

THE ACCUMULATION OF CAPITAL AND ECONOMIC GROWTH IN BRAZIL. A LONG-TERM PERSPECTIVE (1950-2008)

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Abstract

This article analyses the development of economic growth in Brazil in terms of capital accumulation, following the Marxist approach. The aim is to identify the relationship between the two processes, looking at the profit rate, which along with investment effort determines productive investment. In turn, this one affects the capital-labour ratio and labour productivity. Both, with the addition of the price ratio, determine the productivity of capital, a key variable in understanding the accumulation process in Brazil. Using the period 1950-2008 allows comparing two phases in the Brazilian economy, the period of substitutive industrialisation and the neoliberal phase, all from the perspective of the relationship between the aforementioned variables.

Keywords: growth, investment, profitability, productivity

JEL codes: E11; E22; E32; N16; O40

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INTRODUCTION

The purpose of this article is to analyse the growth process in Brazil between 1950 and 2008 using the dynamics of capital accumulation. It draws on Marxist economic theory, whose core lies in the labour theory of value (LTV). The study is performed by estimating two main categories: i) the rate of profit, the foundation of investment, and ii) the productivity of capital, looking at the way in which these variables are related at different stages of economic reproduction. 1950-2008 was chosen because an official series of data on capital stock (see IPEA data) was available for this period and this is the fundamental variable in the analysis. In addition, selecting this period makes sense in economic terms given that it allows for a comparison between two different phases of economic policy and development.

The more specific objective is to analyse the type of relationship between GDP and investment (gross fixed capital formation, GFCF), reflected in the capital stock.¹ This is achieved by taking the aforementioned theoretical approach, based on the LTV. It suggests that economic growth ultimately depends on the rate of investment, which in turn is related to the profitability of capital, the driving force of capitalist production. In other words, capital accumulation and the productive investment of a portion of the profit obtained is the main element behind the process of economic growth (Harris, 1978). The accumulation, on the other hand, represents the rate at which a country increases its stock of productive capital. In Brazil, this analysis is particularly relevant given its status as an underdeveloped economy, being part of what could be described as the semi-periphery.

The literature on this issue focuses mainly on the investment flow, emphasizing the cost of the fixed capital formation (IEDI, 2007), that Carneiro (2007) relates with the economic structure. In the case of studies using the growth of the fixed capital stock and the profit rate, there is an extensive literature largely supporting the idea of a profit-squeeze through finance (see, among others, Gonçalves, 2006, Bruno, 2007; Bruno *et al*, 2009, Medialdea, 2010, 2012). This line of analysis gives a central role to finance so as to negatively influence the path of capital accumulation, profitability and thus industrialization. It is the so-called financialisation or the *finance-dominated*

¹ Rather than to demonstrate it quantitatively. In any case, recognized in orthodox analyses such as those by IEDI (2007) and Bonelli (2005).

accumulation regime. This approach, however so extended in heterodox currents, is criticized by Gaulard (2010), who even sustains the positive role of the financial sector in order to restate profitability, as well as restoring the priority of the organic composition of capital. Within the Marxian approach, the study of Marquetti (2012a) focuses on the technical change, whereas Marquetti, Filho and Lautert (2010) analyse the dynamic of the profit rate, together with the capital accumulation process and the income distribution pattern.

This article takes a similar methodology to that of the above-mentioned Marquetti, Filho and Lautert regarding the estimation of the analytical categories. There are however a number of differences. First, a theoretical framework for analyzing undeveloped economies like Brazil is provided. In particular, giving primacy to the productive capacity of surplus. Secondly, it focuses on the dynamics of economic growth and in comparing two historical phases, where we analyze the way profitability and capital accumulation are related, as well as the reconfiguration of the economic structure and the role of the price ratios.² And third, it aims at analyzing the economic growth, for which it takes profits and capital, nor the other way around.

This paper is organised as follows. I start by setting out the theoretical foundations. First, looking at the role of investment in the dynamics of growth from a Marxist perspective, to which specific features of non-advanced economies are added. Second, I present the variables to be analysed in the following sections: i) the accumulation of capital, which is related to the rate of profit and the investment effort; and ii) profitability, which in turn depends mainly on the productivity of capital. In the second section the relationship between economic growth and investment in Brazil is empirically addressed, while in the third section I study the key determinants of capital accumulation. I start by considering profitability, calculating both the rate and mass of profit; and secondly, the productivity of capital, which is analysed through what I will call the ‘productive efficiency of investment’ and the relative prices of capital and output, as well as their evolution.

² Thus, an additional objective (and so, implicit) is to show the real basis where the so-called financialization is indeed a consequence. Although it is not the purpose of this article, it is worth mentioning at least as a way to show the implications for both the theoretical and the empirical parts, and thus, for further lines of research.

THEORETICAL ASPECTS

In this section I address the theoretical foundations of the relationship between capital accumulation and economic growth. First, in abstract terms through the capitalist mode of production (CMP), and second by highlighting some specific issues relating to underdeveloped economies given their role in the world economy.

Profitability, accumulation and economic growth

Generally speaking, economic growth refers to an increase in gross domestic product ($GDP = Y$), which we mainly explain through the accumulation of capital, as a social relationship for the purpose of valorisation. Roughly, the causality is {profitability \rightarrow accumulation \rightarrow growth}, although this contains significant reciprocities that make the analysis more complex.

The importance we attach to investment is due to the fact that it determines, or at least largely conditions, the other components of aggregate demand. In a closed economy, spending is divided between consumption (C) and investment (I), so that $Y = C + I$. Household consumption depends on the wage income received by workers (W, or variable capital 'v'), resulting from the level of employment (L) and productivity (π). From the perspective of capital, the expenditure to hire workers is one of the elements of investment spending, together with the elements of constant capital (see Mateo, 2011; Shaikh, 1990). Both are related, by means of the different expressions, to what Marx (1867) called 'the composition of capital', which we can approximate, whilst being aware of the theoretical controversies, using the capital-labour (K/L) ratio, capital-wages (K/v) and the productivity of capital or the inverse of the capital-output ratio (Y/K).³

Conceptually, production precedes consumption as it allows for the creation and expansion of the domestic market. This is because investment, unlike consumption, is the mechanism for increasing productivity and reducing production costs.⁴ This central

³ Where K is the stock of fixed capital, as measured by IPEA data, and explained in the appendix. For the theoretical characterization of these concepts, we refer you to Mateo (2007; 2008). It should be clarified that we do not intend to perform an exercise to empirically verify the Marxian variables, but instead use a number of quantitative relationships between variables whose accounting follows the same approach as the System of National Accounts, but that, we believe, have some connection with the expressions for the composition the capital. That said, in this article we do not address the ratio K/v.

⁴ If we now consider the case of an open economy, improving competitiveness (competitive advantage) to increase exports is related to investment, which also allows for the expansion of the foreign market.

role for investment is reflected in the way it determines the economic cycles (Astarita, 2010). Ultimately, recessions occur because of falling investment demand, in turn explained by insufficient profitability.

The rate of capital accumulation is the amount of gross investment (I_G) per unit of gross fixed capital stock ($K = K_{GF}$). It indicates the rate of progress in the accumulation or growth of capital. It can be represented in terms of the rate of profit (r) and the investment effort (ie_f), understood as the mass of profits (p) that is reinvested, i.e., the rate of accumulation of profits (I_G/p).

$$ie_f = \frac{i_G}{p}$$

The ‘investor limit’ (following Shaikh, 2000) is defined by the accumulation of all the mass of profit, that is, when $ie_f = 1$. Therefore, the key determinant of investment is profitability, but this can vary depending on the aforementioned reinvestment of profits.

$$\frac{I_G}{K_{GF}} = \frac{p}{K_{GF}} * \frac{I_G}{p} \Rightarrow k = rie_f \quad (1)$$

Under the profitability term, we can refer to both ‘ p ’, indicating the purchasing power of corporate profit, as well as the ratio $r = p/K$, which represents business profit over the stock of capital. The latter can be expressed as:

$$r = \frac{Y}{K_{GF}} \frac{p}{Y} = PK \cdot \beta \quad (2)$$

The profit rate ‘ r ’ depends on i) the capital-output ratio or capital productivity (PK),⁵ and ii) the profit-share (β), representing the part of the working day accounting for surplus labour. The importance of this equation, however, is the causality derived from the Marxist concept of the accumulation process, together with the limits of the distributive dimension.⁶ Indeed, economic reproduction is carried out by increasing the stock of capital, as reflected in the trend for capital-intensive technological change, or the progressive mechanisation of production. This mechanisation, whose key variable is

5 For a clarification of our interpretation of this term, because of the controversies raised in the field of Marxist economics, please see the annex.

