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Why are policy real interest rates so high in Brazil? An analysis of the determinants of the Central Bank of Brazil's real interest rate

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Abstract

This paper discusses the reasons for Brazil's high policy real interest rates by considering two opposing views, the orthodox and heterodox approaches. While orthodox authors defend the position that bad domestic policies are the cause of the high interest rate, heterodox economists claim that the international financial system and orthodox policies influence the level of the policy rate in Brazil. The aim of this study is to assess whether the proposed arguments can be supported when comparing Brazilian real interest rates with other developing countries under the same monetary regime. The conclusion is that, although the orthodox and heterodox arguments are both intuitively plausible, when comparing stylized facts and testing the hypotheses econometrically neither is sufficient to elucidate the Brazilian case. The paper concludes by suggesting that there might be political causes of the high real interest rates in Brazil such as a politically influential rentier class.

Keywords: Brazil, Central Bank, interest rate, monetary policy, developing countries

JEL Classification: E43, E58

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1. Introduction

The high central bank interest rate in Brazil has been under discussion for a long time in academia and society in general. Although some economists defend interest-rate setting as a purely technical mechanism, monetary policy is constantly under dispute between workers, firms and rentiers. In order to privilege workers and firms, the former Worker's Party government implemented direct attempts to reduce the central bank real interest rate in 2012/13. However, the policy has failed and the country has again raised real policy rates to a level much higher than other similar economies. Therefore, the debate on central bank interest rates and its effects has sparked again in the country, and existing economic theories that seek to explain the phenomenon shall be examined in this paper.

Table 1 shows that Brazil's central bank real interest rate (CBRIR) is among the highest in the world[1]. While Brazil has an average of 8.14% over the period 1996-2015, the corresponding time average for a group of selected countries, including Brazil, is only 1.85%. The extraordinarily high real interest rates of Brazil mean that the country is prone to lower investment rates, reduced growth, increasing public indebtedness and rising income inequalities. Therefore, the Central Bank of Brazil (BCB) has been trying to reduce policy rates since the implementation of inflation targeting policies in 1999. Although there has been a clear declining trend of policy rates, Brazil has not been able to reduce its CBRIRs to a comparable level with the rest of the world. One could argue that, since the country follows the inflation targeting (IT) framework, the central bank needs to respond to accelerating inflation with raising interest rates. However, Brazil does not have inflation rates much higher than other similar economies under inflation targeting regimes, as we can see in Table 2.

[1] CBRIR is the central bank nominal interest rate minus the inflation rate based on the GDP deflator. The detailed measure of it for each country in the sample is described in Appendix A.

Table 1: Central bank real interest rates of selected countries (%), 1996-2015

Country	1996-2000	2001-2005	2006-2010	2011-2015	1996-2015
BRA	16.36	9.69	4.27	2.22	8.14
CHL	2.53	-2.36	-1.99	1.60	-0.05
COL	5.64	0.73	1.70	0.65	2.18
IDN	-6.60	2.10	-5.41	1.36	-2.14
PHL	2.20	2.72	1.20	1.05	1.79
THA	4.13	-0.78	-0.98	0.31	0.67
ZAF	7.36	1.58	1.24	-0.67	2.38
AVR	4.52	1.95	0.00	0.93	1.85

Source: IMF – International Financial Statistics and national Central Banks (more information in Appendix A).
Note: The abbreviations correspond as following: Brazil (BRA), Chile (CHL), Colombia (COL), Indonesia (IDN), the Philippines (PHL), Thailand (THA) and South Africa (ZAF), and the simple average of the selected countries and periods (AVR).

Table 2: Inflation rates of selected countries (%), 1996-2015[2]

Country	1996-2000	2001-2005	2006-2010	2011-2015	1996-2015
BRA	8.51	9.40	7.55	7.67	8.28
CHL	4.33	5.79	6.16	3.26	4.88
COL	18.57	6.43	5.13	3.28	8.35
IDN	26.26	9.71	13.41	5.16	13.64
PHL	9.71	4.85	4.52	2.12	5.30
THA	3.07	2.88	3.40	1.72	2.77
ZAF	7.90	7.52	7.56	5.54	7.13
AVR	11.19	6.66	6.82	4.11	7.19

Source: World Bank – World Development Indicators.

Therefore, economists debate other aspects besides inflation that could explain this discrepancy. Mainstream economists find low saving (Hausmann 2008; Lara Resende 2011; Segura-Ubiergo 2012), the history of sovereign debt default (Reinhart and Rogoff 2004; Salles 2007), strong capital controls (Arida 2003; Arida et al. 2003) and weak domestic institutions (Bacha et al. 2009; Gonçalves et al. 2007; World Bank 2006) to be important causes of the phenomenon. Heterodox economists, on the other hand, claim that high exchange rate volatility (Arestis et al. 2008; Sicsú 2002) as well as high exchange rate pass-

[2] Inflation is defined here as the GDP deflator, following the World Bank measure for real interest rates.

through (Baltar 2015; Ono et al. 2005) are important determinants of the high CBRIR in Brazil. In addition, they argue that, since the country has cost-push inflation due to its indexed prices and high exchange rate pass-through, interest rate policy is not the appropriate tool to control inflation (Modenesi and Modenesi 2012; Oreiro et al. 2012; Summa and Serrano 2012). In combination with conservative interest rate-setting, this induces the BCB to keep on raising its policy rate without succeeding in reducing inflation, thus pushing CBRIR up (Modenesi 2011).

The paper provides an original systematic review and empirical test of the proposed explanations by mainstream and heterodox authors. It assesses the determinants of CBRIRs through stylized facts and econometric evidence. The study will thus contribute to the existing literature by providing evidence for proposed theoretical explanations, which could be used to formulate a more precise theory of the determinants of real interest rates in Brazil. The main finding of the paper is that the orthodox and heterodox theories are not sufficient to explain the high CBRIR in Brazil.

