Original Article

Review of Radical Political Economics
1–23

DOI: 10.1177/0486613416689834
rrpe.sagepub.com
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Measuring the Profit Rate in an Inflationary Context: The Case of Brazil, 1955–2008

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Abstract

A debate in Marxist literature concerns the methodology for measuring the profit rate. This paper investigates this question computing the rate of profit at historical cost, current cost, constant prices, and constant GDP price for Brazil in the 1955–2008 period. Like many developing countries, Brazil experienced medium to high inflation during this period. Inflation determined the trend and cyclical movements of the profit rate at historical cost. It increased in years of rising, and declined in years of falling, inflation. The profit rate at historical cost was at odds with Brazilian economic history. The profit rate at current costs remained unaffected by the inflation rate, and its movements correspond to the historical phases of the Brazilian economy. The same is true for the profit rate at constant prices and at constant GDP price. However, the profit rate at constant prices does not account for changes in relative prices, while the profit rate at constant GDP price is computed using a weighted average of the current and past relative prices.

JEL Classification: E01, B51

Keywords

rate of profit, aggregate capital stocks, rate of inflation

1. Introduction

The debate about the causes of the structural crisis of 2008 has provoked a controversy over the methodology of measurement of the profit rate. Scholars associated with the temporal single system (TSS) interpretation of the Marxian theory of value point out that the profit rate must be measured at historical costs. Among these are Kliman (2010, 2011) and Freeman (2012). Kliman

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Date received: January 14, 2016
Date accepted: December 30, 2016

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(2010, 2011) also suggests an inflation-adjusted rate of profit. This conception contrasts with the larger group of scholars that computes the profit rate at current costs. Members of this group include Weisskopf (1979); Bowles, Gordon, and Weisskopf (1986); Duménil and Lévy (1993, 2011); and Bakir and Campbell (2010).

The central difference between both groups is in their measurement of capital stock used to compute the profit rate. It is calculated as the ratio between profits, a flow variable, and net fixed capital, a stock variable. The scholars associated with TSS suggest that the net fixed capital stock must be measured at historical prices. The capital goods are valued at acquisition prices. In the case of the inflation-adjusted rate of profit, the profit is deflated by the GDP price index and the net fixed capital stock is valued at relative prices, the ratio between the price of capital goods and the GDP deflator, of the current and past periods of time. This measure of the capital stock is not computed by the national statistical offices.[1] The other larger group recommends that profits must be measured at current prices and the net fixed capital stock must be valued at current prices.

The profit rate is a fundamental variable to understand the functioning of the capitalist economy. As pointed out by Duménil and Lévy (1993), it plays a major role in competition and resource allocation, macroeconomic stability, technological change and distribution, and in the historical dynamics of capitalist society. Therefore, it is possible to consider different measurements of the profit rate, depending on the goal of the investigation.

In describing historical tendencies of capitalist economies, the literature decomposes the profit rate as the product of two main components: the profit share, a proxy for the movements in distribution, and capital productivity, a proxy for technical change. It follows Marx's conception which considers the profit rate as a ratio between the rate of surplus value, a distribution variable, and the organic composition of capital, a technological variable. The rate of profit would fall as a consequence of a labor-saving, capital-using technical change and a relatively constant distribution.

We argue that capital productivity at historical cost is a proxy for technical change under a very implausible condition in a capitalist society, a constant inflation rate. The zero inflation rate is a special case in which both capital productivities remain constant over time. The decomposition of capital productivity at historical and current costs allows for understanding the determinants of the profit rate measured at historical and current costs. The path of capital productivity at current price is determined by the price of capital goods relative to output price, and the growth rates of the real output and of the capital stock at constant prices. The path of capital productivity at historical prices depends on the inflation rate, and the growth rates of the real output and of the capital stock at historical prices. Therefore, its trajectory is influenced by the determinants of the inflation rate, such as monetary policy, exchange rate devaluations, money wage increases, contract indexation, inertial factors, and so on.

Basu (2013) emphasized the existence of a threshold rate of inflation in the price of capital goods that maintains a constant percentage difference between the historical and current stocks of fixed capital. He calculated the profit rates for the US economy using the two methods and found similar trends in the profit rate at historical and current costs. Roberts (2009) found similar results for the United States and England.

However, as Kim (2012) showed, there are important gaps in both measures of the profit rate in the US economy during the 1952–2007 period, particularly in years of high inflation as in the

[1]It may explain why the debate is centered in the comparison between rate of profit at historical prices and at current prices. Kliman (2010, 2011) also uses the monetary expression of labor-time (MELT) to adjust for inflation. We do not consider the MELT-adjusted case due to the difficulty of computing it from the Brazilian National Accounts. The MELT-adjusted capital stock is not estimated by the national statistical offices.

1970s. The path of the inflation rate determines the gap between the profit rate measured at historical and current costs and, more importantly, the own trajectory of the profit rate at historical cost.

In addition, we consider two alternative ways to estimate the profit rate adjusted to inflation. The first is the profit rate measured at constant prices. In this case, profit is deflated by the GDP price index, and the capital stock is estimated at constant prices of capital goods. The output/capital ratio at constant prices does not consider changes in relative prices. The cheapening of the price of capital goods plays a central role as a counteracting factor for the tendency of the profit rate to fall. The second is the profit rate measured at constant GDP price. In this case, the profit is deflated by the GDP price, and the capital stock is computed as a sum of net investments deflated by the GDP price.

This paper estimates the profit rate at historical and current costs for Brazil, a country with high and persistent inflation, in the 1955–2008 period to highlight the effects of the inflation rate on the measurement of capital productivity and profit rate at historical cost. We also compute the profit rate adjusted for inflation, the profit rate at constant cost and at constant GDP price. The GDP price deflator increased by 64.7 percent annually between 1955 and 2008. The highest annual rate of inflation was 2,737 percent in 1990 and the lowest was 4.2 percent in 1998. The results reveal that the inflation rate dominates the cyclical movements, and the trend of both capital productivity and the profit rate measured at historical costs. The profit rate and capital productivity at historical prices expanded in periods of rising inflation and declined in periods of falling inflation. If rising inflation expanded the profit rate, then the macroeconomic policies would be thought to increase the inflation rate.

Moreover, the evolution of the profit rate at historical costs was at odds with the main economic and political events of the Brazilian economy over the period of study. The path of the profit rate at current cost was consistent with Brazilian economic history. The long-term paths of the profit rate at constant costs and at constant GDP price were similar to the profit rate at current costs. However, there are some differences between them in a cyclical analysis.

Most of the developing countries had a history of medium to high inflation rates until the early 1990s. For example, the GDP inflation rate in 1990 was 2,076.8 percent in Argentina, 28.1 percent in Mexico, and 58.2 percent in Turkey. Even for Sweden, it was 9.4 percent in 1990 (World Bank 2015). Single-digit inflation rates are a relatively recent phenomenon associated with the spread of neoliberalism in the developing countries. The Brazilian case is similar to many countries worldwide. Thus, the profit rate at historical prices cannot be used to understand the dynamics of capitalism in these societies. If the profit rate at historical prices is the measure of profitability taken into account by firms, then the question is why the inflation rate does not keep rising in the capitalist economies.

The paper adds to the literature on the measurement of the profit rate, an important question to the radical tradition, in five respects. First, it demonstrates the limits of the profit rate measured at historical prices in understanding the historical tendencies of the capitalist economies. Second, it displays the narrow bounds in which capital productivity at historical prices can be interpreted as a proxy for technical change. Third, it shows that the profit rate at current prices permits an accurate measurement of the profit rate with different levels of inflation. Fourth, it reveals that the profit rate at current-cost prices and the alternative inflation-adjusted measures depict similar patterns of movement in the long run; they exhibit slight differences over the short run. The current-cost measures change more sharply than the inflation-adjusted measures. Fifth, the profit rate at current prices allows understanding of the historical dynamics of capitalism in Brazil in different contexts of class struggle. The same is not true for the profit rate at historical prices.

The rest of the paper is organized as follows. Section 2 presents a method to estimate the capital stock at constant, current, and historical costs, and at constant GDP price, and investigates the effects of the inflation rate on the measurements of the profit rate and output/capital ratio. Section

3 depicts a brief background of GDP growth and the inflation rate in Brazil. Section 4 investigates the evolution of the profit rate and the output/capital ratio in the 1955–2008 period. Section 5 concludes with a summary of the main results.

2. Measuring the Profit Rate

In the Marxian tradition, the profit motive is the driving force of capitalism. The profit rate captures the degree of valorization of the total capital advanced and the velocity at which capital expands. It plays a central role in the dynamics of the capitalist system, regulating the processes of accumulation, technical change and distribution, competition among capitals, and the degree of capacity utilization with which firms operate. Besides, the profit rate represents a key variable for analyzing capitalism's long-term tendencies.

