CAPITAL ACCUMULATION IN THE CENTER AND SEMIPERIPHERIES

A Comparative Analysis of the US, Spain, and Brazil

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Abstract: This paper presents a comparative analysis of capital accumulation in the US, Spain, and Brazil from 1990 to 2014, in order to analyze the peculiarities of the main contemporary economy (US), a developed one with a peripheral integration into the Eurozone (Spain), and a semiperipheral economy within a backward region (Brazil). This period is highlighted, especially for Spain and Brazil, by a neoliberal turn and certain monetary stability. Taking the US economy as a reference, Brazil achieved a higher average GDP and investment growth, but its capital-output ratio shows a relative high level. This economy also suffers from less capacity to produce a surplus in US dollars, and its productivity gap widens. In the case of Spain, its real-estate speculative boom has driven down both the profit rate and the productive efficiency of capital stock. Thus, while lacking an outstanding performance, the USA has kept its productive superiority in relation to Spain and Brazil.

Keywords: capital accumulation; productivity; profit rate; underdevelopment

1. Introduction

This paper presents a comparative analysis of the process of capital accumulation in three economies, United States (US), Spain (SPA), and Brazil (BRA), between 1990 and 2014, a period of worldwide economic restructuring, and in which a neoliberal program was introduced in the last two countries.[1] This comparison will address a number of specific issues, mainly: i) the absolute levels and evolution of the rate of

profit; ii) the composition and dynamics of investment, surplus, and output; and iii) the determinants of profitability: the capital-output ratio, productivity, and relative prices, both in terms of its evolution and their relative level in US dollars.

This research is based on a Marxist political economy approach. The object of study is particularly relevant because it requires us to analytically advance in the abstract process of capital accumulation, taking into account what (simplifying) can be claimed to be a center–periphery schema.[2] These three economies have different degrees of economic development. Per capita GDP in US dollars at 2010 constant prices in Spain represented 59–65% of the US level, while in Brazil it barely reached 19–21% (World Bank 2019). This divergence, therefore, allowed us to address the particularities of capital valorization in the advanced center of the world economy (US), the periphery of a developed area (Spain), and the semiperiphery (Brazil), belonging to three different regions. Although it was not intended that the results could be extensible to all advanced and backward economies, the study aimed at least to promote a comparative analysis of the particularities of center–(semi)periphery capital accumulation dynamics.[3]

The period of reference is explained, first, by statistical availability. In Brazil, only since 1990 has there been a disaggregation of the System of National Accounts (SNA) making it possible to exclude certain unproductive activities (IBGE 2019). Also, because the purpose was to study the accumulation process in the current context, with the restructuring of the global economic system, not only the geographical change driven by the restructuring of production, but also in terms of neoliberal-inspired policies—albeit not so much for the US economy. After the 1990s, in Brazil, there was a phase of certain monetary instability linked to the implementation of the neoliberal "Real Plan"; whereas in Spain, the period started with the end of the expansionary cycle (1985–1991), leading to the crisis of 1992–1993 and the subsequent implementation of a neoliberal program in order to later join the European Monetary Union (EMU).

This period was interesting as well because less developed economies led to economic growth (see IMF 2019a). Brazil had an annual average GDP growth of 3.15%, greater than the US (2.44%) and Spain (only 1.97% per year). Even in per capita terms, average growth amounted to 1.65% in 2014 in Brazil, 1.40% in the US, and 1.15% in Spain (World Bank 2019). Although the number of years of economic growth was similar, 14 in the US and Spain, and 15 for Brazil, but differently distributed, crises were unequal: the Spanish economy had seven years of crisis; there were five in Brazil, and only the 2008–2009 recession for the US, and all with different intensites.[4]

The study begins with a theoretical section in which the categories of analysis are explained, as well as the fundamental features and trends of capital accumulation in the center and the periphery. Later, reference is made to the countries

analyzed in the current historical context (1990–2014). In the next section, empirical results are exposed: first, from a short-term perspective, taking the different phases of growth, slowdown and crisis and the dynamics of economic variables; and second, considering the whole period 1990–2014 for the comparative evolution of the composition of capital and profitability.

2. Theoretical Aspects

2.1. Categories and Concepts

Capitalist production is a process of valorization, so the following causality was the starting point: [{*SP, r*} → {*I, K*} → *Y*], where *SP*: surplus, *r*: profit rate, *I*: investment, *K*: stock of capital, and *Y*: output. Thus, the capacity to generate surplus explains the productive investment of a part of that profit, in turn driving economic growth. Within this theoretical framework, both the separation of the capitalist and non-capitalist sectors and the delimitation of productive activities (*p*) within the capitalist sphere do make (analytical) sense, with the purpose of establishing the productive labor (*PL*).[5] In this paper, finance and real estate (*FIRE*) and government and social services (*GOV*) are considered unproductive (*UPL*), so they are deduced in the calculations. However, it has not been possible to exclude the non-capitalist activity of self-employees because of statistical difficulties, especially in the cases of Spain and Brazil.[6]

Gross operating surplus (*GOS*), or just profit (*P*), is the difference between *GDP* and wages (*W*), $P = GDP - W$. When making reference to *SP*, profit is then taken from the productive capitalist sphere, so $SP = P_{tot} - P_{FIRE} - P_{GOV} = \sum \left(GDP - W \right)_{PL}$, and $Y = GDP - FIRE - GOV$. The mass of *SP* at constant prices (*SP**) is calculated in relation to the gross investment price index (P_{inv}), following Shaikh (2016),[7] since it is the purchasing power of money-capital in terms of capital assets that is relevant in the analysis of valorization: $SP^* = SV / P_{inv}$. The measure of the capital stock corresponds to the end of year *t*–1, in net terms, excluding residential assets (*nr*), but for the economy as a whole—including *FIRE* and *GOV* activities, see section 2.4 below. If not specified otherwise, $K = K_{net,nr}\left(t-1\right)$. Therefore, the rate of profit is expressed at current prices as follows:

$$r = \frac{SP}{K} \tag{1}$$

The profit rate is associated with the level of productive development and, by extension, affects the determination of the cost of financing (*i*). The interest rate

has thus an objective foundation in the productive sphere, together with the economic cycle (Shaikh 2016). Hence, it is possible as well to claim that $K \rightarrow r \rightarrow (i,\ r - i)$. That is, there is a reciprocal relationship between profitability and capital, since the level and structure of capital as a social relationship constitutes a fundamental determinant of the profit rate, but the level of profit also explains the flow of investment (GFCF), materialized in "*K*." This capital stock is made up of machinery and equipment (M&E), construction (CONS) and other assets (OTH). In turn, the profitability of capital can be discomposed in terms of the capital-output ratio ($\theta = K/Y$), and the profit share ($\delta = P/Y$):

$$r = \frac{\delta}{\theta} \tag{2}$$

The capital-output ratio, at current prices, can be broken down into the same ratio at constant prices $(K/Y)^*$ (* is for constant or real terms) and the price ratio of capital stock and output (P_{ky}).

$$\theta = \frac{K^*}{Y^*} \cdot \frac{P_K}{P_Y} = \left(\frac{K}{Y}\right)^* P_{ky} \tag{3}$$

Furthermore, $(K/Y)^*$ depends on the stock of capital per employee (capital-labor ratio, σ) and the (labor) productivity achieved (q), with $q = \left(Y^*/L\right)$, where L is labor, so that the capital-output ratio can be expressed as follows:

$$\theta = \frac{\sigma}{q} P_{ky} \tag{4}$$

It should be noted in equation 4 that, conceptually, the essential causality goes from the mechanization of the productive process to productivity and the price ratio, so that $\left\{\sigma \rightarrow q, P_{ky}\right\}$. In the denominator of equation 2, the profit share is the profit to output ratio, and is directly associated with the rate of exploitation (e)—surplus to wage ratio, associated with the profit share, so when "e" goes up, so "δ" does:

$$\delta = \frac{1}{1 + \left(1/e\right)} \tag{5}$$

In order to address profitability, explanatory priority is given to the "θ" ratio. The process of accumulation has theoretically (but not without controversies) a tendency to increase K/Y, the basic mechanism to increase the profit share.

To the extent that mechanization, materialized in the capital-labor ratio (θ), boosts labor productivity (q), then production costs will be reduced, as the underlying causality is as follows: $\theta \rightarrow q \rightarrow \delta$, and therefore prices will relatively fall.