The paper is structured as follows: the second section discusses mainstream and heterodox explanations for high Brazilian CBRIRs and provides an empirical comparison between Brazil and other developing countries under the IT framework. Section 3 presents an econometric analysis of the determinants of CBRIRs for eleven countries from 1996 to 2015. The last section concludes.

2. How do mainstream and heterodox economists explain the high policy rate in Brazil?

In this section, I review the mainstream and heterodox arguments for CBRIRs in Brazil, and present some comparative empirical evidence in order to provide a first reality check of the proposed determinants.

2.1. Mainstream explanations

Mainstream economists consider the high real interest rates in Brazil to be a puzzle (Bacha et al. 2009, p.343; Segura-Ubiergo 2012). Four main arguments have been put forth to explain the phenomenon: lack of saving, a high risk premium, high convertibility risk and jurisdictional uncertainty[3].

[3] Other factors mentioned by mainstream authors are the low level of dollarization and low investment grade in Brazil (Bacha et al., 2009), the high level of subsidized credit that pushes equilibrium interest rates up

Lack of saving

According to mainstream economists, the CBRIR is high because there is a lack of saving in Brazil (Arida et al., 2003; Lara Resende 2011; Lopes 2014; Segura-Ubiergo 2012). This argument is based on the loanable funds theory in which the equilibrium between the supply of saving and the demand for investment in the market for loanable funds determines the equilibrium interest rate (Mishkin 2014, p.78). Although it is acknowledged that short-term interest rates are set by the central bank, it is argued that the central bank rate cannot deviate from the natural rate of interest given by loanable funds market equilibrium without compromising price stability.

Lopes (2014, p.3) disaggregates saving into three components: private saving, government saving and external saving. Private saving corresponds to domestic firms and household saving, while government saving corresponds to the budget surplus, and external saving to the commercial deficit, i.e. the surplus in the capital and financial account (Lara Resende 2011, p.1-2). It is argued that private saving is low in Brazil because the high marginal tax rate affects mostly firms and households with high propensities to save, whereas most of the transfers are made to households with a low propensity to save, such as pensioners and poor individuals (Hausmann 2008, p.27). At the same time, government saving is also low in Brazil, although public investment is the lowest compared to other developing countries. The explanation given for low public saving is thus the considerable weight of pension transfers, high interest rates on public debt and strong government consumption (*ibid*, p.23). Those factors would thus explain why domestic saving rates are lower in Brazil than in other countries, thus pushing central bank interest rates up, according to mainstream authors (Segura-Ubiergo 2012, p.7).

Table 3 depicts gross domestic saving rates as a share of GDP for our sample of seven developing countries that follow an inflation targeting regime. It is possible to see that Brazil has a higher saving-to-GDP ratio in comparison with its peers. For instance, Brazil showed higher rates than Colombia until 2010, South Africa after 2001 and the Philippines for the entire sample period. Thus, the stylized facts do not support the saving gap argument.

(Hausmann, 2008; Lopes, 2014; Segura-Ubiergo, 2012), lack of central bank independence (Arida et al., 2003; Favero and Giavazzi, 2002; Nahon and Meurer, 2009; Segura-Ubiergo, 2012) and high debt-to-GDP ratio (Arida et al., 2003; Favero and Giavazzi, 2002; Gonçalves et al., 2007; Muinhos and Nakane, 2006; Segura-Ubiergo, 2012). However, because of unavailability of data, these mechanisms could not be considered.

Table 3: Gross domestic saving as share of GDP for selected countries (%), 1996-2015

Country	1996-2000	2001-2005	2006-2010	2011-2015	1996-2015
BRA	15.64	19.17	20.46	19.66	18.73
CHL	24.31	25.59	30.32	24.73	26.24
COL	14.57	15.51	20.16	21.84	18.02
IDN	28.06	29.88	31.44	34.24	30.91
PHL	15.06	15.66	16.90	16.20	15.96
THA	34.14	29.64	31.04	29.56*	31.09
ZAF	19.26	19.12	20.28	18.79	19.36
AVR	21.58	22.08	24.37	23.58	22.90

Source: World Bank – World Development Indicators.
Note: Grey areas represent saving rate lower than the Brazilian one.
*Note 2: *Thailand's average is only from 2011 to 2014.*

High default risk premium

A second mainstream argument is that due to Brazil's history of sovereign defaults the country must pay a high default risk premium (Segura-Ubiergo 2012, p.5). In this view, a "country's risk of default on external debt, together with its inflation history […] provides a good measure of a country's capacity to bear debt without brooking high risk of default" (*ibid*, p.54). For being a serial defaulter, Brazil is bound to receive less capital inflow from rich countries (Reinhart and Rogoff, 2004), which means that the country must take action to attract capital. Thus, the high government default risk would be captured by a higher central bank interest rate.

The sovereign default of our selected countries is shown in Table 4. In the sample, Brazil had seven sovereign debt problems in the 1980s and five debt problems in the 1990s. However, in the 1980s Chile and the Philippines presented the same number of sovereign default events as Brazil and in the 2000s Indonesia had two years of default while Brazil had none. Therefore, this explanation also has weak empirical support. This result is consistent with Salles's (2007, p.5) argument that the history of inflation and default is common ground for all Latin American countries, thus not justifying the substantially higher Brazilian CBRIR.

Table 4: Sovereign debt default events for selected countries, 1996 – 2015

Country	1970-1979	1980-1989	1990-1999	2000-2015	1970-2015
BRA	0	7	5	0	12
CHL	0	7	1	0	8
COL	0	0	0	0	0
IDN	0	0	1	2	3
PHL	0	7	3	0	10
THA	0	0	0	0	0
ZAF	0	4	1	0	5
AVR	0	4	2	0	5

Source: Database for Sovereign Defaults, Bank of Canada.

