Notes on "real" dollarization, currency substitution and inflation control

Florencia Fares
CIMaD-EEYN-UNSAM, FCE-UBA, IELAT-UAH

Emiliano Libman
CONICET-CEDES-Equilibra

Guido Zack
CIMaD-EEYN-UNSAM, FUNDAR

Preliminary version to be presented at 27th FMM Conference
September 2023

Abstract

We discuss and characterize the challenges that small open economies face when pursuing traditional stabilization policies in the presence of a specific form of dollarization, called currency substitution. We build a simple model to assess the impacts of monetary policy and government spending policies on inflation and the foreign exchange market. The model starts with a price equation with tradable and nontradable costs and a dynamic for exchange rate evolution which allows for a fixed or free-floating regime. We analyse stability conditions, which are represented in phase diagrams.

This model shows that high-inflation economies are inherently more volatile and potentially unstable due to the presence of currency substitution. Traditional stabilization policies, such as interest hikes to control inflation, or increase in fiscal spending to sustain aggregate demand, may backfire as the public shift their currency demand and domestic money depreciates. The prevalence of exchange rate as a fuel for inflation is in line with recent contributions of Bastian and Setterfield (2020), and the typology elaborated by Bastian, Charles, and Marie (2021). Moreover, we cast doubts on the effectiveness of isolated movements in interest rate to cope with high inflation.

Finally, we explored the feeble stabilization attempts in Argentina. We complement our description with preliminary econometric exercises using VAR models with data from Chile, Brazil, Peru, Uruguay, and Mexico to assess whether currency preferences are relevant to money demand. The group of countries share a common history of high inflation, but Argentina is the only one currently suffering from it. We find some peculiarities in regressions for Argentina: increments of the exchange rate market pressure or interest rates tend to correlate with increasing foreign currency demand. Thus, we have illustrated some of the shortcomings of traditional monetary policy using the example of Argentina, with a clear take-home in mind. Reducing exposure to inflation and real dollarization

requires a complex combination of policies, and isolated moves or traditional policy mixes may backfire badly.

JEL CODES: E31, E52, E58,

Key words: currency substitution, inflation, dollarization, interest rate

1. Introduction

Stabilization policy is harder in less developed economies. They typically face additional and stronger constrains on the utilization of traditional monetary and fiscal tools, such as high and chronic inflation, balance of payments constrains, as well as swallow capital markets and less tolerance to debt, to name a few.

Under rational expectations and price flexibility, the mainstream approach considers that stabilization is neutral, so disinflation and fiscal consolidation can be achieved without real costs. However, it is well established, and more less agreed, that contractionary policies will reduce output and employment, at least temporary.

Post Keynesians and other critiques of the mainstream agree that fiscal and monetary policy have real effects, not only in the short and medium, but also in the long run. Moreover, they also admit that small open and less developed economies are far more constrained that large, developed economies. Finally, they are skeptic about standard fiscal-monetary policies and other policies mixes, as well as the role of other instruments, such as the exchange rate, when addressing external imbalances.

This paper contributes to the skeptic strand of the literature on traditional stabilization policy, addressing one neglected aspect: the role of a particular form of *de facto* dollarization, known as currency substitution. This phenomenon may arise in chronic or high inflation economies, as foreign currency or currencies compete with the domestic currency in its role of means of payment and unit of account. When the rate of inflation increases, the public quickly switches from domestic towards foreign currency, creating pressures on the foreign exchange market.

A clear implication for the design of stabilization policies in less developed open economies follows. Any policy should be formulated considering its effects on domestic and foreign currency demand. While this may seem an obvious lessons for those who design and implement stabilization policy, it is surprisingly less present in the literature. To address this issue, the following paper proceeds as follow. After this introduction, section 2 describes the related literature. Then, we build a toy model to explain the main mechanism at play. For the empirical part, in section 4 and 5 we discuss the case of Argentina

and present some econometric evidence to illustrate the importance of currency substitution. Finally, we outline some final conclusions in section 6.

2. Related Literature

An important problem for less developed economy that faces inflationary pressures is dollarization, a phenomenon that comes in many forms, depending on which function of money is affected. Specifically, the literature distinguishes between "real" and "financial" dollarization. [1] Real dollarization implies a limited ability of the domestic currency to serve as a unit of account and mean of payment, and it is associated with an elevated pass-through and the utilization of foreign currency to settle domestic transactions (the typically example being big ticket items such as cars or real estate). Financial dollarization implies that the domestic currency is not a good vehicle to preserve value, and thus it is associated with saving in foreign currency, often outside the formal financial system.

The distinction between real and financial was motived by the stabilization programs using fixed exchange rates adopted during the 1990s, in low income and emerging economies from Latin America and East Europe. While inflation was reduced and kept at low single digit, several measures of financial dollarization (i.e., the share of foreign currency denominated deposits or loans) did not fall or even increased in some cases. According to the model of Thomas (1985) this is not surprising, given that real dollarization depends on the ratio of nominal interest rates in domestic vs foreign currency, while financial dollarization depends on the same ratio adjusted by exchange rate expectations[2], which include a risk component. Exchange rate-based stabilization reduces the volatility of the exchange rate vis-à-vis the volatility of the domestic price level, and hence a foreign currency deposit becomes safer than a domestic currency (Ize and Yeyati, 2003). Other possible explanations include poorly regulated financial systems (Broda and Yeyati, 2006) and dollarization hysteresis (Dornbusch et al., 1990).

Importantly for the purposes of the present paper which focused on stabilization policies, real dollarization seems to be associated with chronic and high inflation episodes, while financial dollarization may exist even in an environment of price stability. High and hyperinflation usually end abruptly, after a comprehensive stabilization effort. A key ingredient of any effort of that sort is the nominal anchor. A stabilization program may be classified depending on what is the nominal anchor,

[1] The literature also distinguishes between "de facto" or "partial" and "de jure" or "official" dollarization (Calvo, 2002).

[2] We use the following conventions. The exchange rate is defined as the number of domestic currency (i.e., the "peso") per units of foreign currency (i.e., the US dollar). We refer to exchange rate "devaluations" or "depreciations" to define exchange rate movements that are policy induced or market outcomes, although in some contexts there is some ambiguity, for example if there is an official market and a parallel or free segment were the exchange rate may float.

distinguishing between monetary-based and exchange rate-based stabilization plans. Kiguel and Liviatan (1992) and Reinhart and Vegh (1994) claim that the most important lessons are that exchange-rate-based plans usually show boom–bust cycles, while money-based plans work the other way around. Calvo and Vegh (1994) find that lack of credibility is more disruptive under fixed exchange rates than under floating exchange rates. Calvo and Vegh (1999) favor more flexible exchange-rate regimes because a balance of payments crisis is less likely.

The degree of dollarization affects the choice of the nominal anchor. If real and/or financial dollarization are widespread, using the exchange rate as a nominal anchor seems more appealing. Due to the large pass-through from the exchange rate to prices and presence of balance sheet effects, adopting a more flexible exchange rate regime (which in the context of a stabilization policy implies not relying on the exchange rate as the main anchor) may be extremely difficult and even destabilizing.

Post-Keynesians have their own views on stabilization policies. While in general tend to favor the use of fiscal policy as a counter cyclical tool, they have always been suspicious of the idea of stabilizing output and inflation using monetary policy. Some authors suggests that the policy interest rate, the main instrument of the Central Bank should be "parked" at some level, while others believe that it can be used to tame economic fluctuations, provided that it is complemented using other tools (see Rochon, 2007, and Rochon and Setterfield, 2007, for a discussion).

Most of the discussion of stabilization policies, both in its mainstream and its Post-Keynesian version, takes place in a closed economy set-up, which does little ham for studying large economies such as the US or Europe, but it is unacceptable for less developed economies where the dynamics of the external sector are key. Surprisingly, the open economy version of the post-Keynesian model has received relatively little attention, with some exceptions (see for instance Blecker, 2011, Vera, 2014, or Drumond and De Jesus, 2016). However, these contributions do not account for the presence of destabilizing forces associated with dollarization, exchange rate fluctuations and capital flows. Some notable exceptions are Bortz (2016), Porcile et. al. (2011), who include debt dynamics. Others have included destabilizing balance sheet affects associated with currency mismatch, a phenomenon that is related to financial dollarization (Libman, 2019a), but a more prevalent role of others form of dollarization is still missing in that literature.

3. A sketch model

In this section we propose a simple model that capture some unintended consequences of stabilization policy under real dollarization. The model is kept as simple as possible. It represents a small open economy that produces a single good using imported intermediate input and labor. The

price is formed by adding a mark-up over costs and because we assume that inflation has been running steady, there is indexation to past inflation.

The first dynamic equation captures the evolution of domestic inflation:

$$\dot{\pi} = a(w - \pi) + (1 - a)(e - \pi) \quad (1)$$

Were w, π and e represent the rate of wage growth, inflation and currency depreciation. The parameter $a > 0$ captures the non-tradable component of inflation, while $1 - a$ is the share of the imported component. As usual, the "dot" over a variable denotes its rate of change.

Equation (*1*) captures the evolution of inflation in the presence of backward-looking indexation, since $\dot{\pi} \approx \pi - \pi_{-1}$, or in other words, the change in the rate of inflation is approximately equal to the rate of inflation today minus the rate of inflation one period before (to ease the notation, we omit time subscript for current period variables). The main implication is that inflation increases (decreases) whenever wage or the exchange rate increase above (decrease below) the current rate of inflation.

Since we assume that real dollarization is widespread, the most natural interpretation of equation (1) is that of a consumer price index with domestic and foreign goods or at least of goods that are priced in dollars. A higher degree of real dollarization means that a is close to 0. Alternatively, equation (1) can describe an economy where some of inputs are imported. For our purposes, both interpretations are equivalent.

The second equation describes the evolution of the real exchange rate,Q:

$$\dot{Q} = e - \pi \quad (2)$$

The "key" equation of this model is the rate of currency depreciation/devaluation, e[3]:

$$e = b\bar{e} + (1 - b)f(\underset{-}{Q}, \underset{+/-}{\pi}) \quad (3)$$

It is composed of one exogenous element which states for administered shocks to exchange rate markets, $\bar{e}$, and of a function that depends on current account and financial account balances. We assume that authorities manage the exchange rate, but we can capture both freely floating and completely predetermined exchange rates (which include a zero rate of devaluation or a fixed exchange rate as a special case) as follows. The parameter $b \geq 0$ captures the degree of exchange rate flexibility. Under fixed exchange rate regimes, we have $b = 1$, while for pure floating regimes,

[3] We adhere to the definition of the nominal exchange rate as the amount of local currency require to purchase one unit of foreign currency. Hence, when $e > 0$, more local currency is need to buy one unit of foreign currency.

$b = 0$. Anything in between includes cases such as "dirty" or "managed" floating, crawling-pegs or bands and any other similar scheme.

The current account balance depends positively on the real exchange rate, either because of the expansionary effect on the tradable supply side or because there are contractionary mechanisms that reduce domestic absorption and import demand. On the other hand, the capital account behaves differently depending on the inflationary regime. In a high inflation economy where there is currency substitution, the capital account depends negatively on inflation: as inflation increases the public attempt to swap domestic for foreign currency, and hence the exchange rate goes up. Alternatively, if the economy is stable and the Central Bank tries to move the interest rate with inflation, the presence of capital flows induces an appreciation, thus higher inflation is associated with capital account surpluses and nominal appreciation.

For simplicity, we assume that wages growth is related to the level of economic activity, which only depends on the level of the real exchange rate (Q). Later we will include the interest rate (which may depend on inflation) and fiscal spending as determinants of domestic absorption, but we will ignore them for the moment.

Thus, the growth rate of wages is a function of the level of the real exchange rate and inflation. Both variables affect output and employment. We assume that the real exchange rate negatively affects activity levels (i.e., we assume that devaluations are contractionary), so that a higher real exchange rate reduces output, employment and, consequently, the rate of wage growth. On the other hand, inflation has two different effects: a direct and positive effect associated with the loss of purchasing power, and an indirect and ambiguous effect through the level of employment. Since we want to focus on the role of currency substitution, we eliminate all destabilizing reactions to inflation and stick to the assumption that wage growth is positively related to inflation, albeit indexation is imperfect.

The assumption that there is perfect indexation (in particular if the exchange rate is also indexed) will yield a unit root (i.e., the rate of inflation today will be equal to inflation yesterday plus some random shocks.). The assumption that inflation increases output and employment, and hence it positively affects wage growth, can create unstable dynamics that are not the focus of the present paper. Hence, we assume:

$$w = w(\underset{-}{Q}, \underset{+}{\pi}) \tag{4}$$

With $0 < w_\pi < 1$ the associated Jacobian Matrix is as follows:

$$\begin{bmatrix} \frac{\partial \dot{\pi}}{\partial \pi} & \frac{\partial \dot{\pi}}{\partial Q} \\ \frac{\partial \dot{Q}}{\partial \pi} & \frac{\partial \dot{Q}}{\partial Q} \end{bmatrix} = \begin{bmatrix} (1-a)(f_\pi - 1) - a(1-w_\pi) & aw_Q + (1-a)f_Q \\ f_\pi - 1 & f_Q \end{bmatrix} = \begin{bmatrix} -/+ & - \\ - & - \end{bmatrix} \quad (5)$$

If there is no currency substitution, then $f_\pi < 0$ unambigously. The trace is negative, while the determinant is positive if the slope of $\dot{\pi} = 0$ is greater than $\dot{Q} = 0$. This a "stable" economy. In contrast, in an "unstable" economy characterized by high inflation and currency substitution $f_\pi > 1$ is possible. This implies that an increase in inflation generates a higher nominal depreciation rate of the domestic currency because agents refuse to hold domestic money.

Charles and Marie (2016, 2017, 2021) and Marie (2014) studying different cases of high inflation and hyperinflation, claimed that a typical feature of these phenomena is the rejection of the domestic currency, which progressively loses its functions as a store of value, unit of measurement, and medium of exchange as inflation increases. In our model, although the monetary authority may increase the interest rate in an attempt to reduce inflation, due to agents' preference for foreign currency, this may not be enough to maintain local currency holdings. The system will be stable as long as the curves have slopes with opposite signs or when both have positive slopes and $\dot{Q} = 0$ is greater than $\dot{\pi} = 0$.

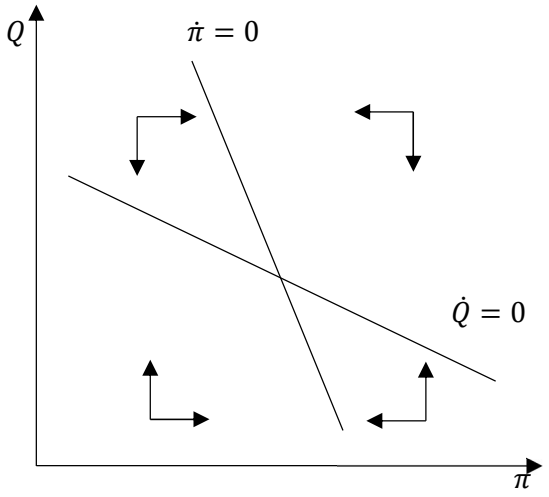
The phase diagrams of the system are as follows. The slopes of the loci are:

$$\left.\frac{dQ}{d\pi}\right|_{\dot{\pi}=0} = -\frac{(1-a)(f_\pi - 1) - a(1-w_\pi)}{aw_Q + (1-a)f_Q} \quad (6)$$

$$\left.\frac{dQ}{d\pi}\right|_{\dot{Q}=0} = -\frac{f_\pi - 1}{f_Q} \quad (7)$$

Figure *1* shows the dynamics associated with the system in a stable economy with negative slopes for both curves $\left.\frac{dQ}{d\pi}\right|_{\dot{Q}=0} < 0$, $\left.\frac{dQ}{d\pi}\right|_{\dot{\pi}=0} < 0$. The out-of-equilibrium trajectories imply that above $\dot{Q} = 0$, Q decreases, while above $\dot{\pi} = 0$, π decreases as well.

