

Economic growth regimes in Brazil: empirical evidence and policy implications

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Introduction

KEYNESIAN-ORIENTED literature has developed growth models in which aggregate demand determines the income in both nominal and real terms, due to possible insufficient demand and the influence of this variable on the development of productive resources. These models still consider the influence of income distribution on growth rates, i.e., the effects of changes in the share of wages and profits in national income on the different components of aggregate demand, especially consumption and investment. In this regard, special mention should be made of Bhaduri & Marglin (1990); Bowles & Boyer (1995); Uemura (2000); Stockhammer & Onaran (2004); Naastepad & Storm (2006-2007); Hein & Vogel (2008); and Stockhammer et al. (2009) among others.

The relationship between growth and income distribution enables identifying economic growth patterns. Thus, if aggregate demand responds positively to a profit share increase in income, it is said that the economy is characterized by a profit-led regime. In situations where aggregate demand responds negatively to a profit share increase in income, the economic growth regime can be characterized as wage-led.

This discussion is now very important for Brazil insofar as the expansionary and contractionary effects of currency devaluations are discussed around here. As rightly pointed out by Bresser-Pereira (2009b), one of the pillars of the so-called new developmentalism for catching up in the context of globalization is to maintain the exchange rate at a competitive level. For the exchange rate to produce its beneficial effects on the dynamics of exports and capital accumulation, the growth regime observed in the country should follow a profit-led pattern. In other words, competitive exchange rates should produce higher profit rates, thus stimulating aggregate investment.

In this respect, Blecker (2010) shows that countries that are highly vulnerable to international competition and whose exports and imports are relatively price-sensitive are less likely to pursue strongly wage-led growth regimes, and

more likely to adopt profit-led growth regimes when compared to closed economies.

This can have important implications for the conventional analysis of the effects of exchange rate depreciation on both output and the trade balance. More specifically, if an economy is wage-led, exchange rate depreciation will probably have contractionary effects on output, although it may be effective in improving the trade balance. On the other hand, in an economy with a profit-led growth regime, exchange rate depreciation tends to have expansionary effects on output, but is less effective in improving the trade balance.

In this regard, the objective of this paper is to investigate the growth regime of the Brazilian economy and the economic policy implications inherent in this result, inspired by the proposals of Bresser-Pereira (2009b). Besides the introduction, the paper is divided into another four sections: the first addresses the theoretical aspects of the classification of growth regimes; the second analyzes the trends of Brazilian macroeconomic variables; the third provides an estimate of the economic growth regime in Brazil; and finally, the last section presents the final considerations of the research and some economic policy implications.

Theoretical aspects of the classification of growth regimes

Since the publication of the Bhaduri & Marglin (1990) article analyzing the effects of a change in functional income distribution on aggregate demand, several studies have been devoted to the empirical investigation of the relationship between distribution, accumulation and aggregate demand, among which are studies by Boyer & Bowles (1995); Uemura (2000); Stockhammer & Onaran (2004); Naastepad & Storm (2006-2007); Hein & Vogel (2008); Stockhammer et al. (2009).

To analyze the effects of a change in income distribution on aggregate demand from the theoretical standpoint, we begin the discussion of our model by defining the profit rate which, as the driving force of capitalist economies, emerges as a key category in the analysis of the capital accumulation process, and can be defined as: ¹

$$\begin{aligned}
 r &= \frac{p_y \Pi}{p_k K} = \frac{\Pi}{Y} \cdot \frac{Y}{Y_p} \cdot \frac{Y_p}{K} \cdot \frac{P_y}{P_k} \\
 r &= \pi u \sigma p = \left(1 - \frac{W}{Y}\right) u \sigma p \\
 r &= \left(1 - \frac{w}{\lambda}\right) u \sigma p \tag{1}
 \end{aligned}$$

In the previous equations r is the profit rate; Π is the real profit; Y is the gross domestic product; $\mathcal{Y}p$ is potential output; π is the profit share; K is the real capital stock capital; u is the capacity utilization; σ is the ratio between potential output and fixed capital stock; py is the prices of output, i.e., the implicit deflator of output; pk is the price of capital or the deflator of gross capital formation; p is the ratio between product price and capital price; W is the real wage (and $ws=W/Y$ is the wage share); w is the nominal average wage; λ is labor productivity, which is equal to \mathcal{Y}/N , where N is the employment level.

