveness of the accumulation rate to the profit share after 2010Q1, both in terms of the size of the parameter and of the contribution of the profit share to the variance of the investment rate, which are larger in the baseline specification than in the third specification. The results also suggest that a break should be considered in the contemporaneous effect of the profit share on capacity utilization (which was not considered in the second specification), as the contemporaneous effect is lower in this third specification, leading to a negative response of capacity utilization to shocks on the profit share despite of a higher value of the parameter associated with the lagged profit share. Additionally,

the variance decomposition of capacity utilization shows that the contribution of the profit share decreases when the whole period is considered, contributing to the conclusion that income distribution had a lower average impact in the whole period than it had before the break.

5.2.4 Overall results

Because the variables are taken in logarithmic form, the accumulated responses to a shock on the profit share can be transformed into elasticities in order to compare the results of the three specifications. Table 3 reports the elasticities and the 90% confidence intervals for the accumulated effects at the tenth period.

Table 3: Estimated elasticities

| | Specification 1 | | | Specification 2 | | | Specification 3 | | |
|---|------------------|-------------|-------------|------------------|----------|-------------|------------------|----------|-------------|
| | LN_GY | D(LN_IY) | LN_PS | LN_GY | D(LN_IY) | LN_PS | LN_GY | D(LN_IY) | LN_PS |
| Period | 2003Q1 to 2014Q4 | | | 2003Q1 to 2010Q1 | | | 2003Q1 to 2010Q1 | | |
| Accumulated effect to a shock on the profit share | 0.02 | 0.01 | 0.03 | 0.07 | 0.00 | 0.03 | -0.26 | 0.00 | 0.01 |
| Standard Error | 0.11 | 0.01 | 0.01 | 0.10 | 0.00 | 0.01 | -0.16 | 0.00 | -0.01 |
| Confidence interval of 90% | 0.02+/-0.18 | 0.01+/-0.01 | 0.03+/-0.02 | 0.07+/-0.17 | 0+/-0 | 0.03+/-0.02 | -0.26+/-0.27 | 0+/-0 | 0.01+/-0.02 |
| Elasticity to the profit share | 0.81% | 0.29% | 1.00% | 2.33% | 0.00% | 1.00% | -26.00% | 0.00% | 1.00% |
| Regimes | profit-led | profit-led | | profit-led | neutral | | wage-led | neutral | |

The baseline specification suggests that both regimes would be profit-led between 2003Q1 and 2014Q4. The second specification, on the other hand, suggests an even stronger profit-ledness of the demand regime from 2003Q1 to 2010Q1, but a neutral accumulation regime in this shorter period. The structural break suggests a regime switch of the accumulation regime from neutral to profit-led after the break. Finally, the third specification suggests a wage-led demand regime and a neutral accumulation regime for the period between 2003Q1 and 2010Q1.

While both the second and third specifications suggest that the income redistribution had a neutral effect on accumulation before the break, they diverge in terms of the effect of the former variable on demand. Due to econometric reasons, the second specification only captures a break in the lagged effect of the profit share on demand, while the comparison between the first and third specifications suggests how the contemporaneous and lagged parameters changed. Therefore, it is likely that there was demand regime switch from wage-led to profit-led.

6 Conclusion

The period of economic growth with income redistribution in Brazil (2006 to 2010) was followed by a period in which the maintenance of income redistribution was not enough to sustain the previous growth rates (2011 to 2014). The argument put forward in this paper is that the international scenario and the financial situation of the private sector might have triggered a set of mechanisms that affected the responsiveness of investment, consumption and net exports to an income redistribution. Consequently, the likelihood of increases in the wage share sustaining high levels of investment and aggregate demand decreased in the latter period.

The results from the SVAR models provide some support to the hypothesis that there was a regime switch, or, at least, a change in the intensity of the regime, in the period. As investment became more dependent on profitability, going from a neutral regime to a profit-led regime, the further decreases in the profit share meant a larger negative stimulus to investment. This, together with the lower increases in consumption (due to the more fragile financial situation of households) and in net exports (due to the more challenging international scenario), led to a demand regime switch from wage-led to profit-led.

Therefore, income redistribution towards wages stimulated growth and did not prevent higher investment rates, so a higher wage share can have a role in enhancing economic growth in Brazil, but this positive effect depends on the underlying economic conditions. This is not to say that a wage-led strategy should not have been pursued in Brazil after 2010, but rather that if one aims to combine economic growth and a more egalitarian income distribution, the underlying economic conditions that allow for such outcome must also be analyzed and targeted.