2.2. Accumulation of Capital in the Center and the Periphery

In order to advance in the degree of concreteness of the analysis, "country A" represents the developed area (the center), issuing the international currency ($), while "country B" would represent a peripheral or undeveloped economy. The main differentiating factor among countries is *capital*—its level, technological content, and structure by assets; they all represent to a great extent the level of productive development.[8] For this reason, the average level of productivity, expressed in the same currency ($), will be higher in A, so that $(q_A > q_B)^{\$}$. However, the rate of profit (r), in gross terms, is expected to be higher in country B: $r_B > r_A$ (see Mateo 2020).

The unequal productive development is manifested in the type of external insertion. Given the lower valorization capacity, the process of capital accumulation in country B has a qualitatively different dependence on external factors (see Astarita 2010), which is why exchange rates (ER, and in real terms, REER) do play an important role in its dynamics of accumulation. The ER expresses the conditions under which domestic socially necessary labor time is transformed into international abstract labor (value). The greater productive development leads to a pressure towards the appreciation of the *ER*, meaning a greater capacity to acquire labor time (Carchedi 1997), which in turn is supported—but also contributes to—greater monetary stability.[9] Moreover, there is a pressure towards higher inflation ($\dot{P}$) in these economies, so $\dot{P}_A < \dot{P}_B$. By extension, there could be an asymmetry between the growth rates of their relative prices because of the dependence on imports of capital goods by country B, $\left(\dot{P}_k > \dot{P}_y\right)_B$—or at least a huge gap in absolute terms, despite the dynamics in some years—meaning for peripheral economies a higher ($\dot{P}$) and a pressure towards the increase of $P_{ky} = P_k / P_y$. In fact, the monetary sphere and relative prices are essential because "the ability to purchase these [capital] goods does determine a country's ability to *develop*" (Smith 2010, 194); hence the "successful attainment in the sphere of consumption in fact depends on prior success in production" (Freeman 2009, 1441).

There is an objective foundation for a more than proportional increase in interest rates in the periphery ($i_B >> i_A$), which should contribute to monetary stability. Thus, the net profit rate of interest in economy B, or the so-called net profit rate of enterprise ($r - i$), is eroded. It has to be considered, therefore, that although $r_B > r_A$, the gap is correspondingly reduced when some other factors such as interest rates, and the progressive depreciation of the exchange rate—which establishes the purchasing power in world currency of the surplus generated in the backward country—are incorporated. That is, country A has wider possibilities to counteract the downward trend in profitability (see Mateo 2016), since the greater purchasing power of its currency could compensate for a deterioration in the rate of profit.

These aspects are reflected in the capital ratios, mainly the K/Y, an essential determinant of the profit rate. First, in less developed areas, the dependence on imports of certain capital goods, together with the possible ER depreciation, and given the possible trend towards the increase of P_{ky} mentioned in country B, led to a capital-output ratio $\left(K/Y = (\sigma/q)P_{ky}\right)$ that can reach a substantially high level in relation to its productive development, or more specifically, the relative level of mechanization (σ). Second, it is relevant to make reference to σ_{BA}/q_{BA} and θ_{BA}/q_{BA}, with $_{BA}$ indicating the underdeveloped economy B percentage in relation to the more advanced country A. These ratios relate to the gap in terms of capital intensity and the relative results of productivity in relation to the developed country. A level higher than 1 is expected ($[\sigma_{BA}/q_{BA}]>1$); that is, a higher productivity gap in country B, regarding the capital-output ratio ($q_{BA} < \sigma_{BA}$).[10]

On the other hand, a double dynamic—apparently contradictory—in terms of the behavior of capital ratios has to be taken into account. Although a higher level is associated with a greater development of the productive forces, at the same time this development contributes to that increase being limited throughout the accumulation process. In other words, a more developed economy is characterized by a greater intensity of capital as well as by the capacity to prevent it from rising through time, which makes it possible to counteract the pressure on the profitability of capital. Hence the difficulty in grasping the meaning of the concrete evolution of capital ratios, as the same evolution of these variables can be associated with opposing tendencies, mainly in undeveloped economies.

This apparent and possible disconnection between "q" and K/Y in the periphery means a downward pressure on the profit rate (equation 2), thus pushing towards a more regressive distribution of income (δ, e). Although the rate of exploitation (e) must be higher as the productive development advances (Milios and Sotiropoulos 2009), there are as well opposing factors that tend to substantially increase the profit share in country B: large layers of people underemployed that press down wages as well as the lower increase in the consumer price index with respect to P_k.

Finally, it is necessary to consider that the tendency towards uneven development and polarization exists not only during the periods of accumulation, but also, and fundamentally, they are even intensified during economic crises (see Gowan 1999). In recessions, the role of finance is decisive for carrying out the specific function of crisis in order to restore profitability: capital movements in search of safe assets in A, which pushes towards a greater depreciation of B's currency, and the increase of its risk premium, greatly enlarging the gap in interest rates between the center and the periphery. These depreciations cheapen the costs of country A's imports, and raise the cost of international currency—denominated debt in backward economies. Consequently, this process generates

the conditions for an acute centralization of capital, strengthening the most powerful capitals, associated with their territorial-geographical dimension. However, this polarizing dynamic admits different nuances, and does not have to be strictly in line with national boundaries.

In short, the main underlying causality that is sustained is the following: it is the low productive development—in terms of surplus, and materialized in the stock of capital—of underdeveloped areas that originates, and is manifested, in an external dependence, with some possible trends to consider: i) trade, in terms of capital assets and/or goods with high technological content; ii) financial, regarding the inflow of capital, the net cost of maintaining foreign exchange reserves, and the proliferation of short-term financial products in cases of huge volatility. This external dependence implies a disarticulation in the economic structure and in the way it reproduces over time: divergences in price levels, between tradable and non-tradable sectors, or in the conformation of the value of the labor force. Thus, this disarticulation implies that trade, finances, and income distribution have a prominent relevance in the accumulation process, which leads to some theoretical approaches to analytically start from variables such as the terms of trade, financial deregulation or indebtedness, monopolies, underconsumption, or the excess of surplus when explaining the foundation of growth and crises, instead of the valorization process (see Mateo 2019, 2020).

2.3. Case Studies within the Framework of Economic Restructuring

As explained in the introduction, the period of analysis is part of a broad economic restructuring. Briefly, two issues are worth mentioning. First, the pressure to contain the composition (intensity) of capital in the current phase of capitalism stands out (Freeman 2004) because of the outsourcing from advanced economies of certain parts of the production process, the increase of the surplus labor and the rise of finance (see Foster, McChesney, and Jonna 2011; Milberg and Winkler 2009). Second, the greater monetary stability, which affects the theoretical framework discussed above. After a huge inflation gap in the 1980s, in the period 1990–2014 average inflation fell in Latin America to 41%, and 2.4% in the center, even in the 2000s it averaged 7% and 2%, respectively (UNCTAD 2019). Economic growth rates became higher in the periphery following the 1990s (and mainly in the 2000s),[11] albeit with a reprimarization process of the Latin American economies, such as Brazil (ECLAC [Economic Commission for Latin America and the Caribbean] 2010). Alternatively, a significant erosion of the US hegemonic position was observed (see Bichler and Nitzan 2012), although it still accounted for a quarter of world GDP in current dollars in this period (IMF 2019a).

The case studies should be analytically located in this historical context, for which the most relevant aspects of the Spanish and Brazilian economies are briefly mentioned.[12] There was a significant economic restructuring in both cases as well following the import-substitution industrialization strategies that collapsed in the mid-1970s and 1980s, respectively, supported by high rates of profit, albeit obviously in different contexts (see Charnock, Ribera, and Purcel 2014; Mateo 2018b; Mateo and Montanyà 2018; Mateo 2019). In Spain, the application of the neoliberal program intensified after the 1992–1993 recession and the signing of the Maastricht Treaty, in order to prepare the economic integration into the EMU. This process culminated with the adoption of the euro in 2002, although exchange parity had already been fixed in 1999. Brazil's deep neoliberal turn took place mainly from the 1990s after a period of high inflation and indebtedness. The Real Plan was implemented in 1993–1994, a program following the IMF guidelines that managed to stabilize inflation, and substitute the domestic currency, the cruceiro, for the new real (*reais*).

Both economies shared one common fact: the level of the gross rate of profit in 1990 was relatively low in relation to previous decades, with a markedly downward trend, unlike the US. In Spain, it was 20.2% below the average of the 1965–1974 growth phase, and barely 1% higher than the average of the 1980s, while the profit rate in Brazil in 1990 was 60% lower than the average of 1965–1979, and 22% below the 1980s average level. On the other hand, profitability in the US started an ascending phase from the beginning of 1982, so in 1990 the level was similar to that of 1983–1989.[13]

In relation to external monetary stability, Spain's nominal parity against the dollar depreciated by 82% between 1990 and 2001, but with the euro and the economic expansion it appreciated 39% until the crisis erupted in 2008, followed by a subsequent depreciation. Brazil experienced significant currency depreciation in the first half of the 1990s (over 1000% between 1992 and 1994), but from 1995 to 2003 the annual depreciation rate was limited to 16%, which then set off a phase of appreciation during the commodity boom of 2003–2008. However, the REER[14] appreciated in Brazil until 2003, subsequently depreciating to the same level as in the early 1990s, while the REER in Spain and the US showed more stability.