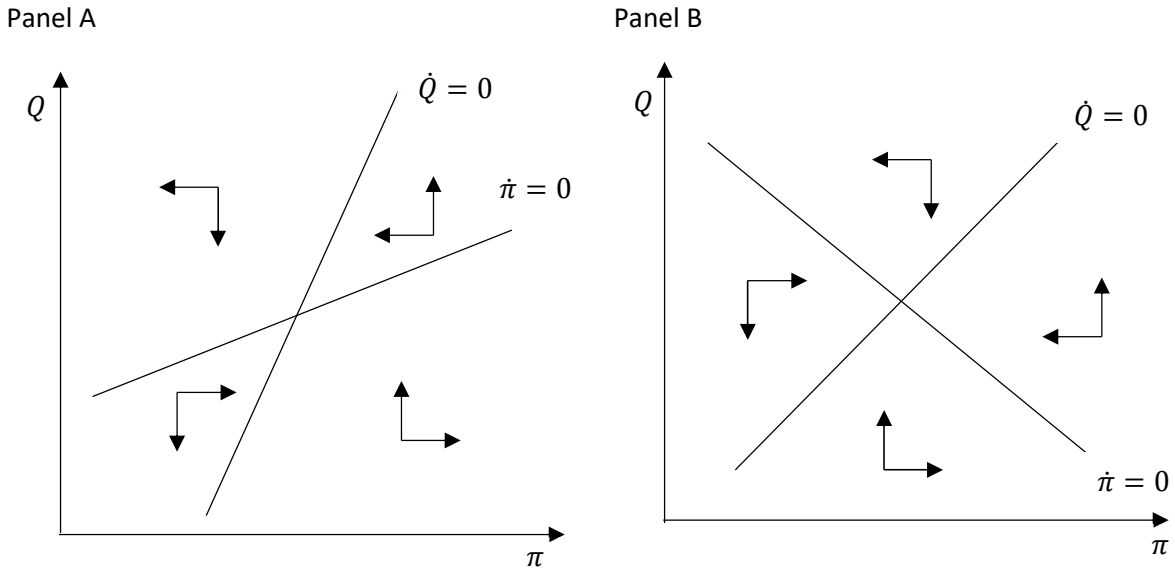
Figure 1: Stable economy in low inflation regime



Source: Authors´ own elaboration

Figure 2 shows in both panels the possible cases in high inflation economies. Panel A is the unstable case, while Panel B describe the stable dynamics.

Figure 2: Instable economy in high inflation regime

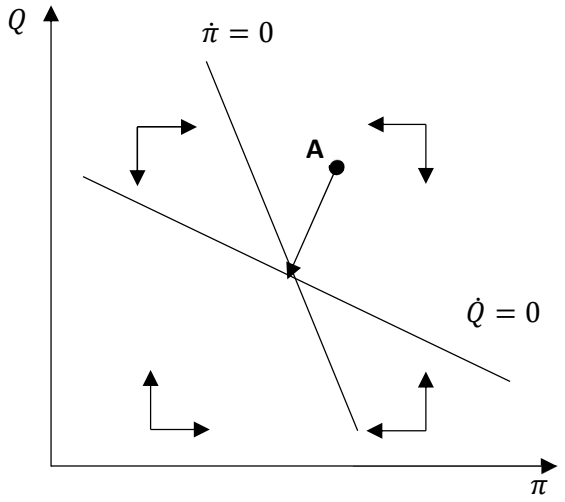


Source: Authors´ own elaboration

The difference between stable and unstable economies can be observed graphically in terms of the oscillation of the trajectories converging to equilibrium. For example, suppose an external shock increases the real exchange rate and inflation. This trigger different dynamics associated with domestic activity and the nominal wage, the current account and capital flows. Figure *3* summarizes the dynamics of convergence in a stable low-inflation economy. An increase in the real exchange rate will tend to reduce the growth rate of nominal wages via lower domestic absorption, thus also generating a positive balance in the current account and, therefore, greater pressure to reduce the

nominal depreciation of the local currency. The Central Bank will decide to increase the interest rate, and this will compensate for the fall in local real yields, attracting capital flows and also causing a reduction in the rate of nominal depreciation. Both mechanisms reduce the initial impact on inflation, so the system returns to equilibrium relatively quick, as shown by the dynamics described.

Figure 3: A joint increase in the real exchange rate and inflation. Adjustment dynamics in a stable economy with low inflation.



Source: Authors´ own elaboration

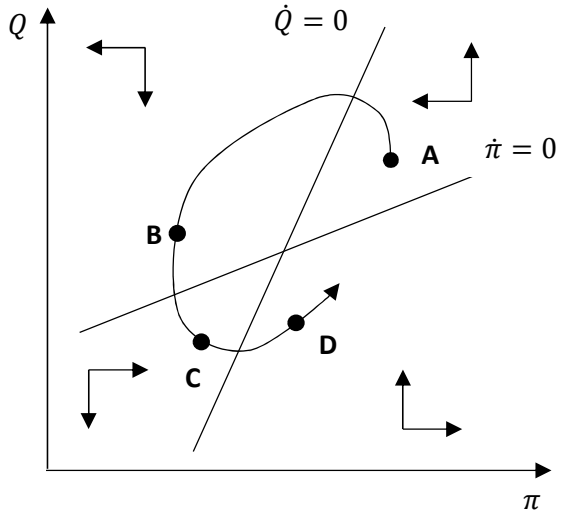
Let us take a look at the dynamics in an unstable economy with high inflation; as shown in Figure *4*, convergence can keep the economy oscillating for some time. Panel A ilustrates that a higher real exchange rate and higher inflation generate, at first, a higher real depreciation of the local currency while inflation falls, but slowly. This is because preferences for foreign currency strongly accelerate the nominal devaluation rate, which reinforces the growth of the real exchange rate. Then the contractionary effects on domestic demand and nominal wage growth begin to operate. Thus, the dynamics show a fall in the real exchange rate and a slowdown in price increases (point B). However, the domestic currency ends up appreciating too much, which pushes in the opposite direction the level of activity, nominal wages and therefore, inflation starts to rise again (point C). The economy now goes through an outflow of capital flows with inflationary rebounds, which introduces real depreciation dynamics and higher inflation, as shown in point D. Thus, the economy could oscillate for quite some time before returning to equilibrium.

Panel B shows a similar dynamic, but the oscillation could be smaller since; unlike the previous scenario (Panel A), the real exchange rate never increases in level after the initial shock. A fall in the real exchange rate and inflation is observed because the contractionary effects on domestic activity and nominal wages dominate, generating positive current account balances, and therefore, the effect of currency substitution on the pace of nominal devaluation is offset. The contractionary effect on

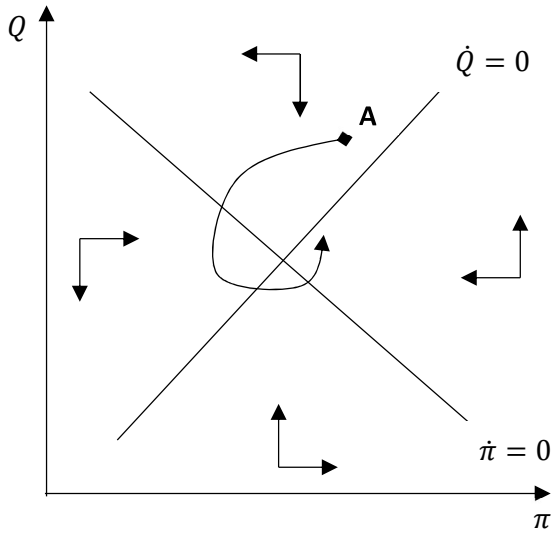
domestic activity more than offsets the inflationary effect of currency substitution allows the economy to converge more rapidly.

Figure 4: A joint increase in the real exchange rate and inflation. Adjustment dynamics in an unstable economy with high inflation.

Panel A: Weak interest rate channel



Panel B: Strong interest rate channel



Source: Authors´ own elaboration

3.1. The interest rate as a stabilizing policy

For some decades now, the monetary policy approach followed by central banks has been inflation targeting (IT, from now on). The main policy instrument is the interest rate, which reacts to price changes following some explicit rule (such as a Taylor rule). In more flexible schemes, interventions to dampen output or exchange rate volatility can also be observed, as well as less degree of central bank independence, but maintaining a firm commitment at the government level to the inflation target.

While Roger (2010) and Hammond (2012) collect a good number of cases for developed and developing countries to study the characteristics and effects of TIs, there is no case where the initial inflation rate was above 15% per year, and only very few above 10%. In other words, the cases studied are rather low-inflation regimes. Calvo (2017) and Libman and Palazzo (2020) warn about the limitations of applying an IT scheme for countries with moderate/high inflation. They note that interest rates are effective as tools for stabilization programs under "normal" conditions, i.e., when inflation is relatively low. For chronic inflation regimes, in a context of imperfect credibility, inertia and liquidity problems, the effectiveness of interest rate-based stabilization is reduced.

To capture some of these nuances of stabilization, let us modify the basic framework as follows. Specifically, let the monetary authority adjust interest rates as a function of the rate of inflation:

$$i = \mathrm{g}(\pi) \tag{8}$$

With $g_\pi > 0$. Since wages depend (negatively) on the level of economic activity, they are also negatively related to the interest rate, or:

$$w = w(\underset{-}{Q}, \underset{+}{\pi}, \underset{-}{i}) \tag{9}$$

The interest rate has two effects on the rate of devaluation. In addition to affecting domestic absorption directly (and hence the current account), it also affects the relative profitability of assets denominated in local currency. An increase in the interest rate acts as an attractor of international capital flows. In both ways, the interest rate has a negative effect on the nominal devaluation rate.

$$e = \bar{e} + f(\underset{-}{Q}, \underset{+}{\pi}, \underset{-}{i}) \tag{10}$$

The Jacobian Matrix of the new system is defined as follows:

$$\begin{bmatrix} \frac{\partial \dot{\pi}}{\partial \pi} & \frac{\partial \dot{\pi}}{\partial Q} \\ \frac{\partial \dot{Q}}{\partial \pi} & \frac{\partial \dot{Q}}{\partial Q} \end{bmatrix} = \begin{bmatrix} a\left(w_\pi + w_{i_\pi} - 1\right) + (1-a)\left(f_\pi + f_{i_\pi} - 1\right) & aw_Q + (1-a)f_Q \\ f_\pi + f_{i_\pi} - 1 & f_Q \end{bmatrix} = \begin{bmatrix} -/+ & - \\ -/+ & - \end{bmatrix} \tag{11}$$

The new term $a\left(w_\pi + w_{i_\pi} - 1\right) < 0$ incorporates the contractionary effect of the interest rate on the level of economic activity and, consequently, on the rate of wage growth. Now not only the real wage falls due to the inflationary effect itself, but also nominal wages are affected by the contractionary monetary policy, via the changes in the interest rate.

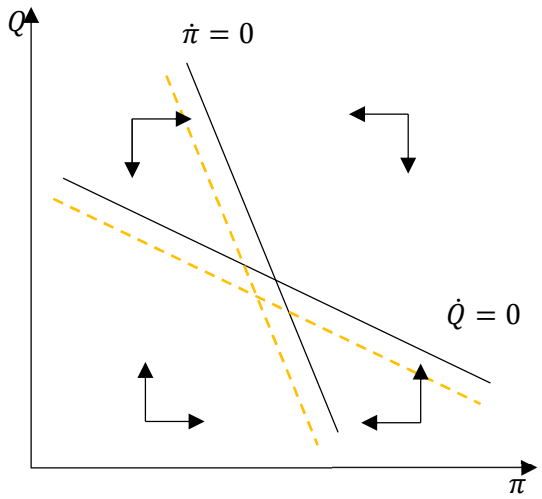
The new term $f_{i_\pi} < 0$ captures the effect of inflation on the level of the exchange rate, via interest rate movements. As already mentioned, an increase in the interest rate acts as a disinflationary policy through two channels: a "real" channel, impacting the level of economic activity and thus affecting domestic absorption and the growth rate of wages, and a "financial" channel, since a higher interest rate tends to attract capital flows and thus reduces the rate of change of the nominal exchange rate (equation (10)).

Therefore, in a stable economy with low inflation and no currency substitution ($f_\pi = 0$), the trace is negative and the determinant is positive, if the slope of $\dot{\pi} = 0$ is greater than the slope of $\dot{Q} = 0$. In an unstable economy with high inflation and currency substitution, the elements a_{11} and a_{21} of the Jacobian could both be positive or have opposite signs.

Consider an increase in inflation. It is now possible to identify two opposing forces that emerge. The first is the currency substitution effect, which drives-up the rate of devaluation; the second is the interest rate effect, which offset the fall in real yields in local currency to boost capital inflows and, therefore, reduce the nominal devaluation rate. The strength of these effects defines whether an economy is stable or unstable. Importantly, in unstable economy, the policy makers may fail to stabilize the system via interest rate hikes. An uninformed observer may actually see that the interest rate increase while at the same time the public increases its demand for foreign exchange.

Suppose that the monetary authority decides to reduce the inflation target, which it can be captured assuming that the reaction function requires a higher interest rate, given the same rate of inflation (i.e., a lower inflation target is contractionary monetary policy). Figures Figure 5 and Figure 6 show the effect of a reduction in the target that induces a shift of both curves, but in no case is it possible to find an unequivocally outcome on the rate of inflation. This happens because, on the one hand, a lower target induces an increase in the interest rate, which helps to achieve lower inflation by impacting domestic activity and wages. On the other hand, a reduction in inflation that is not accompanied by an equal reduction in the rate of nominal devaluation could result in a real appreciation. This may offset the contractionary effect of an increase in the interest rate on domestic activity. In other words, if reducing the inflation target results in a more appreciated domestic currency, the final effect could be the opposite of what was initially sought, provided that the effect of the appreciation is relatively strong. Notice this is valid but for the stable and unstable and volatile economies.

Figure 5: The effect of lowering the inflation target in a stable economy



Source: Authors´ own elaboration

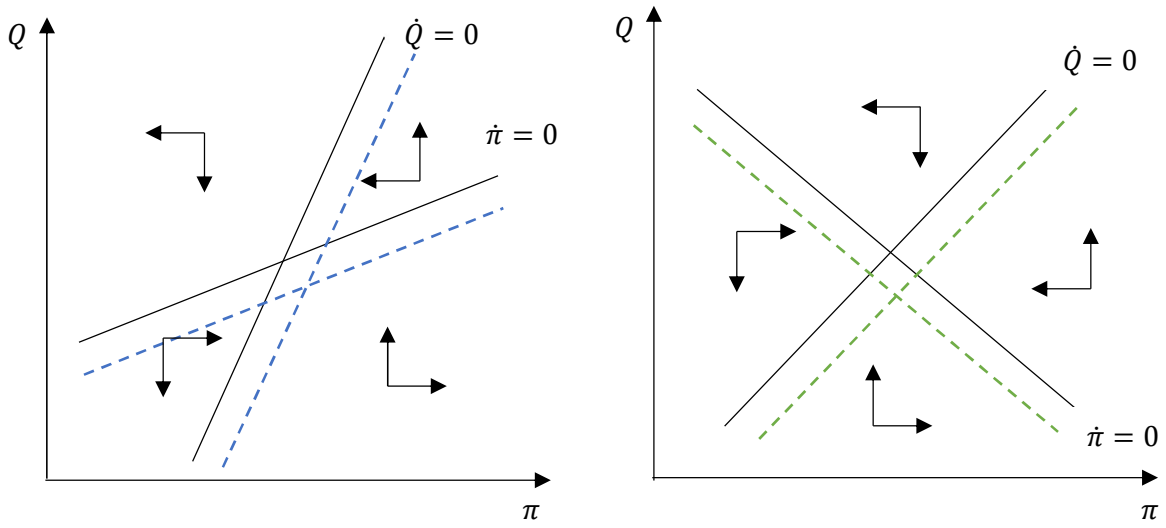
The necessary and sufficient condition for the inflation target reduction to have the desired outcome is that the adjustment through wages is strong enough to achieve larger shifts of $\dot{\pi} = 0$ with respect to $\dot{Q} = 0$ (see the Appendix for calculations). This questions the effectiveness of monetary policy as an effective tool for managing aggregate demand, in particular for the evolution of wages. It is typically assumed that the impact of the interest rate on the level of activity (and wages) depends on its effects on saving and investment. An increase in the interest rate would induce a reduction in present consumption in favor of reallocating consumption in other future periods. At the same time, firms will reduce their investment plans, as the cost of financing increases. However, these mechanisms have been questioned even in rational agent models (Kaplan et al., 2014; Yogo, 2004), mainly because of the difficulties that agents might have in accessing liquid financial assets that would allow them to make the intertemporal reallocation of spending.

In terms of post-Keynesian theory, our result is like that found in, for example, Setterfield (2006). If the interest rate has an impact on the evolution of wages, the inflation target would act as a coordinating mechanism for disinflation, moderating the distributional conflict (Setterfield, 2006, p. 665). However, the power of coordination tends to be greater in relatively stable economies and/or those facing relatively small shocks. When economies exhibit characteristics of instability and/or receive shocks that move them too far away from initial conditions, coordination among agents may be significantly diminished, with the result that there is a possible role for the actions of policy makers (Leijonhufvud, 1973). In other words, lowering high inflation requires more management of the inflation target than in low inflation, and therefore, it could be a more effective tool in "normal" contexts (Calvo, 2017; Libman & Palazzo, 2020).