6 In other words, the sphere of the technology of production, which implies a secular increase in K/L , has an essentially social content because it responds to the basic purpose of capitalist production (valorization), i.e., maximising the appropriated profit given the total product.

the ratio K/L, constitutes the mechanism used to increase 'β'. As $\beta \leq 1$, we look at the productivity of capital (PK= Y/K).

$$PK = \frac{Y}{K_{GF}} = r_{max} \Leftrightarrow W = 0; \Rightarrow \frac{p}{K_{GF}} = \frac{Y}{K_{GF}} \quad (3)$$

The ratio Y/K is 'a basic determinant of unit costs with fixed capital because the amount of capital used in production determines, in turn, the consumption of fixed capital and, therefore, depreciation.' (González and Mariña, 1992:13). Regarding trends in profitability, the output-capital ratio or capital productivity (PK) represent the maximum profit rate (r_{max}) in a zero wage situation ($W= 0$). Under these conditions, all income would take the form of an operating surplus ($p= Y$), so the profit-share would be the maximum ($\beta= 1$). However, this statement is nothing more than a mathematical example taken to the limit. In theoretical terms, the LTV approach implies that surplus value is the result of the surplus labour of the worker, whose surface or empirical manifestation is seen in the business surplus, in turn reflected in various figures appearing in the National Accounts (see Shakih and Tonak, 1994). Therefore, the business surplus requires the use of labour (L), so we always have $W> 0$ and $\beta < 1$.

Prioritising the productive sector over the distributive one, profitability depends mainly on PK because it incorporates two opposing but closely related effects: i) expanding the amount of value per unit of labour, which means a higher potentially appropriable income (β), but also, ii) the need to mechanise the production process in order to increase the productive capacity (K/L, and labour productivity). Thus, the rise in the K/Y ratio is the central variable in the law of the tendency of the rate of profit to fall, as it leads to a fall in effective profitability, no matter how fast business profits increase.

In short, PK depends on the relationship between labour productivity ($\pi= Y/L$) and the capital-labour ratio (mechanisation, K/L), which we represent through the productive efficiency of investment (PEI= θ), together with the ratio of the price deflators of output and capital stock (P_Y/P_K), since both Y and K are expressed in constant or real terms (subscript k):

$$PK = \frac{Y_k/L}{K_k/L} \cdot \frac{P_Y}{P_K} = \theta \cdot \frac{P_Y}{P_K} \quad (4)$$

According to Marx's approach, PK follows a downward trend, unlike in the dominant economic growth theories, both neoclassical and (post) Keynesian. Ultimately, it is the

growing pressure for a fall in the rate of profit that, in generating stagnation or a decline in the amount of surplus, leads to the collapse of investment; and therefore to the economic recession itself (see Mateo, 2007).

Accumulation and underdevelopment

The analytical framework presented above, with a high degree of abstraction, must be developed further to identify the particular features of non-developed economies, as is the case with Brazil. In our analysis we give a central role to the level, structure and growth of the capital stock (K), the key to the ability to reduce costs by increasing productivity, and by extension, economic growth. In fact, the lower capital endowment is itself a structural obstacle in underdeveloped economies (Medialdea, 2012).

The capital accumulation process in these economies share a number of features: i) a reduced level of capital stock; ii) a dependence on importing the means of production, as well as some of the consumption goods for workers, and luxury ones for the upper classes, or in other words, the elements of constant and variable capital; iii) a lower surplus-production capacity to increase this stock, so there is a need to use foreign savings, creating a dependence on international finance, and therefore, iv) imbalances or sectoral and social disparities, i.e., unbalanced growth between different segments of the economy and highly regressive income distribution. As a consequence, the amount of wages leads to a lower working class consumption. Therefore, in analysing the accumulation process in such economies, the external sector must be taken into account in a qualitatively different way to that used for developed economies (Astarita, 2005).

Because of the way it incorporates the external dimension into the dynamics of accumulation, the exchange rate (ER) plays a crucial role in the economic development of these societies. Since the currencies they issue are not reserve (value) currencies on a global level, the conversion of domestic (concrete) labour into global abstract labour (value) is fundamental in the analysis of reproduction. There are several consequences.

First, the causal link between profitability and investment requires the inclusion of other factors, such as expectations about monetary stability, both internal and external, along with the possibility of taking capital out of the country and the availability of international reserves, but also the economic policy of advanced countries and other circumstances of the specific moment. As a consequence, this relationship, generally

much more complicated than theoretically expected, becomes even more dependent in the historical and institutional context in the case of non-developed economies.

Second, the role of the exchange rate (ER) implies a certain duality between sectors, not only in relation to the means of production (I) and labour force (consumer goods) (II), but also with tradable and non-tradable ones. The level and volatility of the ER has an impact on investment and its sectoral composition, which can lead to serious disproportionalities, with unequal levels of growth in the different sectors and in the relationship between productive investment and GDP growth. In a less productive development situation, profitability becomes more affected by the ER due to an external dependence in the production process (Astarita, 2010b). Empirically, it means added importance for the P_Y/P_K ratio, which highly conditions the productivity of capital.⁷ Therefore, economic growth in these economies follows the basic laws of the capital accumulation process, according to the LTV. In this sense, the crucial area is the capacity to produce value, which largely explains the economic growth and the type of external integration.⁸

ECONOMIC GROWTH AND INVESTMENT

During the period studied, 1950-2008, the growth pattern in Brazil underwent substantial changes. Between 1950 and the 1980s, industrialisation arising from the import substitution (ISI) strategy was in effect, and state and transnational foreign capital, across industrial sectors, played a central role. The economic crisis during that decade, manifesting itself in the form of an increase in foreign debt, led to a restructuring towards neoliberalism that culminated in the implementation of the ‘Real Plan’ for the next decade.

So we have therefore considered two periods, 1950-80 and 1980-2008. The first phase corresponds to a period of substantial expansion, with a 7.4 and 4.5 per cent of average annual growth rate (hereinafter AVR) and GDP per capita (pc) respectively, while the

⁷ This underdevelopment leads to a more regressive income distribution. Therefore, the distributive dimension is not a cause of backwardness, but a consequence of a reduced level of capital stock and productive capacity. In addition, the problem does not lie in a low rate of domestic savings, which in fact is a result of the capacity for generating surplus. For these reasons, this paper will not address the issue of the distribution of income, except in a complementary manner simply to illustrate the evolution of the profit share.

⁸ The analysis differs from most Marxist writers on this issue, following the proposal of Emmanuel (see the compilation of discussions shown in Emmanuel, Bettelheim and Amin, 1990), followed by Marini (1973), although he is the author who most consistently has sought to provide the dependence approach with LTV-based foundations, and currently stated by Carchedi (1991).

second phase involves lower figures, just over one-third for GDP and less than one quarter in terms of GDP pc (Table 1). Another important aspect is the relative stability seen during the first three decades, since GDP never fell in absolute terms, only slowing in terms of its growth in 1963 (0.60 per cent), and the same was true for GDP pc. Over this period we can highlight the years 1968 to 1973, known as the ‘Brazilian miracle’, following the launch of the *Plano Estratégico de Desenvolvimento* (Strategic Development Plan), during which it recorded an AVR of 11.1 and 8.26 per cent of GDP and GDP pc respectively, the highest figures in recent history. Since 1980, there have been three relatively short growth phases, although these have not been as intense as previous ones (taking the average over the 3 decades), 5 years with negative GDP growth rates and 3 years with less than 1 per cent of growth.