This suggests that an interesting path of research, which is already partially covered by the literature ([Carvalho and Rezai, 2016](#), [Nikiforos, 2016](#), [Skott, 2017](#)) would be a broad analysis of what are the ultimate determinants of the demand and accumulation regimes and how they interact and change through time. Indeed, Kaleckian models can further contribute by providing policy tools that allow for successful wage-led strategies, that is, strategies that effectively and sustainably combine economic growth and income redistribution.

References

- Araújo, E. and Gala, P. (2012), ‘Regimes de crescimento econômico no Brasil: evidências empíricas e implicações de política’, *Estudos Avançados* **26**(75), 41–56.
- Arestis, P. and Baltar, C. T. (2017), ‘Income distribution and economic growth: a critical approach’, *Panoeconomicus* **64**(2), 125–138.
- Arestis, P., Baltar, C. T. and Prates, D. M. (2016), ‘Brazilian economic performance since the emergence of the great recession: the effects of income distribution on consumption’, *Panoeconomicus* pp. 1–21.
- Baltar, C. T. (2013), Economic growth and inflation in an open developing economy: the case of Brazil, PhD thesis, University of Cambridge, Cambridge.
- Baltar, P. (2015), ‘Crescimento da economia e mercado de trabalho no Brasil’, *Texto para discussão - IPEA* **2036**.
- Bhaduri, A. and Marglin, S. (1990), ‘Unemployment and the real wage: the economic basis for contesting political ideologies’, *Cambridge Journal of Economics* **14**(4), 375–393.
- Biancarelli, A. M. (2014), ‘A Era Lula e sua questão econômica principal: crescimento, mercado interno e distribuição de renda’, *Revista do Instituto de Estudos Brasileiros* **58**, 263–288.
- Blecker, R. A. (1989), ‘International competition, income distribution and economic growth’, *Cambridge Journal of Economics* **13**(3), 395–412.
- Blecker, R. A. (2016), ‘Wage-led versus profit-led demand regimes : the long and the short of it’, *Review of Keynesian Economics* **4**(4), 373–390.
- Brazilian Central Bank (2017), ‘Sistema gerenciador de séries temporais’.
URL: <http://www.bcb.gov.br/>
- Bresser-Pereira, L. C. (2012), ‘Structuralist macroeconomics and the new developmentalism’, *Brazilian Journal of Political Economy* **32**(3), 347–366.

- Bruno, M. (2003), Regimes de crescimento, mudanças estruturais e distribuição na economia brasileira (1970-2001), in 'Anais do VIII Encontro Nacional de Economia Política. Florianópolis'.
- Carvalho, L. and Rezai, A. (2016), 'Personal income inequality and aggregate demand', *Cambridge Journal of Economics* **40**(2), 491–505.
- Carvalho, L. and Rugitsky, F. (2015), 'Growth and distribution in Brazil in the 21st century: revisiting the wage-led versus profit-led debate', *Working Papers, Department of Economics, 2015 -25, University of São Paulo (FEA-USP)* .
- CEMEC (2016), 'Endividamento das empresas brasileiras'.
- URL:** <https://goo.gl/ICzU9T>
- CEMEC (2017), 'Relatório trimestral de financiamento dos investimentos no Brasil'.
- URL:** <https://goo.gl/au5PWR>
- Denton, F. T. (1971), 'Adjustment of monthly or quarterly series to annual totals: an approach based on quadratic minimization', *Journal of the American Statistical Association* **66**(333), 99–102.
- Dutt, A. K. (1987), 'Alternative closures again: a comment on "growth, distribution and inflation"', *Cambridge Journal of Economics* .
- Feijó, C. A., Câmara, F. F. and Cerqueira, L. F. (2015), 'Inflation, growth, and distribution: The Brazilian economy after the post war', *Journal of Post Keynesian Economics* **38**(4), 616–636.
- Feijó, C. A., Lamonica, M. T. and Bastos, J. C. A. (2015), 'Accumulation pattern of the Brazilian economy in the 1990s and 2000s', *International Review of Applied Economics* **21**(1), 15–31.
- Gonçalves, J. B. (2016), 'Distribuição de renda e demanda agregada no Brasil (1995-2015): uma análise de extensões ao modelo neo-kaleckiano pelo método VAR', *Paper presented at the 44th Brazilian National Meeting of Economics (ANPEC)* .
- Hiratuka, C. and Sarti, F. (2015), 'Transformações na estrutura produtiva global, desindustrialização e desenvolvimento industrial no Brasil: uma contribuição ao debate', *Texto para Discussão IE/Unicamp* **255**.

IBGE (2017a), 'Contas econômicas integradas'.

URL: <https://goo.gl/r7xCFQ>

IBGE (2017b), 'Pesquisa mensal do emprego'.

URL: <https://goo.gl/MQZwAU>

IBGE (2017c), 'Sistema nacional de contas trimestrais'.