The profit rate is measured by the ratio of total profits generated during a period of time with total advanced capital. This broad definition of the profit rate is denominated by Duménil and Lévy (1993) as the profit rate *à la* Marx. It is very useful to decompose the profit rate as the profit share and the output/capital ratio. The profit share is a proxy for the rate of surplus value, reflecting the effects of income distribution between capital and labor on the profit rate. The output-capital ratio or productivity of capital is a proxy for the organic composition of capital, its change mirroring the effects of technology. This decomposition resembles Marx's (1981) analysis of the profit rate in terms of distribution and technology. In his conception, the mechanization process would drive a rise in labor productivity and a decline in capital productivity. Under a relatively constant income distribution, this form of technical change may lead to a declining profit rate.

The debate in the literature has focused on the comparison between the profit rate at historical and current prices. Nevertheless, it is possible to measure the profit rate adjusted for the inflation rate. We consider two cases: the profit rate measured at constant prices and the deflated rate of profit proposed by Kliman (2010).

To better understand the different measures of the profit rate, we discuss first the methodology to estimate the net nonresidential fixed capital stock. It can be estimated using the perpetual inventory method and a geometric depreciation function. The method consists of accumulating investment flows and deducting the depreciation. The Organisation for Economic Co-operation and Development (OECD 2001, 2009) and the US Bureau of Economic Analysis (BEA 2003) explore the statistical procedures to measure the capital stock in many developed countries.

Three valuation principles are used to compute the fixed capital assets (BEA 2003; OECD 2009). First, at constant prices, the assets are valued at prices of a selected year. Second, at current prices, the assets are valued at the prices of the current year. Third, at historical prices, the assets are valued at their acquisition prices. Price indices for fixed capital assets are required to compute these valuation methods. Kliman (2010, 2011) proposed a change in the constant price valuation principle. He deflated the fixed capital assets by the GDP price index instead of the price index of capital goods.[2]

The net nonresidential capital stock at constant prices at the end of period *t*, K_t, is the net nonresidential capital stock at the end of the previous period plus the gross investment at constant price, I_t, minus depreciation. Under the hypothesis of a geometric depreciation function, the net nonresidential capital stock can be written as:

$$K_t = (1-\delta)K_{t-1} + I_t, \tag{1}$$

[2]All the valuations of the net stock of nonresidential fixed capital were estimated using the perpetual inventory method with a geometric depreciation function and the same depreciation rate. For further information, see Marquetti and Porsse (2014). The data set is available on request.

where K_t is the net nonresidential capital stock at constant prices; I_t is the gross fixed capital formation deflated by the price index of capital goods, p_t^K; and δ is the depreciation rate.

By repeatedly substituting the net nonresidential capital stock at the end of the previous period, the net nonresidential capital stock at constant prices at the end of the period t can be computed as the sum of net investment (BEA 2003: M-7; Todsen 1997: 39). The net nonresidential capital stock at constant prices is estimated by:

$$K_t = \sum_{s=0}^{L} d_s I_{t-s} = I_t + (1-\delta) I_{t-1} + \cdots + (1-\delta)^L I_{t-L}, \tag{2}$$

where $d = (1 - \delta)^s$ is a geometric depreciation function, s is the age of the asset, and L is the average service life of the asset. The net nonresidential fixed capital stock is the sum of net investment valued at the constant price of capital goods.

At current prices, the net stock of nonresidential capital stock, K_t^C, is computed by multiplying the constant dollar net stock at the end of year t by the price index of capital goods of year t. It is calculated by:

$$K_t^C = p_t^K K_t = p_t^K \sum_{s=0}^{L} d_s I_{t-s} = \sum_{s=0}^{L} d_s p_t^K I_{t-s} = p_t^K I_t + p_t^K (1-\delta) I_{t-1} + \cdots + p_t^K (1-\delta)^L I_{t-L}. \tag{3}$$

The net nonresidential fixed capital stock is the sum of net investment valued at the current price of capital goods.

At historical costs, the net stock of nonresidential capital, K_t^H, is computed in a similar manner to equation 2. It is estimated by:

$$K_t^H = \sum_{s=0}^{L} d_s p_{t-s}^K I_{t-s} = \sum_{s=0}^{L} d_s \frac{p_t^K}{(1+\eta_{ts})} I_{t-s} = p_t^K I_t + p_{t-1}^K (1-\delta) I_{t-1} + \cdots + p_{t-s}^K (1-\delta)^L I_{t-L}, \tag{4}$$

where η_{ts} is the accumulated inflation rate in the capital goods between period t and s and $p_{t-s}^K = p_t^K / (1+\eta_{ts})$. It is the sum of net investment valued at the historical price of capital goods.

The measures above are the traditional valuation principles. The net nonresidential fixed capital stock at constant GDP deflator, K_t^X, proposed by Kliman (2010, 2011) is computed by:

$$K_t^X = \sum_{s=0}^{L} d_s \frac{p_{t-s}^K}{p_{t-s}^X} I_{t-s} = \sum_{s=0}^{L} d_s p_{t-s}^R I_{t-s} = p_t^R I_t + p_{t-1}^R (1-\delta) I_{t-1} + \cdots + p_{t-s}^R (1-\delta)^L I_{t-L}, \tag{5}$$

where p_t^R is the relative price, the ratio between the index price of capital goods and the GDP price deflator, p_t^X. In this case, the net nonresidential fixed capital stock is the sum of net investment valued at historical relative prices.

The measures of the capital stock play a central role in the computation of the profit. The profit rate at historical prices is expressed by:

$$r_t^H = \frac{p_t^X Z_t}{K_t^H} = \frac{p_t^X Z_t}{K_t^H} \times \frac{p_t^X X_t}{p_t^X X_t} = \frac{p_t^X Z_t}{p_t^X X_t} \times \frac{p_t^X X_t}{K_t^H} = \pi_t \rho_t^H, \tag{6}$$

where Z_t denotes the total profits at constant prices, X_t the output at constant prices, K_t^H the net nonresidential fixed capital stock at historical cost, π_t the profit share, and ρ_t^H the output/capital ratio at historical cost. The term $p_t K_t^H$ represents the total profits at current prices and $p_t^X X_t$ the current output.

The profit rate at historical prices can be decomposed by the expression:

$$g_{r_t^H} = g_{\pi_t} + g_{\rho_t^H} = g_{\pi_t} + \eta_t^X + g_{X_t} - g_{K_t^H}, \tag{7}$$

where $g_{r_t^H}$ is the growth rate of the profit rate at historical prices, g_{π_t} is the growth rate of the profit share, $g_{\rho_t^H}$ is the growth rate of the output/capital ratio at historical prices, η_t^X is the inflation in the output deflator, g_{X_t} is the growth rate of real output, and $g_{K_t^H}$ is the growth rate of the capital stock at historical prices. The profit rate rises with the profit share and the output/capital ratio. The output/capital ratio at historical prices increases with both the inflation in the output deflator and the expansion in real output, and falls with the accumulation of capital at historical cost. Inflation plays a key role in the growth of the output/capital ratio measured at historical cost.

The profit rate at current prices is calculated by:

$$r_t^C = \frac{p_t^X Z_t}{K_t^C} = \frac{p_t^X Z_t}{K_t^C} \times \frac{p_t^X X_t}{p_t^X X_t} = \frac{p_t^X Z_t}{p_t^X X_t} \times \frac{p_t^X X_t}{K_t^C} = \frac{p_t^X Z_t}{p_t^X X_t} \times \frac{p_t^X X_t}{p_t^K K_t} = \pi_t \rho_t^C, \tag{8}$$

where K_t^C is the net nonresidential fixed capital stock at current cost, and ρ_t^C is the output-capital ratio at current cost. The profit rate at current cost can be decomposed by:

$$g_{r_t^C} = g_{\pi_t} + g_{\rho_t^C} = g_{\pi_t} + g_{X_t} - g_{p_t^R} - g_{K_t}, \tag{9}$$

where $g_{r_t^C}$ is the growth rate of the profit rate at current cost, $g_{\rho_t^C}$ is the growth rate of the output-capital ratio at current cost, $g_{p_t^R}$ is the growth rate of relative prices, and g_{K_t} is the growth rate of the capital stock at constant prices. The profit rate rises with the profit share and the output/capital ratio at current prices. The output/capital ratio at current prices rises whenever the price of capital in relation to the price of output falls, the real output expands, and the growth rate of nonresidential capital stock at constant prices sags.

The profit rate at constant prices is computed by:

$$r_t = \frac{Z_t}{K_t} = \frac{Z_t}{K_t} \times \frac{p_t^X X_t}{p_t^X X_t} = \frac{p_t^X Z_t}{p_t^X X_t} \times \frac{X_t}{K_t} = \pi_t \rho_t, \tag{10}$$

where K_t is the net nonresidential fixed capital stock at the constant price, and ρ_t is the output/capital ratio at the constant price. The investment in fixed assets is deflated by the price index of capital goods. In growth rates, the profit rate at constant prices is expressed by:

$$g_{r_t} = g_{\pi_t} + g_{\rho_t} = g_{\pi_t} + g_{X_t} - g_{K_t}, \tag{11}$$

where g_{r_t} is the growth rate of the profit rate at constant prices, and g_{ρ_t} is the growth rate of the output/capital ratio at constant prices. The profit rate increases with profit share and the output-capital ratio at constant prices. The output/capital ratio at constant prices rises when the real output expands, and the capital accumulation measured at constant prices declines. The difference between the growth rates of profit rate at constant and at current prices is the growth rate of relative prices. The profit rate at constant prices does not capture an essential counteracting factor in the tendency of the rate of profit to fall, the cheapening of the elements of constant capital (Marx 1981).