The idea that investment decisions are driven by profit expectations is implied in the equation that defines the profit rate. Investment spending is what enables profits and therefore there is a macrodynamic interaction between the two, which determines the level of capacity utilization, as suggested by Keynes (2007) and Kalecki (1987, 1983).

Wages, in turn, are at the same time determinants of aggregate demand and production cost, and an important tool in management and discipline strategies in capital-labor relations. Thus, although indirectly the wage level will influence the level of capacity utilization and the behavior of labor productivity.

The following macroeconomic relationship can be mobilized in order to clarify the links between the dynamics of productivity (λ), real average salary (w) and wage share (ws) and w is the average real wage,

$$w_s = \frac{W}{Y} = \frac{w}{\lambda} \quad (2)$$

considering that primary income distribution can be formulated as $\mathcal{Y} = \Pi + W$ and that $W = n.w$, where N is the employment level.

Among the factors that influence labor productivity (λ), three can be pointed out for the purpose of this analysis: in the short term, capacity utilization (u) and unemployment rate (μ); in the long term, the accumulation rate (i/K) has a positive effect on productivity growth, expressing the existence of increasing dynamic returns on a dynamic scale as indicated by the *Kaldor-Verdoorn law* (Kaldor, 1978). The latter represents the effect of cumulative growth, when higher demand levels pull productivity which, in turn, pulls the demand through the income and the acceleration effects on productive investment.

$$\lambda = \phi(u, \mu) \cdot \lambda_0 \cdot e^{[\rho(i/K)]} \quad (3)$$

com $\phi_u \geq 0$; $e \phi_\mu \leq 0$; $\rho_{i/K} \geq 0$

As a result, the rate of employment growth can be formulated as:

$$\dot{N} = \dot{Y} - \dot{\lambda} \quad (4)$$

Investment rate, in turn, can be defined as follows:

$$\frac{I}{K} = g_0 + g_r r + g_u u \quad (5)$$

In equation (5): I/K is the accumulation rate, where I is the real investment rate and K is capital stock; r is the gross profit rate, which includes depreciation of capital stock; u is the level of capacity utilization.

Thus, the capital accumulation rate (i/K) is influenced by three main factors: a) the (g_0) coefficient that captures the influences of the macroeconomic environment on investment decisions; b) the sensitivity of the accumulation rate to the gross profit rate (g_r) plays an active role and varies with changing expectations in the capital accumulation process; and c) the response of the capital accumulation rate to the increased use of installed capacity utilization (g_u) may be perceived as an adjustment mechanism to adapt supply to oligopolistic production conditions.

Using a saving function based on Kaldor (1978), we have:

$$S = s_w W + s_r \Pi \quad (6)$$

where s_w is the rate of savings from wages; W is the wage; s_r is the rate of savings from profits; Π is the amount of profits. Following the Kadorian hypothesis, the marginal propensity of capitalists to save is higher than that of workers, $s_r > s_w$.

Given the increasing share of exports in GDP, another important point to consider is the demand share made up by exports, more specifically how exports are related to the profit rate. The export function can be written as:

$$NEX_K = nex_0 + nex_{\pi-1} \pi_{-1} + nex_{u-1} u_{-1} + nex_{e-1} e_{-1} \quad (7)$$

Where NEX_k are net exports normalized by K ; e is the exchange rate; π is the profit share. It should be pointed out that real exchange rate depreciation increases the profit share and reduces real wages.

A function of excess aggregate demand (ED) is obtained from the investment and saving functions. When ED is normalized through nominal capital stock, $p_k K$, we have:

$$ED = g + (p_x S + G - T + NEX) / p_k K \quad (8)$$

In equation (8), g is equal to I/K ; G is government spending; and T is tax revenues.