Note: The indicator was calculated by using the foreign currency bank loans and transforming them into dummy variables. When there was an event of default on this type of loan, the dummy assumed the value of 1, while 0 means its absence.

Note 2: The grey areas show the periods in which countries had a number of sovereign debt default events similar to or greater than in Brazil.

Convertibility risk

A further argument is that the convertibility of the Brazilian *Real* is considered very restrictive. As clarified by Gonçalves et al. (2007, p.62), this argument is not related to pegged exchange rate regimes, but to capital controls, i.e. any restrictions to convert local currency into foreign currency. Some examples of capital controls that impose restrictions on foreign investments by Brazilian residents are: the prohibition of big institutional investors such as pension funds to invest abroad, the high level of bureaucracy that increases compliance costs and, lastly, a requirement of previous authorization from the BCB to transfer large amounts abroad (Arida et al. 2003, p.12). As a result, mainstream authors argue that foreign lenders would be very cautious in providing funds to Brazilian residents as there would be a high risk that residents would not be able to repay their loans. Thus, lenders would increase their interest rates in foreign currency because of the convertibility risk. The higher interest rates on foreign loans would also push domestic interest rates up (Arida 2003).

An empirical investigation by Gonçalves et al. (2007) finds only a weak relation between capital controls and interest rates in Brazil. Table 5 displays the level of capital controls for the seven countries under analysis, using a capital control index as a proxy for the convertibility risk argument. The index was constructed by Fernández et al. (2015) based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. As it is noticeable, Brazil had relatively strong capital controls until 2001, but so did other countries.

Moreover, Brazil had lower capital controls than the average from 2001 to 2010. Therefore, it is not possible to conclude that this is a strong cause of the Brazilian higher real interest rate, which is also confirmed by the time series in Gonçalves et al. (2007).

Table 5: Convertibility risk measured by capital control indexes of selected countries, 1996-2013

Country	1996-2000	2001-2005	2006-2010	2011-2013	1996-2013
BRA	0.76	0.41	0.49	0.65	0.58
CHL	0.88	0.29	0.18	0.40	0.44
COL	0.74	0.64	0.63	0.58	0.65
IDN	0.54	0.63	0.66	0.66	0.62
PHL	0.77	0.85	0.88	0.88	0.85
THA	0.66	0.77	0.79	0.77	0.75
ZAF	0.63	0.62	0.60	0.63	0.62
AVR	0.71	0.60	0.60	0.65	0.64

Source: Fernández et al. (2015).
Note: The grey areas indicate higher capital control indexes than Brazil.

Jurisdictional uncertainty

Regarding institutional aspects, we find the so-called *jurisdictional uncertainty* hypothesis. According to this hypothesis, the institutions of a particular country are determinants of interest-rate setting (Arida et al. 2003). The theory is based on the fact that there is no domestic market for long-term credit and bonds (Gonçalves et al. 2007, p.55) either in *Real* or foreign currency, but there is a possibility for the Brazilian government, big firms and large banks to receive foreign credit denominated in foreign currency (Arida et al. 2003, p.4). The lack of a domestic credit market is due to uncertainties related to Brazilian jurisdiction. One example of jurisdictional uncertainty would be the risk created by the government, since it could modify financial contracts at any time, such as through surprise inflation, asset confiscation and direct lending policies – as it has done in the past. Therefore, investors would demand a premium for a possible future loss. The other example relates to the lack of legal rights for creditors and a legal system that systematically benefits debtors (World Bank 2006, p.26). Moreover, in this view, there is an anti-creditor bias reflected in the common Brazilian opinion that the creditor has a negative connotation and opposes itself to the debtor, which in contrast is regarded as the productive capital that is able to generate jobs and output (Arida et al. 2003, p.6). In this respect, the uncertainty related to Brazilian jurisdiction would

then require from the central bank the setting of a higher interest rate to attract foreign capital.

Bacha et al. (2009, p.347) quantify the jurisdictional uncertainty through the rule-of-law index from the World Bank to estimate its impact on interest rates in Brazil, but find no relation between the two variables. In the same way, Gonçalves et al. (2007) use the rule-of-law and regulatory quality as proxies for jurisdictional uncertainty, but find no relationship between the variables and interest rates. Table 6 deals with the jurisdictional uncertainty argument. Following the work of Gonçalves et al. (2007), I use the rule-of-law variable as a proxy for jurisdictional uncertainty. Rule-of-law is an estimation of the confidence that agents have in law enforcement and legal stability, especially in the "quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence" (World Bank database definition). It is captured by an index ranging from minus 2.5 to 2.5 units in a standard normal distribution. As we can see, many countries such as Colombia, Indonesia and the Philippines have a similar or worse rule-of-law index than Brazil. Thus, the empirical evidence does not support this mechanism.

Table 6: Rule-of-law index of selected countries, 1996-2014

Country	1996-2000*	2001-2005**	2006-2010	2011-2014	1996-2014
BRA	-0.31	-0.40	-0.29	-0.08	-0.27
CHL	1.13	1.28	1.26	1.37	1.26
COL	-0.89	-0.73	-0.44	-0.37	-0.61
IDN	-0.61	-0.86	-0.66	-0.53	-0.67
PHL	-0.15	-0.47	-0.52	-0.46	-0.40
THA	0.53	0.18	-0.13	-0.17	0.10
ZAF	0.08	0.06	0.11	0.12	0.09
AVR	-0.03	-0.13	-0.10	-0.02	-0.07

Source: World Bank – Worldwide Governance Indicators.
*Note: *1997 and 1999 are missing. **2001 is missing.*
Note 2: The grey areas show rule-of-law values lower than the respective Brazilian one.