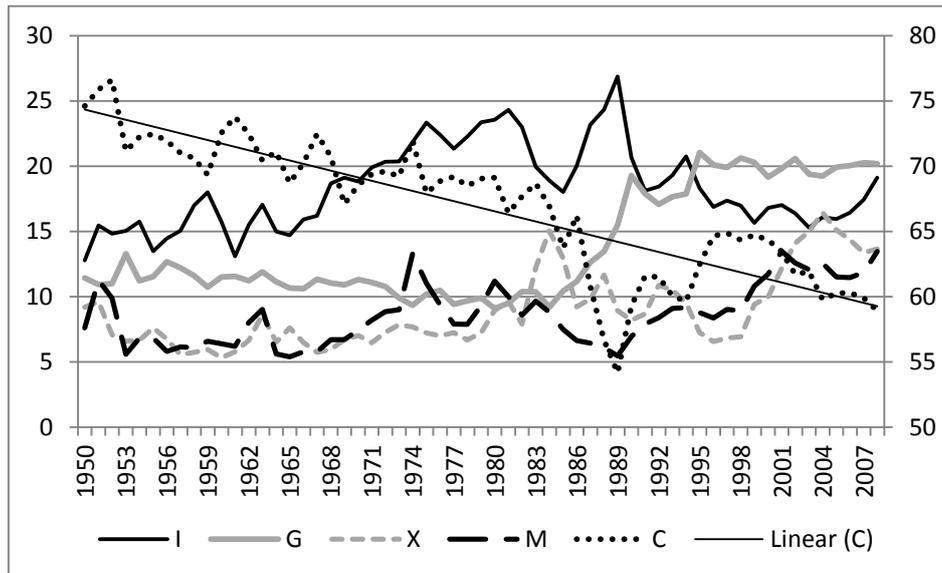
Table 1. Phases of economic growth in Brazil

		1950-1980			1980-2008			
	1950-2008		1950-62	1963-80		1983-87	1992-97	2003-08
GDP	5.10	7.41	7.39	7.83	2.54	6.07	3.99	4.82
GDP pc	2.76	4.50	4.25	5.10	0.83	3.81	2.39	3.59
Notes. Annual rates of change of GDP and GDP per capita (%)								
Source: IPEA data								

From a long term perspective, in Figure 1 we see the aggregate demand elements of GDP for the purpose of locating the variable under study, namely investment. The share of GFCF in GDP does not exhibit a downward trend over the long term, but we do see abnormally low levels. It accounted for just over 20 per cent of GDP between 1972 and 1982, and later again in 1986-90 (and 1994), with the second half of the 1980s being the period with the highest level of investment in relative terms, with a maximum of 26.86 per cent in 1989.⁹ Furthermore, it did not exceed 15 per cent in 1950-7 and 1964-5. The 1970s and 1980s were therefore the years with the greatest investment, although averaging only 21.4 and 22.2 per cent of GDP respectively. Subsequently, the two later decades saw levels significantly higher than those for the 1950s and 1960s: 18.2 and 16.7 compared to 15.2 and 16.1 per cent respectively.

⁹ The problem is that these increases in the investment coefficient imply falls in profitability, with a lag of two years in the first phase and one year in the second one, as will be seen later.

Figure 1. Structure of aggregate demand (%)

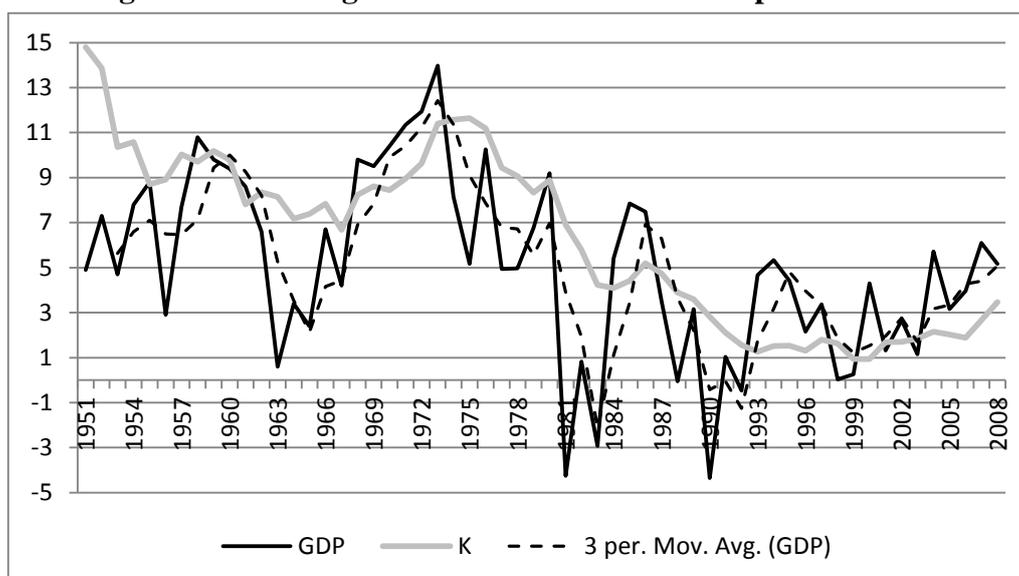


Notes. Series of private consumption (C) (right), Gov. expenditures (G), investment (I), exports (X) and imports (M) (left) (% of GDP).

Source: IPEA data

The rate of accumulation is generally higher than that for GDP (Figure 2). Between 1950 and 1980 the difference is 2.11 percentage points and since 1980 both series have been more highly correlated with very similar averages and a difference of only 0.23 points in favour of accumulation. However, while the expansionary phases of 1950-62 and 1963-80 saw differences of 2.86 and 1.26 points, which was subject to a downward trend, later stages were characterised by a paradox because during times of GDP growth, the accumulation rate is relatively low, but when there is a recession, accumulation exceeds the rate of growth of GDP.

Figure 2. Rates of growth of the fixed stock of capital and GDP



K: gross fixed capital stock, also shown in a trend line

Source: IPEA data

Table 2. Comparison of GDP and capital stock growth rates during periods of expansion and recession

	1950-1980		Growth		1980-2008			Recession			
			1950-62	1963-80	1983-87	1992-97	2003-08	1980-83	1987-92	1997-99	
GDP	7.41		7.39	7.83	2.54	6.07	3.99	4.82	-2.12	-0.14	0.14
K	9.52		10.26	9.09	2.77	4.61	1.48	2.44	5.64	2.79	1.29

Annual rates of change of GDP and gross fixed capital stock (K)

Source: IPEA data

In contrast, the effectiveness of capital accumulation, in terms of the GDP growth it induces, has been progressively greater, especially since the 1980s. However, its trend is downwards, and therefore the growth rate of GDP also falls progressively. So, for each percentage point of growth of the capital stock, GDP grew by 0.78 per cent between 1950 and 1980; and 0.72 and 0.86 per cent in the two sub-periods of expansion (1950-62 and 1963-80). In the second phase, the ratio is 0.91, with 1.32 in 1983-7, 2.69 in 1992-7, falling to 1.97 during 2003-08. In a complementary way, in the periods 1980-3, 1987-92 and 1997-9, when GDP fell on average 2.12; 0.14 and 0.14 per cent per year, respectively, the rate of accumulation is 5.64; 2.79 and 1.29 per cent. Also, in 2001 and 2003, with GDP growth of only 1.31 and 1.15 per cent respectively, the accumulation rate is higher, at 1.69% and 1.84 per cent. The correlation coefficient between the change in GDP and gross fixed stock of productive capital is 0.989, but nevertheless the

growth rates of both variables have a weaker correlation (0.56), although this is increasing over time.

DETERMINANTS OF CAPITAL ACCUMULATION

Having analysed the dynamics of accumulation, in this section we address its determinants. We start with profitability, due to the nature of capitalist production, this being a process of valorisation, and continue with the productivity of capital because of its relationship with the rate of profit.

Profitability of capital

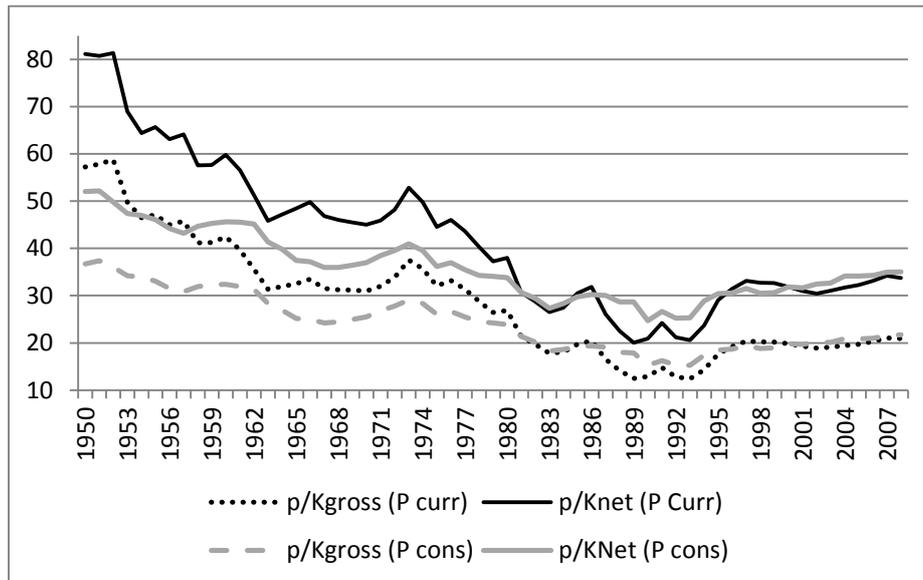
Following the approach of Marx (1867), the key determinant of the accumulation process is profitability. At this point it is worth looking at different dimensions of the ratio $r = p/K$, and thus the evolution of the mass of profits, so that we can later address their relationship with investment.