URL: <https://sidra.ibge.gov.br/home/scnt/brasil>

IMF (2017), 'International financial statistics'.

URL: <https://goo.gl/uvMb5V>

Jesus, C., Araujo, R. A. and Drumond, C. E. (2017), 'An empirical test of the Post-Keynesian growth model applied to functional income distribution and the growth regime in Brazil', *International Review of Applied Economics (online)* pp. 1–22.

Kalecki, M. (1990), *Collected works of Michal Kalecki [1956]*, Oxford: Clarendon, chapter Theory of Economic Dynamics.

Lavoie, M. (2014), *Post-Keynesian Economics: New Foundations*, Cheltenham, UK; Northampton, MA, USA: Edward Elgar.

Lütkepohl, H. (2005), *New Introduction to Multiple Time Series Analysis*, Berlin: Springer.

Morrone, H. (2015), 'Do demand and profitability stimulate capital accumulation? An analysis for Brazil', *CEPAL Review* **116**.

Nikiforos, M. (2016), 'Distribution-led growth in the long run', *Review of Keynesian Economics* **4**(4), 391–408.

OCDE (2017), 'Quarterly national accounts'.

URL: <https://goo.gl/pHV1mU>

Onaran, Ö. and Galanis, G. (2014), 'Income distribution and growth: A global model', *Environment and Planning A* **46**(10), 2489–2513.

- Onaran, Ö. and Stockhammer, E. (2005), 'Two different export-oriented growth strategies: Accumulation and distribution in Turkey and South Korea', *Emerging Markets Finance and Trade* **41**(1), 65–89.
- Oreiro, J. L. and Araújo, E. (2013), 'Exchange rate misalignment, capital accumulation and income distribution: Theory and evidence from the case of Brazil', *Panoeconomicus* **60**(3), 381–396.
- Oreiro, J. L., Punzo, L. F. and Araújo, E. C. (2012), 'Macroeconomic constraints to growth of the Brazilian economy: diagnosis and some policy proposals', *Cambridge Journal of Economics* **36**(4), 919–939.
- Paula, L. F. d., Modenesi, A. d. M. and Pires, M. C. C. (2015), 'The tale of the contagion of two crises and policy responses in Brazil: A case of (Keynesian) policy coordination?', *Journal of Post Keynesian Economics* **37**(3), 408–435.
- Rezende, F. (2016), 'Financial fragility, instability and the Brazilian crisis: a Keynes-Minsky-Godley approach', *Minds (Multidisciplinary Institute for Development and Strategies): Discussion paper 1* .
- Rowthorn, R. (1981), 'Demand, real wages and growth', *Thames Papers in Political Economy* **Autumn**, 1–39.
- Rugitsky, F. (2017), 'The rise and fall of the Brazilian economy (2004-2015): economic antimiracle', *Paper presented at the 45th Brazilian National Meeting of Economics (ANPEC)* .
- Serrano, F. and Summa, R. (2012), 'Macroeconomic policy, growth and income distribution in the Brazilian economy in the 2000s', *Investigación Económica* **71**(282), 55–92.
- Skott, P. (2017), 'Weaknesses of 'wage-led growth'', *Review of Keynesian Economics* **5**(3), 336–359.
- Tomio, B. (2016), 'Understanding the Brazilian demand regime: a Kaleckian approach', *Institute for International Political Economy Berlin Working Paper* (73).

Appendix

Table A.1: Database

| Variable | Name | Source |
|-----------------------|---|---|
| <i>IY</i> | Brazilian investment rate | IBGE (2017c, Table 1846) |
| <i>GY</i> | Brazilian GDP growth rate, real | IBGE (2017c, Table 1621) |
| <i>RER</i> | Real effective exchange rate, based on consumer price index | IMF (2017) |
| <i>R</i> | Real interest rate, based on <i>IPCA</i> | Brazilian Central Bank (2017, Table 4390) |
| <i>IPCA</i> | Broad national consumer price index | Brazilian Central Bank (2017, Table 433) |
| <i>Y_f</i> | G20 GDP, real | OCDE (2017) |
| <i>W</i> | Aggregate Wages | IBGE (2017a,b) |
| <i>Y_{fc}</i> | GDP at factor cost (value added) | IBGE (2017c, Table 1846) |
| <i>P</i> | Aggregate Profits | $Y_{fc} - W$ |
| <i>ps</i> | Profit share | P/Y_{fc} |

Note: The aggregate wages series was interpolated through [Denton's \(1971\)](#) interpolation method.