To sum up, mainstream economists provide four key explanations for why the policy real interest rate in Brazil is higher than in other countries which are summarized in Table 7. They refer to the lack of saving, the country's history of default on external lenders, the level of capital controls and the intrinsic risk of the national institutions. Yet, the analysis of the

stylized facts shows that those arguments are not supported by evidence when comparing the Brazilian results with other developing countries under the IT regime.

Table 7: Summary of mainstream explanations for the high real interest rate in Brazil

Argument	Proponents	Cross-country comparison	Empirical support?
Low level of saving	Arida et al. 2003; Hausmann 2008; Lara Resende 2011; Segura-Ubiergo 2012	Colombia, the Philippines and South Africa have lower saving rates	No
Default history	Reinhart and Rogoff 2004; Salles 2007; Segura-Ubiergo 2012	Brazil only has more default issues than other countries in the 1990s	No
Convertibility risk	Arida 2003; Arida et al. 2003	The Philippines show higher capital control measures for the entire sample	No
Jurisdictional uncertainty	Arida et al. 2003; Bacha et al. 2009; Gonçalves et al. 2007; World Bank 2006	Colombia, Indonesia and the Philippines exhibit worse rule-of-law indicators	No

2.2. Heterodox explanations

Heterodox economists also provide several explanations for the high interest rates in Brazil. Two key arguments are related to the effect of the exchange rate on inflation. Moreover, heterodox economists believe that the application of incorrect monetary policies and the conservative approach of the BCB are also strong factors for the high CBRIR in Brazil[4].

Exchange rate volatility

The first argument of the heterodox approach is that the high volatility of the exchange rate has a strong connection with the high interest rates (Sicsú 2002, p.132; Oreiro et al. 2012,

[4] Moreover, the indexation of government bond interest rates to the central bank interest rate is mentioned by Baltar (2015), Modenesi and Modenesi (2012) and Oreiro et al. (2012) as a factor contributing to the high Brazilian real policy rate. However, other developing countries under IT also have bond interest rates indexed to inflation (Deacon et al. 2004), so it seems this is not a particularity of the Brazilian economy. Because of the inability of measuring the level of indexation between those variables, I leave this argument out of this analysis.

p.576). According to Carneiro and Rossi (2013, p.6), "international investors demand a premium which takes the form of an increase in the nominal interest rate to compensate for the risk of moving to an unstable currency". This argument stems from the Keynesian assumption that every asset has a liquidity premium, that is, a value for its convenience and security, which is included in the final rate of return on this asset (Keynes 2003 [1936], p.143). Considering national currencies as assets, the more convenient and secure the currency, the lower its interest rate will be. Herr (2008, p.129) calls this phenomenon currency premium, in which "each currency in the world earns a specific non-pecuniary rate of return" that represents its respective qualities. This concept is also present in Conti et al. (2014, p.355-356), who elaborate the determinants of the domestic interest rate under this aspect.

In Table 8, the volatility of the nominal exchange rate for selected countries can be compared[5]. Although Brazil does show a strong volatility, other countries' exchange rates are also unstable, such as the Indonesian and the South African ones. Therefore, this argument seems not to be a sufficient explanation for the high CBRIRs in Brazil.

Table 8: Nominal exchange rate volatility of selected countries, 1996 – 2015

Country	1996-2000	2001-2005	2006-2010	2011-2015	1996-2015
BRA	0.035	0.099	0.077	0.075	0.072
CHL	0.028	0.054	0.060	0.040	0.046
COL	0.065	0.035	0.067	0.050	0.054
IDN	0.135	0.048	0.045	0.040	0.067
PHL	0.058	0.018	0.035	0.020	0.033
THA	0.084	0.025	0.030	0.022	0.040
ZAF	0.058	0.078	0.082	0.058	0.069
AVR	0.066	0.051	0.057	0.044	0.054

Source: USDA, Economic Research Service.
Note: Following Clark et al. (2004), volatility is measured as the yearly standard deviation of the growth rate of monthly exchange rates.
Note 2: The grey shadows show periods in which volatility in other countries was greater to that of Brazil.

[5] For details of the volatility measure, please refer to Appendix A.

Exchange rate pass-through

Furthermore, heterodox authors highlight the effects of strong exchange rate pass-through in Brazil. The high exchange rate pass-through means that in the case of a currency devaluation there is a strong effect in the domestic price level. Consequently, the BCB is forced to increase the nominal interest rate to contain the increase in general prices (Ono et al. 2005, p.241). A high exchange rate pass-through is a second channel through which exchange rate volatility may affect the CBRIR, according to heterodox authors. Since exchange rate volatility changes the expected inflation rate, the monetary authority might be unable to meet the previously established target (Arestis et al. 2008, p.26). According to Barbosa-Filho (2015, p.414), by adopting an interval of tolerance of 2 percentage points, the BCB can adjust the target according to the exchange rate variations. In this case, exchange rate volatility is able to explain most of the changes in inflation in Brazil since the IT implementation. This is supported by an empirical study by Oreiro et al. (2012) that shows that the variation in the exchange rates is the main determinant of the Consumer Price Index (CPI) and central bank interest rate in the country.

The measurement of exchange rate pass-through for each country in the sample is beyond the scope of this paper. However, empirical evidence shows that Brazil does not have a higher pass-through than its peers. Baqueiro et al. (2003, p.349) found that, for Colombia, the country has an exchange rate pass-through coefficient between 0.77 and 2.56. Extending the model to Brazil, Silva and Vernengo (2008, p.69-70) find the exchange rate pass-through coefficient in Brazil to be between 0.02 and 0.91, which is much lower than the Colombian equivalent. Thus, although it is possible that exchange rate variation has a positive effect on inflation in Brazil, this cannot be the only explanation for the high real interest rates.