On the other hand, the value that Q^* will take after the shock in an economy with currency substitution and high inflation will always be below its initial value, while it is not possible to determine it in a low inflation economy. Moreover, nominal and real swings in an unstable economy could trigger acceleration/depreciation cycles, which would prolong the adjustment period and thus delay the emergence of the expected results. This may be a factor to weigh on the choice of disinflationary policy strategies since stabilization programs to be successful must show results quickly and in a sustained manner, otherwise they could face serious credibility problems.

Figure 6: Effect of lowering inflation target in an unstable economy with currency substitution

Panel A: Weak interest rate channel Panel B: Strong interest rate channel



Source: Authors´ own elaboration

To sum up, monetary policy based on interest rate management and inflation targets is effective in certain contexts. In both low and high inflation economies, monetary policy will be effective to the extent that the contractionary effect on domestic activity is sufficiently high. However, this does not allow us to identify how the real exchange rate will evolve in low inflation economies. On the other hand, in high inflation, the real exchange rate will always end up at a lower level than the initial one if the interest rate channel is sufficiently strong, although appreciation/acceleration cycles could occur that prolong the realization of the expected results and, therefore, call into question the continuity of the chosen strategy.

3.2. Introducing fiscal policy

In this section we use public spending (G) to instrumentalize the conduct of policy. In this case, we will assume that the increase or reduction of public spending arises from a situation of fiscal balance, i.e., an increase in spending, *ceteris paribus*, generates a fiscal deficit. The key is to distinguish between fiscal deficits financed via foreign borrowing vs. fiscal deficits financed by money printing. Traditionally, the literature has argued that fiscal policy is effective (albeit bond financed could be potentially destabilizing) in the context of closed economies IS-LM type of model (Blinder and Solow, 1973). In an inflationary environment, the literature discusses the connection between fiscal policy and stabilization using a variant of Cagan (1956) approach, were a “Laffer curve” for the demand for money can potentially create multiple and/or unstable equilibria (for example, Guerrero and Kawamura, 1994).

Our approach is much simpler, and it is based on simpler observation. Countries where real dollarization is widespread face strong pressures on the foreign exchange market that very often do not seem to relate to relative return differentials. Pursuing fiscal expansion without the necessary

foreign exchange to pay for the import bills that is often associated (specially in semi-industrialized economies that rely heavily on imported intermediated and final goods) will lead to pressures on the foreign exchange market, which can undo the positive effects of public spending on output and employment, with the undesirable effects on inflation.

The modified system is defined as follows:

$$\dot{\pi} = a(w(Q, i, G) - \pi) + (1 - a)(\bar{e} + f(Q, \pi, i, G) - \pi) \tag{12}$$

$$\dot{Q} = \bar{e} + f(Q, \pi, i, G) - \pi \tag{13}$$

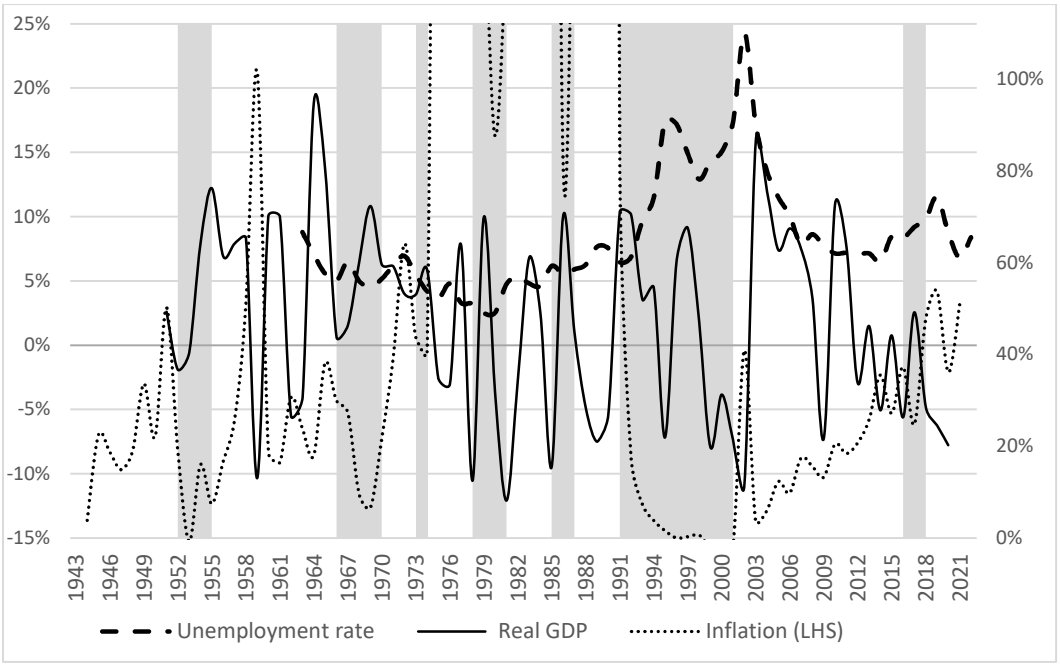
The Jacobian remains as in (11) so the stability conditions remain unchanged. Consider an expansionary fiscal policy financed using money printing. Higher spending increases the rate of change of nominal devaluation which is compatible not only with the classical domestic-absorption approach, but also orthodox views of fiscal deficit monetization (or monetary approach to balance of payments). In contrast, consider now an expansionary fiscal policy that relies on foreign borrowing: now the current account worsens, but the capital account improves, so the effects on the rate of depreciation is ambiguous.

4. Argentina feeble stabilization attempts

During the last eight decades Argentina lived with almost all kinds of inflation regimes, from price stability to chronic and high inflation, including two hyperinflation episodes. Several stabilization programs were attempted, with mixed success in the short and medium term, as depicted in Figure *7*. During the late 1940s, 1950s and 1960 inflation remained between 20-30% on average, peaking above 100% during 1958, and often below 10% after contractionary policies associated with stabilization programs (which often produced a contraction of output and employment, such as in 1952, 1966 and 2016). However, if stabilization plans are based on exchange rate anchor, the decline in inflation coincides with output expansion and a decline in the unemployment rate, e.g., in 1973, 1978 and 1985.[4]

Figure 7: Real GDP annual growth rate, unemployment rate and annual inflation rate (end of the year) in 1943-2022 for Argentina.

[4] The most striking exemption of this phenomenon took place in 1991-1998 when not only output grew but also the unemployment rate.



Source: Author´s own elaboration based on INDEC and Ferreres (2010). Notes: The shaded areas delimit the duration of the stabilization plans. Details: 1952-1955: "Plan de Emergencia Económica de 1952" carried on by Alfredo Gómez Morales during Perón's second presidency; 1966-1970: "Plan Krieger Vasena" carried on by Adalbert Krieger Vasena during Ongania's dictatorship; 1973-1974: "Plan Gelbard" carried on by José Ber Gelbard during Perón's third presidency; 1978-1981: "La Tablita" carried on by José Alfredo Martínez de Hoz during Videla's dictatorship; 1985-1987: "Plan Austral" carried on by Juan Vital Sourrouille during Alfonsin's presidency; 1991-2001: "Convertibilidad" initiated by Domingo Cavallo during Menem's presidency; sep.2016-2018 "Régimen de metas de inflación" carried on by Federico Sturzenegger during Macri's presidency. Data are display in the Appendix B.

As the population, firms, banks and the public sector get used to price instability, the degree of real and financial dollarization increased. But it was not until the last part of the 1970s that the use of the dollar as unit of account and means of payment of big-ticket item and as a mean of preserving purchasing power become a significant phenomenon. In the aftermath of "El Rodrigazo"[5], assets denominated in local currency lost much of their value and, together with the financial liberalization carried out by the dictatorship at the end of the 1970s, domestic agents began to see the dollar as a refuge from macroeconomic volatility (Burdisso and Corso, 2011; Kiguel, 2015).

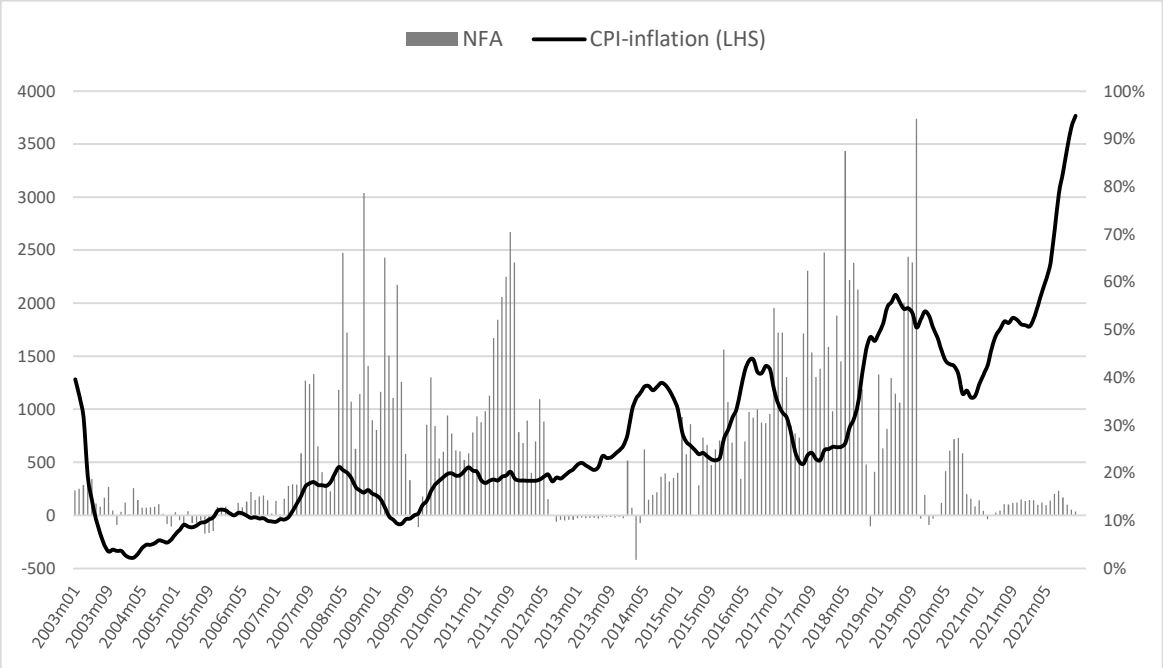
For the last five decades, Argentineans have been living in a crisis prone environment. Macroeconomic policies were subject to intense pressures emanating from the public portfolio choices. During the 1990s financial dollarization become widespread, as the Convertibility Plan of March of 1991 designed both the peso and the dollar as legal tender, setting the exchange rate to one and backing the monetary base with foreign exchange reserves with a ratio of almost one (a small fraction could be backed with public bonds).

[5] This included a brutal devaluation of the national currency and significant increases in public services and energy prices.

Episodes of exchange rate instability and currency crashes were common. During a typically crash, interest rates soar, while the public rushes to get rid of domestic currency denominated assets. Interestingly, also during "normal" times there seems to be a steady demand for foreign exchange (typically US dollar), which does not seem to be associated with yield differential. Figure 8 depicts alternative measures for dollarization in Argentina since 2003 which exemplify this behavior. The exemptions during 2011-2015 and since September 2019 are due to the restrictive measures implemented by the government to cope with the steady increase in the demand of dollars. There are at least two reasons associated to this behavior, related to the different forms of dollarization. On the one hand, purchases of real estate (and to a lesser degree, vehicles) are priced and settled to a large extent in dollars. On the other hand, large depreciations are typically contractionary in Argentina, so households with peso incomes can hedge by purchasing dollars.

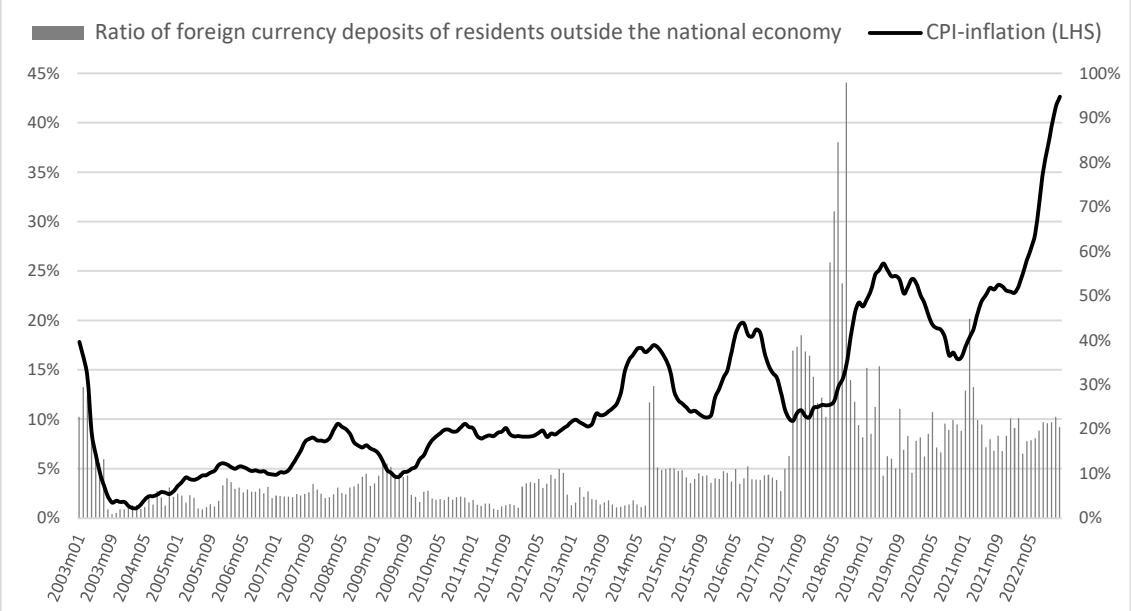
Figure 8: Alternative measures of demand of foreign currency[6] and annual inflation rate in 2003-2022 for Argentina.

Panel A: Net foreign assets

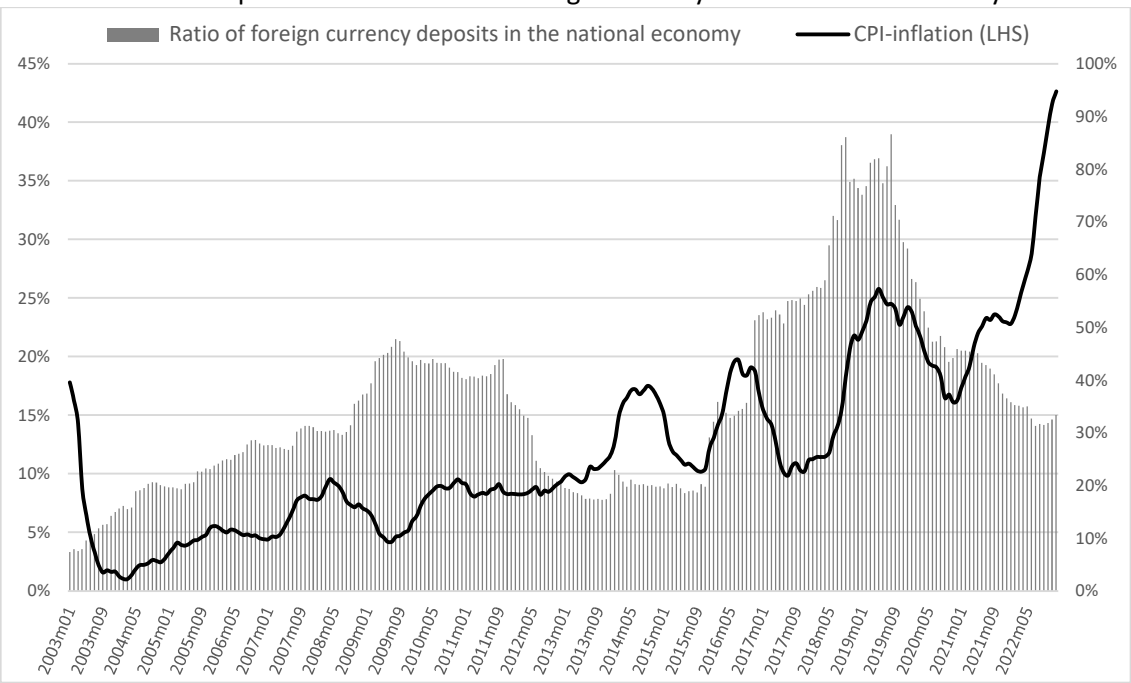


Panel B: Ratio of deposits denominated in foreign currency in the rest of the world

[6] We acknowledge that these estimates of foreign currency demand have their shortcomings because a certain part of the population trades and keeps foreign currency outside the financial system. Given the nature of these transactions, there are no officially well-estimated data on that part of the phenomenon. However, there are no reasons to think that the behavior outside the financial system will vary widely from what is observed in this data.