Last, the profit rate adjusted for inflation using the GDP price deflator as suggested by Kliman (2010, 2011) is computed by:

$$r_t^X = \frac{p_t^X Z_t / p_t^X}{K_t^X} = \frac{Z_t}{K_t^X} \times \frac{p_t^X X_t}{p_t^X X_t} = \frac{p_t^X Z_t}{p_t^X X_t} \times \frac{X_t}{K_t^X} = \pi_t \rho_t^X, \tag{12}$$

where K_t^X is the net nonresidential fixed capital stock at constant GDP deflator, and ρ_t^X is the output/capital ratio at constant GDP price deflator. The investment in fixed assets is deflated by the GDP price index. The output/capital ratio at constant GDP price is calculated using a weighted relative price of the present and previous periods, while the output/capital ratio at current prices is computed with the relative price of the current period. Under the assumption of constant relative prices, both measures are equal.

The profit rate at constant GDP price deflator can be decomposed by:

$$g_{r_t^X} = g_{\pi_t} + g_{\rho_t^X} = g_{\pi_t} + g_{X_t} - g_{K_t^X}, \tag{13}$$

where $g_{r_t^X}$ is the growth rate of the profit rate at constant GDP price, and $g_{K_t^X}$ is the growth rate of the capital stock at constant GDP price. It expands with the profit share and the output/capital ratio at constant GDP price. This later rises when real output increases, and capital accumulation measured at constant price GDP declines.

It is possible to compute the ratio between the profit rates at current and historical costs. It is equal to the ratio between the nonresidential capital stocks at historical and current costs. For simplicity, the depreciation rate is considered equal to zero, and real investment is equal to one in each period of time. The ratio between both measurements is given by:

$$\frac{r_t^C}{r_t^H} = \frac{K_t^H}{K_t^C} = \frac{\sum_{s=0}^{L} \frac{1}{(1+\eta_{ts})}}{\sum_{s=0}^{L} 1}. \tag{14}$$

There are three cases to consider. First, if the inflation rate is positive, then the capital stock at current prices is greater than its value at historical prices and $r_t^C < r_t^H$. Second, if the inflation rate is negative and $-1 < \eta_{ts} < 0$, the capital stock valued at current prices is lower than its value at historical prices, and $r_t^C > r_t^H$. Third, if the prices of capital goods are constant, then both measures of the nonresidential capital stock are equal, and $r_t^C = r_t^H$.

Furthermore, if the annual inflation rate in capital goods is positive and increasing, the term $(1 + \eta_{ts})$ has a convex shape, and the ratio between the capital stock at historical and current prices will decline. The gap between the profit rate at historical and current costs will increase. If the annual inflation rate in capital goods is positive and declining, the term $(1 + \eta_{ts})$ has a concave shape, and the ratio between the capital stock at historical and current prices will rise. The gap between the profit rate at historical and current costs will decline. Therefore, the movements in the inflation rate in the capital goods sector have a fundamental effect on the relative differences between both measures of the fixed capital stocks and over the gap between both measures of the profit rate.

The ratio between the profit rate at historical and at current prices in two periods of time is equal if the inflation rate in capital goods is the same in both periods. Equation 15 shows this result:

$$\frac{r_{t2}^C}{r_{t2}^H} = \frac{r_{t1}^C}{r_{t1}^H} \Rightarrow \sum_{s=0}^{L} \frac{1}{(1+\eta_{t2s})} \Big/ \sum_{s=0}^{L} 1 = \sum_{s=0}^{L} \frac{1}{(1+\eta_{t1s})} \Big/ \sum_{s=0}^{L} 1 \Rightarrow \sum_{s=0}^{L} \frac{1}{(1+\eta_{t2s})} = \sum_{s=0}^{L} \frac{1}{(1+\eta_{t1s})}. \tag{15}$$

This same condition holds for the growth rate of the profit rate at historical and current costs. They will be equal when the inflation rates in capital goods are equal in two periods of time as displayed in equation 16:

$$g_{r_t^H} = g_{r_t^C} \Rightarrow \frac{Z_{t2}/K_{t2}^H}{Z_{t1}/K_{t1}^H} - 1 = \frac{Z_{t2}/K_{t2}^C}{Z_{t1}/K_{t1}^C} - 1 \Rightarrow \frac{1/K_{t2}^H}{1/K_{t1}^H} = \frac{1/K_{t2}^C}{1/K_{t1}^C} \Rightarrow 1 \Big/ \sum_{s=0}^{L} \frac{1}{(1+\eta_{t2s})} = 1 \Big/ \sum_{s=0}^{L} \frac{1}{(1+\eta_{t1s})}. \quad (16)$$

An interesting paper by Basu (2013) discussed the percentage difference between current-cost and historical cost measures of the profit rate in two periods of time. He showed under what condition the percentage change in the profit rate measured at historical cost is equal to the percentage change in the profit rate at current cost in two periods of time. Similarly, as in equation 15, both measures will be equal when:

$$\frac{r_{t2}^H - r_{t1}^H}{r_{t1}^H} = \frac{r_{t2}^C - r_{t1}^C}{r_{t1}^C} \Rightarrow \sum_{s=0}^{L} \frac{1}{(1+\eta_{t2s})} = \sum_{s=0}^{L} \frac{1}{(1+\eta_{t1s})}. \quad (17)$$

The percentage change in the profit rate measured at historical cost is equal to the percentage change in the profit rate at current prices when the inflation rate in the capital goods sector is equal in both periods of time. Basu (2013) also considered a threshold rate of inflation in the price of capital goods that maintains a constant percentage difference between the historical and current stocks of fixed capital and, therefore, between both measures of the profit rate.

It is also possible to compute the ratio between the profit rate at constant prices and at constant GDP price. Under the simplified assumption that the relative prices are constant over time, the result is:

$$\frac{r_t}{r_t^X} = \frac{K_t^X}{K_t} = \frac{\sum_{s=0}^{L} d_s p^R I_{t-s}}{\sum_{s=0}^{L} d_s I_{t-s}} = \frac{p^R \sum_{s=0}^{L} d_s I_{t-s}}{\sum_{s=0}^{L} d_s I_{t-s}} = p^R = \frac{p^K}{p^X}. \quad (18)$$

It is equal to the ratio between the capital stock at constant GDP price and capital stock at constant prices and the relative prices. A rise in the price of capital goods in relation to the GDP deflator results in an increase of the profit rate at constant prices in relation to the rate of profit at constant GDP price.

3. An Overview of Output and Inflation in Brazil

The history of the Brazilian economy might be summed up by an analysis of three interconnected variables: output growth, inflation rate, and profit rate. In this section, we briefly investigate the evolution of the inflation rate and the output growth rate, examining the different measures of the profit rate in the next section. After the Second World War, we can highlight three phases in the Brazilian economy with different institutional organizations: the import substitution industrialization (ISI) up to the late 1970s and its crisis until the late 1980s; the neoliberal era, from the late 1980s to the early 2000s; followed by a combination of elements of these models with greater social inclusion after 2003.

As expected, these phases combine different historical records on capital accumulation, output growth, and inflation. The 1950s to the late 1970s was a period of high capital accumulation and economic growth. The GDP per capita expanded at 4.58 percent with moderate and rising inflation. Between 1980 and 1989, per capita GDP expanded just 0.61 percent per year, while the inflation rate reached 124.9 percent annually. The first years of neoliberalism in the early 1990s

combined declining capital accumulation with reduced economic growth and rising inflation. The middle 1990s to early 2000s was associated with low inflation and diminished economic growth. The GDP per capita expanded just 0.68 percent between 1989 and 2003. There was a deindustrialization of the Brazilian economy in this period (Trindade, Cooney, and Oliveira 2016). Between 2003 and 2008, the low inflation was accompanied by rising capital accumulation and higher economic growth with the per capita GDP growing at 3.67 percent a year. The three phases are visible in Figure 1, which depicts the per capita GDP over the period of study.

The ISI *shared common features with* the Golden Age of capitalist development, adapting Keynesian economic policies to the problems of a developing country. Under the leadership of the state, there were strong incentives to foster capital accumulation in the industrial sector. Between 1955 and 1980, the manufacturing sector expanded at 8 percent a year and its share rose from 21.2 to 33.7 percent of GDP.

There were two economic booms, both were followed by a rise in inflation. During the Plan of Goals (*Plano de Metas*) from 1955 to 1960, Brazil went through a rapid industrialization process. Coordinated by the state, the program of investment had the participation of national and foreign capital. The introduction of the automobile industry and the construction of Brasília are two main symbols of this period. During the same period, there was acceleration in urbanization and the consolidation of an industrial proletariat. Led by the demand for consumer durables, in particular from the automobile industry and capital goods sectors, the per capita GDP expanded at an annual compound growth rate of 4.61 percent between 1953 and 1962.