Cost-push inflation

Heterodox economists do not assume that inflation is only a matter of pressures from aggregate demand. The increase in prices can also occur on the supply-side, due to so-called *cost-push inflation*. This phenomenon can derive from an increase in rents (Wray 1997), indexation of administrated prices (Summa and Serrano 2012), devaluation of the national currency (Serrano 2010), but mostly from aspirations of workers or capitalists (Rochon and Rossi 2006, p.9; Smithin 1994, p.99). Also known as *conflict inflation*, this latter type of increase in prices takes place because, by demanding higher wages or establishing higher profits, there is an increase in costs of production. Therefore, the distributional conflict

between workers and capitalists can push prices up (Lavoie 2014, chap.8; Rochon and Rossi 2006).

Correspondingly, heterodox authors believe that the orthodox policy of controlling inflation through monetary policy is not appropriate. This is particularly important in Brazil, where indexed prices in the economy cause cost-push inflation, which cannot be prevented by setting a higher interest rate (Summa and Serrano 2012, p.4; Oreiro et al. 2012, p.563). Due to high inflation in the 1980s, many services and goods, including administered prices, were indexed to inflation in order to maintain their real values. Although there was a reduction of indexation after the *Real Plan* in 1994, a significant share of goods and services still have formally indexed prices, such as rents, energy and telecommunication (Modenesi and Modenesi 2012, p.403). In addition to the indexation, administered prices exhibit other peculiarities. Those prices show insensitivity towards interest rate changes, represent around 30% of the CPI and have growth rates beyond the free-price goods and services (*ibid*, p.396), which pushes inflation further. A study by Summa and Serrano (2012, p.8) shows that average administrated price inflation has been higher than total average price growth during the 2000s. This study corroborates the hypothesis that the indexation of administered prices has a strong effect on inflation in Brazil. Moreover, there is an 'amplifying effect' of monitored prices. For instance, exchange rate fluctuations have a greater effect on those prices than free-price goods or services (Oreiro et al. 2012, p.566). Serrano (2010, p.68) affirms that these fluctuations first impact monitored prices, which are later passed on to free-price goods. Thus, inflation in Brazil could not be reduced by increasing interest rates and, by trying so, the BCB keeps on raising interest rates beyond the international level.

Empirically, the indexation of prices as a factor of increasing central bank interest rates is difficult to compare due to lack of data. Although Brazil has a high indexation level, as discussed above, other countries also exhibit the same issue. In Colombia, for instance, regulated prices of electricity, gas, water and sewage are indexed to the previous inflation level, while fuel and transport services adjust prices according to costs (Vargas et al. 2009, p.137). Moreover, López (2008, p.24) affirms that, although showing a declining trend in relative prices with respect to free-priced goods, administered prices in Colombia have a higher annual variation than the latter. They also have a large impact on total inflation, when considering its relative size in the basket of goods. Therefore, administered-price indexation is a feature not only of the Brazilian economy. Since Colombia exhibits a much lower CBRIR than Brazil, this explanation can also be regarded as insufficient.

Monetary policy conservatism

Considering the political aspect of the IT framework, Oreiro et al. (2012, p.563) claim that the BCB has an excessive concern about the inflation rate. To confirm this argument, Modenesi (2011, p.427-428) shows that the BCB has an extremely conservative reaction function: it sets the interest rate higher than necessary to fight inflation and it reduces the rate only very slowly when actual inflation is below the target. This "slow to ease, quick to hike" philosophy has been adopted by other inflation-targeting central banks as well (Bibow 2013, p.623). In fact, under disinflation or economic deceleration is it likely that the BCB interest rate will remain unchanged (Modenesi 2011, p.428).

Schmidt-Hebbel and Werner (2002, p.9) econometrically test the causality between CPI inflation and inflation targeting. For Brazil, they do not find any causality, probably due to the small sample period or the fact that the country already had low inflation rates when adopting the IT framework. For Chile, however, they conclude that CPI inflation caused the setting of the inflation target and consider this finding to be consistent with the argument that the Central Bank of Chile was conservative during the setting of its targets in the 1990s. In that way, Brazil seems not to be the only country in which the Central Bank sets conservative targets to reduce inflation, but still keeps higher CBRIR.

To conclude, heterodox economists believe that the BCB's interest rate policy has another purpose beyond controlling inflation directly: to control exchange rate volatility due to high exchange pass-through. Moreover, due to an incorrect diagnosis of the causes of inflation, the BCB is unable to reduce inflation effectively. Therefore, the interest rate ends up being set at a much higher level than it should be. A summary of heterodox arguments can be found in Table 9.

Table 9: Summary of heterodox arguments for the high real interest rate in Brazil

Argument	Proponents	Cross-country comparison	Empirical support?
Exchange rate volatility	Arestis et al. 2008; Sicsú 2002	South Africa has strong volatility as well	No
High exchange rate pass-through	Baltar 2015; Ono et al. 2005; Oreiro et al. 2012	Brazil shows a lower coefficient than Colombia	No
Cost-push inflation	Modenesi and Modenesi 2012; Oreiro et al. 2012; Serrano 2010; Summa and Serrano 2012	Colombia exhibits indexation of administered prices too	No
BCB conservatism	Modenesi 2011; Oreiro et al. 2012	Chile also implemented conservative targets in the 1990s	No

As we can see, the stylized facts show us the fragility of the current analyses for the case of Brazil. However, in order to test for the general explanatory power of each argument, I will use an econometric analysis to investigate whether those could be relevant in a context of developing countries under the IT regime. Moreover, the econometric analysis will provide evidence on country-specific characteristics that are not captured by the existing explanations.