Panel C: Ratio of deposits denominated in foreign currency in the national economy



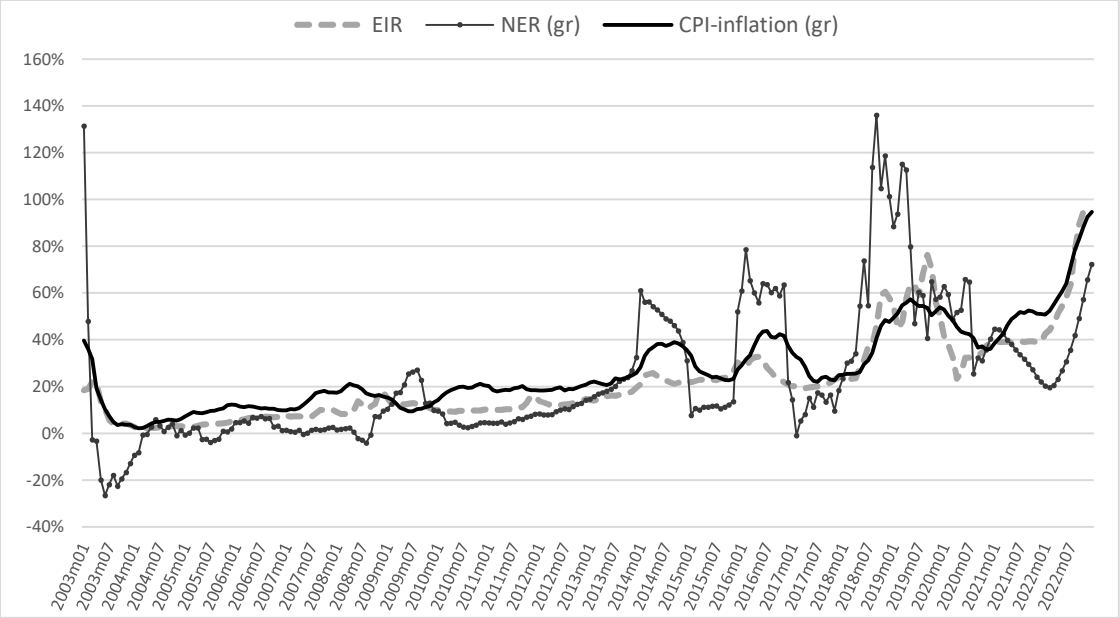
Source: Author´s own elaboration based on Central Bank of Argentina and INDEC.

On the other hand, increases in interest rates, especially if they failed to reduce inflation (a task that monetary policy alone may not accomplish), do very little to reduce the demand for dollars if they are motivated by currency substitution or if they were triggered by precatory reasons. Moreover, interest rate hikes can easily convey to the public the wrong message: instead of increasing the return of peso denominated assets, they could easily create panic among investors and the public, as they can signal that a financial crisis is coming. This could be perfectly justified, and indeed a crisis may take place if the quality of banks portfolio deteriorates, but it could also trigger a pure self-fulfilling panic where

the public prefers to hold a dollarized portfolio, which in the event of a currency crash will largely trump any other investment.

Figure 9 and Figure 10 help to understand these dynamics. In the first one, we can see a highly correlated behavior between exchange rate variation and inflation, particularly since 2014. Interest rates reacted to changes in inflation and depreciation rate, albeit more strongly in 2019. Even though Figure 9 seems to show a decline in the depreciation rate, restrictive quantitative measures and crawling-peg system were impose by the government in September 2019 to cope with the volatility in the foreign exchange market. However, alternative measures of dollarization (such as NFA or deposits outside the domestic economy) showed an increase of dollar hoarding (Figure 8).

Figure 9: Growth rate of nominal exchange rate (NER), effective annual interest rate (EIR) and inflation rate (CPI-inflation) in 2003-2022 for Argentina.

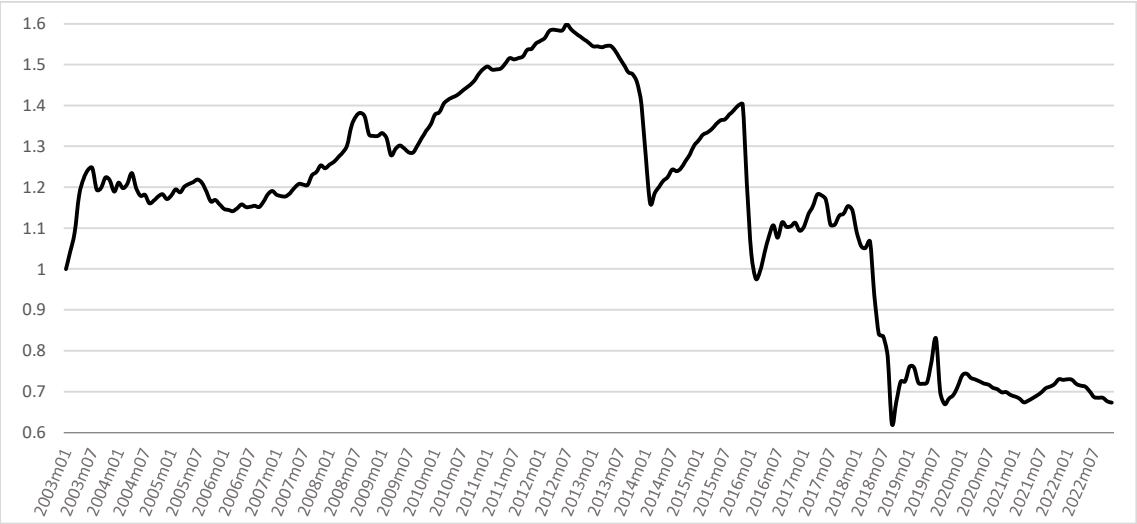


Source: Author´s own elaboration based on Central Bank of Argentina and INDEC.

Figure 10 shows the relative accumulated yield of holding a deposit in pesos vs dollar hoarding from the starting point in 2003m01, i.e., compares the yield in deposits in pesos vs dollar hoarding if the investment were taken place in January, 2003. Even though during the period 2003-2018 the relative accumulated yield in pesos were positive compared to the counterpart, domestic agents still increased its demand of foreign currency, as depicted in Figure 8. Following the nominal depreciations in 2018 and 2019, the yield in dollar hoarding hikes drastically, which reinforces the currency preferences, even with positive real interest rates in pesos. The government hiked interest rate to keep a positive real yield but demand for foreign currency was so high that they decided to established a quota to dollar purchases. Indeed, alternative exchange rates[7] kept an increasing rate until 2021.

[7] For example, the black-market exchange rate (called, *"Dólar blue")* or the implicit exchange rate from transactions between bonds denominated in different currencies (*"Dólar CCL" or "Dólar MEP"*).

Figure 10: Evolution of relative accumulated yield in pesos[8] vs. dollar hoarding



Source: Author´s own elaboration based on Central Bank of Argentina. Note: The indicator is normalized by the base-period (2003m1). A value greater than 1 means relatively atractive returns of pesos, meanwhile a smaller one favors dollar hoarding.

5. Exchange market pressures and money demand

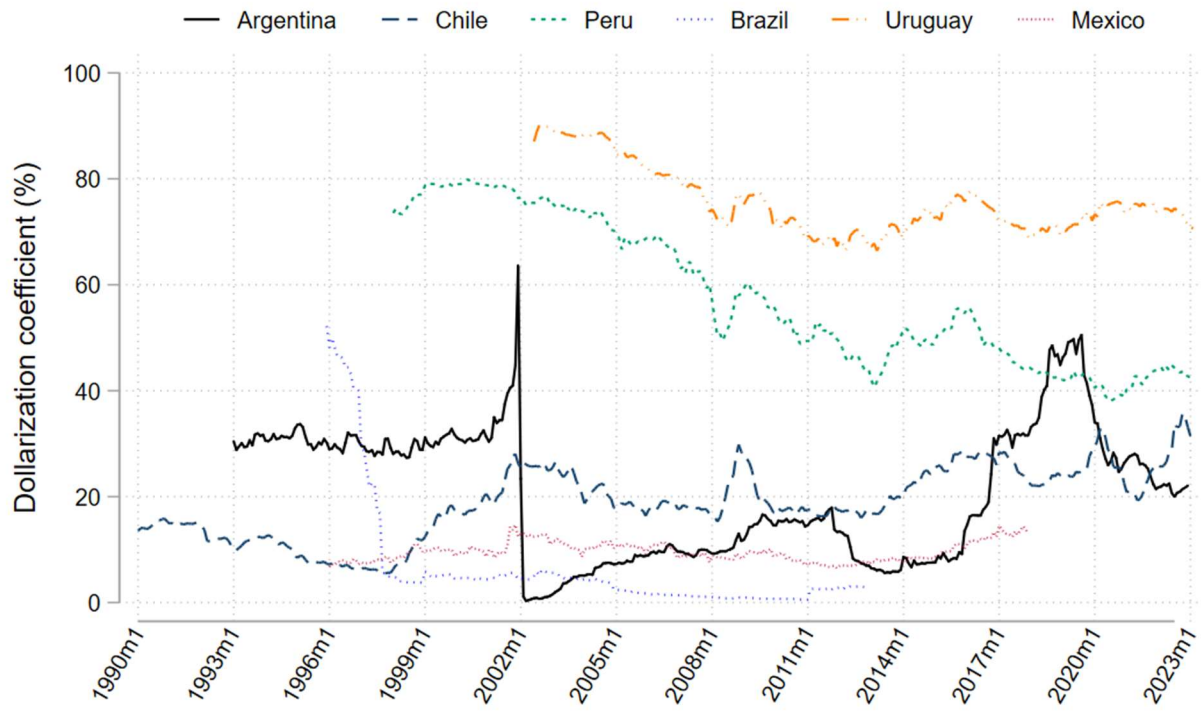
As a final exercise, this section explores the behavior of domestic agents when facing pressures in the exchange rate market. As already pointed out, it is expected that money demand be more volatile when agents show currency preferences against the national money. To provide hints on this point, we analyzed foreign currency demand in six Latin American countries (Argentina, Chile, Brazil, Peru, Mexico and Uruguay). Peru, Argentina and Uruguay were considered to be countries with strong preferences for foreign currency (Argentina still is), while Brazil, Chile and Mexico did not show such behavior even though the similar inflationary history in these economies. Except for Argentina, these countries have controlled high inflation in the late 1990s or early 2000s. In this sense, Peru and Uruguay have decreased their demand for foreign exchange, although they are still somewhat more dollarized (financially) than the rest.

Figure 11 depicts the different dollarization coefficients for each country (details on the data used are found in Appendix C). At least during the first decade of the 2000s most countries show a clear decline in dollarization, except Argentina and Chile; then trajectories diverged: some stabilized (Uruguay and maybe Chile) while others increased (México and Argentina). An important note in this chart is that the sharp decline in Argentina's ratio does not correspond to a sudden change in portfolio choice by

[8] 30 to 59-day time deposits interest rate.

agents, but rather to a mandatory pesification of USD-denominated deposits in the wake of the convertibility crisis.

Figure 11: Dollarization coefficient as a % of total deposits.



Source: Author´s own elaboration based on national central banks data.

To account for exchange rate market pressures, we construct the index found in Kaminsky, Lizondo and Reinhart (1998) and Kaminsky and Reinhart (1999). Although the central bank intervenes in the foreign exchange market, it cannot have complete control over it. However, a central bank tries to influence it indirectly by two different ways: buying/selling international reserves or managing interest rates. Indeed, Ros (2015) and Barbosa-Filho (2015) observed some bias in the monetary policy of Latin America economies, especially since the implementation of IT regimes (see Libman (2019b) for an econometric exercise to test this hypothesis). The index is built as follows.

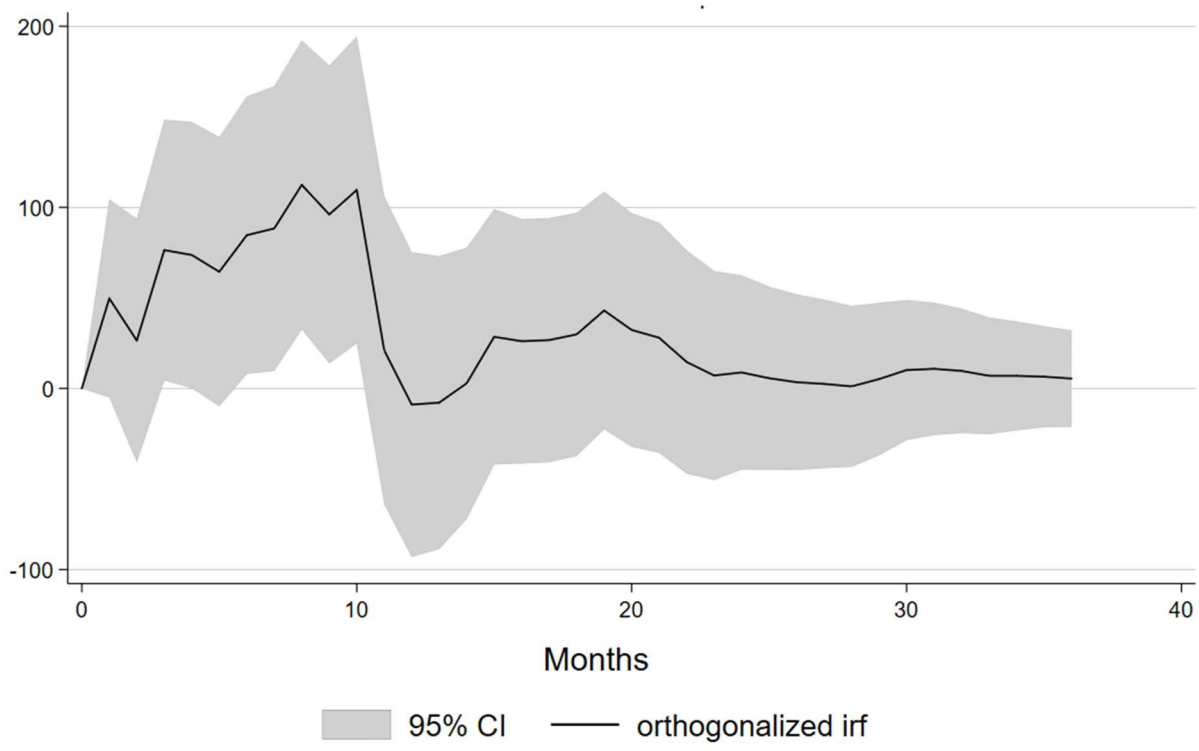
$$EMPI_{it} = \frac{\Delta E_{it}}{E_{it}} - \frac{\sigma_E}{\sigma_r}\frac{\Delta r_{it}}{r_{it}} + \frac{\sigma_E}{\sigma_{Int}}\Delta Int_{it}$$

Where EMPI in the exchange market pressure index, E is the nominal exchange rate, r denotes the international reserves, Int is the representative interest rate, Δ denotes change, and σ is the standard deviations of the rate of change of the respective variable. A positive EMPI implies net pressure towards depreciation, while a negative EMPI indicates net pressure for appreciation. Figure D.1 in the Appendix D show the close relationship between this indicator and the nominal exchange rate.

After performing VAR regressions using monthly indicators, we found three different patterns in our sample (see Figure in the Appendix D). First, we found that in Brazil, Mexico and Uruguay, demand-switching behavior do not correlate with exchange rate market pressures. This means that when facing pressures towards depreciation of the domestic currency, agents do not show a substitutive behavior flying from domestic to foreign currency at a great extent. On the other hand, Chile and Peru show a more persistent substitutive behavior, not only regarding decreasing the national money demand, but also increasing the foreign currency deposit ratio.[9]

The last case is Argentina, which tend to show a decline in domestic money demand, and an overshooting effect on dollar-denominated deposits. The latter, after a shock in EMPI, US deposits decrease, and then it moves in the opposite direction. We suspect that a great part of foreign currency demand is not in bank deposits, but "under the mattress", so we need to test with another measure that tries to capture "hidden" dollar hoarding, such as Net Foreign Assets. Figure 12 show precisely that when facing EMPI shock, NFA increase within the same year with some lag.