If only the period after monetary stabilization was considered, an aspect specific to Brazil was a lower inflation gap than the Spanish and US economies, as well as a greater stability in the exchange rate that avoided a progressive depreciation in real terms in relation to the US. In the case of Spain, its integration into the Eurozone implied it had an extremely appreciated exchange rate, which affected the housing boom, and in turn drove its dynamics of accumulation, analyzed in the following section.

2.4. Methodological Issues

The measurement of homogeneous variables was forced to rely largely on the statistics available from Brazil. As there was no sectoral disaggregation for the unproductive activities in both GFCF and *K* in this economy, the ratios calculated using these variables take GDP instead of *Y*. Therefore, there is not a full correspondence with other categories when the annual rates of change were calculated. GDP price deflators were taken from the IMF (2019a), while the exchange rates came from the OECD (2019) and IMF (2019b) for Spain and Brazil, respectively. For the profit, rate *K* in year (*t*–1) was used, except in Brazil in 1990–1994, for which the average *t*/*t*–1 was taken because of high inflation and the corresponding lack of an economic meaning for the results.

The main statistical issues for both Spain and Brazil were as follows:

(i) Spain: the only homogeneous series of the SNA was the NSI (National Statistics Institute) (NSI 2019) from 1995, which was taken as a reference, and linked with EU KLEMS[15] (EU KLEMS 2011) in order to distinguish the unproductive activities of income and labor since 1990, while depreciation was calculated from AMECO (the Annual Macro-Economic Database of the European Commission's Directorate General for Economic) (AMECO 2019) as well as GDP before 1995.

(ii) Brazil: the series for *Y, W*, and *L* came from IBGE; *K* from IPEA (Instituto de Pesquisa e Economia Aplicada) (IEDI 2019), which only ran until 2008. For the following years, it was linked to Morandi (2015), but keeping the structure of IPEA, as the latter was based on 2010 prices. Since there was only information of *K* at constant prices, the investment price deflator was used to obtain series *K* at current prices. For this reason, the same price index was used to calculate the mass of surplus in the three economies. For *L*, the percentage structure of Marquetti and Porsse (2014) was followed between 1990–1999 due to inconsistencies of the IBGE series. Data of GFCF only reach until 2013, and so the series of P_{inv} and the mass of surplus.

In Table 3, the capital-labor (output) to productivity ratio in relation to the US is calculated as follows:

$$\frac{\sigma_i}{q_i}$$

Where σ_i is *K*/*L* of Spain/Brasil in relation to *K*/*L* in the US, and q_i is the ratio of Spanish/Brazilian productivity to US productivity, both expressed in US dollars. However, the *K*/*Y* ratio is calculated in domestic currency for Spain and Brazil.

3. Comparative of the Capital Accumulation Process

3.1. The Conjuncture: Phases of Growth and Crisis

This section addresses the comparative process of accumulation based on the short-term perspective of cycles of growth, recession, and intermediate periods that I call slowdown or weak growth, characterized by some instability, slow growth, or stagnation (Table 1).

First, macroeconomic variables had lower volatility in the US. Inflation was lower with higher levels of development. Even ignoring the problematic early 1990s, Brazil's average inflation since 1995 was almost four times higher than the US. True, from a historical perspective this country had achieved an outstanding moderate inflation, but the counterpart had seen very high interest rates. In the case of Spain, the adoption of the euro represented an important change, from a relatively inflationary crisis in 1992–1993 (more than 5% a year) to the recent Great Recession with barely 0.59% of average price rise per annum.

The cyclical evolution of capital ratios was to some extent paradoxical, as there was no clear upward trend during the phases of growth. Indeed, they seemed to be more influenced by the utilization of productive capacity, making K^*/L more dependent on employment (denominator) than on total capital (numerator). As a consequence, K/Y dynamics was contradictory as well, and even productivity, which was weak during periods of growth. The fall (–0.16% per year) during the long boom in the Spanish economy has to be highlighted here.

Therefore, these results revealed the importance of the "ability" of an economy to limit the increase of this ratio (K/Y), as since 1990 it was in Spain—the economy with the greatest drop in profitability—where it rose the most, followed by Brazil. Thus, in the last two periods of growth, the Brazilian surplus in US dollars increased, K/Y was reduced, the level of mechanization only increased between 2010 and 2014, and even the stock of capital became relatively cheaper. Yet, the US economy generally required a smaller increase in the volume of GFCF to push the output upwards by one point—the average annual growth rate ratios of both magnitudes were 1.1 to 1.6% in the US, compared to 1.7% of SPA and 1.4–2% in Brazil. The price ratio (P_{ky}) tended to increase during periods of growth and slowdown, with the sole exception of Brazil, where it stabilized in 2004–2008 (–0.01% average) and even reduced in 2010–2014.

Another implication was the fall of the rate of exploitation (e) along various phases of growth. Indeed, there was no clear relationship between the dynamics of this variable and the moment of the economic cycle, nor was there a direct relationship between productivity and the rate of exploitation. Therefore, a correlation of these variables with the dynamics of capital profitability was not found.[16]

Table 1 Comparative Dynamics of Macroeconomic Variables

	Annual rates of change								*Average I/GDP*	*Annual rates of change*					*Avg. e*	*ARCh*	
	Years	*SP**	*SP*($)*	*GFCF**	*K**	*GDP**	*P**	*r*		*K/Y*	*(K/L)**	P_k/P_y	*(Y/L)**	*e*		*ER*	*REER*
Growth																	
US	1992–2000	2.93	4.35	6.37	2.42	3.84	1.92	0.72	21.19	–1.23	–0.06	0.40	1.44	–0.86	0.69	*	1.50
	2003–2007	1.47	3.69	3.29	2.03	2.87	2.74	–0.14	22.12	1.22	0.86	2.32	1.88	1.85	0.74	*	–3.57
SPA	1994–2007	2.83	3.00	6.15	4.22	3.60	3.61	–1.37	25.91	1.04	0.97	0.12	–0.16	–0.71	1.13	–0.33	0.50
BRA	1993–1997	13.60	–67.50	7.54	1.56	3.98	313.26	–0.29	18.52	1.52	–0.22	8.71	6.77	3.06	1.61	253.49	5.35
	2004–2008	4.82	16.23	9.93	2.09	4.81	7.12	2.01	17.00	–2.64	–0.55	–0.01	2.19	–1.97	1.91	–9.84	9.90
	2010–2014	3.81	1.90	6.42	3.95	4.39	6.93	0.24	18.78	–2.37	2.66	–2.61	1.00	–5.19	1.46	1.90	–0.09
Slowdown/weak growth																	
US	2001–2002	2.18	3.49	–1.06	3.04	1.38	1.91	–1.37	21.74	3.13	4.13	0.28	1.28	2.88	0.66	*	2.66
	2010–2014	1.86	3.21	3.61	1.17	2.08	1.71	2.10	18.73	–1.71	–0.65	0.28	0.66	0.63	0.80	*	–0.56
BRA	2000–2003	1.14	–10.49	–1.18	1.64	2.35	9.82	0.24	16.37	1.52	–0.73	3.48	1.33	5.06	1.98	14.13	–2.87
Crisis																	
US	2008–2009	–1.62	–1.19	–9.03	2.27	–1.54	1.36	–6.95	19.69	7.77	6.11	1.01	1.05	0.50	0.76	*	0.20
SPA	1992–1993	0.07	–9.47	–5.98	6.01	–0.06	5.62	–6.36	22.23	5.41	9.53	–1.71	3.80	–2.77	1.13	10.67	–5.77
	2009–2013	–0.58	0.23	–7.15	2.54	–1.07	0.59	–3.77	22.78	4.64	6.94	–0.26	2.24	1.44	0.99	0.51	0.09
BRA	1991–1992	–8.50	–88.87	–5.68	1.18	0.28	642.91	–11.68	18.27	9.30	–1.00	1.43	–6.51	–8.38	1.55	712.87	–13.97
	1998–1999	2.96	–20.97	–4.35	2.48	0.14	6.34	2.80	16.31	–1.79	0.18	–2.27	–1.44	2.53	1.59	29.72	–19.62
	2009	–4.93	–14.74	–6.72	4.29	–0.33	7.19	–12.64	18.07	9.94	3.56	1.01	–3.03	–10.41	1.63	9.03	–0.76