The roots of inflation in Brazil are associated with balance of payment constraints and the consequent devaluation of the exchange rate. Exchange rate devaluations increase the cost of imported goods and the internal price of exported commodities which triggers a dispute over income distribution. When the working class is capable of resisting the fall in the real wage due to high labor demand or political organization, the result is an inflationary process. It starts a run between exchange rate devaluation, and rising prices and wages. Either a supply or a demand shock or a further deterioration of the balance of payments results in a rise in inflation.

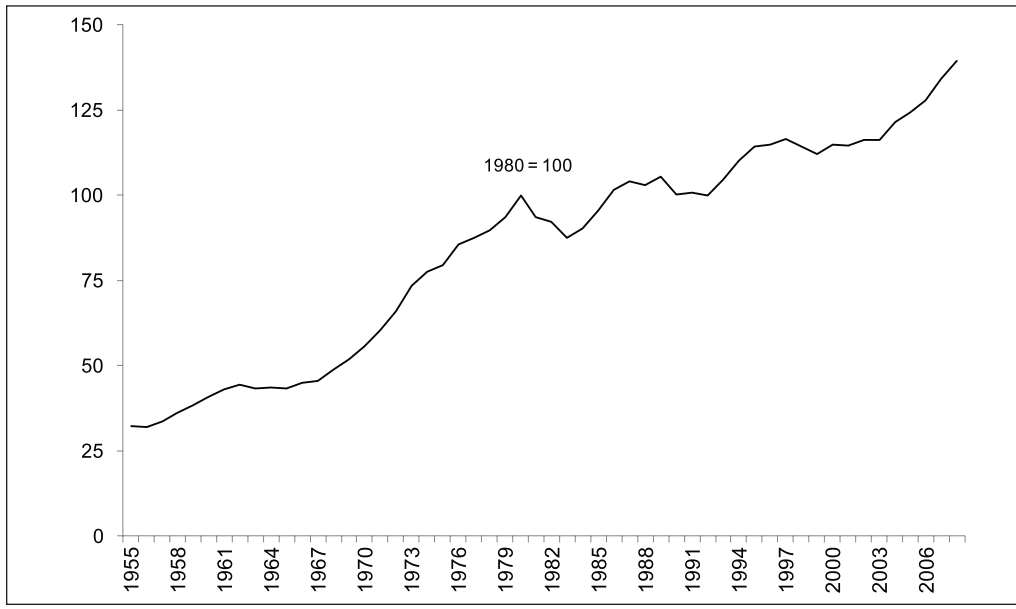

Figure 1. Real GDP per Capita, Brazil, 1955–2008.
Source: Marquetti and Porsse (2014) and IBGE (2006, 2013).
Note: IBGE = Instituto Brasileiro de Geografia e Estatística.

The deficit in the current account expanded from US $35 million in 1955 to US $518 million in 1960. It drove exchange rate devaluations in the late 1950s and early 1960s which, combined with high labor demand and the push for higher wages by organized workers, resulted in higher inflation. The inflation rate, whose average was 17 percent in the 1950s, rose from 25.6 percent in 1960 to 89.5 percent in 1964.

The pressure from leftist political parties for structural reforms and the high inflation led to political tension in the early 1960s. The military coup in 1964 overthrew the democratic government, reaffirming the capitalist class power. After launching a stabilization program to control inflation, the military dictatorship initiated the Government Economic Action Program (*Programa de Ação Econômica do Governo*). It consisted of a series of institutional reforms designed to reshape the financial markets, the tax system, and the labor markets. Among these was the indexation of specific long-run contracts such as mortgages. In the meantime, it repressed the working-class movements and ensured wage restraint through indexation below inflation. The military dictatorship maintained the ISI and stimulated capital accumulation.

The second economic boom from 1968 to 1973 represented the economic apex of the military dictatorship. The boom in the international economy associated with the monetary and fiscal stimulus resulted in robust growth. The annual compound growth rate of GDP was 10.6 percent and manufacturing was 14 percent during the so-called Economic Miracle (*Milagre Econômico*). In these years, the dictatorship strongly repressed the political opposition, particularly the labor and leftist movements.

With the end of the Golden Age and first oil shock in 1973, the ISI entered into a crisis. The military dictatorship answered the international crisis by implementing the Second National Plan of Development (*Segundo Plano Nacional de Desenvolvimento*) that aimed to expand the production of intermediary goods and energy. The investment boom was led by state enterprises and was financed by foreign loans through recycling of petrodollars. The external debt grew from US $14.9 billion in 1973 to US $55.8 billion in 1980. The external problems in the balance of payments were intensified with the second oil shock and, particularly, with the skyrocketing interest rates adopted by the Federal Reserve in 1979.

The pace of growth lessened in the period 1973–1980, but remained relatively strong. Both GDP and manufacturing sector rates of growth were 6.6 percent per year, while the per capita GDP increased 4.41 percent annually. There was a maxi-devaluation of the exchange rate in 1979. The rise of the inflation rate culminated in the indexation of most contracts by past inflation. Moreover, the period of wage adjustment was reduced to six months. The inflation rate rose from 29.6 percent in 1973 to 92.1 percent in 1980, signaling troubles ahead for the Brazilian economy.

The demise of the dictatorship began in 1974 with mounting economic problems. There was the reorganization of the labor movement and the intensification of the struggle for democracy in the late 1970s. In 1979, a series of strikes occurred throughout the country. The Workers' Party was founded the next year. The economic crisis also reduced the political support of the military dictatorship by the Brazilian bourgeoisie.

The debt crises led to economic instability, with the country displaying weak economic growth and high and rising inflation. The Brazilian democratization occurred in this context with the first civilian president taking power in 1985 through an indirect election. The new constitution was promulgated in 1988. Several economic plans were designed to fight inflation. None of them succeeded in the task. A major reason was the necessity of exchange rate devaluations to generate the foreign currency required to service the debt.

The inflation rate went from 82.1 percent in1980 to 248.5 percent in 1985, peaking at 2,736.9 percent in 1990. The average annual growth rate of per capita GDP was 0.61 percent and the manufacturing sector increased at 0.8 percent in the 1980–1989 years. The "lost decade" combined inflationary pressures with stagnant growth. The economic liberalization program and

deindustrialization started in the second half of the 1980s. Brazil embarked on a process of reforming its institutional framework.

In the early 1990s, after the first direct election for the presidency in 1989, Brazil fully embraced the neoliberal model. There was an opening up of the economy through the trade balance and capital account. A program of privatization of public enterprises was implemented. The institutional changes put an end to the ISI model. The state's attempt in directing capital accumulation toward the industrial sector had finally ended in Brazil.

In 1993, the inflation rate reached 1,996 percent. A new plan, known as the Real Plan, was designed to contain the inflationary process. The plan consisted of two parts. First, a new currency, the Real, linked to the dollar was adopted, and a set of short-term economic policies were implemented to fight inflation. Brazil restructured its external debt in April of 1994 within the Brady Plan, which coupled with the liberalization of the capital account opened the possibility of a wave of fresh capital. In July of 1994, when the Real Plan was launched, Brazil had accumulated foreign reserves on the order of US$43 billion. The capital account surplus went from US $8.7 billion in 1994 to US $29 billion in 1995. Second, neoliberal reforms were introduced to spur growth. The Real Plan was very successful in controlling inflation but was a failure in reviving economic growth. The inflation rate dropped to 77.6 percent in 1995, achieving 7.64 percent in 1997.

In January of 1999, there was a devaluation of the Real after a sequence of international financial crises. The authorities changed the political economy to a mix, which combined an inflation target, a primary fiscal surplus, and a floating exchange rate. Despite the exchange rate devaluation of 48 percent in 1999, inflation was maintained under control. The indexation of the nominal wages was eliminated in 2005. Moreover, the high unemployment rate had reduced the capacity of the working class to struggle against wage restraint. In the metropolitan area of São Paulo, the average real wage in 1999 was 16.6 percent lower than in 1989.

Per capita GDP increased at 0.68 percent and the manufacturing sector expanded 0.6 percent annually between 1989 and 2003. The process of deindustrialization accelerated, and the manufacturing share declined to 16.9 percent of the value added in 2003 (Instituto Brasileiro de Geografia e Estatística [IBGE] 2013).[3]

After 2003, the GDP growth rate accelerated, fueled by the international demand for commodities and changes in the institutional framework with the electoral victory of the Workers' Party in 2002. The per capita GDP expanded at 3.67 percent between 2003 and 2008. The new economic strategy included a rise in public investment with an expansionist fiscal policy with a high real interest rate, combining elements of the developing model with the neoliberal one. There was a decline in the unemployment rate and an expansion in real wages above the growth rate of labor productivity. Inflation was maintained under control with exchange rate appreciation due to the current account surplus between 2004 and 2007. Table 1 summarizes the per capita GDP growth rate and the inflation rate from 1955 to 2008.

4. Measures of the Profit Rate in Brazil

The upper part of Figure 2 exhibits the profit rate at historical and current costs and the inflation rate in the GDP deflator over the period 1955–2008. Both series decreased in the long-term perspective. In 2008, the profit rate at current costs represented 28.9 percent, and the profit rate at historical cost represented 31.4 percent of their 1955 levels. However, the downward trend in the

[3]The values of the manufacturing share are not strictly compatible with each other. Instituto Brasileiro de Geografia e Estatística (IBGE 2013) follows the System of National Accounts of 2008, while the data set organized by IBGE (2006) uses the System of National Accounts of 1968. However, the difference between both numbers is staggering, indicating the deindustrialization of the Brazilian economy.