Figure 12: Impulse response function of one s.d. shock of EMPI on NFA in Argentina

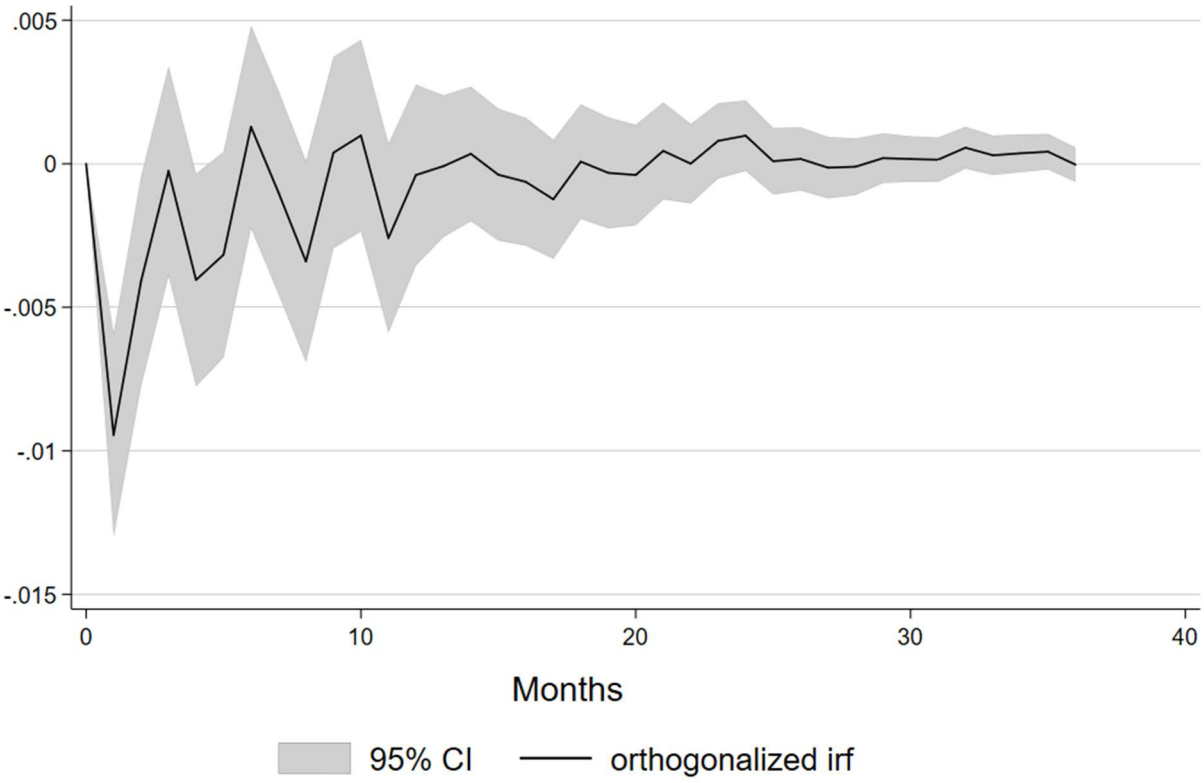


Source: Author´s own elaboration

[9] The cases of Chile and Uruguay contradict our priors about the expected behaviour of currency substitution. We suspect that the period covered by the data availability influence our results. Indeed, for Chile since 2000 onwards the substitutive behavior practically disappeared. Data availability starts in 2002 for Uruguay, some years after its inflation stabilization process.

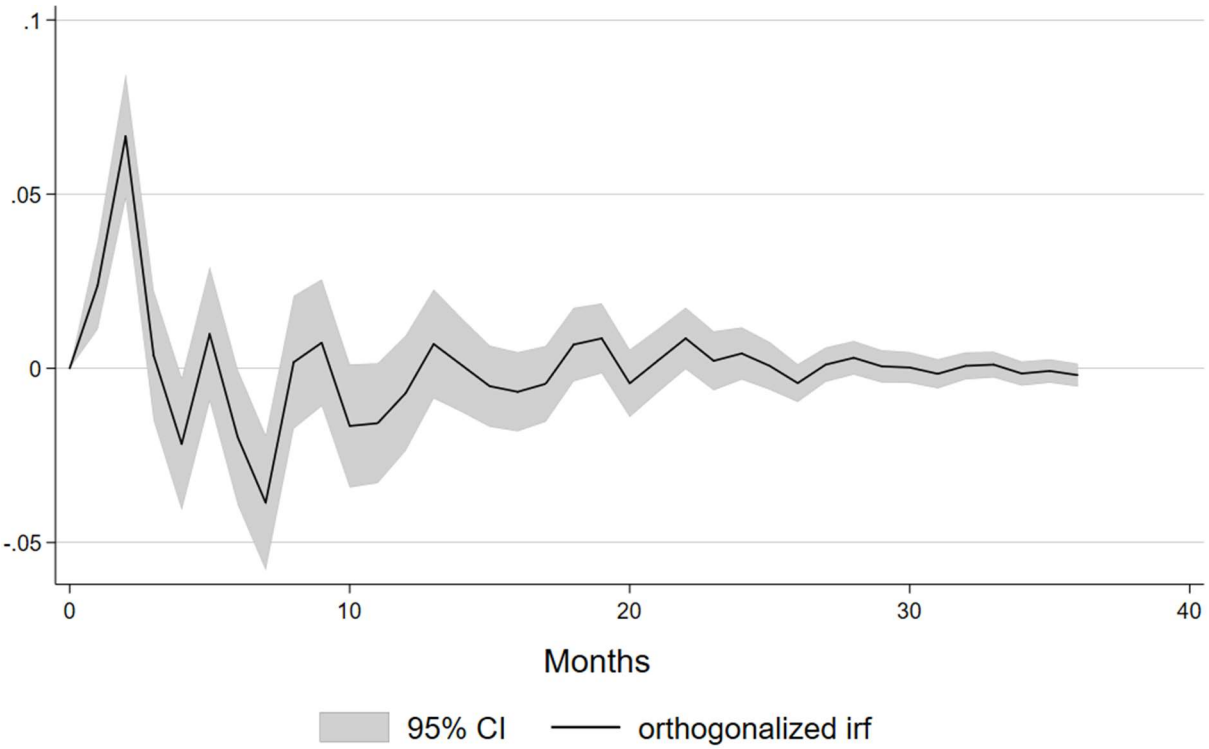
Finally, since we did not find conclusive dynamics regarding legal deposits and EMPI, we perform the VAR regressions but using interest rate instead of EMPI. In the model of section 3.1, we conclude that in some cases the interest rate as a stabilization policy may be very limited when facing high inflation coupled with currency preferences. From VAR regressions, we found that a shock that increases interest rates correlates with a decrease in domestic money demand (Figure *13*) and an increase dollar-denominated deposits (Figure *14*).

Figure 13: Impulse response function of one s.d. shock of interest rate on M1/P in Argentina



Source: Author´s own elaboration

Figure 14: Impulse response function of one s.d. shock of interest rate on dollar-denominated deposits in Argentina



Source: Author´s own elaboration

While it is not possible to obtain an official estimate of "hidden" dollar hoarding, these exercises contribute to the existing literature on the shortcomings of interest rate policy when faced with high inflation and currency preferences. In fact, we found that currency substitution is more muted in other Latin American countries which have been less nominally volatile over the last two decades but share a common history of high inflation with Argentina. For this country, there is room for macroeconomic policy to coordinate disinflation considering currency preferences. A stabilization plan is needed that not only relies on interest rates but also on other nominal anchors, along with specific control of public deficit monetization.

6. Final remarks

This paper claims that a specific form of real dollarization (i.e., currency substitution) can account for some of the observed counter intuitive effects of stabilization policies in high-inflation countries. There are several reasons why standard stabilization policies may fail to work. We have illustrated the specific role of portfolio choices in an open economy where the public can react to changes in the rate of inflation by exchanging domestic for foreign currency, hence destabilizing the foreign exchange market.

In this set-up, monetary policy become less effective, and it cannot be used as a stabilization tool, unless some other policies are adopted to tame currency substitution. Fiscal policy has direct effects on aggregate demand, and the literature has often argued that it will trump over monetary policy in different context. While some authors claim that fiscal policy is king, others suggest that this is only the case under special circumstances (i.e., a zero lower bound). In this paper we have not address that issue, but instead we have touched on the role of money vs. bond financed fiscal policies, by noticing that currency substitution can easily turn a reasonable policy into a totally inappropriate one.

We have reviewed Argentina attempts to stabilized inflation and we compared money-demand with other countries of the region. Thus, we illustrated some of shortcomings of traditional fiscal and monetary policy using the example of Argentina, with a clear take home in mind. Reducing the exposure to inflation and real dollarization requires a complex combination of policies, and isolated moves or traditional policies mixes may backfire badly.

7. Appendix A

The Jacobean Matrix of the modified system, provided that the effect of interest rates on the rate of wage growth and depreciation rate are strong enough, is given by:

$$\begin{bmatrix} \frac{\partial \dot{\pi}}{\partial \pi} & \frac{\partial \dot{\pi}}{\partial Q} \\ \frac{\partial \dot{Q}}{\partial \pi} & \frac{\partial \dot{Q}}{\partial Q} \end{bmatrix} = \begin{bmatrix} a\left(w_\pi + w_{i_\pi} - 1\right) + (1-a)\left(f_\pi + f_{i_\pi} - 1\right) & aw_Q + (1-a)f_Q \\ f_\pi + f_{i_\pi} - 1 & f_Q \end{bmatrix} = \begin{bmatrix} - & - \\ - & - \end{bmatrix}$$

A "stable" economy requires $\det[J] > 0$ so the slope of $\dot{\pi} = 0$ should be larger than the slope of $\dot{Q} = 0$. If the slope of $\dot{\pi} = 0$ is negative and the slope of $\dot{Q} = 0$ is positive the system is stable. In other words, if:

$$\begin{bmatrix} \frac{\partial \dot{\pi}}{\partial \pi} & \frac{\partial \dot{\pi}}{\partial Q} \\ \frac{\partial \dot{Q}}{\partial \pi} & \frac{\partial \dot{Q}}{\partial Q} \end{bmatrix} = \begin{bmatrix} a\left(w_\pi + w_{i_\pi} - 1\right) + (1-a)\left(f_\pi + f_{i_\pi} - 1\right) & aw_Q + (1-a)f_Q \\ f_\pi + f_{i_\pi} - 1 & f_Q \end{bmatrix} = \begin{bmatrix} - & - \\ + & - \end{bmatrix}$$

Thus, currency substitution has a potential destabilizing effect, provided that $f_\pi + f_{i_\pi} - 1 > 0$.

Another unstable case exists if currency substitution is very strong and the interest rate has a small impact on activity and absorption. In other words, if the slope of $\dot{Q} = 0$ is larger than the slope of $\dot{\pi} = 0$ and $a\left(w_\pi + w_{i_\pi} - 1\right) + (1-a)\left(f_\pi + f_{i_\pi} - 1\right) - f_Q > 0$:

$$\begin{bmatrix} \frac{\partial \dot{\pi}}{\partial \pi} & \frac{\partial \dot{\pi}}{\partial Q} \\ \frac{\partial \dot{Q}}{\partial \pi} & \frac{\partial \dot{Q}}{\partial Q} \end{bmatrix} = \begin{bmatrix} a\left(w_\pi + w_{i_\pi} - 1\right) + (1-a)\left(f_\pi + f_{i_\pi} - 1\right) & aw_Q + (1-a)f_Q \\ f_\pi + f_{i_\pi} - 1 & f_Q \end{bmatrix} = \begin{bmatrix} + & - \\ + & - \end{bmatrix}$$

Shock to the inflation target

Stable economy (low inflation and no currency substitution). The effect on the $\dot{\pi} = 0$ locus is:

$$\frac{\mathrm{d}\pi^*}{\mathrm{d}\pi^T} = \frac{\begin{vmatrix} aw_{i_{\pi^T}} + (1-a)f_{i_{\pi^T}} & aw_Q + (1-a)f_Q \\ f_{i_{\pi^T}} & f_Q \end{vmatrix}}{\begin{vmatrix} a\left(w_\pi + w_{i_\pi} - 1\right) + (1-a)\left(f_{i_\pi} - 1\right) & aw_Q + (1-a)f_Q \\ f_{i_\pi} - 1 & f_Q \end{vmatrix}} = \frac{(-)(-) - (-)(-)}{(+)} \gtreqless 0$$

The effect on the $\dot{Q} = 0$ locus is:

$$\frac{\mathrm{d}Q^*}{\mathrm{d}\pi^T} = \frac{\begin{vmatrix} a\left(w_\pi + w_{i_\pi} - 1\right) + (1-a)\left(f_{i_\pi} - 1\right) & aw_{i_{\pi^T}} + (1-a)f_{i_{\pi^T}} \\ f_{i_\pi} - 1 & f_{i_{\pi^T}} \end{vmatrix}}{\begin{vmatrix} a\left(w_\pi + w_{i_\pi} - 1\right) + (1-a)\left(f_{i_\pi} - 1\right) & aw_Q + (1-a)f_Q \\ f_{i_\pi} - 1 & f_Q \end{vmatrix}} = \frac{(-)(-) - (-)(-)}{(+)} \gtreqless 0$$

Unstable economy (high inflation, currency substitution and weak interest rate channels). The effect on the $\dot{\pi} = 0$ locus is:

$$\frac{\mathrm{d}\pi^*}{\mathrm{d}\pi^T} = \frac{\begin{vmatrix} aw_{i_{\pi^T}} + (1-a)f_{i_{\pi^T}} & aw_Q + (1-a)f_Q \\ f_{i_{\pi^T}} & f_Q \end{vmatrix}}{\begin{vmatrix} a\left(w_\pi + w_{i_\pi} - 1\right) + (1-a)\left(f_\pi + f_{i_\pi} - 1\right) & aw_Q + (1-a)f_Q \\ f_\pi + f_{i_\pi} - 1 & f_Q \end{vmatrix}} = \frac{(-)(-) - (-)(-)}{(+)} \gtreqless 0$$

The effect on the $\dot{Q} = 0$ locus is:

$$\frac{\mathrm{d}Q^*}{\mathrm{d}\pi^T} = \frac{\begin{vmatrix} a\left(w_\pi + w_{i_\pi} - 1\right) + (1-a)\left(f_\pi + f_{i_\pi} - 1\right) & aw_{i_{\pi^T}} + (1-a)f_{i_{\pi^T}} \\ f_\pi + f_{i_\pi} - 1 & f_{i_{\pi^T}} \end{vmatrix}}{\begin{vmatrix} a\left(w_\pi + w_{i_\pi} - 1\right) + (1-a)\left(f_\pi + f_{i_\pi} - 1\right) & aw_Q + (1-a)f_Q \\ f_\pi + f_{i_\pi} - 1 & f_Q \end{vmatrix}} = \frac{(+)(-) - (+)(-)}{(+)}$$

$$\gtreqless 0$$

Unstable economy (high inflation, currency substitution and strong interest rate channels). The effect on the $\dot{\pi} = 0$ locus is:

$$\frac{\Delta\pi^*}{\Delta\pi^T} = \frac{\begin{vmatrix} aw_{i_{\pi^T}} + (1-a)f_{i_{\pi^T}} & aw_Q + (1-a)f_Q \\ f_{i_{\pi^T}} & f_Q \end{vmatrix}}{\begin{vmatrix} a(w_\pi + w_{i_\pi} - 1) + (1-a)(f_\pi + f_{i_\pi} - 1) & aw_Q + (1-a)f_Q \\ f_\pi + f_{i_\pi} - 1 & f_Q \end{vmatrix}} = \frac{(-)(-) - (-)(-)}{(+)} \gtrless 0$$

The effect on the $\dot{Q} = 0$ locus is:

$$\frac{\Delta Q^*}{\Delta\pi^T} = \frac{\begin{vmatrix} a(w_\pi + w_{i_\pi} - 1) + (1-a)(f_\pi + f_{i_\pi} - 1) & aw_{i_{\pi^T}} + (1-a)f_{i_{\pi^T}} \\ f_\pi + f_{i_\pi} - 1 & f_{i_{\pi^T}} \end{vmatrix}}{\begin{vmatrix} a(w_\pi + w_{i_\pi} - 1) + (1-a)(f_\pi + f_{i_\pi} - 1) & aw_Q + (1-a)f_Q \\ f_\pi + f_{i_\pi} - 1 & f_Q \end{vmatrix}} = \frac{(-)(-) - (+)(-)}{(+)}$$

$$> 0$$

8. Appendix B

Table B.1: Unemployment rate, real GDP annual growth rate and annual inflation (end of the year) for each stabilization plan.