Table A.2: Model output

| | Specification 1 | | | Specification 2 | | | Specification 3 | | |
|-------------------|----------------------|-----------------|--------------------|---------------------|------------------|--------------------|----------------------|-----------------|------------------|
| | LN_GY | D(LN_IY) | LN_PS | LN_GY | D(LN_IY) | LN_PS | LN_GY | D(LN_IY) | LN_PS |
| LN_GY(-1) | -0.63*** (0.18) | 0.01 (0.01) | 0 (0.01) | -0.63*** (0.18) | 0.01 (0.01) | 0 (0.01) | -0.71** (0.28) | 0.01 (0.01) | -0.00 (0.00) |
| D(LN_IY(-1)) | 3.03 (3.65) | 0.1 (0.17) | -0.07 (0.12) | 3.6 (3.91) | -0.01 (0.18) | -0.12 (0.12) | -0.59 (6.43) | 0.04 (0.28) | -0.35* (0.20) |
| LN_PS(-1) | 4.95 (3.26) | 0.26* (0.15) | 0.62*** (0.11) | 5.67 (3.68) | 0.12 (0.17) | 0.55*** (0.12) | 9.21 (6.25) | 0.19 (0.28) | 0.43** (0.19) |
| Constant | -4.92** (2.12) | 0.07 (0.1) | -0.19*** (0.07) | -4.21 (2.67) | -0.07 (0.12) | -0.26*** (0.08) | -0.59 (3.63) | 0.06 (0.16) | -0.21* (0.11) |
| LN_RER | 2.97* (1.7) | 0.1 (0.08) | 0.09* (0.06) | 3.25* (-1,83) | 0.05 (0.08) | 0.07 (0.06) | 4.36 (3.43) | 0.13 (0.15) | -0.02 (0.10) |
| LN_RER(-1) | -2.36 (1.69) | -0.07 (0.08) | -0.12** (0.06) | -2.67 (1,85) | 0 (-0,08) | -0.09 (0,06) | -3.95 (3.38) | -0.10 (0.15) | -0.04 (0.10) |
| LN_R | -0.16* (0.08) | 0 (0) | 0 (0) | -0.16* (0,08) | 0 (0) | 0** (0) | -0.29 (0.34) | -0.01 (0.01) | 0.00 (0.01) |
| LN_R(-1) | -0.1 (0.09) | 0 (0) | 0.01** (0) | -0.09 (0,09) | -0.01 (0) | 0.01 (0) | -0.65 (0.53) | -0.01 (0.02) | -0.02 (0.01) |
| D(LN_YF) | 115.24*** (22.84) | 1.36 (1.08) | 0.67 (0.74) | 115.11*** (23,1) | 1.38 (1,04) | 0.68 (0,73) | 118.74*** (41.39) | 1.24 (1.85) | 0.69 (1.31) |
| D(LN_YF(-1)) | -0.78 (18.23) | -0.98 (0.86) | 0.71 (0.59) | -4.51 (20,28) | -0.25 (-0,91) | 1.07* (0,65) | 2.03 (28.54) | -0.58 (1.28) | 2.03** (0.90) |
| LN_PS_BK(-1) | | | | -0.13 (0,3) | 0.03* (0,01) | 0.01 (-0,01) | | | |
| Estimation period | 2003Q1 to 2014Q4 | | | 2003Q1 to 2014Q4 | | | 2003Q1 to 2010Q1 | | |
| R-squared | 0.7 | 0.37 | 0.89 | 0.7 | 0.43 | 0.9 | 0.82 | 0.55 | 0.86 |
| Adj. R-squared | 0.63 | 0.21 | 0.86 | 0.62 | 0.27 | 0.87 | 0.73 | 0.32 | 0.79 |

Note: Standard errors in parenthesis. * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table A.3: Structural coefficients

| | Specification 1 | | Specification 2 | | Specification 3 | |
|-------------------|-----------------|------------|-----------------|------------|-----------------|------------|
| | Coefficient | Std. Error | Coefficient | Std. Error | Coefficient | Std. Error |
| α_{PS_GY} | -0.02** | 0.01 | -0.02** | 0.01 | -0.04** | 0.02 |
| α_{GY_IY} | -12.99*** | 4.10 | -12.87*** | 3.36 | -23.16 | 26.62 |
| α_{GY_PS} | 11.50 | 11.56 | 4.07 | 8.69 | 50.39 | 84.96 |
| β_{GY} | 0.44*** | 0.10 | 0.39*** | 0.06 | 1.01 | 1.10 |
| β_{IY} | 0.02*** | 0.00 | 0.02*** | 0.00 | 0.02*** | 0.00 |
| β_{PS} | 0.01*** | 0.00 | 0.01*** | 0.00 | 0.01*** | 0.00 |

Note: * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. Coefficients α_{PS_GY} , α_{GY_IY} and α_{GY_PS} have the opposite sign of that of the contemporaneous effect of one variable on the other.