3. Econometric analysis of the determinants of central bank real interest rates

This section develops a panel analysis of the determinants of central bank real interest rates based on the orthodox and heterodox explanations presented above. The sample consists of Brazil (BRA), Chile (CHL), Colombia (COL), Indonesia (IDN), Mexico (MEX), Peru (PER), the Philippines (PHL), Poland (POL), Thailand (THA), Turkey (TUR) and South Africa (ZAF). The time period is 1996-2015. I start from the following general regression equation:

$$(1) \qquad CBRIR_{it} = \alpha_i + \beta_1 SAV_{it} + \beta_2 RULE_{it} + \beta_3 KCONTR_{it} + \beta_4 XRVOL_{it} + \beta_5 IT_{it} + \beta_6 FED_t + \beta_7 GDP_{it} + \varepsilon_{it}$$

Where *CBRIR* is the central bank real interest rate, α_i is the fixed effect of each country, *SAV* is gross domestic saving as share of GDP, *RULE* is the rule-of-law index, *KCONTR* is an index for overall restrictions to inflow and outflow of assets and *XVOL* is the volatility of nominal bilateral exchange rates with respect to the U.S. dollar. *IT* is a dummy variable for the years in which the country was under the inflation targeting framework (0 is not under IT and 1 is under IT), *FED* is the effective federal funds rate of the United States (US) and *GDP* is the GDP growth rate[6].

The first three variables are derived from mainstream theory. *SAV* is the saving rate of the economy which, according to the loanable funds theory, is expected to exert a negative effect on the *CBRIR*. *RULE* is a proxy for jurisdictional certainty. A better ranking in the rule-of-law index is expected to have a negative impact on *CBRIR* because it implies lower risk for creditors. Mainstream authors further argue that capital controls constitute convertibility risk for foreign investors that is being compensated by a higher interest rate. *KCONTR* is thus expected to have a positive effect on *CBRIR*.

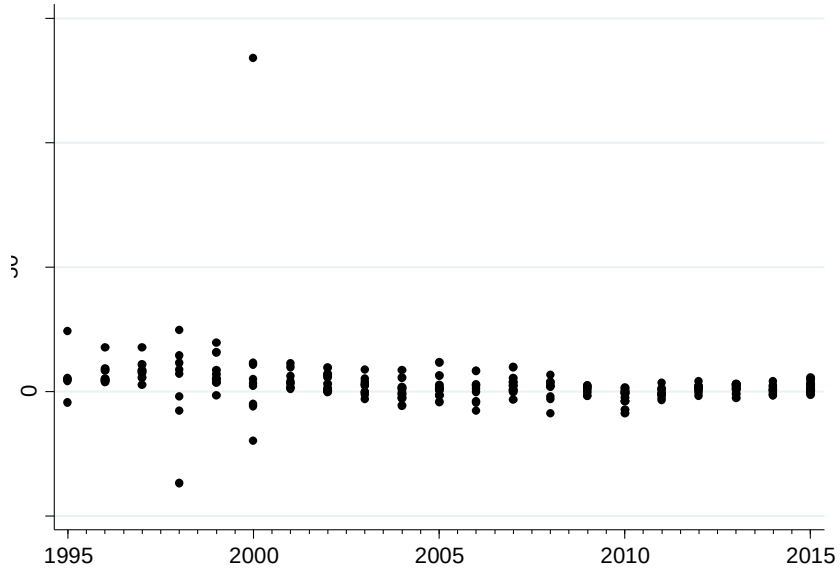
The variables *XRVOL* and *IT* capture arguments that have been put forth by heterodox authors. *XVOL* is expected to have a positive impact on *CBRIR* because it leads to a lower quality of the currency, which is assumed to be compensated by a higher interest rate premium. Heterodox authors further argue that since monetary policy is a largely ineffective tool to control inflation, inflation targeting will lead to higher and higher policy rates as long as the true causes of inflation remain untouched. Therefore, *IT* is expected to exert a positive effect on *CBRIR*.

Lastly, *FED* and *GDP* are added as control variables. It has been argued that in a financially globalized world, US monetary policy influences policy rates in the rest of the world through speculative capital movements (Rey 2016). *FED* is thus expected to have a positive effect on *CBRIR*. Moreover, output growth is expected to impact on monetary policy setting insofar as the output gap is an argument of the central bank reaction function. We would, therefore, expect *GDP* to exert a positive effect on *CBRIR*.

[6]Appendix A displays detailed information on these variables.

Figure 1 shows a scatter plot of the dependent variable. We can see that Turkey's value of 133.97 in the year 2000 constitutes an extreme outlier. It has thus been removed from the sample.

Figure 1: Scatter plot for the *CBRIR* variable for all the countries in the sample, 1995-2015



I initially estimate the model using a within estimator method and run different tests to control for certain effects that could bias the estimations. First, I check for unit roots in the time series. I conduct Fisher type panel unit root tests for all time series variables using the augmented Dickey-Fuller test. The mean of the series across the panel for each period has been subtracted in order to correct for cross-sectional dependence and the *drift* option is used since the mean of each variable is nonzero for all the countries in the sample. The result is that there are no unit roots in the estimation. Second, I conduct a Hausman test to decide between random and fixed effects. The result indicates the use of fixed effects. Then, I perform a Wald test which suggests no time fixed effects. Fourth, a modified Wald test showed the presence of heteroskedasticity in the model. Lastly, in order to test for autocorrelation, I run the Wooldridge test for autocorrelation in panel data and the result indicates first-order autocorrelation (AR1) in the model.