Years	Stabilization plan	Unemployment rate	Real GDP - Annual growth rate	Inflation - End of the year
1952	"Plan de Emergencia Económica de 1952"		-1.9%	19%
1953			-0.6%	-1%
1954			7.9%	16%
1955			12.2%	7%
1966	"Plan Krieger Vasena"	5.0%	0.7%	30%
1967		6.5%	1.5%	27%
1968		5.0%	6.5%	10%
1969		4.6%	10.8%	7%
1970		5.2%	6.3%	22%
1973	"Plan Gelbard"	5.5%	4.0%	44%
1974		4.2%	5.9%	40%
1978	"La Tablita"	3.2%	-10.5%	170%
1979		2.5%	10.0%	140%
1980		2.5%	-3.6%	88%
1981		4.7%	-12.1%	131%
1985	"Plan Austral"	6.2%	-9.4%	385%
1986		5.6%	10.1%	82%
1987		5.9%	1.1%	175%
1991	"Plan de la Convertibilidad"	6.5%	10.4%	84%
1992		6.9%	10.2%	18%
1993		9.7%	3.5%	7%
1994		11.5%	4.5%	4%
1995		17.5%	-7.2%	2%
1996		17.2%	6.5%	0%

1997		14.9%	9.1%	0%
1998		12.9%	1.8%	1%
1999		14.3%	-7.9%	-2%
2000		15.1%	-3.8%	-1%
2001		17.4%	-7.4%	-2%
2016	"Régimen Metas de inflación"	8.4%	-5.6%	37%
2017		9.2%	2.6%	25%
2018		9.8%	-4.8%	48%

Source: INDEC and Ferreres (2010)

9. Appendix C

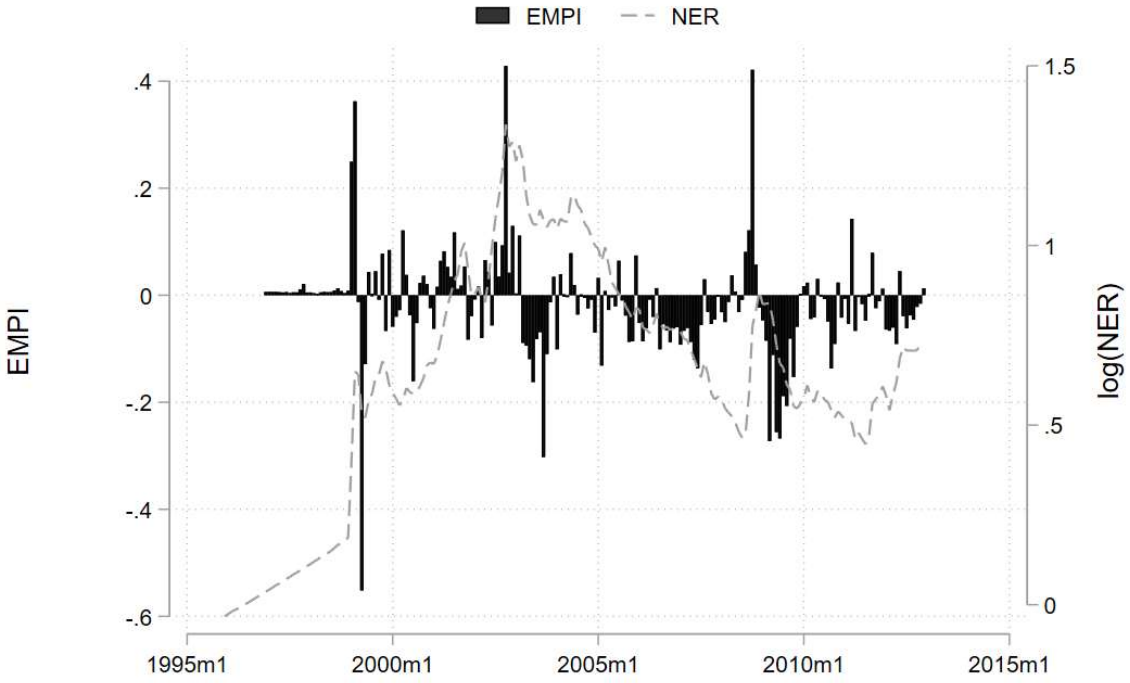
Table C.1: Indicator, period and data sources by country

Country	Period	Indicator of Ratio USD	Sources
Argentina	1993m1-2022m12	Depósitos a la vista and cajas de ahorro	Banco Central de la República Argentina, https://www.bcra.gob.ar/
Chile	1990m1-2023m2	Depósitos en moneda extranjera	Banco Central de Chile, https://www.bcentral.cl/
Brazil	1996m1-2012m12	Depósitos registrados em moeda estrangeira	Banco Central do Brasil, https://www.bcb.gov.br/
Uruguay	2002m6-2022m10	Depósitos en moneda extranjera de residentes	Banco Central del Uruguay, https://www.bcu.gub.uy/
Peru	1998m1-2023m2	Índice de la dolarización de la liquidez	Banco Central de Reserva del Perú, https://www.bcrp.gob.pe/
Mexico	1996m1-2017m12	M1 en moneda extranjera	Banco de México, https://www.banxico.org.mx/

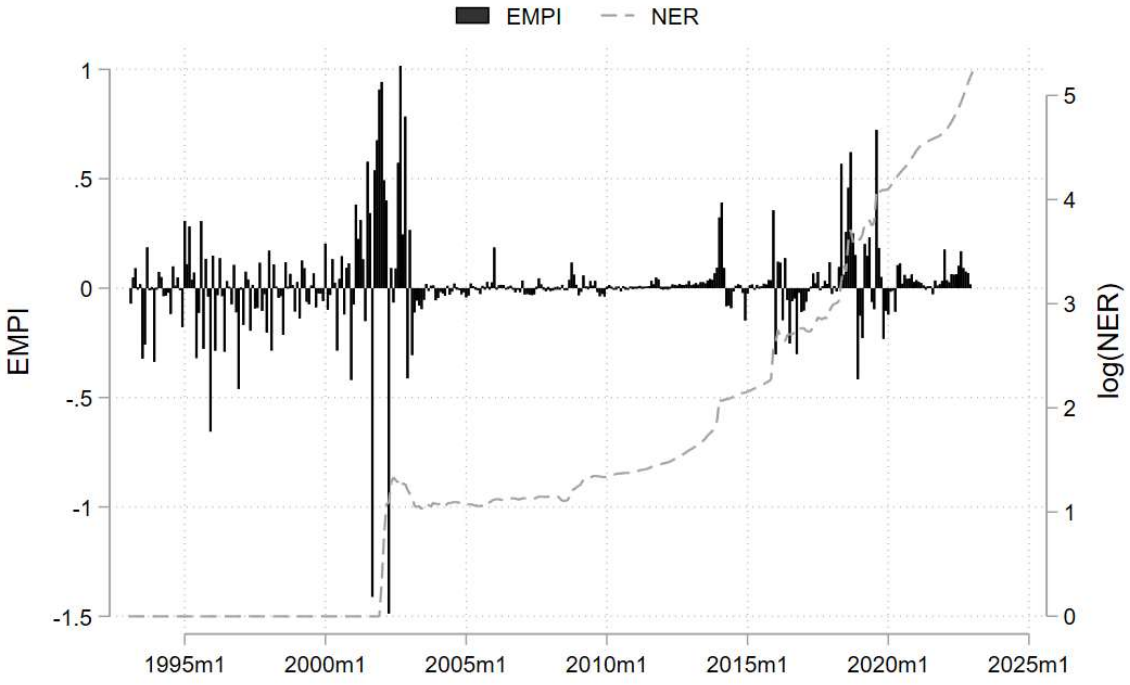
10. Appendix D

Figure D.1: exchange market pressure index (EMPI) and natural logarithm of the exchange rate

Brazil

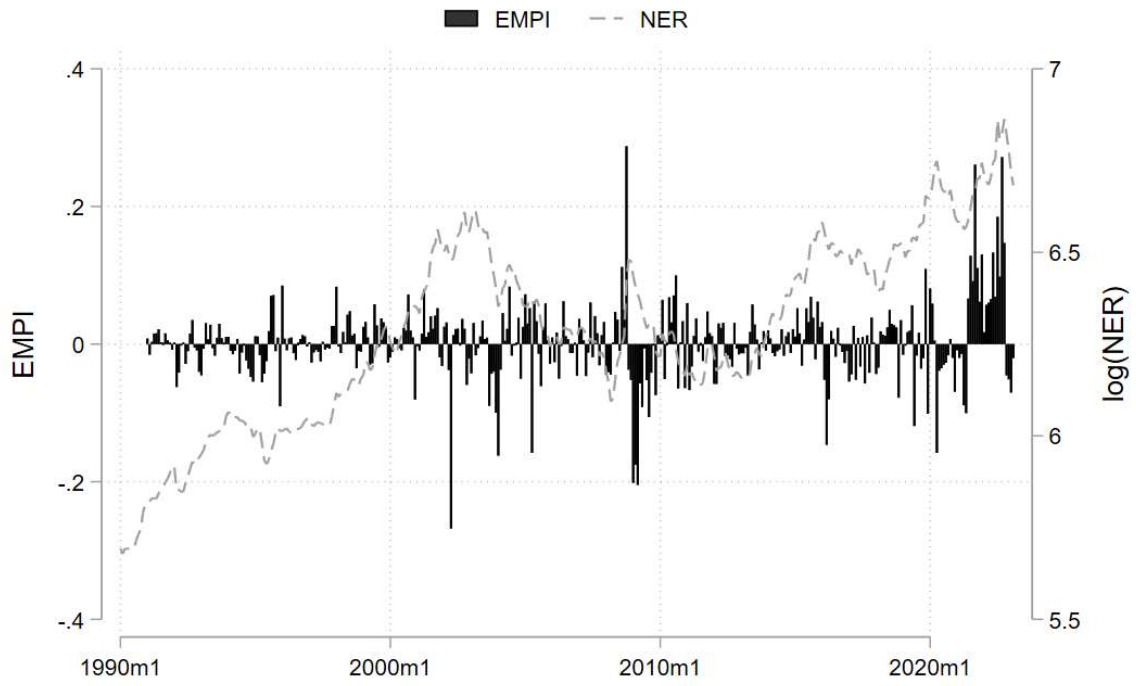


Argentina[10]

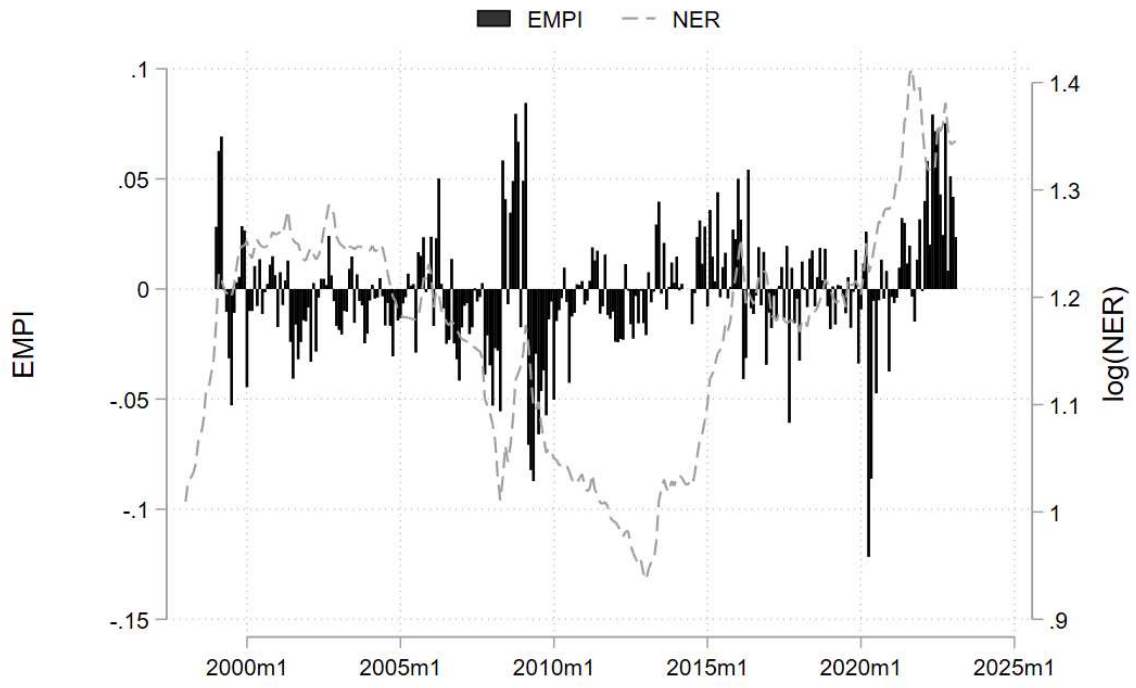


Chile

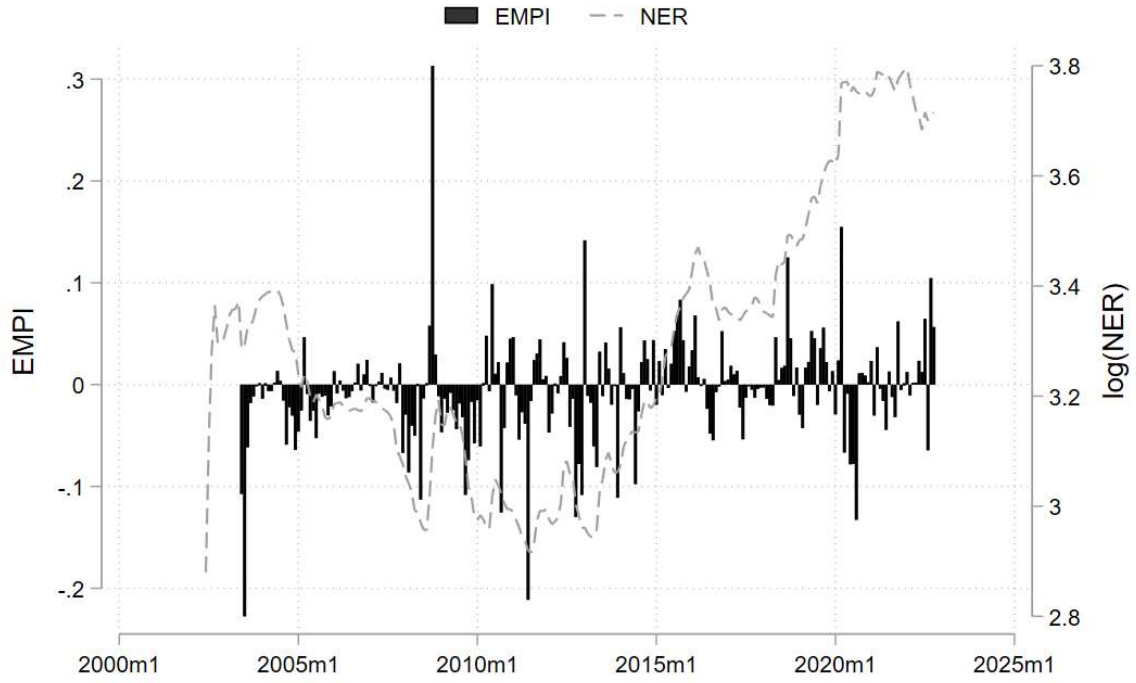
[10] Given that a fixed-exchange rate regime prevailed in Argentina before 2002, we use a modified version of the EMPI proposed by Desai et al. (2017) and Patnaik et al. (2017), which includes not only international reserves but also nominal interest rate.