Rate and mass of profits

The calculation of different expressions of the rate of profit (Figure 3) clearly shows that this has declined over the period. However, the scale of the fall depends on the type of estimate. The greatest decrease was seen using the gross capital stock at current prices, which had fallen to only 36 per cent of the level in 1950, while the net stock measure is slightly higher, at 41 per cent. At constant prices, the fall is 40 and 33 per cent for gross and net stock, respectively.¹⁰

¹⁰ Although emphasizing the evolution, it is worth mentioning the high level of the profit rate, mainly in the 1950s, above 50 per cent in the case of the net stock at current prices. The analysis of the level would require another research, as it should be necessary to make international comparisons and addressing internal factors like the protectionist of the import substitution strategy. See Saad-Filho and Mollo (2000).

Figure 3. Capital profitability (%)



Series for the rate of profit calculated as profits (p) over the fixed capital stock in gross (Kgross) and net terms (Knet) at current (P curr) and constant prices (P cons) (%)

Source: Marquetti (2012b) and IPEA data

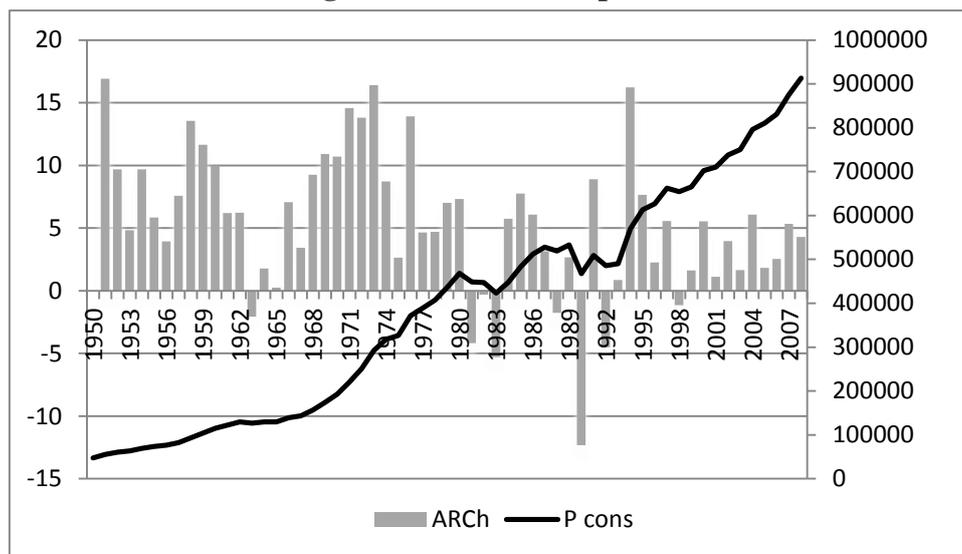
If we analyse the rate of profit to gross stock at current prices (r), two periods can be observed, each of which must be qualified. From 1952 to 1989 it fell by 78 per cent and was followed by a period of stagnation between 1989 and 1993. After that it increased by 68 per cent. If we look at the annual average, the rate of profit falls initially at a rate of -3.81 and then increases to 3.76 AVR.

In the first period, two phases can be observed, the first from 1952 to 1963 and the second from 1973 to 1989, with AVR of -5.36 and -6.30 respectively, profitability increasing very slightly between them, a total cumulative of 19.5 per cent or 1.88 AVR. In the second phase of recovery it can be seen that the rise is limited to the first five years (1993-7), when it increases at an AVR of 13.42, after which time it stagnates (only a 0.25 per cent of annual increase). The recent growth in 2004-8 is based on a recovery of the profit rate, which was 11 –per cent from 2002 to 2007, representing a 2.16 AVR.

The mass of profits (Figure 4) completes the information provided by the profit rate. Falls in absolute profits allow us to identify recessions in the Brazilian economy: i) - 2.04 per cent in 1963, with stagnation until 1965; ii) in the early 1980s (1981, 1982 and 1983); and iii) shortly afterwards in 1988, 1990 and 1992, where we can highlight the decline of -12.30 per cent in 1990. Subsequently, there was a slight fall of -1.14 per cent

in 1998, and almost stagnation (1 per cent of growth) in 1999, 2001, 2003 and 2005. Therefore, it becomes evident that the potential capacity to generate a surplus was much higher between 1950 and 1980, when the AVR was 8.85 from 1950 to 1962 and 9.02 from 1966 to 1980. The mass of profit then stagnates between 1981 and 1993 (0.53 AVR), recovering after 1994, but the expansion cycle is limited to 1994-7 as a result of the subsequent volatility.

Figure 4. The mass of profits



Notes. Series in annual rates of change (ARCh) (%) (left) and R\$ million at 2000 constant prices (P cons) (right)

Source: Marquetti (2012b) and IPEA data

In conclusion, in the first part of the period the level of the profit rate is substantially higher but with a marked downward trend, although the rate of increase in the surplus is favourable. From 1980, the rate of increase in the mass of profit descends and its volatility increases, while the fall in the rate of profit continues. It was from 1993, and mainly during the growth cycle from 1993 to 1997, when both the mass and rate of profit increased, during which time the first (p) was relatively constant and the second (r) saw slower growth and increased instability. This relationship between the profitability variables requires us to look at the behaviour of accumulation and the denominator of the rate of profit, the stock of capital.

Accumulation, profitability and investment effort

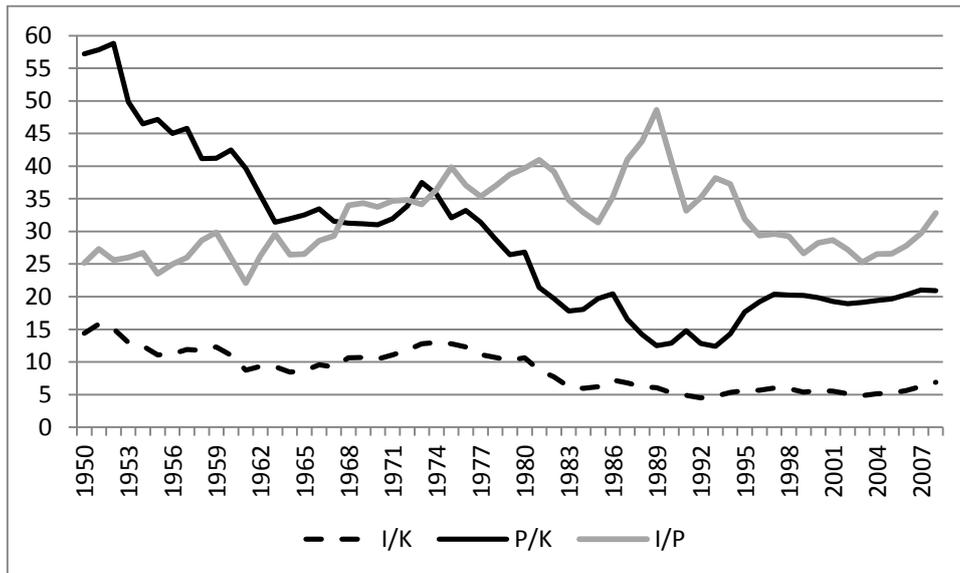
The rate of accumulation is shown in Figure 5, now expressed as $k = I/K$, with its determinants being profitability (p/K) and the investment effort (I/p). In the early 50s

the ratio I/K averaged 14-15 per cent, and across the whole decade it was around 11-12, again exceeding 10 per cent between 1968 and 1980. Since the 1980s it has been below 7 per cent (excluding 1981-2 and 1986), varying from 4 to 6 per cent. In fact, the rate of 6.87 per cent in 2008 was the highest since the aforementioned year of 1986.