Table 1. Real Per Capita GDP Growth Rate and Inflation Rate, Brazil, 1955–2008 (Compound Annual Growth Rate, %).

Period	Per Capita GDP	Inflation Rate
1955–2008	2.77	64.66
1955–1973	4.58	28.36
1955–1962	4.61	23.98
1962–1973	4.56	31.15
1973–1989	2.27	87.28
1973–1980	4.41	38.85
1980–1989	0.61	124.95
1989–2003	0.68	106.11
1989–1994	0.87	271.05
1994–2003	0.58	9.11[a]
2003–2008	3.67	6.87

[a]1995–2003.
Source: Marquetti and Porsse (2014).

series occurred in distinct periods of time. The profit rate at historical costs was trendless between 1955 and the early 1990s, declining sharply after 1994, when inflation was controlled with the Real Plan. It was the fall in the inflation rate, which drove the decline in the profit rate at historical costs. The trend of the profit rate at current costs declined up to the late 1980s, at which point it slowly started to increase.

As expected from the analysis in section 2, the profit rate at historical costs is higher than at current costs, and the difference between them rises with a higher inflation rate and declines with a lower inflation rate. The movements of the ratio between the profit rate at current and historical costs were determined by the inflation rate as one can see in Figure 3. As predicted by equation 14, it dropped in periods of rising inflation, from 1955 to 1964 and from 1973 to 1993, and expanded in years of falling inflation, from 1964 to 1973 and from 1993 to 2008.

The profit rate at historical costs has a considerably higher variance than at current costs. The phases displayed by the profit rate at historical costs suggest a strong correlation with the periods of rising and declining inflation in Brazil. First, in the 1950s, the profit rate at historical costs fell initially, expanding rapidly in the early 1960s, peaking in 1965, one year after the military coup. Second, it then declined from the mid-1960s to the late 1970s. Third, the profit rate at historical costs boomed during the "lost decade" and the early 1990s, the period of high inflation. Neoliberalism was implemented in Brazil in the early 1990s. Fourth, after the control of the inflationary process in 1994, the profit rate at historical costs fell sharply until the late 1990s, declining smoothly in the 2000s.

It is very difficult, if not impossible, from a Marxian perspective to use the profit rate at historical costs to understand key events of Brazilian economic and political history. For instance, the military coup in 1964 and the adherence to neoliberalism in the early 1990s would also have happened in periods of a thriving profit rate. The institutional changes in both cases would result in declining profitability. The profit rate skyrocketed in the early 1960s and during the lost decade, periods which combined reduced economic growth and high inflation rates. This is contrary to expectation from a Marxian perspective. In countries with a history of chronic inflation, like Brazil, the use of the profit rate at historical prices can produce inadequate results.

The profit rate at current costs has four main phases. First, it declined between 1955 and the early 1960s, during the implementation of the Plan of Goals. Second, it stabilized in the first decade of the military dictatorship between 1963 and 1973. Third, it plunged between 1973 and the late 1980s, during the crisis of the ISI. Fourth, it rose moderately from the early 1990s to

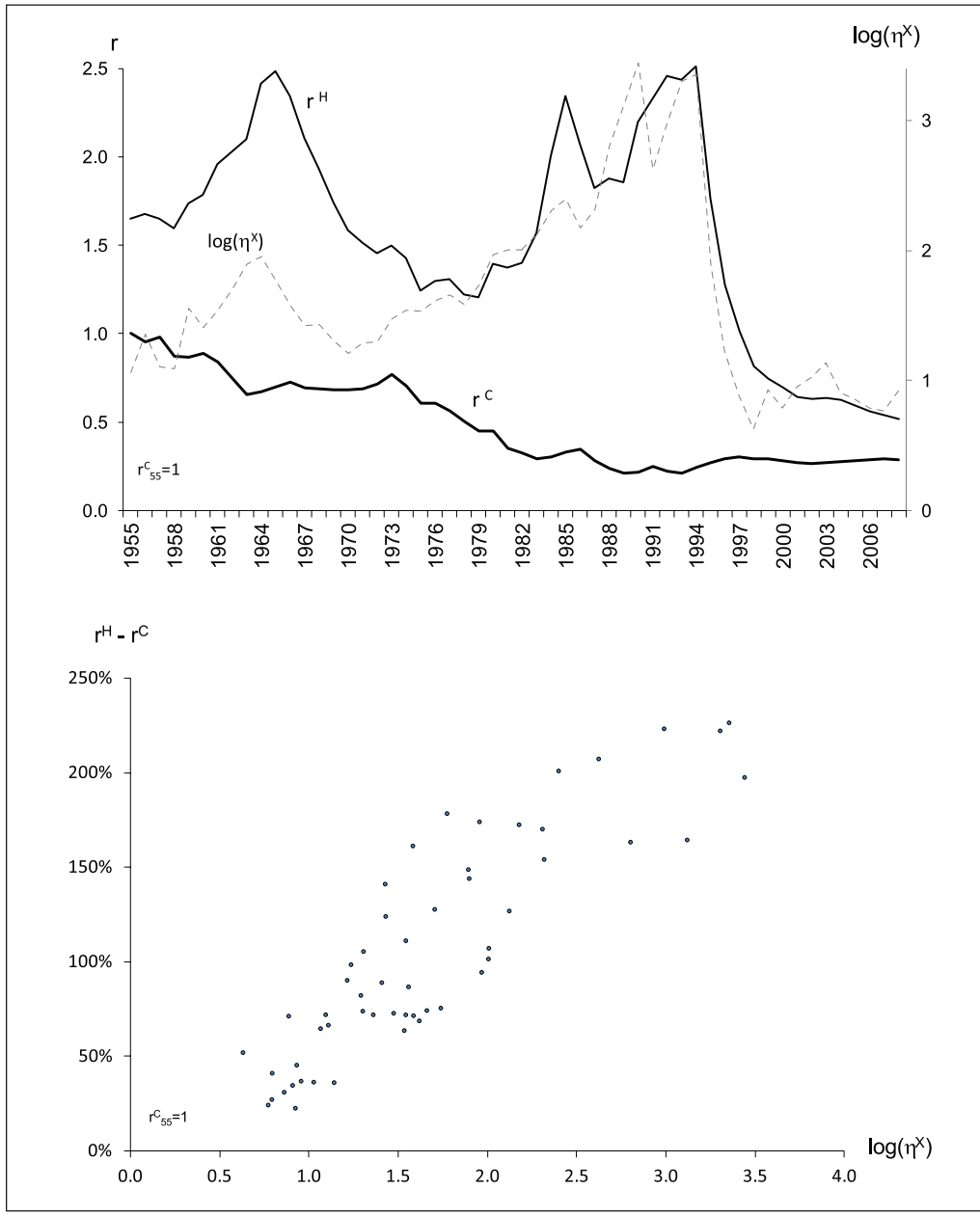

Figure 2. The Profit Rate at Historical, r^H, and Current, r^C, Costs and the Logarithm of the Inflation Rate in the GDP Deflator, $\log(\eta^X)$, and the Scatterplot between the Difference of the Profit Rate at Historical and Current Costs and the Logarithm of the Inflation Rate, Brazil, 1955–2008.
Source: Marquetti and Porsse (2014).
Note: The profit rate at current cost was set equal to one in 1955, and it is the reference for all observations.

2008, during neoliberalism and the first Workers' Party government. The military coup and the adoption of neoliberalism occurred during periods of declining profitability, and the institutional changes they promoted were able to stabilize or raise the profit rate. It is possible to understand