(continued)

Table 1 (continued)

	Annual rates of change								Average I/GDP	Annual rates of change					Avg. e	ARCh	
	Years	SP*	SP*($)	GFCF*	K*	GDP*	P*	r		K/Y	(K/L)*	P_k/P_y	(Y/L)*	e		ER	REER
Total 1990–2014																	
US	1990–2014	1.87	3.26	2.72	2.12	2.44	2.06	–0.18	20.75	0.44	1.04	0.74	1.28	0.45	0.73	*	–0.13
SPA		1.46	0.92	1.34	3.90	1.97	2.97	–2.54	24.57	2.33	3.27	–0.17	0.86	–0.59	1.10	0.87	–0.20
BRA		–	–35.98	3.37	2.34	3.15	70.59	–1.07	17.74	0.68	0.26	1.93	1.28	–0.96	1.69	60.03	–0.59
Total 1995–2014																	
US	1995–2014	1.72	3.30	2.63	2.15	2.41	1.96	–0.42	20.91	0.65	1.17	0.05	1.42	0.53	0.73	*	0.08
SPA		1.21	1.58	1.75	3.57	2.09	2.34	–3.99	24.88	2.17	2.57	0.96	0.46	–0.65	1.08	0.03	0.49
BRA		–	–1.63	3.48	2.67	3.19	8.15	–0.79	17.31	0.07	0.75	0.09	0.78	–1.23	1.71	5.08	–0.12

Notes: Variables with (*), at constant prices; *e*: rate of exploitation (surplus/wages); *P*: GDP price index; exchange rates in nominal (ER) and real terms (REER) refers to US dollar.

Sources: BEA (2019), EU KLEMS (2011), FBBVA (2019), IMF (2019b), IPEA (2019), Marquetti and Porsse (2014), Morandi (2015), and NSI (2019).

Economic crises have driven sectoral restructurings leading to countercyclical increases in productivity on several occasions in the US, Spain, and in 1991–1992 in Brazil—again, this was the effect of a fall in the denominator, *L*. However, the decisive factor was that crises occurred more often in SPA and BRA, and with higher intensities than in the US economy. Moreover, usually they tended to lead to exchange rate depreciation, higher inflation, except in Spain, and capital ratios tended to increase greatly, except in 1980–1999 in Brazil. As a result, the production of surplus in US dollars revealed the different productive level of these economies. In the case of Spain, the number of years of the last crisis has to be highlighted, in which the surplus stagnated, but to a greater extent than Brazil. This country suffered from deep falls in the volume of surplus in US dollars during recessions, ranging between –14% and –88%, and the rise in domestic surplus along the growth phase of 1993–1997 lacked its counterpart in international currency.

The worldwide Great Recession of 2008–2009 is illustrative. In some way, it did not have a clearly differentiated effect in center–periphery terms, as it hit harder in Spain. For the US and Brazil, this crisis meant a brief decline in GDP, 2008–2009 in the first case, and 2009 in the second, and even for the US the recession was greater. Yet, an asymmetry should be highlighted: the lower drop in GDP in Brazil was simultaneous with an abrupt decline in the surplus of US dollars (–5%), almost three times of that in the national currency (–14.7%), as well as in the profit rate (–12.6%), together with labor productivity (–3%) and therefore the rate of surplus value (–10%). The contrast with the US indicators for these magnitudes is illustrative, and this despite the fact that the volume of investment fell to a greater extent (–9% in 2008–2009 compared to –6% in 2009 in Brazil).

As for Spain, the impact was more lasting (between 2009 and 2013), with a great impact on profitability, investment, and GDP, although the exogenous nature of the exchange rate was manifested in the asymmetry between the generation of surplus in euros, which decreased, and in US dollars, which increased. Likewise, another particular feature of this type of economy was the countercyclical nature of the evolution of the capital ratios, as they rose during the recession based on the fall in employment of labor-intensive and low-productive activities, thus boosting productivity and the rate of exploitation (see Mateo 2019). In this case, the center–periphery asymmetry was found within a developed area, the Eurozone, with an extensive accumulation dynamic, so that the variation in employment in the context of the housing boom explained this apparent contradiction. Therefore, it seemed that recessions were essential, becoming a functional mechanism to maintain divergence between these three economies. That is, crises were not neutral for center–periphery relations.

Even with these particularities, and as expected, it was the capital-output ratio that drove profitability: the rise in K/Y made the profit rate fall, and vice versa, with only the exception of Brazil in 2000–2003. But K/Y depended on K/L, whose level, not so much the annual variation, as it will be shown later, was associated with productivity, and relative prices as well. This preeminence of capital ratios was in turn in the sphere of distribution, with a pressure towards the increase of inequality (rate of exploitation, profit share) in these backward economies.[17]

In short, i) the US economy showed less volatility and a stronger relationship between the evolution of the volume of surplus, investment, and output, even at the depth of the recession of 2007–2009; ii) in Spain, the extraordinary increase in investment was explained by the speculative boom associated with construction assets, but it lacked the capacity to improve productivity and "e," boosting up K/Y and thus pushing down profitability, so the surprising decrease of P_{ky} turned out to be a consequence of the crisis, as it was not based on a productive improvement; iii) and in Brazil, despite the recovery of investment from 2003 under an important historical monetary stability, and even preventing K/Y from rising, there was not a substantial boost to productivity and the volume of surplus produced. Furthermore, the contradiction with the surplus measured in US dollars, essential when it comes to importing capital goods, turns out to be crucial.

Yet, these results in terms of phases of growth and recession did not show clear differences between the dynamics of accumulation. Probably, this could be due to the inertia of the capital composition ratios; the capital stock did not fluctuate like other variables, and the incidence of the use of installed capacity, together with the relevance of employment volatility, and perhaps because of the higher cost of capital assets for backward economies (Brazil), greatly increased their capital-output ratio during crises. As a consequence, it was necessary to complement the analysis with a study of the evolution of macroeconomic variables over a longer term of 20–25 years, which is shown below.

3.2. Trends and Levels in the Medium Term

3.2.1. Profitability

The gross profit rate in the US and Brazil showed a steady evolution, with the exception of the wide oscillations during the first years of Brazil's hyperinflation, such as the (apparent) peak in 1993–1995 (Figure 1). It barely fell by 5% in the US, but in Brazil this rate dropped by 17.8%. In the Spanish economy, on the other hand, profitability fell more than 60% between 2009–2014. As a result, although the general gross profit rate in Spain was higher than Brazil until 2004–2005, by 2014 it was already 30% lower. Since the Great Recession, thus, the comparison

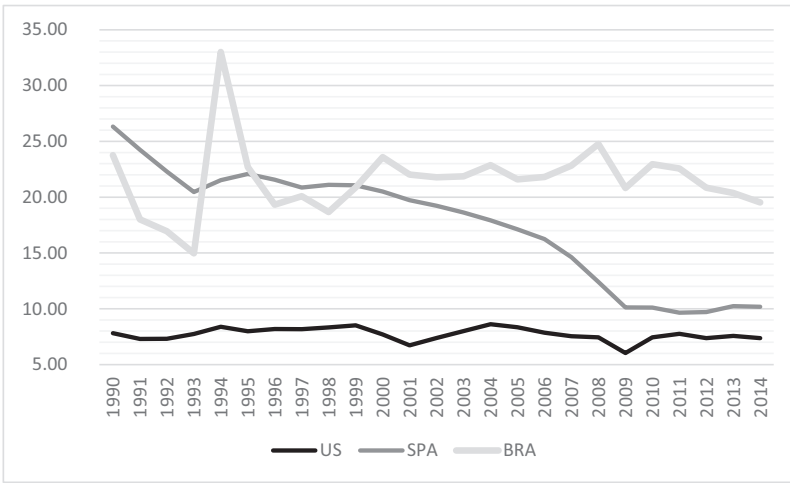

Figure 1 The General Gross Profit Rate (%)

Sources: AMECO (2019), BEA (2019), EU KLEMS (2011), FBBVA (2019), IBGE (2019), IPEA (2019), Morandi (2015), and NSI (2019).

in absolute terms corresponded more to the level of development of each country: the average in 2008–2014 is 7.28% (US), 13.88% (SPA), and 21.70% (BRA).

However, the net profit rate of enterprise should have been substantially different, and mainly in Brazil since interest rates were disproportionately high in relation to both the US and Spain after they joined the Eurozone (Table 2). The interest rates gap between the US (but Spain as well) and Brazil exceeded the gross profit differential, although it must be considered that this last economy is one of the few where the short-term rate was higher than the long-term rate.