The rate of accumulation fell by 70 per cent between 1950 and 1992, with a sub-period of recovery between 1961 and 1974 (from 8.7 to 13 per cent). Since 1992, an increase in capital accumulation has been observed, although limited, dominated by respective increases in 1992-7 and 2003-8, coinciding with the cycles of GDP growth. Similarly, Figure 5 shows that the profile of 'k' is closely linked to the rate of profit. That is, profitability is the key determinant of the dynamics of accumulation, while income capitalisation only has a circumstantial impact on the cyclical fluctuations of investment.

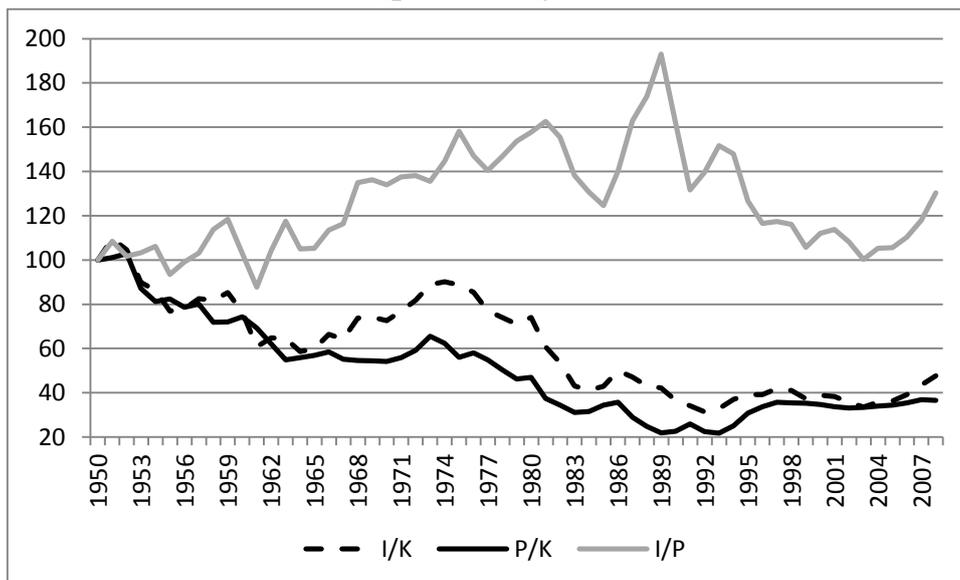
The investment effort was below 30 per cent between 1950 and 1967 and also 1996 and 2007. From 1968 to 1993 it was above 35 per cent on average, while from 1968 to 1993 it averaged over 35 per cent. Therefore, the level of 28 per cent between 1995 and 2008 (32.8 in this final year) is not exceptionally low from a historical perspective, although lower than the immediately preceding period.

Figure 5. Rate of accumulation, profitability and investment effort (%)



Notes: I: gross investment, K: gross fixed capital stock, P: profits
 Source: Marquetti (2012b) and IPEA data

Figure 6. Rate of accumulation, profitability and investment effort (1950= 100)



Notes: I: gross investment, K: gross fixed capital stock, P: profits
 Source: Marquetti (2012b) and IPEA data

The restructuring of the accumulation model initiated in the early 1990s (see Plan Real) resulted in a recovery in corporate profitability, putting a stop to the downward trend seen since the 1950s. However, this change in the trend for the rate of profit did not translate into a significant boost for accumulation. In fact, between 1993 and 1997 'r' rose from 12 to 20 per cent, a level at which it would remain in subsequent years, while

I/K only increased from 4.7 to 6 per cent, which implies a reduction in investment effort, losing 9 points over those years.

This is one of the most important phenomena to explain, and forms the basis of the theories of financialisation.¹¹ Is there such a disconnection between profitability and capital accumulation? A long-term analysis shows, however, the uniqueness of the previous period (Figure 6). Indeed, the key point appears to be not the behaviour of the rate of accumulation in the neoliberal period, in fact close to the rate of profit, but rather the profile of the investment effort. The intensification of the process of accumulation observed from the late 1960s to the middle of the following decade (the ‘Brazilian miracle’ and beyond) was based on a rate of profit that managed to halt its decline through an increase in the invested profit, so boosting the rate of accumulation. In this case, it should be considered the use of idle capacity created during the years 1963 to 1967, the wage restraint of the dictatorship government, the tax measures in favor of higher income groups under the reform of the Castello government and external and internal conditions favorable to inflows of foreign capital (see Bonelli, 2005; Hermann, 2011), but also the degree to which the profits of the main corporations were secured by the ISI strategy.

As explained by Saad-Filho and Mollo (2002: 116), the economic policy “facilitated the adoption of rigid mark-up pricing rules by the leading firms”, protecting its income from workers demand “or adverse fluctuations in the level of activity, which may have protected investment in certain key industries”.¹² So, the reduction in this investment effort, seen later in the 1990s, constitutes a return to historically normal levels in terms of the time horizon shown, hence the increase in profitability does not correspond to a similar expansion in accumulation. In other words, the long term perspective clarifies that discrepancy in the relationship between profitability and accumulation during the 1990s.

11. In this paper, however, the different forms assumed by the business surplus are not addressed, although this is certainly a field of analysis on which work could be done to clarify the causality and the role of finance in profitability and accumulation, as it was mentioned in the introduction.

¹² But in doing so, the economy was made vulnerable to inflation, as in fact it revealed how the contradictions of the accumulation process were to be manifested. In this sense, the kind of neoliberal and finance-dependent restructuring was a by-product of these traits. See Saad-Filho and Mollo (2002).

Technology, capital and product

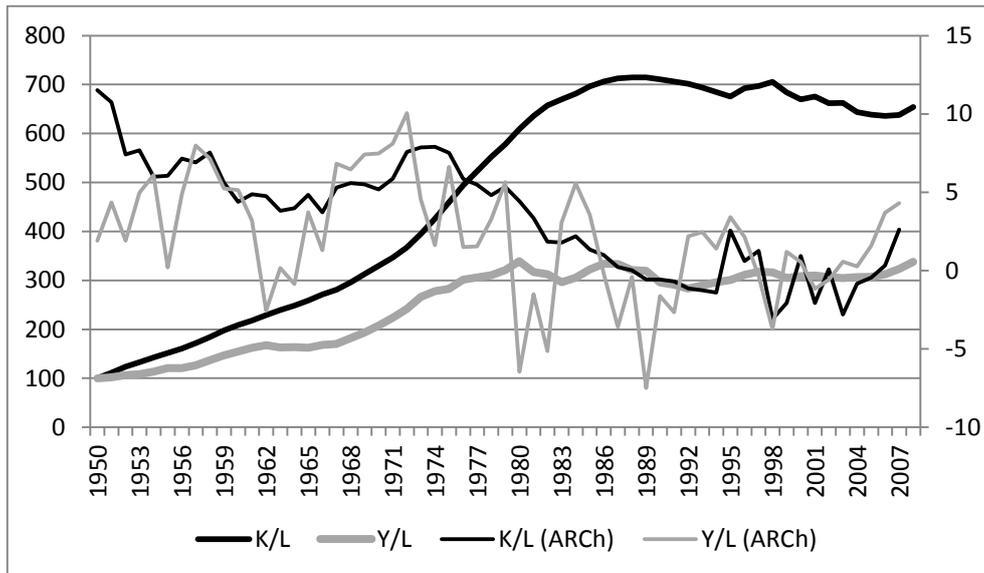
We saw above (section II.1) that the rate of profit depends on the productivity of capital and the profit share. In this section we analyse the first variable, starting with its determinants (the productive efficiency of investment and relative prices) and then examining its history.¹³

Productive efficiency of investment and relative prices

The pattern for the capital-labour ratio (K/L) is instructive in relation to the macroeconomic performance of Brazil (Figure 7). The AVR between 1950 and 1980 is 6.22. Since 1980, however, the rate has fallen, although decreasingly, to an AVR of 0.27, with a brief and slight rebound in 1984-5. In 1989 the K/L ratio reached the maximum level, after which point it went into decline over the next two decades, and only at two moments was there an increase in at least two consecutive years, 1996-8 and 2007-8. It represents a contradictory result i) because of the weakness of the increase; ii) the decline over two decades, as well as iii) the fact that even during the phases of recession it does not increase as a result of the decline in employment. Therefore, this mechanisation pattern can only harm productive development in Brazil.