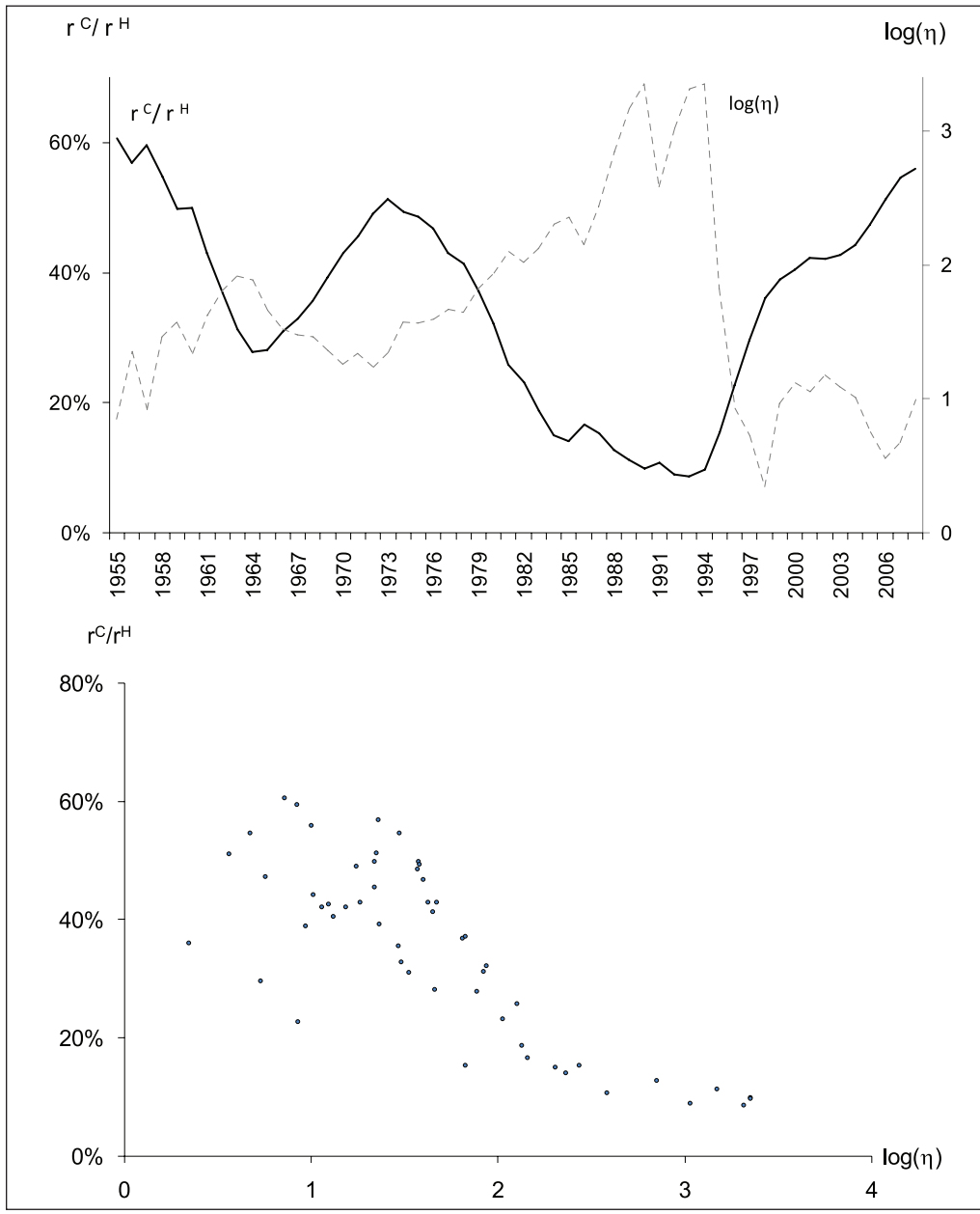

Figure 3. The Ratio between the Profit Rate at Current and Historical, r^C/r^H, Costs and the Logarithm of the Inflation Rate in the Deflator of Capital Goods, log(η), and the Scatterplot Relating the Ratio between the Profit Rate at Current and Historical Costs, r^C/r^H, and the Logarithm of the Inflation Rate in the Deflator of Capital Goods, Brazil, 1955–2008.
Source: Marquetti and Porsse (2014).

the main economic and political events that clouded the Brazilian economy over the last decades with the profit rate at current costs.

The upper part of Figure 4 exhibits the paths of profit rates measured at constant prices and at constant GDP price and the relative price in the period of study. The profit rate measured at

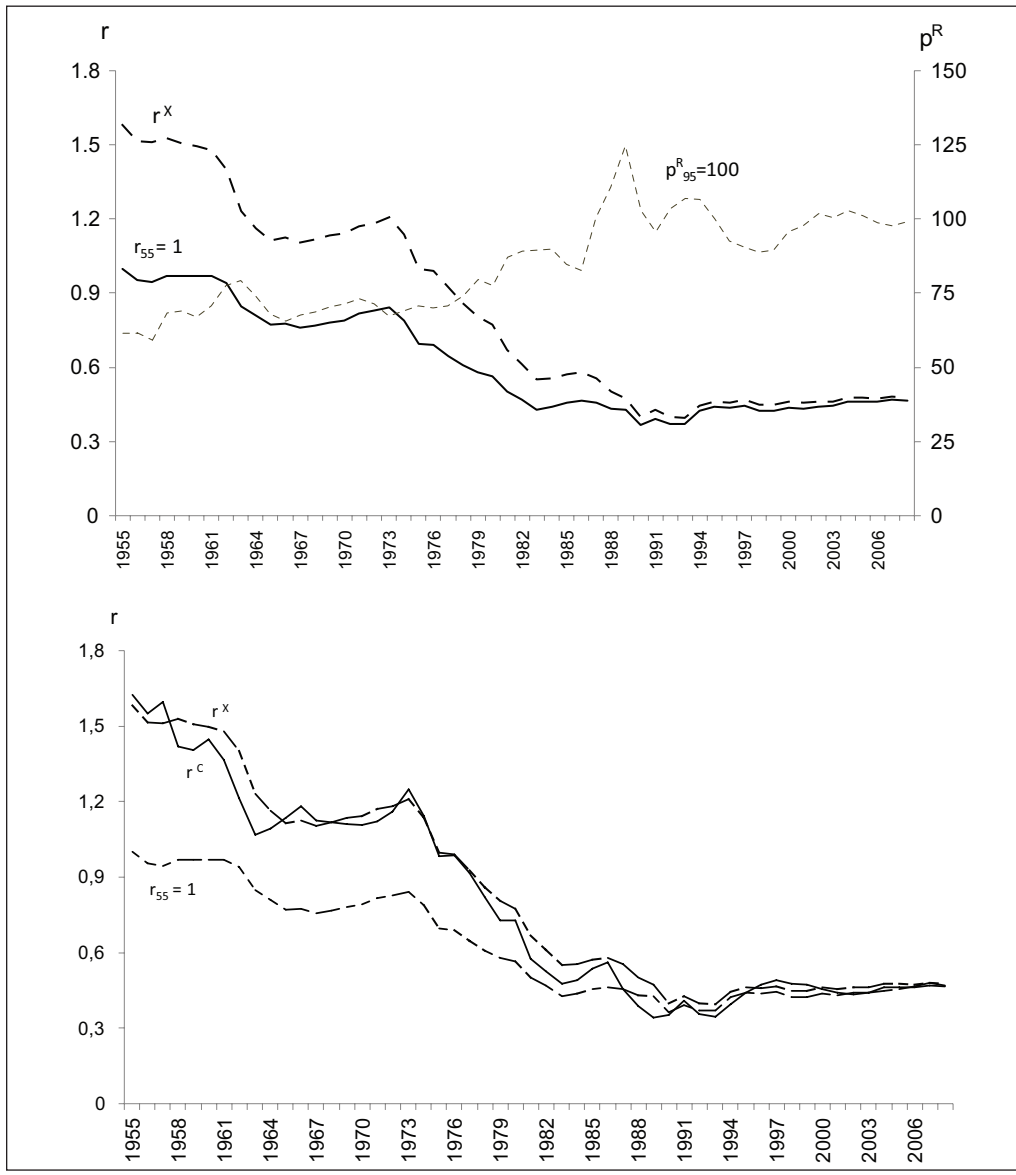

Figure 4. The Profit Rate at Constant GDP Price, r^X, at Constant Prices, r, and the Relative Price, p^R, and the Paths of the Profit Rate at Constant GDP Price, at Constant Prices, and at Current Prices, r^C, Brazil, 1955–2008.
Source: Marquetti and Porsse (2014).

constant prices represented 46.6 percent, while the profit rate at constant GDP price comprised 30 percent of their initial values. Both series declined until the early 1990s, then displayed a tiny increase until 2008. The fall in the profit rate at constant GDP price was faster due to the price hike of capital assets in relation to the GDP deflator. With the stability of the relative price, the paths of the two series were close to each other. As expected, there are no effects from the inflation rate in the trajectory of both series.

The lower part of Figure 4 shows that the trajectory of the rate of profit at current, constant GDP, and constant prices. The long-term movements are similar among the series. However, the

profit rate at current cost displays larger swings and anticipates the movements of the other series.

4.1. The decomposition of the profit rate at historical costs

This section explores the determinants of the profit rate at historical costs through its decomposition in capital productivity at historical costs and the profit share. There are two main results in Table 2. First, the output/capital ratio at historical prices drove the profit rate. Between 1955 and 2008, the profit rate at historical costs declined 2.19 percent per year, whereas the output/capital ratio at historical costs fell 2.21 percent per year. The phases of the profit rate at historical costs were determined by the capital productivity at historical costs. Second, the profit share expanded 0.03 percent per year in the period of study, playing a smaller role in the movements of the profit rate at historical costs.

Table 2 also displays the decomposition of the growth rate of the output/capital ratio into the inflation rate, the real GDP growth rate, and capital accumulation at historical costs. The inflation rate and capital accumulation at historical costs were the main determinant variables of the output/capital ratio at historical costs. The real GDP growth rate had a minor role in the definition of the output/capital ratio at historical costs, particularly after 1980.

Figure 5 indicates that the output/capital ratio at historical costs is positively associated with the inflation rate. The process of industrialization during the ISI played a secondary role in the phases and in the long-term movements of the output/capital ratio at historical cost. In the 1980s, the lost decade, the output/capital ratio at historical costs increased due to rising inflation rate. During the deindustrialization of the Brazilian economy after 1990, the output/capital ratio at historical cost declined sharply, a movement opposed to the expected. However, the output-capital ratio at historical cost increased from 1989 to 1994, when the inflation rate was rising, then it fell by 16.19 percent annually between 1994 and 2003. The average inflation rate declined from 271.05 percent in the period 1989–1994 to 9.11 percent during the 1995–2003 years. The output/capital ratio at historical costs is not a proxy for technical change in Brazil.