The function of excess aggregate demand (ED) can also be written as a function of profit share and the level of capacity utilization (u):

$$ED = g_0 + g_r r + g_u u - (s_w W + s_r \Pi) \cdot (p_x / p_k K) + (G - T + NEX) / p_k K$$

$$ED = g_0 + g_r \pi u \sigma p + g_u u - s_w (1 - \pi) u \sigma p - s_r \pi u \sigma p + (G - T + NEX) / p_k K \quad (9)$$

The macroeconomic equilibrium condition can be written so as to match the investment demand with aggregate savings, i.e., $ED = 0$. In this context, investment determines savings, where the following partial derivatives, which are essential for identifying the patterns of economic growth, can be obtained:

$$ED\pi = -(s_r - s_w - g_r) u \sigma p + \partial(NEX / p_k K) \partial\pi$$

$$EDu = g_r \pi \sigma p + g_u - [s_w (1 - \pi \sigma p) + s_r \pi \sigma p] \quad (10)$$

The effect of changes in profit share on the capacity utilization is determined by the total differentiation of the equilibrium condition in the product market. Thus we have:

$$\frac{du}{d\pi} = \frac{-ED\pi}{EDu} \quad (11)$$

Following Boyer & Bowles (1995) and Uemura (2000), $ED = 0$ is the Keynesian stability condition. If $ED > 0$, the growth regime is considered “profit-led” in the sense that an increase in the profit share leads to an increase in the excess of aggregate demand because of the high sensitivity of investment to profit rate. Under these conditions, an increase in the profit share in the product would lead to an increased accumulation rate (i/K). On the other hand, if $ED < 0$, the growth regime is “wage-led.” In this case, an increase in the wage

share (w/s) would cause an increase in excess demand and then in the accumulation rate, due to the high sensitivity of investment to aggregate consumption.

As for the role of the external sector in the classification of growth regimes, Hein and Vogel (2008), for example, analyze the relationship between income distribution and economic growth in Austria, France, Germany, Holland, USA and UK, from 1960 to 2005. The results found by the authors suggest that in France, Germany, USA and the UK the growth regime is wage-led, while in Austria and the Netherlands it is profit-led. In the case of Austria, domestically speaking the economy has a wage-led growth regime, but when the external sector is included, the growth regime becomes profit-led. The authors conclude, based on this result, that a wage-led growth regime becomes less likely when the effects of distribution on the external sector are considered.

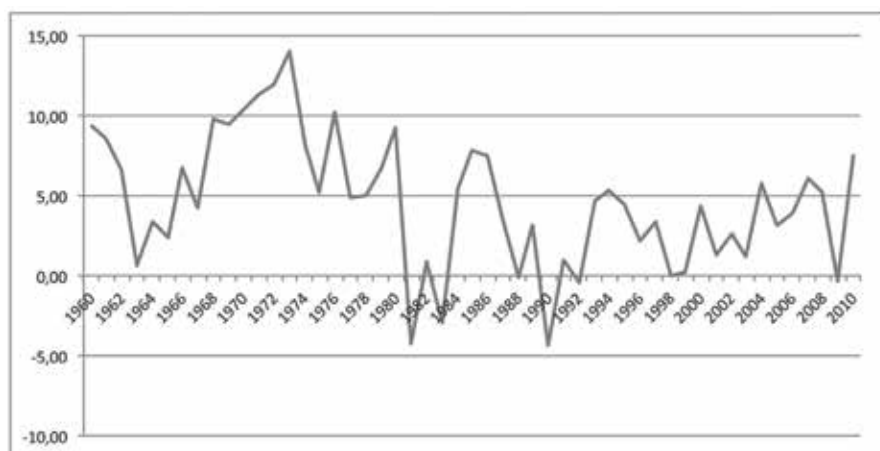
Blecker (2010) also shows that countries that are highly vulnerable to international competition and whose exports and imports are relatively sensitive to price are less likely to follow strongly wage-led growth regimes and more likely to have profit-led growth regimes when compared to closed economies (or open economies without trade volumes highly insensitive to price).

This can have important implications for the conventional analysis of the effects of exchange rate depreciation on output and trade balance. More specifically, if an economy is wage-led, exchange rate depreciation is likely to have contractionary effects on output, though it may be effective in improving the trade balance. On the other hand, in an economy with a profit-led growth regime, exchange rate depreciation tends to have expansionary effects on output, but is less effective in improving the trade balance

Trends of key macroeconomic variables in Brazil

The analysis of the dynamics of some macroeconomic variables such as real GDP growth, profit rate, capital accumulation, wage share and level of capacity utilization provide an overview of Brazil's economic growth and allows us to infer some aspects of the economic growth regime in Brazil.