13 'β', in any case, is between 50 and 62 per cent of GDP, so its influence on profitability is limited. Broadly speaking, it increased in the fifties, declined over the next decade, increased again during the expansionary phase of 1968-73, and fell in the eighties until 1989-92. It then recovered until 2004, at which time it fell slightly.

Figure 7. Capital-labour ratio and labour productivity



Notes. Series of gross stock of capital at constant prices per labourer (K/L) and GDP at constant prices per labourer (Y/L), 1950= 100 (left), and annual rates of change (ARCh) (%) of both variables (right)

Source: Marquetti (2012b), GGDC (2007) and IPEA data.

The movements of K/L in turn have a decisive influence on productivity, one of the Brazilian economy's great problems. The ratio Y/L grows over the period at an AVR of 2.18, but with a downward trend. Since the 1950s the average rates per decade have been just over 4 per cent, with the exception of 6 per cent in the 1970s, but in the 1990s the average fell to around 1 per cent. While productivity grew by an AVR of 4 during the expansive phase, between 1980 and 2008 it fell to -0.37 per cent annually. In general, annual increases in labour productivity were lower than those for mechanisation, and the periods when this did not happen were linked to the phases of exiting from recessions, in which the recovery of employment can take advantage of idle capacity and, therefore, there is no need to increase the stock of capital. Only between 1967 and 1973 (the aforementioned 'Brazilian miracle') do increases in K, K/L, Y/L coexist together with rises in GDP, and partially in 1983-6, 1992-7 and 2003-8.

There is also another aspect to examine when analysing the relationship between accumulation and productivity. A sectoral breakdown (Table 3) allows us to see that the most dynamic sector over the last decade was farming, whose productivity grew by over

5 per cent annually.¹⁴ In the import substitution stage, the evolution of changes in production was spread across the extractive sectors, such as manufacturing, mining, public utilities, transportation, etc., with services being relatively more backward, and the agricultural sector being somewhere in between. However, over the next three decades manufacturing, transport, construction and services experienced significant setbacks.

Table 3. Average annual growth rates of labour productivity by sector

Periods	AGR	MIN	MAN	AGE	CON	THR	TRA	FIRE	SER	TOT
1951-59	2.61	8.64	5.91	4.87	4.25	1.52	3.30	2.42	0.21	4.12
1960-69	2.26	8.31	2.50	-4.67	-0.50	0.52	4.90	1.25	3.66	3.94
1970-79	3.84	9.43	5.22	5.30	6.86	2.34	10.09	3.16	0.98	6.01
1980-89	4.36	1.42	-1.67	15.99	-1.19	-3.18	2.28	-0.91	-1.61	-0.36
1990-99	2.06	5.37	0.84	6.32	-1.01	-2.61	-3.13	-3.64	-0.75	-1.17
2000-08	5.55	0.43	0.02	0.73	-0.33	-2.03	-0.48	-1.14	-0.70	0.91
1950-80	2.84	7.15	4.89	5.20	3.07	1.97	5.96	2.11	1.85	4.66
1950-62	2.92	7.67	5.73	2.64	3.56	1.34	3.96	1.98	1.90	4.46
1963-80	2.97	6.38	4.87	7.67	3.26	2.81	7.41	2.27	1.96	5.08
1980-08	4.05	4.02	-0.87	4.42	-0.55	-3.47	-0.43	-1.99	-1.39	-0.37
1983-87	4.14	16.73	0.54	10.75	2.39	-0.53	10.58	1.68	4.89	2.66
1992-97	3.81	8.53	4.27	9.31	1.97	2.10	0.18	-3.38	0.46	1.39
2003-08	5.29	2.34	-0.14	0.83	0.18	1.45	0.79	-0.64	-0.09	1.86

Notes. Labour productivity as GDP per worker a constant prices. AGR: agricultural sector and similar (branches 1-5 following ISIC rev. 3); MIN: mining (10-14); MAN: manufacturing (15-37); AGE: public services (electricity, gas and water) (40-41); CON: construction (45); THR: trade, hotels and restaurants (50-55); TRA: transport, storage, etc. (60-64); FIRE: finances and others (65-74); SER: diverse services (75-99); TOT: total (1-99).

Source: Marquetti (2012b), GGDC (2007) and IPEA data.

Such a poor performance for industry in productive terms, especially that seen for manufacturing, is one of the critical features of the accumulation process in Brazil, and by extension, of its economic growth patterns (see Feijó and Lamonica, 2012). This sector is the one that contributes most to spreading technological progress, and presents more upward and downward links with other sectors.¹⁵ In addition, the sectors that are more intensive in terms of scale and technological content are the ones that experience a greater setback, precisely those that provide the necessary inputs for the production of

14 If we consider the post-1980 period, we refer to the specific branches of a primary export insertion in the world economy (farming and mining), and non-tradable ones such as water, gas and electricity services. The average growth exceeds 4 per cent, while the rest experience a fall.

15 Gonçalves (2011) highlights the fall in the share of the Brazilian transformation industry in the global value-added of this sector, from 2.5 in 1990-9 to 2.3 per cent in 2000-7, while its relative GDP remains stable.

intermediate goods, and that demand more skilled labour, while there was growth in the sectors related to natural resources (Feijó and Lamonica, 2012).

Although it is not the purpose of this article to analyse the causes of this reconfiguration, it is worth noting that it is not due to the greater productive development of the manufacturing industry, as it has been in advanced economies since the 1970s (Rowthorn and Ramaswamy, 1999). Instead, this re-primarisation is the result of productivity conditions under which the integration in world capitalism occurs.¹⁶ Thus, during the 1990s, a reconfiguration of the economic structure took place in Brazil, during which the manufacturing industry lost half of its share of total GDP, from 30-35 per cent from 1972 to 1989 to around 16-18 per cent since 1995. In other words, this sector grew by between 6 and 9 AVR during the decades of import substitution, while from the 1980s the maximum is the 2 per cent reached in the 2000s.

In this sense, but from another perspective, the Brazilian economy has experienced some changes that can be approximated using different price deflators (Table 4 and Figure 8). Until 1989 capital goods were becoming more expensive in relation to products, with some exceptions, although this did not impede an intense phase of accumulation. Later, P_K/P_Y descended, but it exceeded the level seen before 1980.¹⁷ The rise of this ratio (P_K/P_Y) has brought with it an increased share of investment in GDP at current prices that does not have a corresponding rise at constant prices, especially in the period 1985-1992, and mainly with the rate of increase of the stock of capital at constant prices. In other words, it appears that the increase in I/GDP at current prices compared to the same figure but in real terms is rooted in the price effect derived from the higher prices of capital goods. It seems obvious that relative prices and the dynamics of accumulation have divergent paths.

16 In any case, the role we attribute to industry is simply a corollary of the role assigned in the introductory section to the stock of capital, which results in a certain type of subordinate and dependent external insertion.

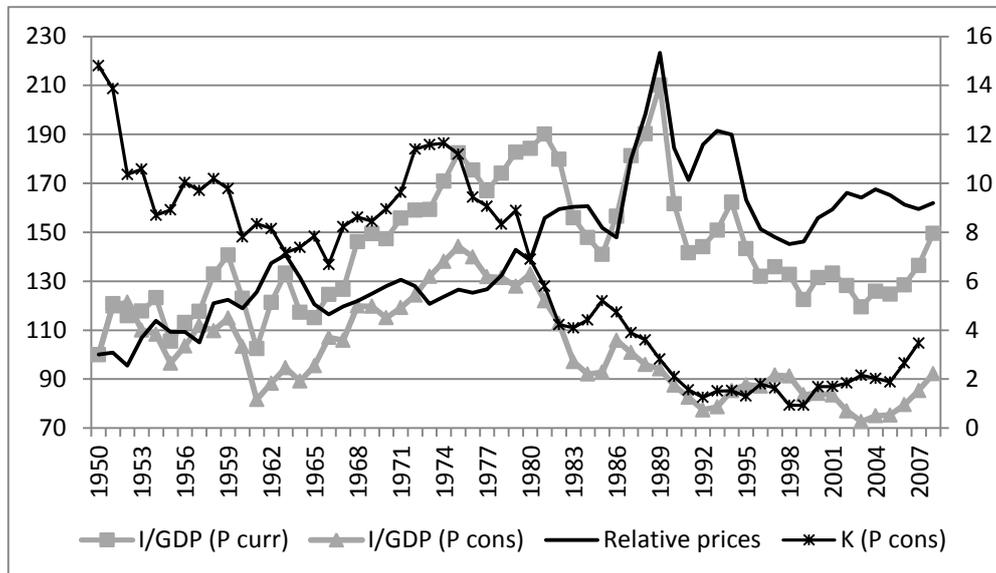
17 The study by IEDI (2007) shows that if we compare Brazil to other countries, whether developed, emerging or underdeveloped, and across different continents (including Latin America), the relative price index of capital formation is substantially higher in Brazil. In this sense, for Bacha and Bonelli (2004) the rise of the relative price of investment in Brazil is somewhat anomalous compared to other economies.