It is nonetheless necessary to specify i) the capacity of the US not only to increase the $(r - i)$ differential through a low interest rate, but also, together with Spain during the economic boom, with low-risk premiums (2–3%) in relation to Brazil (from 37–57% in 1997–2003 to 20–37% up to 2014) (IMF 2019b). These low rates indeed allowed US companies to invest abroad and to achieve higher profit rates, leading to a net surplus inflow (Panitch and Gindin 2009; Schwartz 2009); ii) the, at least to a great extent, exogenous nature of Spain's interest rates, because of the monetary union, which first contributed to the housing boom in 2007, and then produced an extraordinary increase in the risk premium during the long depression (see Mateo 2019); iii) the functionality, or necessity, of high-interest rates in Brazil to keep exchange rate stability and moderate inflation.[18]

The production of surplus at constant prices revealed different results (Figure 2). If the first half of the 1990s was excluded, the path of the volume of the surplus was

Table 2 Main Interest Rates (%)

Year	*Discount rate*			*Money market rate*			*Treasury bill rate*			*Long-term rates*		
	US	*SPA*	*BRA*	*US*	*SPA*	*BRA*	*US*	*SPA*	*BRA*	*US*	*SPA*	*BRA*
1990	6.98	14.61		8.10	14.76	15,778.57	7.51	14.17		8.55	14.68	
1991	5.45	13.11		5.69	13.20	847.54	5.41	12.45		7.86	12.36	
1992	3.25	12.83		3.52	13.01	1,574.28	3.46	12.44		7.01	11.69	
1993	3.00	11.19		3.02	12.33	3,284.44	3.02	10.53		5.87	10.21	
1994	3.60	7.71		4.20	7.81	4,820.64	4.27	8.11		7.08	10.00	
1995	5.21	8.83		5.84	8.98	53.37	5.51	9.79	49.93	6.58	11.27	23.39
1996	5.02	7.48	25.49	5.30	7.65	27.45	5.02	7.23	25.73	6.44	8.74	16.06
1997	5.00	5.35	27.57	5.46	5.49	25.00	5.07	5.02	24.79	6.35	6.40	10.13
1998	4.92	4.25	37.72	5.35	4.34	29.50	4.82	3.79	28.57	5.26	4.83	11.67
1999	4.62	3.83	29.08	4.97	2.72	26.26	4.66	3.01	26.39	5.64	4.73	13.22
2000	5.73	5.06	19.94	6.24	4.11	17.59	5.84	4.61	18.51	6.03	5.53	10.75
2001	3.41	5.23	19.82	3.89	4.36	17.47	3.45	3.92	20.06	5.02	5.12	9.50
2002	1.17	4.21	23.59	1.67	3.28	19.11	1.61	3.34	19.43	4.61	4.96	9.88
2003	2.10	3.25	30.77	1.13	2.31	23.37	1.01	2.21	22.10	4.02	4.12	11.50
2004	2.40	3.00	23.22	1.35	2.04	16.24	1.37	2.17	17.14	4.27	4.10	9.81
2005	4.25	3.02	26.27	3.21	2.09	19.12	3.15	2.19	18.76	4.29	3.39	9.75
2006	6.02	3.94	22.19	4.96	2.83	15.28	4.72	3.26	14.38	4.79	3.79	7.88
2007	5.79	4.94	18.70	5.02	3.85	11.98	4.41	4.07	11.50	4.63	4.31	6.38
2008	2.17	4.73	19.10	1.93	3.85	12.36	1.46	3.71	13.68	3.67	4.37	6.25
2009	0.50	2.06	16.67	0.16	0.68	10.06	0.16	1.00	9.70	3.26	3.98	6.13
2010	0.73	1.75	16.39	0.18	0.45	9.80	0.13	1.69	10.93	3.21	4.25	6.00
2011	0.75	2.00	18.36	0.10	1.02	11.66	0.06	3.04	11.66	2.79	5.44	6.00
2012	0.75	1.63	14.98	0.14	0.27	8.48	0.09	2.66	8.07	1.80	5.85	5.75
2013	0.75	1.13	14.67	0.11	0.15	8.18	0.06	1.17	8.99	2.35	4.56	5.00
2014	0.75	0.51	17.51	0.09	0.12	10.86	0.04	0.39	11.54	2.54	2.72	5.00

Notes: Discount rate 1990–1998 (Spain), 1999–2014 (Euro area). Long-term rates are government bonds, for Brazil, the BNDES (*Banco Nacional de Desenvolvimento Econômico e Social*) rate.

Sources: BNDES (2019), Federal Reserve Bank of St. Louis (2019), IMF (2019b), and OECD (2019).

quite similar in both the US and Brazil, but slightly higher in the first case (84% vs 74% of the accumulated variation in 1995–2013). In contrast, Spain's surplus stagnated starting in the early 2000s, showing only an overall increase of 35%.

More interesting is the valorization process in US dollars, which showed a more volatile trajectory in Spain before joining the EMU, and mainly in Brazil

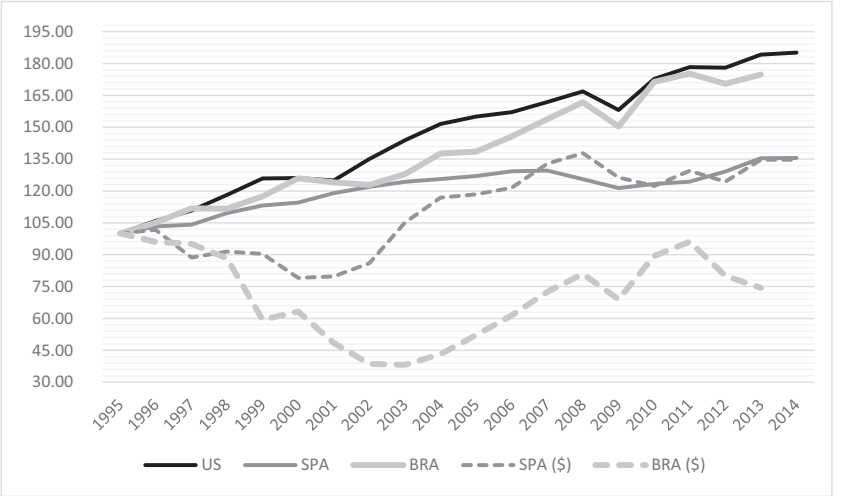

Figure 2 Dynamics of the Volume of Surplus in Domestic Currency and US$ (1995 = 100)

Notes: For domestic currencies, the surplus is deflated by the domestic GFCF price index (P_{inv}), and for the surplus denominated in US dollar, it is converted with market ER. P_{inv} is available in Brazil only until 2013.

Sources: BEA (2019), EU KLEMS (2011), FBBVA (2019), IBGE (2019), IMF (2019b), IPEA (2019), Morandi (2015), and OECD (2019).

with the boom of commodities in the 2000s. The international purchasing capacity of the Brazilian surplus suffered a deep fall between 2002–2003, while the surplus in domestic currency rose, leading to a huge gap between both measures. The 74% accumulated rise in domestic currency turned out to be a loss of 25%. As for Spain, the period of increase was actually reduced in 2000–2008, when it reached 6.7% per year, but then fell by 20%. This duality is one of the main obstacles facing peripheral economies, even an emerging or semiperipheral one such as Brazil. In other words, there was less capacity to generate international surplus and develop the central role of both the exchange rate and the price index of capital goods.

3.2.2. Investment, Capital-Output Ratio, and Productivity

The composition of investment (GFCF) by assets showed some contrasts in these countries. At current prices, Brazil was the economy with the highest percentage of total investment in M&E, more than 40% since 1995, and it exceeded 50% from 2006 onwards. It fluctuates around 25–30% in Spain, while in the US it only represented 20–25%. In terms of investment in construction assets, it accounted for a larger share in Spain, as could be expected due to the housing boom of the 2000s, more than 60% of the total (including residential) up to the outbreak of the crisis.

In the US, it was 54–58% until the Great Recession, as well as a post-crisis fall, while in Brazil it was generally less than 50% from 1995. Finally, the US stood out for having a greater percentage of investment in other assets (intellectual property), which represented 20–25%, well above Spain and Brazil's levels (6–7%).

Figure 3 shows the dynamics of GFCF at constant prices, with two distinct cycles in the three cases: before and after the outbreak of the Great Recession in the US and Spain, and 2003 as a turning point in Brazil. Investment in the US was characterized by a sustained increase in all assets with the exception of construction. Conversely, volatility was higher in the other two countries, since investment in Spain accelerated relatively from 2000 onwards, but the crisis was also on a greater scale, leading to a deep collapse of accumulation. In the case of Brazil, GFCF stagnated up to 2003, followed by a subsequent boom except in other assets and culminating with an accumulated increase higher than the other economies.