Figure 1 shows the growth rate of the Brazilian economy since the 1960s.



Source: World Bank National Accounts Data, and OECD National Accounts data files (s. d.).

Figure 1 – Trend of GDP growth rate in Brazil after 1960.

It is possible to infer that the Brazilian economy records high growth rates in the period corresponding to the country's "Economic Miracle" (1967-1973). But in the 1980s and 1990s it experiences periods of irregular growth, alternating between positive and negative GDP growth rates. From the 2000s, especially after 2004, the Brazilian economy started to boast positive economic growth rates, although below those recorded in the 1970s. The period of high economic growth rates is also characterized by high capital accumulation and profit rates. Thus, during the 1970s the observation of these series shows that the investment rate was driven by increases in profit rates, which may be indicative of a profit-led growth regime, as shown in Figure 2. The capital accumulation rate and the profit rate in fact share a common evolution trend in the period 1966-1993, and remain clearly in positive correlation. There is, however, a growth period (1966-1975) and then a joint decrease in these variables, which express the unfolding crisis in the growth regime of the "miracle" period, with the structural and cyclical problems throughout the 1980s.

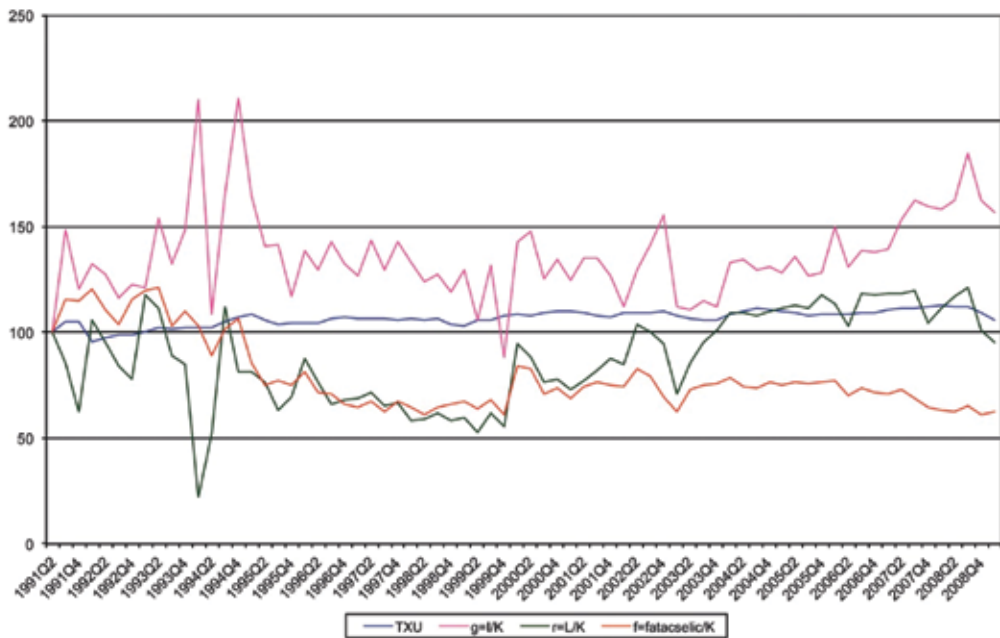


Source: IBGE (2011) and Marquetti (2000).

Graph 2 – Average profit rate and accumulation rate (1966-2008).

Starting from 1994 the evolution pattern becomes very different, highlighting two other phases: a phase of relative stagnation, when profit rate and accumulation rate disconnect. The first variable maintains itself in a growth path, while the second remains almost stagnant. As a direct macroeconomic result, economic growth became very unstable and at very low rates relative to the historical average. The third and last phase reveals that these two variables go back to showing expansion paths, just as the Brazilian economy begins to grow again. But, in fact, it was the capital accumulation rate that grew fast again (average of 7.8% annually between 2004-2008), because the profit rate had been growing since 1999, with an average annual growth of 1.8%.