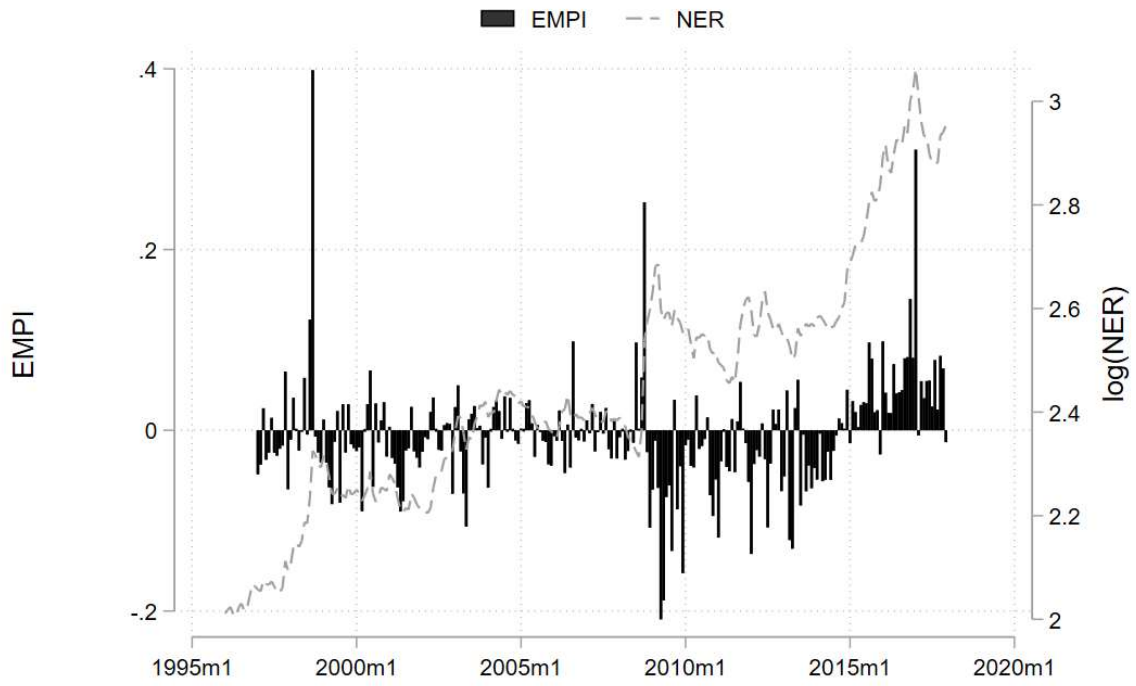
Peru



Uruguay



Mexico

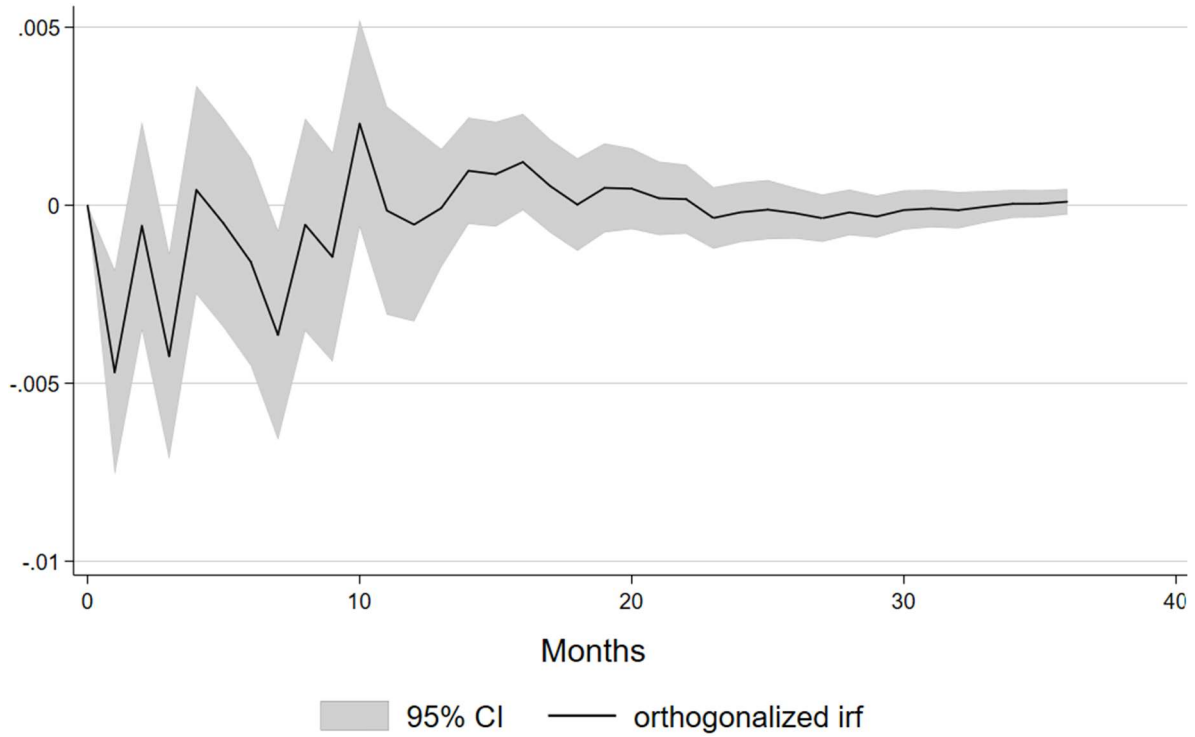


Source: Author´s own elaboration on the basis of national Central Banks data

Figure D.2: IRF after VAR regressions on EMPI and demand of money (national and foreign currency).