Table 4. Average rates of change in price deflators of the capital stock and the product (P_K/P_Y)

P_K/P_Y			
Rise		Fall	
1950-89	2.28	1954-57	-2.62
1950-63	2.85	1963-66	-6.13
1966-82	2.07	1984-86	-4.05
1986-89	14.82	1989-98	-4.36
1998-02	3.45	1989-91	-12.24
		1993-98	-5.25
		2003-07	-1.63

Notes. Average rates of change (%)
Source: IPEA data

Figure 8. Investment and relative prices



Notes. Rate of investment in % (I/GDP) at current (P curr) and constant prices (P cons); relative prices: ratio of price deflator to gross fixed capital formation with respect to GDP (P_K/P_Y), all of them expressed in index 1950= 100 (left); K (P cons): rate of growth of capital stock at constant prices (%) (right)
Source: IPEA data

The figures in Table 4 show that the process of intense accumulation in 1950-80 occurred despite the increase in P_K/P_Y , the mid-1960s recession even coinciding with a decrease in the price ratio (1963-6). In addition, the intensification of accumulation in Brazil causes (or implies) such relative price increases, and also a greater increase in labour productivity than mechanisation. In contrast, the level of GDP growth is lower during the 1990s despite having the advantage of the fall in P_K/P_Y . In other words, the relative fall in the prices of capital goods over the past two decades has not brought about a truly significant recovery in real investment, probably because they are still at a

high level. The three phases of decline in the P_K/P_Y ratio are associated with both ways of expressing I/GDP (1989-91), with an increase in I/GDP at constant prices only (1993-8) and finally an increase of both rates (2003-7).

It can be generally stated that the relative increase in P_K is a barrier to accumulation and growth. In turn, the absolute level seems to be relevant in the light of what has happened since the 1990s, given the positive but limited impact that its decline has had on accumulation. However, the trends in relative prices and the accumulation process call into question analyses that point to the monetary dimension as the main cause. Although the data suggest that it does play a significant role, more important are the dynamics of internal accumulation. Therefore, the result of the accumulation process must also be considered, not only in terms of relative prices, but also in terms of mechanisation and labour productivity, which we address in the next section.

The productivity of capital

As expected from the above analysis, P_K fell by 68% between 1950 and 2008, representing an AVR of -1.67. In fact, it is one of the most significant elements of Brazil's macroeconomic performance. Specifically, we believe that it is the main reason for the fall in the profit rate, which in turn slowed the accumulation process.¹⁸

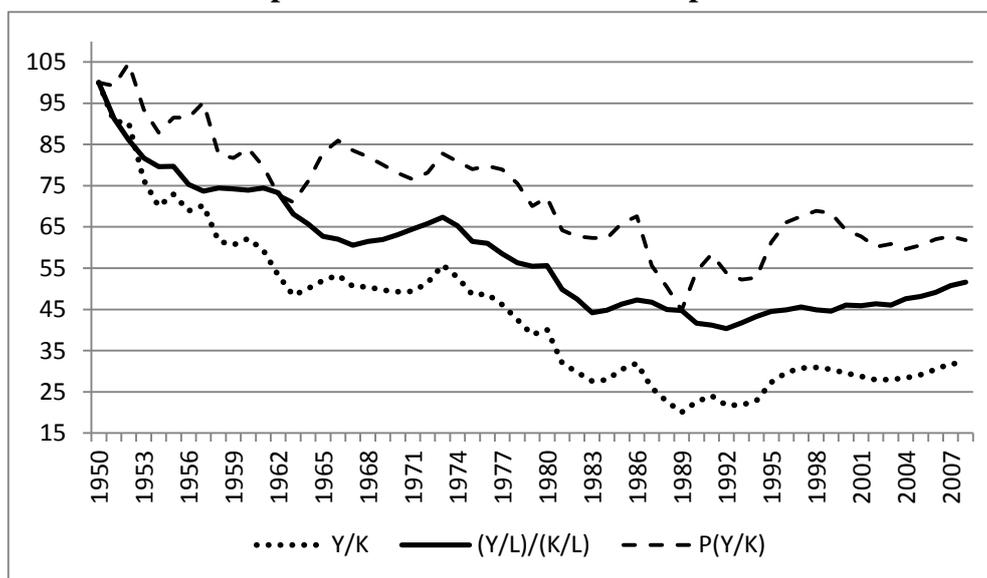
We can distinguish between two separate periods, pre and post 1989 (or 1992), even considering the exception caused by the increase in P_K between 1962 and 1973. During the first period P_K fell by 80 per cent, before rising by 59 per cent in the second, with an AVR of 3.77 and 2.66 respectively. Figure 9 shows the comparative profile (1950=100) of P_K and its determinants.¹⁹ From 1950 to 1980 the high rate of accumulation and the continuous renovation of capital equipment (Gaulard, 2010) allowed for an increase in labour productivity, but this did not prevent a fall in capital productivity. The limited and relatively inefficient capital-goods production sector caused (although with a reciprocal relationship) both a fall in the productive efficiency of investment (θ) and a rise in the relative price deflator for capital goods. This is a

18 In this sense, the comparative analysis of Hoffman (1992) alludes to the extraordinary fall in the productivity of capital in Brazil relative to other economies in the region such as Argentina, Chile, Colombia, Mexico and Venezuela. According to Maldonado, Filho and Lautert (2010), the P_K explains both the levels and path of the profit rate, which is consistent with the results shown here.

19 Note that we now use relative price in an inverse way to that seen in the previous section, as we argue it from the definition of capital productivity. Thus, an increase in P_Y/P_K means a lower price for capital goods.

result of its limited productive development in relation to its competitors and, thus, the link between high profitability and prices in a protectionist context (Bacha and Bonelli, 2004, Bonelli, 2005).²⁰

Figure 9. The productivity of capital and its determinants: labour productivity, capital-labour ratio and relative prices



Notes. Y/K: capital productivity at current prices; Y/L: GDP per labourer; K/L: gross capital stock per labourer, with Y and K at constant prices; P(Y/K): price deflator of Y and K ratio
Source: Marquetti (2012b), GGDC (2007) and IPEA data

In the second period, which coincides with the progressive implementation of the neoliberal program, capital productivity slowed its fall, but showing only a partial recovery. Between 1989 and 1992, both the ratio of relative prices and the ‘ θ ’ started on an upward path. However, compared to the negative and paradoxical trajectory of mechanisation and labour productivity in Brazil, the path of PK has been significantly influenced by the ratio of prices. That is, it is the relative cheapening of capital goods which allows for the increase in the productivity of capital, since the evolution of ‘ θ ’ is a consequence of a setback in both K/L and Y/L. The productive efficiency of investment (θ) fell by half between 1950 and 2008, but since 1992 has increased by 27 per cent, although it slowed its fall beginning in 1983 and since then rose by 16 per cent up until 2008.

²⁰ From mid-seventies, it should be considered the projects associated with the Second National Plan of Development and the reduced capacity utilization in the 1980s, as stated by Marquetti, Filho and Lautert (2010).

This higher level of θ in the second part of the study period may be related to several factors. First, the structural reconfiguration of the Brazilian economy mentioned before, and specifically the relative decline in the importance of manufacturing in GDP. Second, growth that is based on a rise in demand and commodity prices, which thus favours the greater dynamism of natural resource-intensive sectors, requires lower investment rates, which moreover reproduces sectoral imbalances in the economy and adds to external vulnerability.²¹ However, it is true that the kind of growth seen in the 1990s is not of this type. Therefore, we must take into account the appreciation of the real exchange rate, which has helped to raise the productivity of capital by lowering the cost of imports (Morandi, 2005).²²

In addition, the slowdown in the accumulation process implies that equipment goods are not renewed, so part of the investment does not materialise in increased capital stock.²³ In other words, an increase in depreciation in relation to the gross stock of capital is observed, which rises over the 1980s from 30 per cent (the average until 1980) to 38 per cent, the figure for the following years. Moreover, and in relation to this last point, the adoption of new information and communication technologies (ICT) leads to increases in both labour and capital productivity, with lower investment in the stock of capital, especially when referring to organisational transformations in companies (Marquetti, 2012a), but the counter effect is greater depreciation of these assets.