In order to account for the problems of autocorrelation and endogeneity, I chose the autoregressive distributed lag (ADL) approach to find the right lag structure for the model. I start from a general model with contemporaneous explanatory variables and two time lags each, including the dependent variable. The Pesaran test for cross-sectional independence was

not rejected, which suggests the presence of cross-sectional independence. Therefore, I apply robust standard errors to correct heteroskedasticity. Then I successively withdraw the explanatory variable with the lowest t-value until I reach a model with one explanatory variable each:

$$(2) \qquad CBRIR_{it} = \alpha_i + \beta_1 CBRIR_{it-1} + \beta_2 SAV_{it-1} + \beta_3 RULE_{it-1} + \beta_4 KCONTR_{it-1} + \beta_5 XRVOL_{it} + \beta_6 IT_{it-2} + \beta_7 FED_{t-2} + \beta_8 GDP_{it-1} + \varepsilon_{it}$$

The description of variables is the same as in equation (1), but with different lags. I employ four different methods to estimate equation (2). The first one is the within estimation with robust standard errors of the ADL model given by equation (2) (RB), which corrects for heteroskedasticity and first order autocorrelation. Now, the Pesaran test indicates that the model (2) suffers from cross-sectional dependence. I thus use the fixed-effect method with Driscoll-Kraay standard errors (DK) correcting for heteroskedasticity and cross-sectional dependence as a second estimation method. Then I use the Pesaran and Smith (1995) Mean Group Estimator (MG) with robust standard errors that allows for heterogeneous slope coefficients across group members and corrects for cross-sectional dependence. Lastly, I apply a regression using the first difference of both dependent and explanatory variables with robust standard errors as to account for autocorrelation and heteroskedasticity. The specifications are described in Table 10, while the results are shown in Table 11.

Table 10: Methodology of each ADL estimation

Specifi-cation	Estimation method	Unobserved country fixed effect	Standard Errors	Corrects for heteroskedas-ticity?	Corrects for Autocorrelation AR1?	Corrects for Cross-sectional dependence?
(1) RB	Within	Fixed	Robust	Yes	Yes	No
(2) DK	Within	Fixed	Driscoll-Kraay	Yes	No	Yes
(3) MG	Mean group		Robust	Yes	No	Yes
(4) FD	Within	Fixed	Robust	Yes	Yes	No

As it is possible to notice, no explanatory variable is statistically significant across all specifications. Except for the estimations using first differences, the *IT* regime dummy variable is statistically significant in most specifications and has a negative effect on *CBRIR*. In the first specification, for instance, implementing the IT framework reduces *CBRIR* by about 5.2 percentage points on average two years later. Thus, there is some evidence that the IT framework reduced the *CBRIR* in the sample. This result is at odds with the argument that the IT framework is beneficial for the rentier class as a whole as made by Epstein (1992, 2002) and Papadatos (2009) – at least for developing countries. This is a puzzling finding that may warrant further research. Apart from *IT* no other variable is statistically significant in more than one specification. Therefore, none of the other explanatory variables can be considered robust.

As a final robustness check, I redo the ADL method with fixed-effects and robust standard errors, and successively remove the variables with the lowest t-value until only statistically significant variables remain, which turn out to be $CBRIR_{it-1}$ and IT_{it-2}, thus confirming previous findings.

Table 11: Estimations of equation (2)

Dependent variable: central bank real interest rate (*CBRIR*)				
	(1) RB	**(2) DK**	**(3) MG**	**(4) FD**
$CBRIR_{it-1}$	0.18**	0.18**	0.26***	-0.15
	(0.08)	(0.07)	(0.07)	(0.10)
SAV_{it-1}	0.22	0.22**	0.21	-0.07
	(0.13)	(0.08)	(0.36)	(0.25)
$RULE_{it-1}$	-2.27	-2.27*	5.49	4.37
	(1.73)	(1.08)	(6.42)	(3.38)
$KCONTR_{it-1}$	1.62	1.62	0.01	-9.91**
	(2.26)	(2.76)	(9.19)	(4.75)
$XRVOL_{it}$	0.54	0.54**	0.55	-0.18
	(0.33)	(0.23)	(1.01)	(0.55)
IT_{it-2}	-5.24***	-5.24***	-2.98***	-2.02
	(0.90)	(0.23)	(1.14)	(1.88)
FED_{t-2}	0.11	0.11	0.14	0.42**
	(0.12)	(0.19)	(0.17)	(0.21)
GDP_{it-1}	0.09	0.09	0.18	-0.16*
	(0.10)	(0.10)	(0.18)	(0.07)
Observations	149	149	143	115
Groups	11	11	10	11
Time period	**1996 – 2015**	**1996 – 2015**	**1996 – 2015**	**1996 – 2015**
F-test	0.0000***	0.0002***	0.0035**	0.0000***

Note: * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level.

Note 2: Values in the brackets are standard errors.

In conclusion, the results show that the proposed explanations for CBRIR determination in developing countries under IT cannot obtain strong econometric support. The weak performance of the explanatory variables points to the relevance of omitted variables that are

partly captured by the country-specific constants. A closer look at the country-specific constant also shows whether Brazil still exhibits a significantly higher CBRIR after controlling for other factors. Table 12 displays the country-specific constants of the sample obtained from specification (1).

Table 12: Country fixed effects of sample countries

Country	BRA	CHL	COL	IDN	MEX	PER	PHL	POL	THA	TUR	ZAF
FE	5.22	-0.76	0.15	-3.04	-0.27	-0.45	-0.47	0.67	-1.10	-0.41	0.34

Here it is possible to see that Brazil has a very high fixed effect of 5.22, while other countries had smaller and even negative country-specific constants. What could then explain this strong variance in country-specific factors that are not captured by the model?