Globally, total investment grew 56% and 34% in the US and Spain until 2013, respectively (77% and 41% for non-residential), and almost 85% in Brazil. Despite this increase in Brazil, which in any case was limited to the post-2003 period, its relative level of GFCF to GDP was substantially lower than the other economies (see Table 1). Between 1996 and 2007, the GFCF was 15–17% of GDP, with a slight rebound later, and only in 1990 and 1994 did it reach 20%. This level was higher in Spain, but so was its volatility, with a maximum of 31% of GDP in 2006–2007, although it subsequently collapsed below 20%; while in the US it was relatively constant around 20%. However, if residential investment was deducted, the percentages of gross investment relative to GDP were very similar in Spain and the US, and about 3–5 points lower in Brazil.

GFCF flows nevertheless led to higher average net capital accumulation rates in Spain (3.9%), well above both the US (2.3%) and Brazil (2.1%). In the first case (SPA), the accumulation rate nearly collapsed in 2009, while in the US the expansion of K^* was higher than in Brazil until the outbreak of the Great Recession. And from this path of accumulation, the level and dynamics of the capital-output ratio (θ) could be comparatively addressed, as shown in Figure 4.

The absolute levels of the capital ratios showed important contrasts. Brazil's K/Y was exceptionally high, above 90% of the US value between 1996 and 2005, and higher than the ratio of Spain until 2007. However, K^*/L levels were closer to the unequal level of development of these three countries. In Brazil, this ratio decreased from a quarter of the US level in 1995, to 10% in 2001, and subsequently ranged between 7% and 11%. In the case of Spain, there were two distinct phases: a decline in the relative level from almost half the value of the US in the mid-1990s to just under one-third in the early 2000s; this later initiated a relative increase that led Spain to overtake 60% of the US K^*/L ratio in 2013–2014.

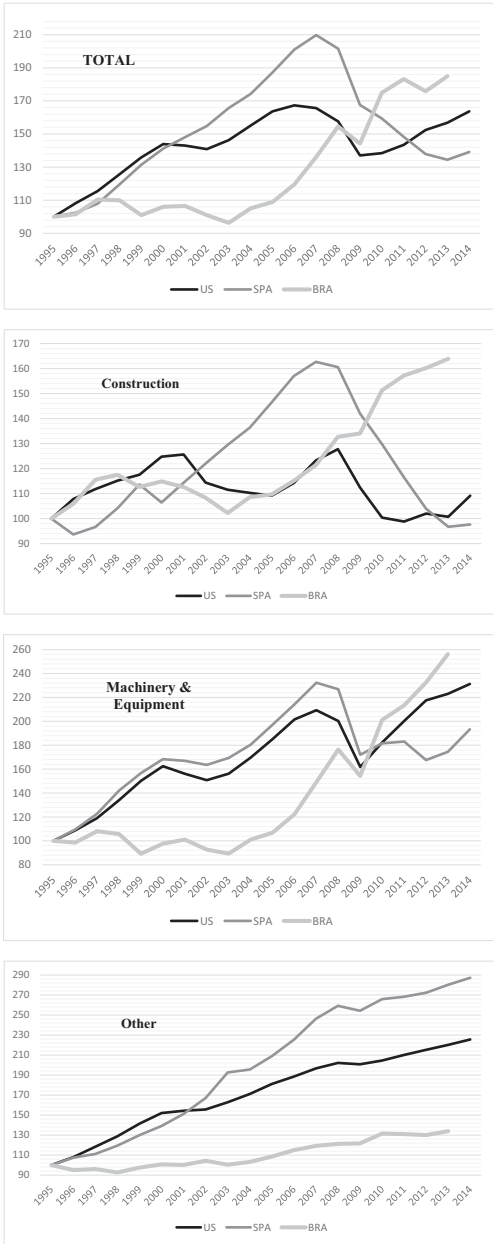

Figure 3 Comparative Path of Gross Investment at Constant Prices and Its Components (1995 = 100)

Note: Gross investment in construction in Brazil includes residential assets, unlike the US and Spain.

Sources: BEA (2019), FBBVA (2019), and IPEA (2019).

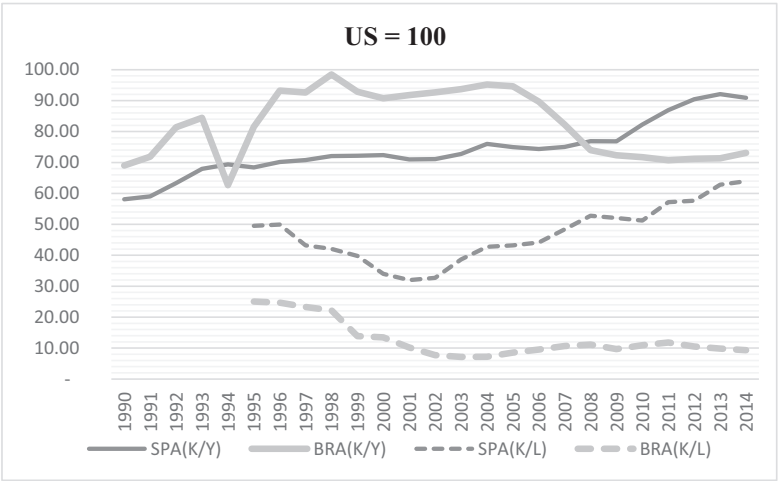

Figure 4 Capital-Output and Capital-Labor Ratios: Comparative Level in Spain and Brazil in Relation to the US (%)

Notes: *K*/*L* is measured in US dollars at constant prices, and *K*/*Y* in domestic currency.

Sources: BEA (2019), EU KLEMS (2011), FBBVA (2019), IPEA (2019), Morandi (2015), and NSI (2019).

The relationship between these two ratios of capital was explained by both labor productivity and price ratio (Figure 5). First, productivity in the US had grown by 30% since 1995, three times that of Spain (9.1%) and this doubled the Brazilian record (15.9%).[19] In addition, productivity in the US was progressing steadily, with the exception of the stagnation in the last four years, while in Brazil productivity fluctuated deeply in the first half of the 1990s, stagnated in its second half, and declined after 2010.[20] On the other hand, Spain experienced a clearly differentiated evolution in three phases with a countercyclical character, as it was shown in the previous section.

The P_{ky} ratio revealed a peculiar evolution, since it increased until 2012–2014 almost 20% in the US, and hardly 3–4% in Spain between 2010–2014; however, general inflation was lower in the US, as shown in Table 4. As for Brazil, it was true that P_{ky} increased by 51% between 1990 and 2013, but since 1995 there was a striking stability. In other words, the monetary instability was related to the relative higher prices of the capital stock, as in fact could be expected. Moreover, after a rise in 2005, it was followed by a remarkable drop of 13% up to 2013, so that the total increase in 1995–2013 was less than 10%.[21]

As a consequence, there was a great increase in the rate of capital accumulation in Spain and a relative price stability; however, this occurred inefficiently, as the rise in the volume of capital did not lead to higher productivity. Consequently,

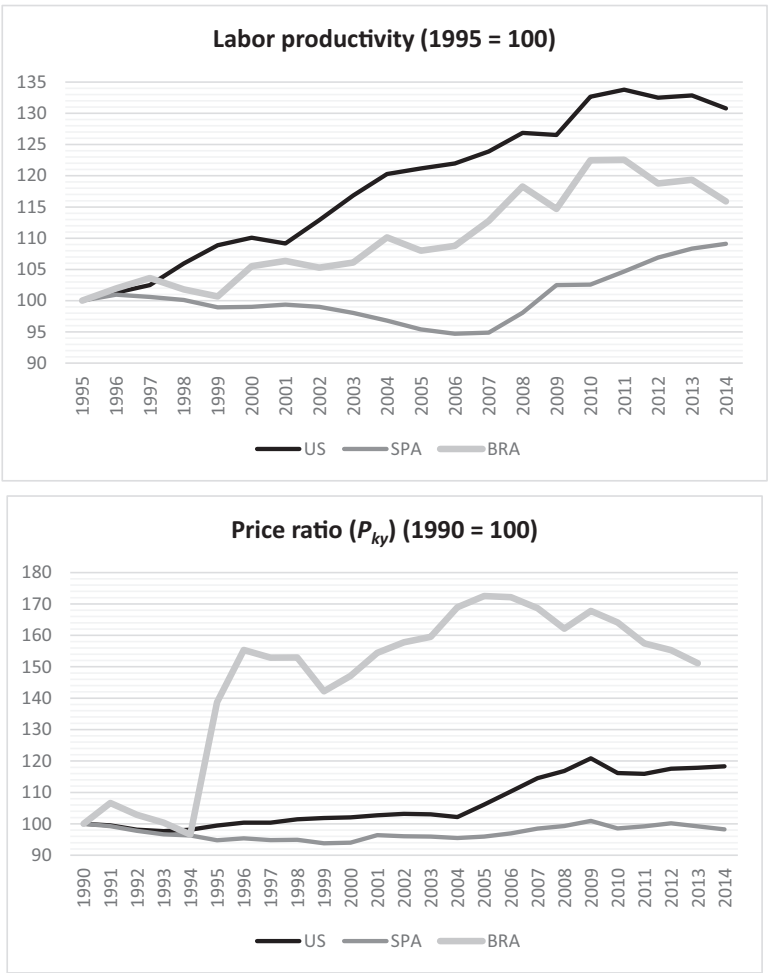

Figure 5 Labor Productivity and Prices Ratio

Source: BEA (2019), EU KLEMS (2011), IBGE (2019), IPEA (2019), Marquetti and Porsse (2014), and NSI (2019).