A central question is under what conditions the movements of the output/capital ratio at historical prices represent technical change. An answer to this question could be the case of a constant inflation rate, particularly the case of a zero or near-zero inflation rate. However, in capitalist

Table 2. Decomposition of the Profit Rate and Output/Capital Ratio at Historical Costs, Brazil, 1955–2008 (Compound Annual Growth Rate).

Period	g_r^H	g_π	g_p^H	η^x	g_x	g_{K_H}
1955–2008	−2.19	0.03	−2.21	64.66	4.9	71.77
1955–1973	−0.53	0.22	−0.75	28.36	7.44	36.55
1955–1962	2.96	0.43	2.52	23.98	7.64	29.1
1962–1973	−2.75	0.09	−2.84	31.15	7.3	41.29
1973–1989	1.34	−0.48	1.82	87.28	4.45	89.91
1973–1980	−1.02	−0.08	−0.93	38.85	6.81	46.59
1980–1989	3.17	−0.79	3.96	124.95	2.62	123.61
1989–2003	−7.67	0.65	−8.31	106.11	2.21	116.64
1989–1994	6.03	0.16	5.87	271.05	2.19	267.37
1994–2003	−15.27	0.91	−16.19	14.48	2.23	32.89
2003–2008	−4.07	−0.77	−3.3	6.87	4.7	14.88

Source: Marquetti and Porsse (2014).

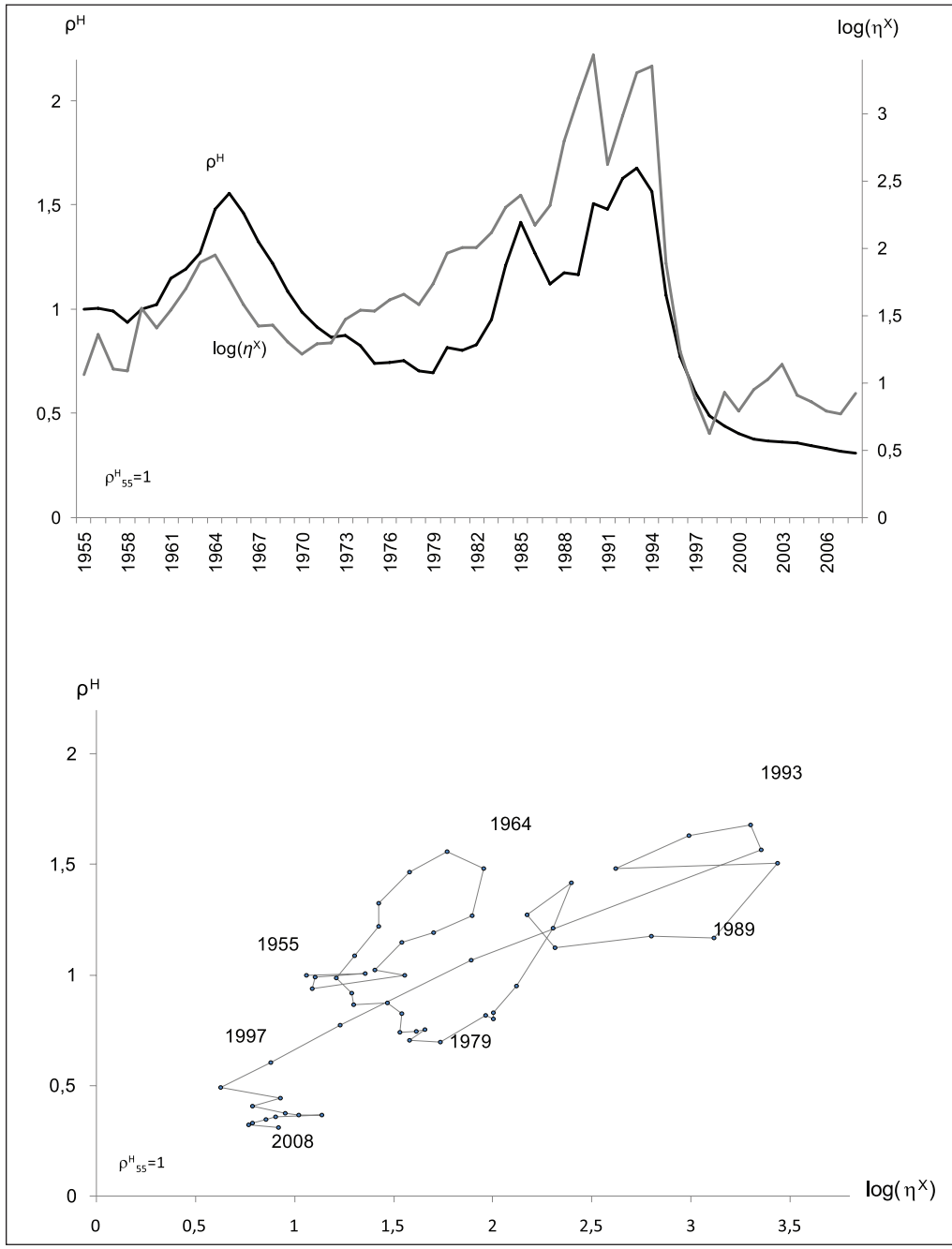

Figure 5. The Output/Capital Ratio at Historical Costs, ρ^H, and the Logarithm of the Inflation Rate in the GDP Deflator, *log(h*^{X}), Brazil, 1955–2008.
Source: Marquetti and Porsse (2014).
Note: The output/capital ratio at historical cost was set equal to one in 1955.

society, it is just a theoretical possibility. In addition, if the output/capital ratio at historical prices represents technical change, then the question is why the inflation rate does not keep rising in capitalist society.

4.2. The decomposition of the profit rate at current costs

Table 3 shows the decomposition of the profit rate and of the output/capital ratio at current costs in the period 1955–2008. It dropped 2.34 percent annually between 1953 and 2008. The time profile of the profit rate at current costs does not present the same ups and downs of the rate of profit at historical costs. As before, the output/capital ratio drives the movements of the profit rate.

The output/capital ratio at current costs rises with relative prices and real GDP growth rate and declines with capital accumulation. From 1955 to 2008, the output/capital ratio declined 2.37 percent per year. However, it displayed four phases. First, it declined at 1.68 percent annually between 1955 and 1973; second, it fell sharply from 1973 to 1989; third, it increased at 1.16 percent from 1989 to 2003; and fourth, it increased 2.07 percent between 2003 and 2008.

Between 1955 and 1962, the rate of profit at current costs declined 4.14 percent annually due to a fall of 4.57 percent of the output/capital ratio. These were the construction years of the capital Brasília and the implementation of the automobile industry, which is reflected in the expansion of 7.64 percent in GDP and 8.95 percent in the real net nonresidential fixed capital stock.

The profit rate and output/capital ratio at current costs increased between 1962 and 1973. The process of rapid capital accumulation was similar to the previous cycle; however, there was a decline in relative prices. The military dictatorship implemented a series of institutional reforms in the labor and financial markets to reduce inflation and to stimulate growth. The result was rapid economic growth in the late 1960s and early 1970s, during the Economic Miracle.

The end of the Golden Age in 1973 represented a turning point in the ISI in Brazil. During the massive investments of the Second National Plan of Development, the profit rate declined sharply due to falling capital productivity. The impressive growth rate of the real net fixed capital stock was the predominant factor of this fall. The 1980–1989 years marked the end of the military dictatorship. The fall in the profit rate and in the output/capital ratio was influenced by the rising prices of capital goods.

After 1989, the profit rate grew due to rising capital productivity and profit share. The increase in capital productivity at current prices may reflect the incorporation of innovations linked to information and communications technology. With the adoption of neoliberalism, the price of capital goods declined relative to the GDP deflator. In 1994, inflation was controlled and neoliberalism embarked on a new phase. The profit share increased by 0.91 percent per year. The expansion in the profit rate did not result in higher economic growth which is characteristic of neoliberalism. The average growth rate of net fixed capital stock in the 1989–2003 period was

Table 3. Decomposition of the Profit Rate and the Output/Capital Ratio at Current Costs, Brazil, 1955–2008 (Compound Annual Growth Rate).

Period	g_r^C	g_π	g_ρ^C	g_{P_R}	g_{X_R}	g_{K_C}
1955–2008	−2.34	0.03	−2.37	0.9	4.9	6.37
1955–1973	−1.46	0.22	−1.68	0.5	7.44	8.62
1955–1962	−4.14	0.43	−4.57	3.26	7.64	8.95
1962–1973	0.24	0.09	0.15	−1.26	7.3	8.41
1973–1989	−8.09	−0.48	−7.61	3.84	4.45	8.22
1973–1980	−7.67	−0.08	−7.59	1.97	6.81	12.43
1980–1989	−8.41	−0.79	−7.62	5.3	2.62	4.95
1989–2003	1.81	0.65	1.16	−1.53	2.21	2.58
1989–1994	2.97	0.16	2.81	−3.1	2.19	2.48
1994–2003	1.16	0.91	0.25	−0.66	2.23	2.64
2003–2008	1.3	−0.77	2.07	−0.28	4.7	2.91

Source: Marquetti and Porsse (2014).

lower than in the lost decade. Marquetti, Maldonado Filho, and Lautert (2010) present an analysis of the profit rate at current cost in Brazil for the period 1953–2003.