A possible explanation is that central bank policy is affected by political determinants that have not been properly considered by the economic literature on interest rates in Brazil. Different authors have pointed to the strong political power of rentiers in the country, although have not provided empirical evidence of the maintenance of high CBRIR in Brazil. Boito Jr. (2008, p.79-80) mentions the rapprochement of industrialists with the workers' movements in 1996 to protest against neoliberal reforms and the increase of interest rates, which were considered to be a pro-rentier policy. Singer (2015) writes about the attempt of the active reduction of CBRIR in 2012 and 2013 by the then president Dilma Rousseff. He shows how expansionary monetary policies caused a strong reaction from the rentier class and later, even from industrialist organizations, as a result of an elite coalition. Another aspect of the opposition of industrialists to decreasing CBRIRs is investigated by Bruno (2011) who points out the increasing financialization of firms in Brazil, thus aligning the interests of industrialists to that of rentiers. Vernengo (2008) explains how the rentier class and financial capital benefit from the current monetary regime with high real policy rates, while workers and firms bear the costs of such restrictive monetary policies. Even if the hypothesis of restrictive monetary policy due to the political power of rentiers is conceivable, empirical investigation on this matter is still lacking and should be dealt with in future research. However, data that measure rentier power are not readily available, in particular for developing countries.

Rentier power could be operationalized by analyzing the composition of high-level administration of each country in order to assess the policy-making power of the financial sector, as has been done already for the United States (Bellamy Foster and Holleman 2010). Another method would be to estimate capital flight as a proxy for the pressure of rentiers with respect to reductions in the CBRIR in each country and compare the results. In this case, if a decrease in CBRIR would have a stronger effect on capital outflows from Brazil than other countries, *ceteris paribus*, it could be concluded that the rentier class is able to easily transfer its capital, thus possessing a strong bargaining power. However, the required data would first have to be originally collected for the countries of interest, which would constitute a promising research project for the future.

4. Conclusion

This paper presented orthodox and heterodox views in order to explain the high Central Bank real interest rate in Brazil. Mainstream economists highlight low saving rates, the default history of the country, strong capital controls and jurisdictional uncertainty, while heterodox authors mention exchange rate volatility and the inappropriateness of monetary policy to control inflation in Brazil due to indexed prices and exchange rate pass-through. After a comparison of stylized facts between Brazil and other developing countries under the IT framework, it was concluded that the existing arguments are not sufficient to explain why the CBRIR is much higher in Brazil than in other countries. Furthermore, an econometric model including the most important variables proposed by both opposing views was tested empirically using panel data. The result corroborated the comparative analysis and showed that all proposed variables perform weakly as predictors of CBRIR in developing countries under inflation targeting. There is some weak evidence that the introduction of the IT regime in the selected countries reduces CBRIR, in contrast to what some heterodox authors have previously argued. Another conclusion of the econometric analysis regards the country fixed effects of the sample countries. In comparison to other countries, Brazil had a very high coefficient, which means that there are some specificities of the country that are not captured by the model. Based on the political economy literature, my suggestion is that the rentier class in Brazil has a strong influence over the establishment of central bank policy rates and that this may help explain the phenomenon of extraordinarily high real interest rates. This presumption could be addressed in further research.

Currently facing a severe recession together with accelerating inflation, Brazil needs to reconsider its policies of high real interest rates, which seem to be ineffective in bringing down inflation. Thus, the country needs to adopt alternative measures to deal with inflation, while at the same time considering the distributive policies that must take place to stimulate growth and provide social justice.

Appendix A: Description of variables used in the model (1) and (2)

Table A1: Dependent variables' measures, period and sources

Country	Variable	Measure	Period	Source
BRA	SELIC/TCB	Simple average	1996 – 2015	Central Bank of Brazil
CHL	Tasas de interés de referencia de la política monetaria	Simple average	1995 – 2015	Central Bank of Chile
COL	Tasa de intervención	Simple average	1995 – 2015	Banco de la Republica
IDN	Central bank policy rate	Percentage per annum	1995 – 2015	International Financial Statistics, IMF
MEX	Tasa de fondeo bancario	Weighted average	2008 – 2015	Bank of Mexico
PER	Tasa Referencia de Politica Monetaria	Simple average	2003 – 2015	Central Reserve Bank of Peru
PHL	RRP Rate (term)	Simple average	1995 – 2015	Central Bank of the Philippines
POL	Reference rate	Simple average	1998 – 2015	Narodowy Bank Polski
THA	Max. interest rates of fixed deposits (1 year)	Simple average	1995 – 2015	Bank of Thailand
TUR	Central bank policy rate	Percentage per annum	1999 – 2015	International Financial Statistics, IMF
ZAF	Central bank policy rate	Percentage per annum	1995 – 2015	International Financial Statistics, IMF

Table A2: Explanatory variables

Variable	Name	Measure	Period	Source
Gross domestic saving (% of GDP)	*SAV*	Gross domestic saving is calculated as the GDP minus the final consumption expenditure (total consumption)	1996 – 2015	World Development Indicators, World Bank
Rule-of-law	*RULE*	Index of an estimation of the confidence that agents have in the rules of society	1996 – 2014	Worldwide Governance Indicators, World Bank
Capital control	*KCONTR*	Overall restrictions index (all assets categories)	1996 – 2013	Fernández et al., 2015
Exchange rate volatility	*XRVOL*	Yearly standard deviation of the first difference of monthly nominal values (local currency per USD) in log, as defined by the IMF (2004)	1996 – 2015	USDA, Economic Research Service
Inflation-targeting	*IT*	Dummy variable for the years under the inflation-targeting framework	1996 – 2015	Hammond, 2012
Effective federal funds rate	*FED*	Volume-weighted median of overnight federal funds transactions	1996 – 2015	Federal Reserve Economic Data
GDP growth	*GDP*	Annual percentage growth rate of GDP at market prices based on constant local currency	1996 – 2015	World Development Indicators, World Bank

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