It is interesting to perform a more detailed analysis of what has happened in the recent period of the Brazilian economy. As of 1994, as shown in Figure 3, the rate of productive capital accumulation grows again, when the profit rate seems to be the main determinant of capital accumulation rate, while the capacity utilization rate seems to not have had great influence. It is noteworthy that the profit rate used here is the corporate profit rate, i.e., that which is calculated on the corporate profit rate, which is what really matters for an investment decision. This variable rises during the economic growth period (2004-2009) in relation to the variable used as proxy for the cost of use of productive capital.

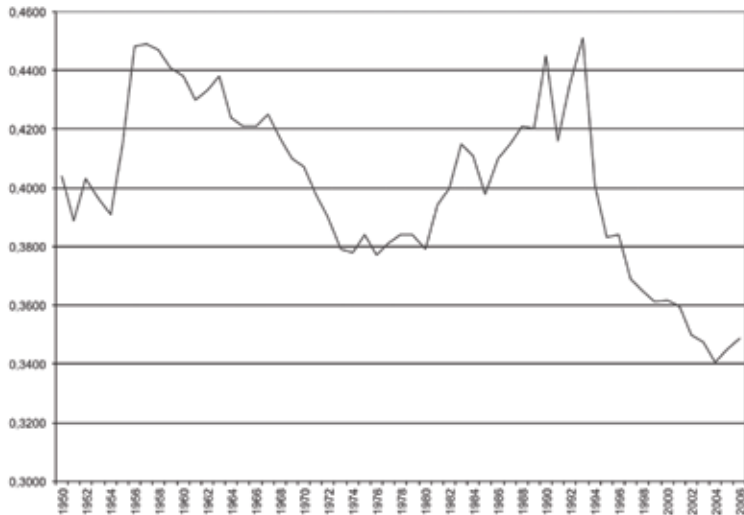


Source: Ipeadata (2008).

Graph 3 – Profit rate and its components (logarithmic scale).

Another interesting point is that between 1991 and 2003, corporate profit rates and this proxy go together, in such a way that companies cannot profit in a way that justifies the allocation of productive resources, hence the trend towards a semi-stagnation.

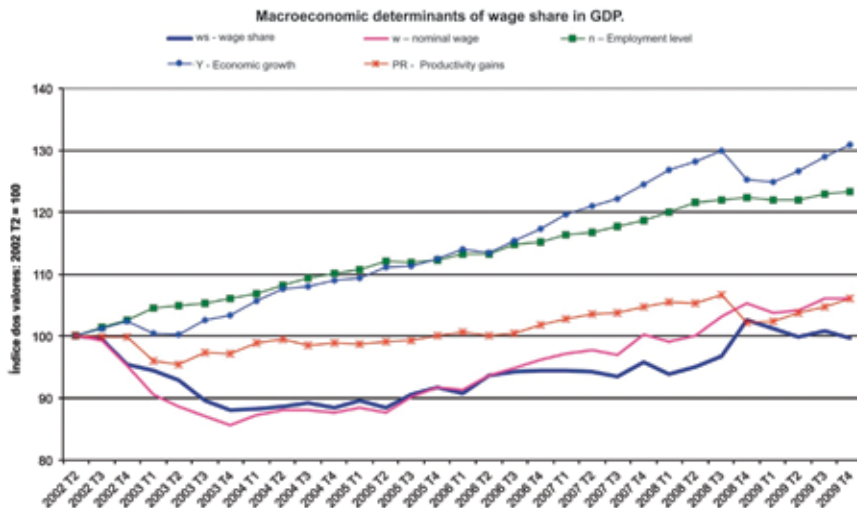
Figure 4 shows the behavior of the wage share in Brazil since the 1960s, from which it is possible to infer the behavior of the profit share that is given by a minus for the wage share. It is clear that the 1960s and 1970s are characterized by a reduction in the wage share in total income. In the 1980s the wage share gains ground, but soon after starts a downward trend.



Source: IBGE (2011) and Marquetti (2000).

Graph 4 – Wage share

Figure 5 presents the latest data on the evolution of wage share in Brazil and some other labor market indicators. According to the figure, an increase in wage share is seen from 2006, due mainly to the growth of employment and real wages.



Source: Ipeadata (2008) and IBGE (2008).

Note: Value Index.

Graph 5 - Macroeconomic determinants of wage share in GDP.