During the 2003–2008 period, the profit rate at current costs increased due to the expansion in capital productivity. The rise in real GDP was the principal component of the rising output/capital ratio. The profit share declined, revealing an important change in relation to the neoliberal years.

4.3. The decomposition of the profit rate at constant prices

Table 4 shows the decomposition of both the profit rate and the output/capital ratio at constant prices. The difference between the profit rate at constant and current prices is that the former accounts just for the quantity movements while the latter also accounts for changes in relative prices in the measurement of the output/capital ratio. Thus, there are similarities between the results. The profit rate at constant prices dropped 1.44 percent annually due to the fall of 1.47 percent in the output/capital ratio. The profit rate at constant prices diminished in the period 1955–1989, during the ISI and the lost decade. It increased in the period 1994–2008, after the first years of neoliberalism.

There were dissimilarities between both measures. First, in the period 1962–1973, during the first decade of the military dictatorship, the profit rate at constant prices fell 1.02 percent annually. It is explained by the decline of 1.11 percent in the output/capital ratio at constant prices. Second, the increase of the profit rate by 0.28 percent in the years 1989–2003 resulted in a 0.65 percent rise in the profit share. Third, the output/capital ratio at constant prices declined 0.37 percent per year from 1989 to 2003. Overall, the movements in the profit rate at constant prices correspond to the historical phases of the Brazilian economy.

4.4. The decomposition of the profit rate at constant GDP prices

Table 5 reveals the decomposition of the profit rate at constant GDP prices. This profit rate declined at 2.26 percent per year in the 1955–2008 period driven by the reduction of 2.29 percent in the output/capital ratio. Thus, as in the other measures, the decline in the profit rate is explained by the proxy of technical change.

The fall in the profit rate at constant GDP prices also presents the phases that are consistent with the economic growth of Brazil. It declined during the ISI period between 1955 and 1973. It fell sharply during the crises of ISI and the lost decade, mildly increasing from the early 1990s to 2008.

Table 4. Decomposition of the Profit Rate and the Output/Capital Ratio at Constant Prices, Brazil, 1955–2008 (Compound Annual Growth Rate).

Period	g_r	g_π	g_ρ	g_{X_R}	g_K
1955–2008	−1.44	0.03	−1.47	4.9	6.37
1955–1973	−0.96	0.22	−1.18	7.44	8.62
1955–1962	−0.88	0.43	−1.31	7.64	8.95
1962–1973	−1.02	0.09	−1.11	7.3	8.41
1973–1989	−4.25	−0.48	−3.77	4.45	8.22
1973–1980	−5.7	−0.08	−5.62	6.81	12.43
1980–1989	−3.12	−0.79	−2.33	2.62	4.95
1989–2003	0.28	0.65	−0.37	2.21	2.58
1989–1994	−0.13	0.16	−0.29	2.19	2.48
1994–2003	0.5	0.91	−0.41	2.23	2.64
2003–2008	1.02	−0.77	1.79	4.7	2.91

Source: Marquetti and Porsse (2014).

Table 5. Decomposition of the Profit Rate and the Output/Capital Ratio at Constant GDP Price, Brazil, 1955–2008 (Compound Annual Growth Rate).

Period	g_r^x	g_π	g_ρ^x	g_{X_R}	g_{K_X}
1955–2008	−2.26	0.03	−2.29	4.90	7.19
1955–1973	−1.49	0.22	−1.71	7.44	9.15
1955–1962	−1.76	0.43	−2.19	7.64	9.83
1962–1973	−1.33	0.09	−1.42	7.30	8.72
1973–1989	−5.85	−0.48	−5.37	4.45	9.82
1973–1980	−6.38	−0.08	−6.30	6.81	13.11
1980–1989	−5.44	−0.79	−4.65	2.62	7.27
1989–2003	−0.19	0.65	−0.84	2.21	3.05
1989–1994	−1.29	0.16	−1.45	2.19	3.64
1994–2003	0.42	0.91	−0.49	2.23	2.72
2003–2008	0.58	−0.77	1.35	4.7	3.35

Source: Marquetti and Porsse (2014).

The output/capital ratio at constant GDP price is computed using a weighted average of current and past relative prices. In the long term, its path was very similar to the path of the output/capital ratio at current prices. In the short term, particularly in periods of rapid change in relative prices, it is possible to observe differences between both measures of the output/capital ratio.

Comparing the results of the profit rate at current costs with the profit rate at constant GDP price, we observe that the former presents larger swings, anteceding the movements of the latter. An in-depth analysis of the two profit rates for the subperiods confirms our findings. For instance, the profit rate at constant GDP price fell from 1973 to 1989, whereas a more intense decrease occurred in the profit rate at current costs for the same period. In the same fashion, the profit rate at current costs grew faster than the profit rate at constant GDP price from 2003 to 2008.

It becomes clear from the analysis of Tables 3 and 5 that something is behind these features. As both the profit rates at current costs and at constant GDP price are triggered by the movements of technical change, their patterns must relate to the methodology used to measure the output/capital ratio. The output/capital ratio at constant GDP price is computed using a weighted average of current and past relative prices. This fact is the chief reason why the two series behave similarly. In the long term, the path of the output/capital ratio at constant GDP price was similar to the path of the output/capital ratio at current prices.

Despite the interesting estimates exhibited in Table 5, the results should be interpreted with a grain of salt. As emphasized before, these happen because the output/capital ratio at constant GDP price is calculated using a weighted average of current and past relative prices. Moreover, it seems incorrect to deflate investment by the GDP price index. Last but not least, the national statistical offices do not compute the fixed capital stock at current GDP price.

5. Conclusion

The paper discusses four different methodologies for measuring the profit rate. We estimate and analyze the profit rate at historical cost, current costs, constant prices, and constant GDP price for Brazil, a country with a history of medium to high inflation, in the 1955–2008 period. From a Marxian perspective, the path of the profit rate is crucial for understanding the performance of capitalist economies.

Section 2 compares the computation of the net fixed capital stock at historical cost, current cost, constant prices, and constant GDP price and the effects of the inflation rate over the path of the profit rate and capital productivity. The profit rate at historical cost rises with the inflation

rate. It implies that the profit rate at historical cost is determined by other factors besides distribution and technical change. However, the growth rate of the profit rate at historical costs is equal to the profit rate at current cost in the case of a constant rate of inflation. Many of the developing countries have a history of medium to high inflation and variation in the inflation rate across time.

Section 3 summarizes the paths of Brazilian GDP and inflation rate in the period of study. The Brazilian record on inflation is relevant for understanding its effects on the measurement of the profit rate, and it can shed light on the debate. The case of Brazil is similar to many developing countries such as Mexico, Argentina, and Turkey, among others.

The results in section 4 support the measurement of the profit rate at current costs. The path of the profit rate at historical costs was determined by the inflation rate, and is at odds with key events in Brazilian history. It declined in the first years of the military dictatorship, expanded in the lost decade, and fell during the neoliberal years. The movements of the profit rate at constant prices and at constant GDP price correspond to the historical phases of economic growth in Brazil. However, there are limits in the employment of both measures. The profit rate at constant prices does not account for the cheapening of fixed capital goods, an important counteracting factor to the tendency of the profit rate to decline. The profit rate at constant GDP price is computed using a weighted average of the current and past relative prices. Moreover, the national statistical offices do not calculate the fixed capital stock at constant GDP price. The researchers must estimate it by themselves.

The main results of the paper can be summarized as follows:

1. The profit rate at historical costs was higher than at current costs.
2. The path of the output/capital ratio determines the movements of the profit rate.
3. The profit rate and capital productivity at historical prices increased in the years of rising inflation and fell in the years of declining inflation.
4. The inflation rate affects not only the level of the profit rate and capital productivity at historical prices but also their cyclical movements and their trends.
5. The output/capital ratio at historical costs did not represent technical change in the Brazilian economy.
6. The path of the profit rate measured at current prices is not affected by the inflation rate. The profit rate at current prices allows for an accurate measurement of the profit rate in the context of high inflation, functioning as the central variable in understanding the dynamics of capitalism in the Brazilian economy.
7. The profit rate at current cost presents larger variance and anticipates the changes in the direction of the movements of the profit rates at constant prices and at constant GDP prices.

The studies about capital productivity and the profit rate of economies with different inflation patterns must use the current costs measurement. The use of historical costs in economies with experience of medium and high inflation implies that the paths of both capital productivity and the profit rate are conditioned by the determinants of inflation. The profit rate at historical cost is no longer determined only by distributive and technical variables.

Acknowledgments

We thank Silvio Tai for his helpful comments and the referees for their constructive critique. Any shortcomings or errors are ours.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The authors acknowledge partial support from CNPq (Grant number 307310/2015-9).

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