Thus, the rate of accumulation is influenced by fluctuations in the investment effort and relative investment, but structurally, in terms of its long-term trend, it mainly reflects the evolution of the rate of profit, which is explained, in turn, by the productivity of capital (see also Marquetti, Filho and Lautert, 2010).

CONCLUSIONS

To recapitulate, in this section we present a summary of the evolution of the most significant variables in the analysis carried out, in this case looking at the dynamics of GDP over a period.

21 On this issue, we refer to studies such as that of Dalum, Laursen and Verspagen (1999) or Cimoli *et al* (2005), who point out that the productive sectors do not play the same role and do not contribute equally to the dynamics of the productivity and economic growth of a country.

22 Indeed, between 1989 and 1998, the share of imported machinery and equipment increased from 9 per cent, a very low figure in historical terms, to 40 per cent in 2000 (IBGE, 2003).

23 It is the cause given by Feu (2004). While GDP grows less, capital productivity may increase. Gaulard (2010) agrees, while the OECD (2007) says that it has increased the elasticity of labour in GDP, from 0.4 to 1.2 between 1992-6 and 2000-4, the largest rise in emerging countries (BRIC), increasing the use of labour with respect to fixed capital.

Table 5. Average annual growth rates of the variables of both growth and accumulation by phases of economic expansion

Periods	Y	P	r	K	K/L	Y/L	P_K/P_Y	Y/K
1950-08	5.10	5.40	-1.38	6.27	3.35	2.19	1.05	-1.67
1950-80	7.41	8.05	-2.31	9.52	6.22	4.20	1.23	-2.83
1950-62	7.39	8.85	-3.71	10.26	7.16	4.42	2.88	-4.91
1963-80	7.83	8.07	-0.77	9.09	5.65	4.44	-0.01	-2.83
1980-2008	2.54	2.55	-0.39	2.77	0.27	0.04	0.85	-0.43
1983-87	6.07	5.69	-1.19	4.61	1.58	3.00	3.39	-0.84
1992-97	3.99	6.52	10.07	1.48	-0.13	2.33	-4.26	7.43
2003-08	4.82	4.02	1.83	2.44	-0.22	2.08	-0.27	2.62

Y: GDP, P: profits at constant prices; r: profit rate; K: gross capital stock; L: labour, P: price deflators, K/L and Y/L: numerator at constant prices; Y/K: at current prices

Source: Marquetti (2012b), GGDC (2007) and IPEA data

Between 1950 and 1980 the growth process is stronger (7.41 AVR), less volatile (only a mild recession in the mid-1960s), and is led by the accumulation of capital. This is reflected first in an increase in both the stock of capital, growing faster than GDP, as well as the mechanisation of the production process (K/L), exceeding 6 per cent per year; and second, in the resulting expansion of labour productivity (4 per cent) and the generation of a surplus (8 per cent). The limited productive development however leads to both a sharp drop in capital productivity and a relative increase in the price of capital, which in turn pushes down the rate of profit. The exception is the period of the ‘Brazilian miracle’ (1968-73), during which labour productivity grew on average more than the K/L ratio (7.72 Vs 5.83 AVR), the rate of increase of P_K/P_Y slowed (0.20 per cent), and the AVR of the capital stock was around 10 per cent. Consequently, PK grew at 1.68 per cent on average, and the profit share rose from 55 to 60 per cent, implying that profitability increased to 3.02 AVR, from 31.2 to 37.5 per cent. This situation is, however, highly unusual in Brazil.

The decrease in profitability continued until the late 1980s and in 1992 it began what was to be a substantial recovery, although also a partial one from a long-term perspective. This increase was mainly limited to the period 1992-7, when it reached 10 per cent per year. It should be noted that the rise in the rate of profit does not imply the start of a sustained path of accumulation ($\Delta K/K$), as it fluctuates from around 4 to 6 per cent, compared to over 10 per cent in the previous period. That is, representing a fall of nearly three quarters of this rate between 1950 and 1992. This evolution is due to the very specific features of the neoliberal period that started in the 1990s: an increase in

the profit share and the recovery experienced by the productivity of capital, almost 60 per cent from 1989 to 1992. However, the most important issue is how this change has occurred with a stagnation in the rate of increase of the capital stock at about 1-2 per cent per year, which resulted in a fall of 10 per cent in the K/L ratio between 1989 and 2004-8

Despite this slowdown or stagnation of accumulation not allowing for the development of labour productivity, increasing by only 1.12 AVR between 1993 and 2008, the productive efficiency of investment has risen. In this way, it has succeeded in reversing the traditional relative increase in the prices of capital goods, which fell by 27.5 per cent between 1989 and 2008, thus lowering the growing dependence on imports of the means of production.

This apparent paradox is explained by a sectoral shift to the detriment of the manufacturing industry, further associated with the accumulation of capital, which has favoured the re-primarisation of the economic structure (and its consequent external integration), together with the use of technological innovations that do not require a major expansion of the capital stock. But as the increase in the surplus generation capacity is the key to reducing external dependence and vulnerability, the role of industries with greater technological intensity turns out to be central. This is because industry has traditionally been the decisive vehicle for technological diffusion, and in addition, it stands out for the high degree of externalities it has with other segments of the economy. Therefore, the mechanisms developed to drive up profitability are associated with a serious weakness in capital accumulation, which explains the lower economic growth rate and the higher volatility during the period.

In short, and in general terms, it can be argued that the fall in the rate of accumulation is explained by the evolution of profitability, which in turn is largely determined by the extraordinary fall in capital productivity. This in turn, as was explained, is conditioned by the role of Brazil in the global capitalist system, reflected in the productive efficiency of investment and the price ratio, specific aspects of underdeveloped social formations.

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Annex. Economic categories and methodology in the calculations

The statistical information usually comes from the series collected by IPEA (IPEA data) from the agencies responsible for its implementation (IBGE, Central Bank of Brazil) and, unless stated otherwise, data are expressed in millions of Reais (R\$).

Stock of capital (K). Although it is impossible to rigorously measure K following the postulates of the LTV (see the theoretical clarification of the concept in Mateo, 2007), the study used the series of fixed capital stock of non-residential construction (thus excluding residential), machinery and equipment, in gross terms, due to the greater statistical reliability concerning the net value as well as its closer links with the phases of accumulation and profitability following the discussion in Shaikh (1999) and the OECD (2001). However, in Figure 2 other expressions of the capital stock are shown in order to compare how they affect the results of the rate of profit and to provide our estimates with greater robustness.

Profits (P). As with K, it is not possible to make an estimate of the surplus for the period. The most approximate measure is gross operating surplus, that we computed as the difference between GDP and wage compensation from the series provided by Marquetti (2012b), whose methodology is explained in Marquetti (2012a). The mass of profit is calculated at constant prices using the GDP price deflator (IPEA data).

Total product (GDP=Y). Gross Domestic Product at market prices in current and constant terms, according to IPEA data.

Employment (L). Total number of workers from Marquetti (2012b), and the percentage structure estimated by GGDC (2007) is used to calculate the composition by sectors.

Labour productivity (Y/L). It is estimated taken as a proxy the ratio of GDP at 2000 constant prices (IPEA data) per worker (GGDC, 2007; Marquetti, 2012b). To calculate productivity by industry, the GDP composition is based on the percentage structure of GGDC (2007).

Capital productivity (Y/K). We use this term from Marx's own concept of capital as a social relationship (opposite from the reification of orthodox analysis) that assumes different forms, one of which will be the circulating capital embodied in the labour force. We refer to the statement by Marx (1857-58, I; 1861-1863, I, III), for which capital is the foundation of production and it is possible to speak of 'productivity of capital' when it is conceived as a representation of a particular social relationship of production. Indeed, one could speak of a *labour productivity of capital* (Mateo, 2007). The measurement of Y/K uses both magnitudes at current prices.