it was necessary to significantly increase the capital stock (K) in order to increase the output (Y), pushing up the K/Y ratio and, in addition, leading to a contradictory evolution of the variables following the crisis of 2008 (see Mateo and Montanyà 2018; Mateo 2019). In Brazil, there was a high level of volatility: stagnation of investment up to 2003 and a subsequent rise which, paradoxically, was not related to productivity, while the decline of P_{ky} since 2005 contributed to stabilizing the K/Y ratio.

Table 3 Measures of Productivity in Spain and Brazil in Relation to the USA (Average, %): Comparison between Different Sources and with PPP Index and Market ER

Source	*Country*	*1990–1994*	*1995–1999*	*2000–2004*	*2005–2009*	*2010–2014*	*Variation (%)*
The Conference Board	SPA	86.31	85.44	77.05	71.97	73.54	–14.79
	BRA	27.60	28.56	25.21	24.64	25.05	–9.27
World Bank	SPA	94.32	92.15	81.49	74.65	75.81	–19.62
	BRA	30.39	29.71	26.72	26.48	27.03	–11.06
Penn World Tables	SPA	86.45	82.83	74.66	69.88	71.77	–16.99
	BRA	28.80	29.68	26.35	25.66	26.43	–8.22
ILO	SPA	91.34	88.63	78.01	71.12	72.21	–20.95
	BRA	26.83	26.19	23.13	22.68	24.11	–10.14
System of National Accounts (SNA)	SPA	79.28	64.89	49.57	59.05	59.93	–24.40
	BRA	–	27.56	11.32	13.07	13.58	–50.74

Notes: Average percentage during subperiods, and variation (%) between 2010–2014 and 1990–1994, of some measures of productivity (GDP per persons employed) from different sources with purchasing power parity (PPP), except productivity from the SNA (this paper), which takes market exchange rates with the US. For ILO, from 1991.

Sources: BEA (2019), EU KLEMS (2011), Feenstra, Inklaar, and Timmer (2015), IBGE (2019), ILO (2019), IMF (2019b), IPEA (2019), Marquetti and Porsse (2014), NSI (2019), The Conference Board (2019), and World Bank (2019).

Likewise, it was necessary to address the comparative analysis of the absolute levels in productivity. The previous figure showed an absence of convergence, but Table 3 allows us to compare different data sources and see the implications of the use of the purchasing power parity (PPP) index and the nominal exchange rates with the US dollar. Taking the level of US productivity as a reference (= 100), on the one hand, differences were appreciated depending on the database, up to 10 points in the case of Spain, but were minimal for Brazil. The greatest divergence in the productivity series stood out when using market ER. First, because relative values were substantially lower for Spain and Brazil. In the case of the Spanish economy, the true productivity gap with the US ranged between 20 and 40 points, while that with PPP stayed between 15 and less than 30 points (6 and 25 points in the case of the World Bank [2019] database). Even this difference was greater in Brazil: instead of a productivity equaling 25–30% of the US, our data showed levels of just 8–15% from 1999.

Second, the evolution over time of relative productivities was more divergent with market ER. In the last column, it was observed that Spain's averages fell by a quarter, compared to 14–20% of the conventional measures; and in the case of

Brazil, the divergence was even greater, not 8–11% but 50%, even in relation to the post-1995 subperiod.

Therefore, it should be noted that both the productivity gap and the productive divergence of Brazil with respect to the US was higher than what followed from the comparison of annual rates of change in both domestic currency (Figure 5) and PPP. In this sense, it should be noted that the evolution of the Spanish labor productivity expressed in US dollars increased the volatility with respect to the measure in national currency, as shown in Figure 5. Productivity fell by 34% between 1995 and 2001 and recovered later, although the cumulative increase in these two decades did not even reach 10%. Yet, the contrast was absolute in the case of Brazil: this index dropped by almost half in the second half of the 1990s and almost 60% until 2001. Even between 2002 and 2005, productivity in US dollars was less than 40% of the 1995 level. Overall, between 1995 and 2013–2014, this measure of productivity fell more than half. Taking the US level again as a reference, the gap in terms of productivity was lower in Spain and Brazil than in the capital-labor ratio. As can be seen in Table 4, these countries had values lower than 1, in turn indicating a lower distance in productivity than in mechanization; that is, a more relative efficiency of the capital-labor ratio.

Regarding the capital-output ratio, in Spain, its gap with the US was only lower than the relative productivity in the first years (1990–1993 and 1995–1996), so its level was relatively high. This inefficiency was evident to an extraordinary degree in the Brazilian economy. In contrast to the lower K^*/L gap, the K/Y ratio was excessively high, over 4 points since 1999, and even reached 10 points in 2003–2004. Therefore, it put additional pressure on the sphere of income distribution from the perspective of profitability. As for Spain, the distance in K/Y multiplied by 2 over the period, but still with less variability than in Brazil.

Thus, a relative inefficiency in terms of K^*/L was not observed in this study, but there was a tendency to worsen, while the pressure towards the relative elevation of K/Y in relation to the productivity gap was verified. These gaps increased over time in both countries. In the case of Spain, the K^*/L gap increased by 86% between 1990–1991 and 2013–2014, and in Brazil it reached 68% between 1990–1993 and 2012–2014. Furthermore, between 1990 and 2014, the K^*/L ratio grew in the US by barely a third of the rate of the increase in Brazil, while K/Y grew a third less per year. However, both economies experienced the same increase in annual productivity. And if the interval was taken from 1995, K^*/L grew very weakly in Brazil, and K/Y practically stagnated, though in these two decades labor productivity rose in the US almost twice per year.[22] This showed the different link between investment and productivity in the US and Brazil.

Table 4 Capital Ratios to Productivity in Relation to the USA

Years	*Capital-labor*		*Capital-output*		*Years*	*Capital-labor*		*Capital-output*	
	SPA	*BRA*	*SPA*	*BRA*		*SPA*	*BRA*	*SPA*	*BRA*
1990	0.55	0.56	0.69	–					
1991	0.55	0.48	0.71	–	2003	0.73	0.80	1.37	10.53
1992	0.59	0.47	0.73	–	2004	0.76	0.78	1.36	10.31
1993	0.63	0.44	0.95	–	2005	0.79	0.78	1.36	8.66
1994	0.65	0.71	1.00	–	2006	0.81	0.78	1.36	7.36
1995	0.66	0.75	0.91	2.45	2007	0.82	0.76	1.27	5.91
1996	0.68	0.78	0.95	2.93	2008	0.83	0.74	1.21	4.95
1997	0.69	0.77	1.13	3.07	2009	0.82	0.72	1.22	5.41
1998	0.71	0.83	1.22	3.69	2010	0.89	0.70	1.43	4.61
1999	0.73	0.87	1.33	5.84	2011	0.94	0.73	1.42	4.37
2000	0.73	0.84	1.56	5.67	2012	0.99	0.80	1.55	5.40
2001	0.70	0.81	1.55	7.23	2013	1.03	0.82	1.51	5.95
2002	0.71	0.79	1.53	9.49	2014	1.03	0.85	1.46	6.66

Notes: See appendix for the measures. A value < 1 shows less gap in terms of capital-ratio with the US than in terms of productivity.

Sources: BEA (2019), EU KLEMS (2011), FBBVA (2019), IBGE (2019), IMF (2019b), IPEA (2019), Marquetti and Porsse (2014), Morandi (2015), and NSI (2019).