Estimates of growth regime of the Brazilian economy

In this paper the classification of growth regimes is based on the theo-

retical model discussed in section 2 of the article and performed for the period 2002-2008, with quarterly data.² The construction of the series is described in the appendix.

Previous studies, such as Bruno's (2003), have already classified the economic growth regime in Brazil between 1973 and 2000, using the same methodology as in this research. The results found by the author suggest that the growth pattern of the Brazilian economy was profit-led between 1973 and 1979, and wage-led in the period 1981-2000.

The classification of growth regimes for the recent period can be done by estimating the savings, investment and net export functions (Table 1).

Table 1 – Estimated equations (2002-2008)

Investment Function:		$\frac{I}{K} = g_0 + g_r r_{t-1} + g_u u_{t-1}$			
Dependent variable	G_0	G_r	G_u	R^2	
	-7.68	0.31	0.31	0.55	
	(-1.97)	(1.96)	(1.96)		
	(0.063)	(0.063)	(0.063)		
Savings Function:		$S = s_w W + s_r \Pi$			
Dependent variable	s_w	s_r	R^2		
<i>S</i>	0.42	1.46	0.79		
<i>Test t</i>	1.77	4.19			
<i>Prob.</i>	(0.08)	(0.00)			
Export Function 1:		$NEX = nex_0 + nex_{\pi-1} \pi_{-1} + nex_{u-1} u_{-1} + nex_{e-1} e_{-1}$			
Dependent variable	nx_0	nx_{π}	nx_u	nx_e	R^2
<i>NEXk</i>	-2.90	1.31	0.48	0.40	0.63
<i>Test t</i>	(1.07)	(3.62)	(0.96)	(3.26)	
<i>Prob</i>	(0.29)	(0.00)	(0.34)	(0.00)	
Export Function 2:		$NEX = nex_0 + nex_{\pi-1} \pi_{-1} + nex_{u-1} u_{-1}$			
Dependent variable	nx_0	nx_{π}	nx_u	nx_e	R^2
<i>NEX</i>	4.88	1.45	-0.85	0.40	0.46
<i>Test t</i>	(3.22)	(3.40)	(-2.43)	(3.26)	
<i>Prob</i>	(0.00)	(0.00)	(0.02)	(0.00)	

Note: All series in log, test t in brackets.

Considering the model presented in the theoretical section, the rule for deciding on the classification of a country's internal growth regime is:

If: $-(sr - sw - gr) > 0$ à *profit-led*

If: $-(sr - sw - gr) < 0$ à *wage-led*

According to the decision rule and without considering the external sector we have:

$$-(1,46 - 0,31 - 0,42) = - 0,63$$

Which implies a wage-led internal growth regime.

However, when considering the export function we have:

$$-(1.46 - 0.31 - 0.42) = - 0.63 + 1.31 = 0.68 \text{ à } \textit{profit-led}$$

Or,

$$-(1.46 - 0.31 - 0.42) = - 0.63 + 1.45 = 0.82 \text{ à } \textit{profit-led}$$

Therefore, when including the participation of the external sector, the growth regime of the Brazilian economy can be classified as profit-led, which is consistent with the idea that a wage-led growth regime is less likely when considering the effects of distribution on the external sector. These results were reported by Hein and Vogel (2008) and established by Blecker (2010).

According to Bhaduri & Marglin (1990) and Blecker (2002), in the context of growth and income distribution models like those presented and discussed in this research, the level of the real exchange rate can affect long-term growth due to the impact it has on functional income distribution. Thus, if the accumulation regime is characterized as profit-led, a depreciation of the real exchange rate would lead to an increase in the degree of capacity utilization and the rate of investment, given that the depreciation of the real exchange rate will imply a reduction in real wages, which will increase the profit margin of the companies and have a positive effect on their planned investments.

This reduction in real wages will reduce consumer demand because of the differences between the propensity of workers and capitalists to consume. However, if the sensitivity of investment to profit margin variations is high and the difference between the propensity to consume of capitalists and workers is reduced, the decrease in consumer demand induced by the reduction in real wages will be more than offset by increased investment demand, leading to an increase in the degree of capacity utilization.