4. Conclusions

This paper has carried out an analysis of the accumulation process in three economies with different levels of development, the US, Spain, and Brazil. First, there is no clear relationship between the annual growth rates of the variables of capital accumulation and the cycles of expansion and recession. Indeed, their relevance can be grasped from the global evolution in the period, and how crises, deeper and longer relating to lower levels of development, do affect inflation and exchange rates, and, thus, push up capital ratios in Spain and Brazil. Therefore, although the short-term analysis still raises questions, the use of installed capacity, the specificity of the conjuncture (the housing boom in Spain, for example), and insufficient disaggregation of data on capital must be considered. In this sense, an increase or decrease in the composition of capital can arise from opposite factors, such as the

asset structure (the centrality of construction in Spain), or external dependency (the ER in Brazil). Underlying these apparently contradictory processes, it is the relative backwardness of both Brazil and Spain, in this case, with respect to the Eurozone, and with an internal disarticulation that is not independent of the adoption of an overvalued currency, such as the euro. In turn, this short-term analysis is relevant, but quite complex.

In a longer-term analysis, it has been shown that the general (gross) rate of profit is higher when the level of development is lower, although this has only been achieved since the crisis of 2008–2009, as previously the level of gross profitability in Spain had been relatively high. Only Spain has there been an intense downward trend, exceeding 60% between 2009–2014. However, in both Spain and Brazil the level of profitability in 1990 was substantially lower than in previous years. It was also verified that interest rates were disproportionally higher in the peripheral economy, Brazil, which eroded the net profit rate of enterprise ($r - i$).

The dynamics of accumulation do not generate exactly the same cycles in these three economies, since in Brazil the fundamental change occurs in 2003, linked to an external factor, the boom in commodities, while in the more advanced economies the Great Recession turned out to be more decisive. Although the accumulation rate was higher in Spain and Brazil, productivity increased more in the US. This reveals a greater efficiency of its investment flows, with more relative weight for "other investment assets," and in addition the differential widens from 1995 onwards, being three times that of Spain and twice in relation to Brazil. In this sense, the case of Spain negatively stands out because of the inflation of residential assets. Contradictorily, in both Spain and Brazil, the gap with the US was higher in terms of K^*/L than in their relative labor productivity. However, there was a decrease in the relative productive efficiency of mechanization in these cases. As expected, on the other hand, capital-output ratios are relatively high both in Spain and, above all, in Brazil, and this divergence tended to increase along this period.

An underlying issue is the monetary sphere, as a direct relationship with the level of development of the productive forces is clearly found. It was verified that the semiperipheral economy has more than the proportional rate of inflation, as well as in terms of exchange parity with the US dollar and the relative increase of capital goods price index. It can be claimed, on the one hand, that the reduction of the cost of capital for the US economy provided by offshoring is fading away. Also, the incorporation into the euro area has not led Spain to a substantial fall in the relative price of capital assets. On the other hand, Brazil reverses one of the trends characteristic of the stage of industrialization by import substitution (the increase of P_{ky}), but at the price of a lower productive dynamism.

The exchange rate evolution is actually important to explain the fall in the real volume in the US-dollar-denominated surplus of Brazil, in contrast to both Spain and mainly the US; the small differences in the level of K^*/Y, and also the relatively limited rise of K/Y during crises. As a result, one of the more relevant issues of this paper is that although the less developed economy (BRA) has outgrown the more advanced ones, this does not necessarily imply a convergence in terms of productivity. Moreover, the productivity gap in US dollars with respect to the US is greater for Brazil than in Spain, and likewise, PPP measures conceal the true dimension of the market ER gap.

Notes

1. However, the same results are only shown from 1995 onwards because of statistical problems with Brazil's hyperinflation of the early 1990s.
2. By using the terms "center" and "periphery," it is shown that the divergence has a geographical content of a structural nature, following the theoretical approach, so there is no trend towards convergence in the world economy.
3. Usually, studies of profitability and capital accumulation are still generally focused in one advanced economy, mainly the US, given the availability of databases (capital stock), with a lack of comparative studies.
4. For a complete picture, see Table 4.
5. This perspective differs from the dominant approach within classical economics, as set out by Shaikh and Tonak (1994). They start from the concept of production, and then proceed to separate the specifically capitalist from the non-capitalist one. See Mateo (2007) for the debate on productive and unproductive labor.
6. In the case of FIRE activities, apart from the fact that they include a higher-than-average part of unproductive activity, certain issues, such as the problem of tax accounting, have to be considered (see Bichler and Nitzan 2012; Hudson 2010), as well as the speculative booms, as in Spain (Mateo 2018b; Mateo and Montanyà 2018).
7. See Section 2.4. "Methodological Issues."
8. In contrast to "circulationist" approaches that emphasize the type of commercial or financial 9.
9. Briefly, it should be taken into account that monetary stability is not a neutral or technical idea, but an essential requirement for the operation of the law of value, the comparison of labor time and its social validation by the market.
10. See this relationship for Mexico in Mateo (2007) and for Peru in Weeks (1985). Valle and Martínez (2013, 183) claim that the "value composition in industries using imported means of production is higher than the corresponding value composition of the same industries in countries with higher productivity," because of the fact that "the pce system establishes the value of an imported commodity according to national values and thus more work is necessary to purchase it."
11. Advanced economies grew at 1.94% per year in 1990–1915, compared to 5.18% in developing economies (UNCTAD 2019). As a result, the advanced areas' GDP, even based on PPP share of the world total, fell sharply from 63% between 1980 and 1991 to 41% in 2016, although the share of Latin America also declined, from 10% in the early 1990s to 7.8% in 2016 (IMF 2019a).
12. As the US economy is widely known, see Beitel (2009) and Bakir (2015).

13. In Spain: net operating surplus (NOS) (AMECO 2019) (year t); $K_{net,nr}$ (t–1) (FBBVA 2019) (Mateo 2019); for Brazil: GOS, $K_{gross,nr}$ (t) (Mateo 2018a); and for the US: NOS, $K_{net,nr}$ (t–1) (Mateo 2016).
14. In this case, reference is made to the REER calculated by the IMF (2019b) based on the consumer price index (CPI) against a weighted average of several foreign currencies.
15. EU KLEMS was initiated as a research project funded by the European Commission, Research Directorate General as part of the 6th Framework Programme, Priority 8, "Policy Support and Anticipating Scientific and Technological Needs." Its original name was "Productivity in the European Union: A Comparative Industry Approach." The EU KLEMS acronym stands for EU level analysis of capital (K), labor (L), energy (E), materials (M) and service (S) inputs. The initial project lasted from 2003–2008 and was developed by 18 European research institutes under the coordination of the University of Groningen, Groningen Growth and Development Centre (GGDC), who also hosted (and still hosts) the original EU KLEMS website http://www.euklems.net.
16. But an inverse link of "e" does exist with the level of development, as Brazil has an average rate of the rate of exploitation 2.3 times higher than the US, and 1.5 times that of Spain along the whole period, as expected.
17. And linked to the relatively high level of K/Y in less productive economies, as it will be shown later.
18. But in order to support long-term investments, Brazil has The National Bank for Economic and Social Development (BNDES), with a specific line of credit for acquiring capital goods at a lower interest rate, as shown in the last column of Table 2.
19. Data of productivity from the IBGE series used are misleading in 1990–1995, showing an outstanding rise in Brazil (17.8%) that is not coherent with other series such as GGDC (2007) (only 1.2%).
20. On the other hand, the measure of the productivity of the total economy also increases the differential in favor of the US, and in Spain it advances more than Brazil. Thus, the cumulative increases from 1990 would be 42.9% (US), 28.2% (Spain) and 19.8% (Brazil). As a result, the exclusion of unproductive sectors reduces in relative terms the rate of productivity growth in the US.
21. The moderated path of the P_{ky} ratio represents an extraordinary change of trend in the Brazilian economy, as it has historically been characterized by the relative price increase of capital stock, even in relation to other developing economies (see IEDI [Instituto de Estudos para O Desenvolvimento Industrial] 2007; Mateo 2018a). However, these data require some caution, as the P_{inv}/P_Y ratio shows a different evolution, mainly in the US and Brazil, and very important, it is not only the dynamics of P_{ky}, but the absolute level as well. In other words, the capital stock can be very expensive for a country such as Brazil, even though they do not rise over time.
22. A peculiarity of this country is the increase of P_{ky}, although this is associated with another peculiarity: its low prices in labor-intensive activities, largely due to immigration, and which is reflected in a lower contrast between GDP in dollars and PPP compared to other advanced economies, such as the European ones (World Bank 2019).

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