Otherwise, the reduction in real wages produced by exchange rate depreciation will result in a decrease in the degree of capacity utilization, which generates negative effects on investment and thus on the growth rate of real output due to the “acceleration effect.” In this case, the economy will be operating on a wage-led regime.

Based on the estimates presented, it can be expected, therefore, that a depreciation of the real exchange rate will have a positive effect on investment in the Brazilian economy, which is in agreement with the arguments favoring the adoption of more competitive exchange rates, as presented in Bresser-Pereira (2009a, 2009b).

Final considerations

The possibility to establish relationships between the macro growth pattern and accumulation regimes led this article to investigate which growth regime has been observed in the Brazilian economy over the past few years, providing a theoretical model that served as the framework for the presentation of empirical results regarding the Brazilian economy.

The empirical results show, on the one hand, that internally the Brazilian economy follows a wage-led growth pattern, in such a way that aggregate demand responds positively to an increase in the share of wages in income. On the other hand, when considering the participation of the external sector, i.e., the determination of net exports, the accumulation regime can be established as profit-led. This result, according to international empirical evidence, is becoming increasingly characteristic of internationalized economies. Thus, when considering investment and exports, aggregate demand responds positively to an increase in the share of profits in income, and it can be said that the economy is characterized by a profit-led accumulation regime.

This conclusion has important implications for the analysis of exchange rate policy and the possible effects of a more depreciated exchange rate on the Brazilian economy. A higher exchange rate has positive effects on investment profitability, given the characterization of the Brazilian economy as profit-led. This would imply greater capital accumulation, savings, exports and a higher level of aggregate demand, as highlighted by Bresser-Pereira (2009b). Moreover, stimulating aggregate demand through exchange rate could lead the Brazilian economy to a macro growth pattern that is more sustainable and less prone to external constraint issues, pulled by more investment and less consumption, which would lead to higher economic growth rates, as is the case in China and other Asian countries like Korea, Thailand and Malaysia.

Notes

- 1 There are several models that analyze the effects of a change in functional income distribution on demand, but this section is based largely on the works of Uemura (2000) and Bowles & Boyer (1990 and 1995). Bruno (2003) also follows these articles as the basis for his analysis of growth regimes in Brazil between 1973 and 2000.
- 2 The period of choice follows the change in methodology for calculating the employment series and precedes the financial crisis whose effects began to be felt in Brazil in the last quarter of 2008.

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Appendix

Table 1 – Research variables

Variable	Comment	Source
Capital stock (K)	Stock of fixed productive capital. This corresponds to the sum of stock for machinery and equipment in non-residential constructions.	Ipeadata
Gross profit rate (r)	Corresponds to the mass of macroeconomic gross profit divided by total fixed productive capital stock (K) of the Brazilian economy. The gross income was calculated by the difference between GDP and wages. The latter included the remuneration of employees and self-employed workers and social security contributions.	IBGE and Ipeadata
Accumulation rate of fixed productive capital (g)	Corresponds to the ratio between gross fixed capital formation and stock of productive fixed capital (K) available to the Brazilian economy.	Ipeadata and IBGE
Level of installed capacity utilization (u)	Corresponds to the seasonally adjusted series produced by the National Industry Confederation (CNI).	Ipeadata
Savings (S)		Ipeadata

Investment (I)	Corresponds to the ratio between gross fixed capital and GDP	Ipeadata
Real effective exchange rate (e)		Ipeadata
Net exports (NEX)	Trade balance	Ipeadata
Total wages (W)	Corresponds to the sum of income of employees, revenue of autonomous workers plus social contributions.	IBGE
Total profits (L)	Corresponds to non-agricultural GDP minus wages (W).	IBGE
Profit share (π)	Corresponds to profit share (L) in GDP	IBGE

ABSTRACT – This article investigates the growth regime prevailing in the Brazilian economy from 2001 to 2009 by presenting a theoretical model that underpins the empirical research concerning the Brazilian economy. The results show that, internally, the growth regime of the Brazilian economy is *wage-led*, but when considering the external sector it can be characterized as *profit-led*. This has important implications for a conventional analysis of the effects of a depreciation of the exchange rate on domestic production. More specifically, depreciation in the exchange rate tends to have expansionary effects on domestic production.

KEYWORDS: Growth regimes, Brazilian economy, Exchange rate policy.

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