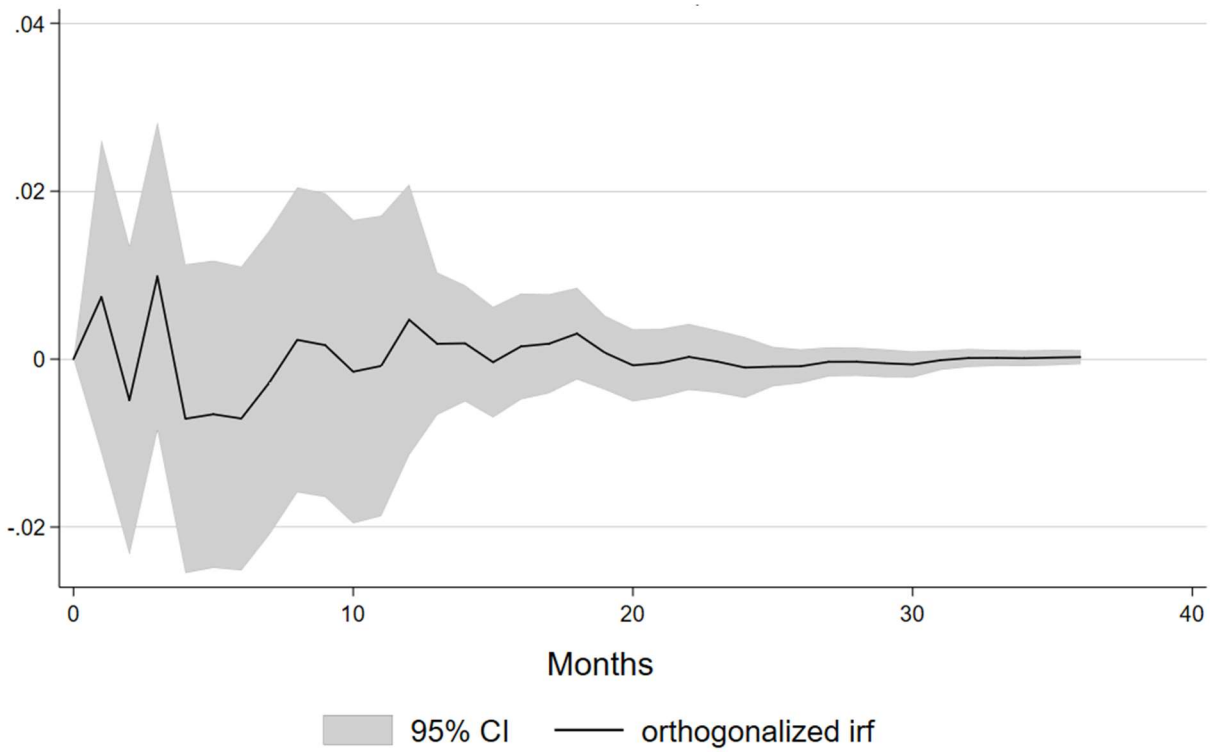
Brazil

One s.d. shock of EMPI on M1/P growth rate



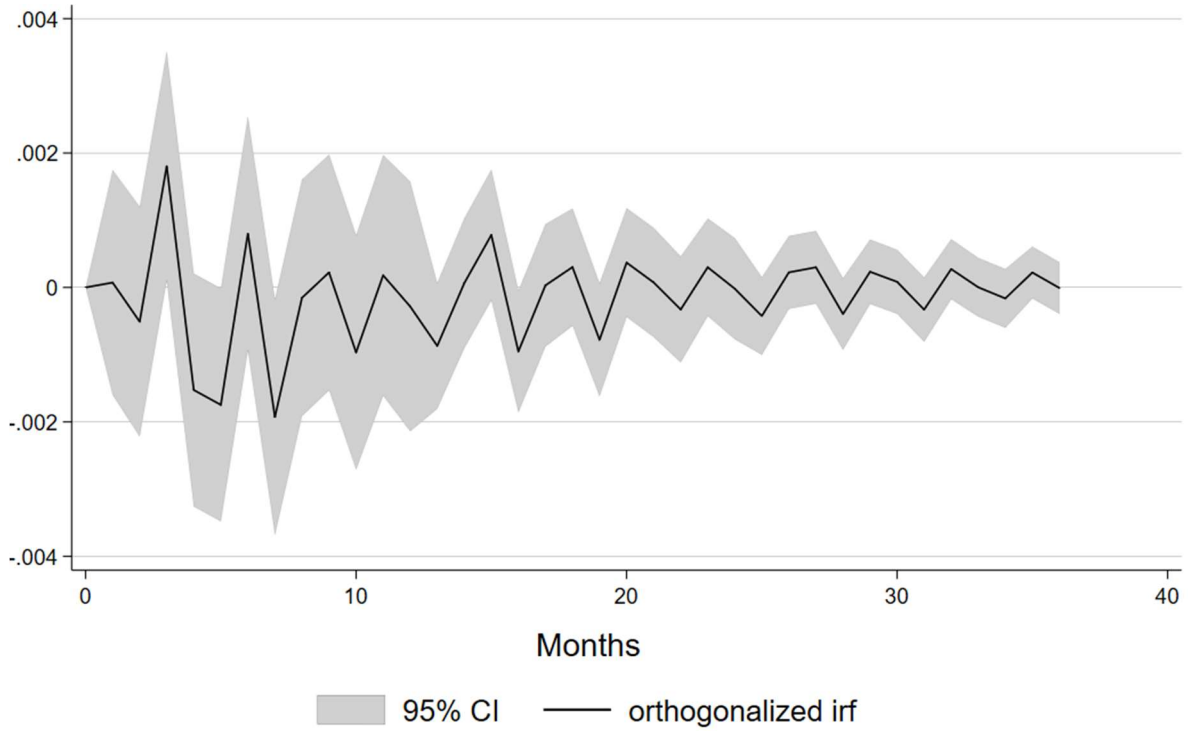
Brazil

One s.d. shock of EMPI on ratio USD/ total growth rate



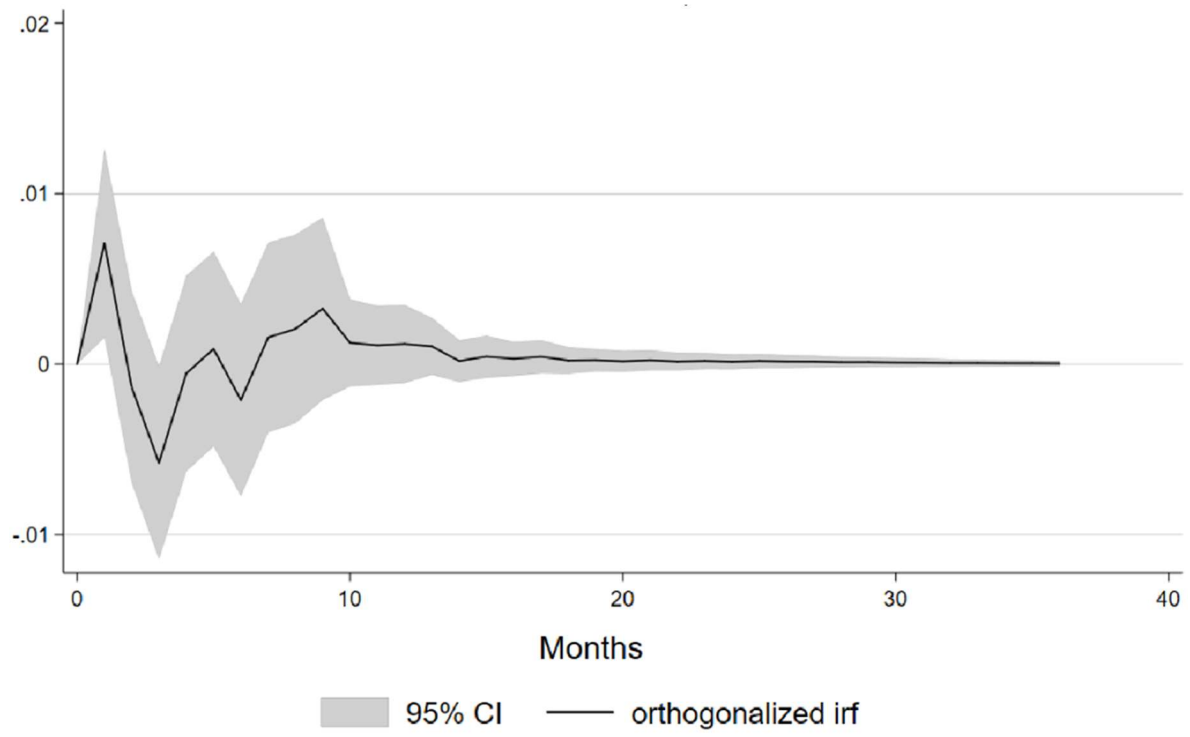
Mexico

One s.d. shock of EMPI on M1/P growth rate



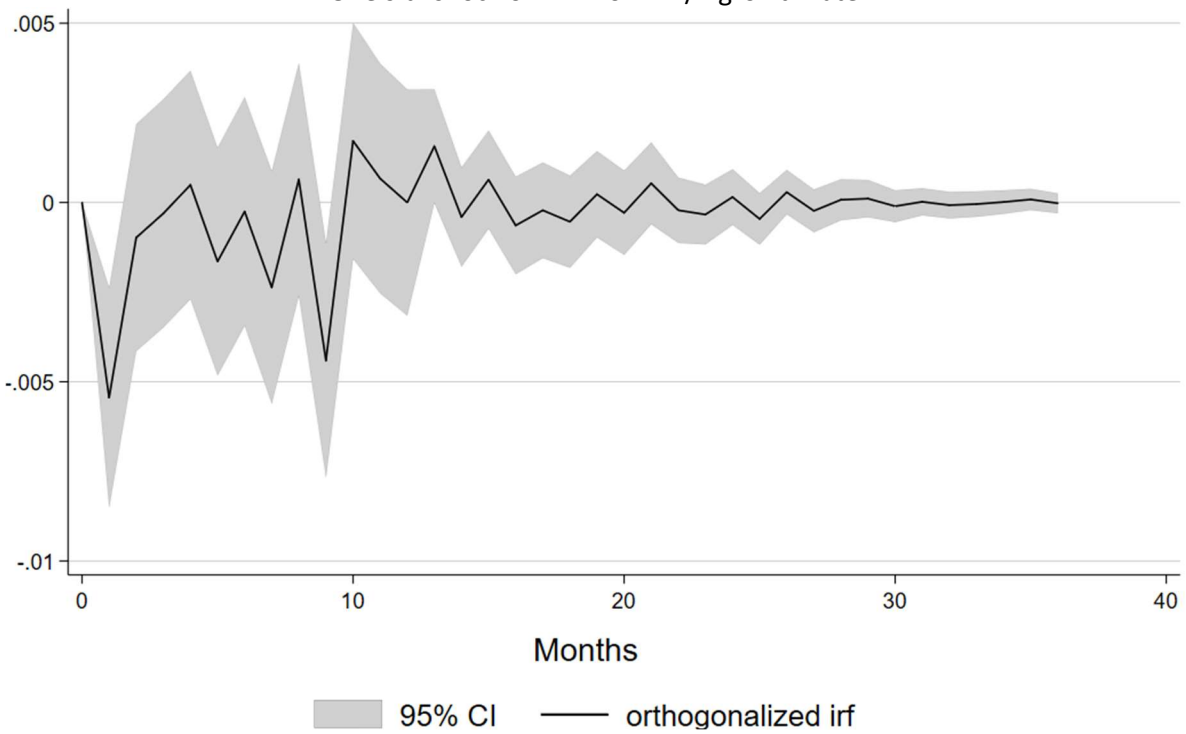
Mexico

One s.d. shock of EMPI on ratio USD/ total growth rate



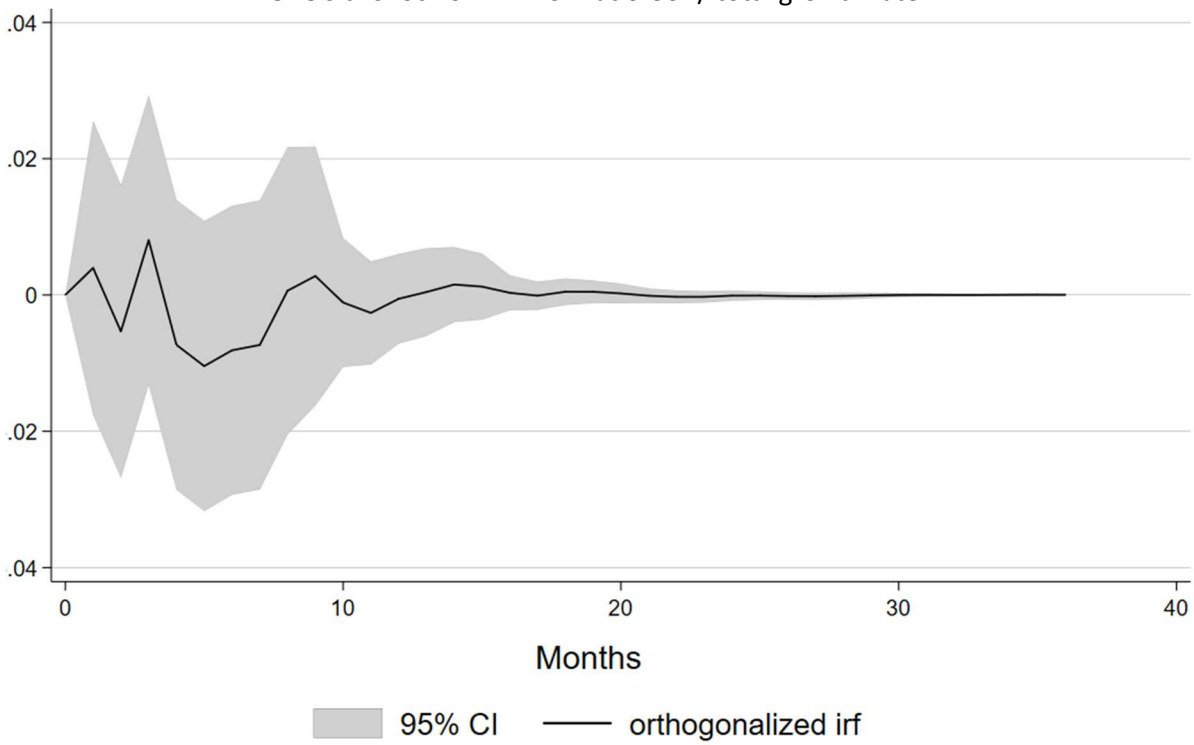
Uruguay

One s.d. shock of EMPI on M1/P growth rate



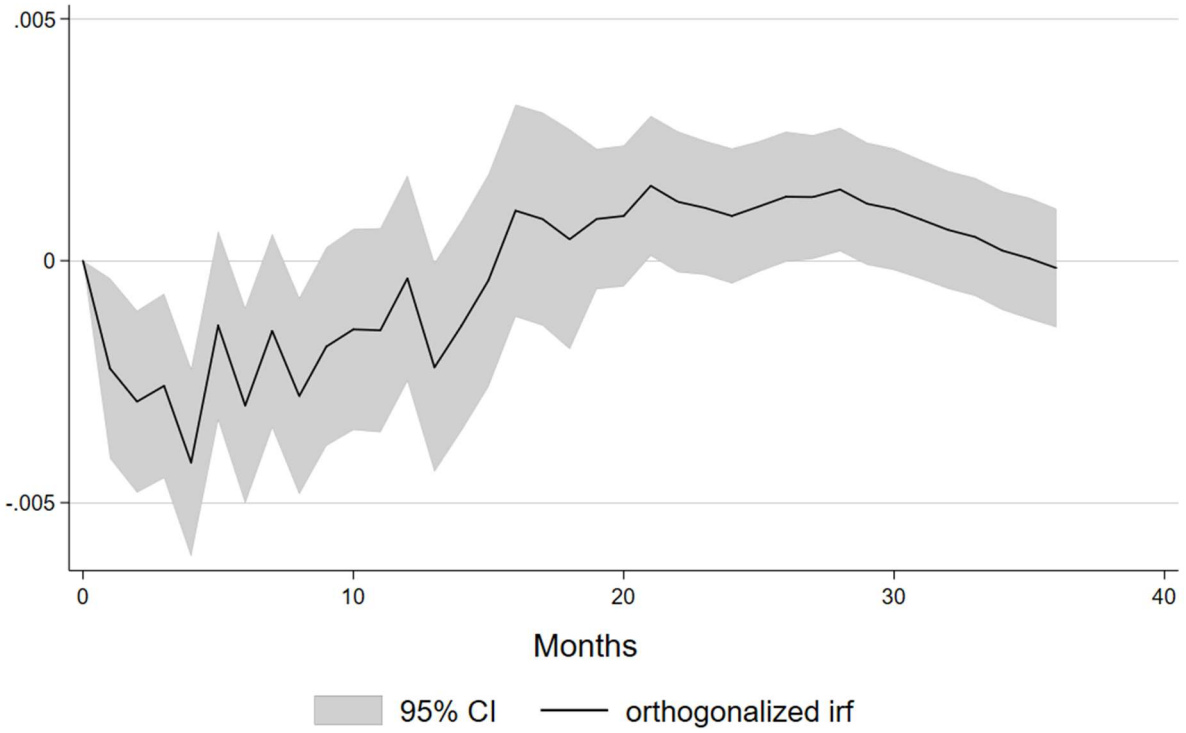
Uruguay

One s.d. shock of EMPI on ratio USD/ total growth rate

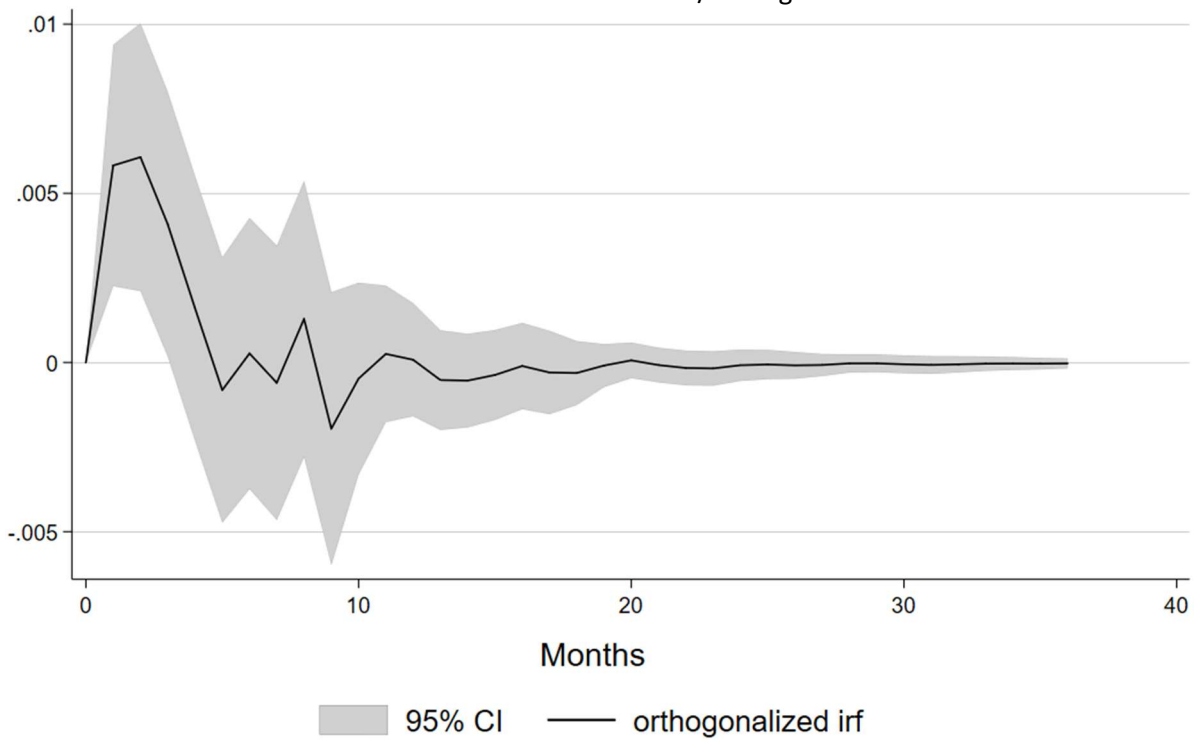


Chile

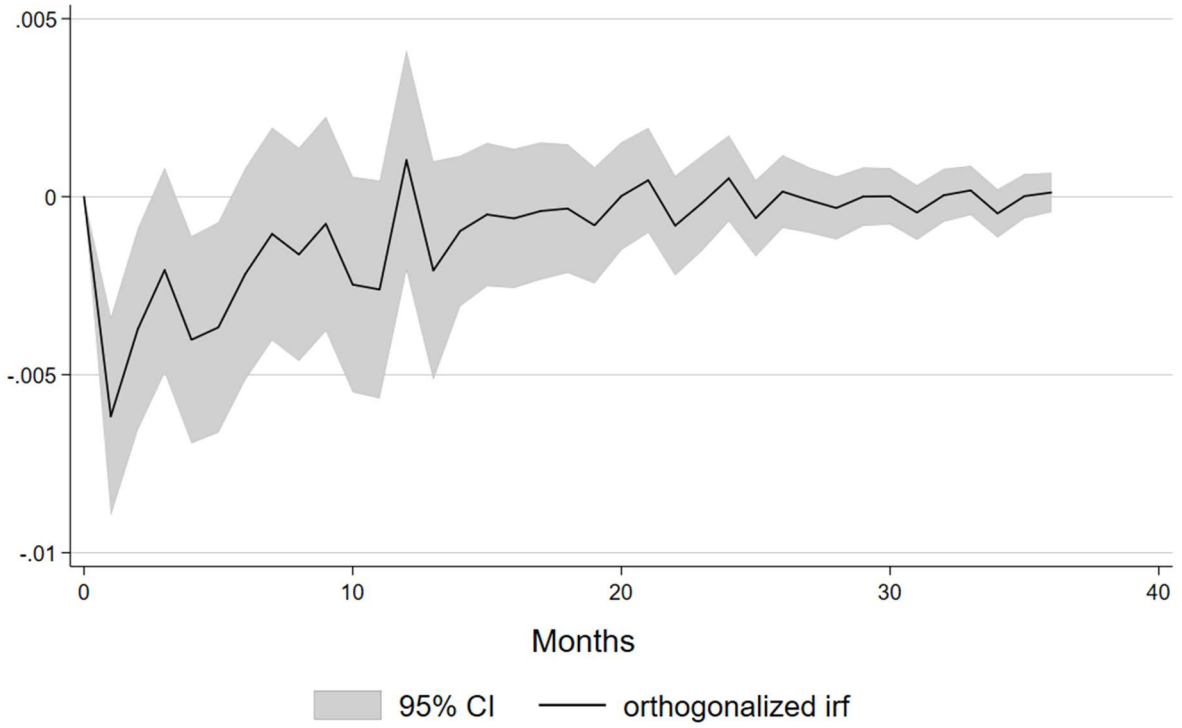
One s.d. shock of EMPI on M1/P growth rate



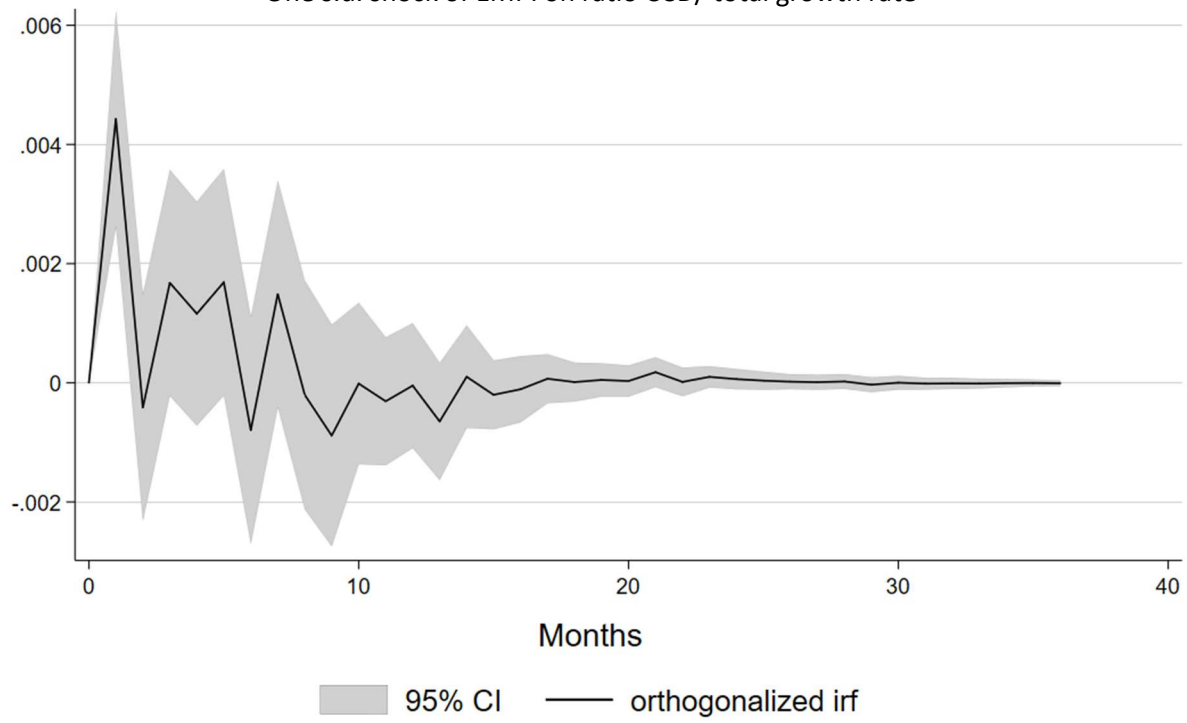
Chile
One s.d. shock of EMPI on ratio USD/ total growth rate



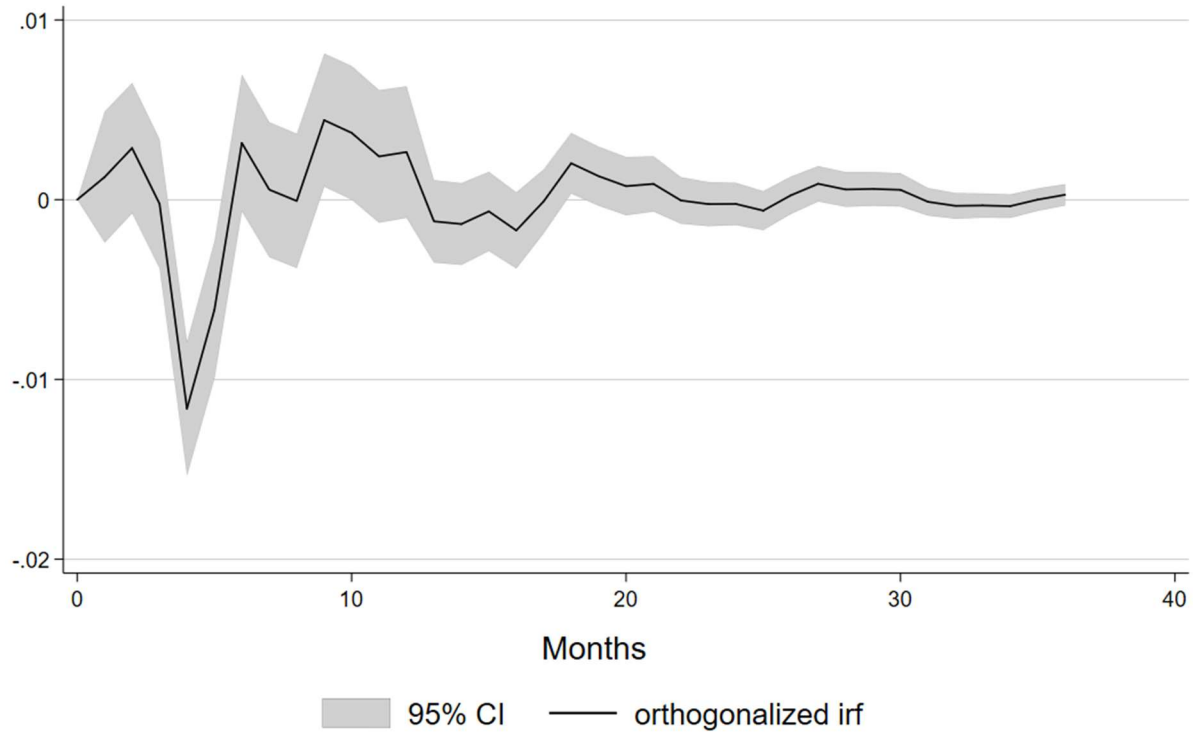
Peru
One s.d. shock of EMPI on M1/P growth rate



Peru
One s.d. shock of EMPI on ratio USD/ total growth rate

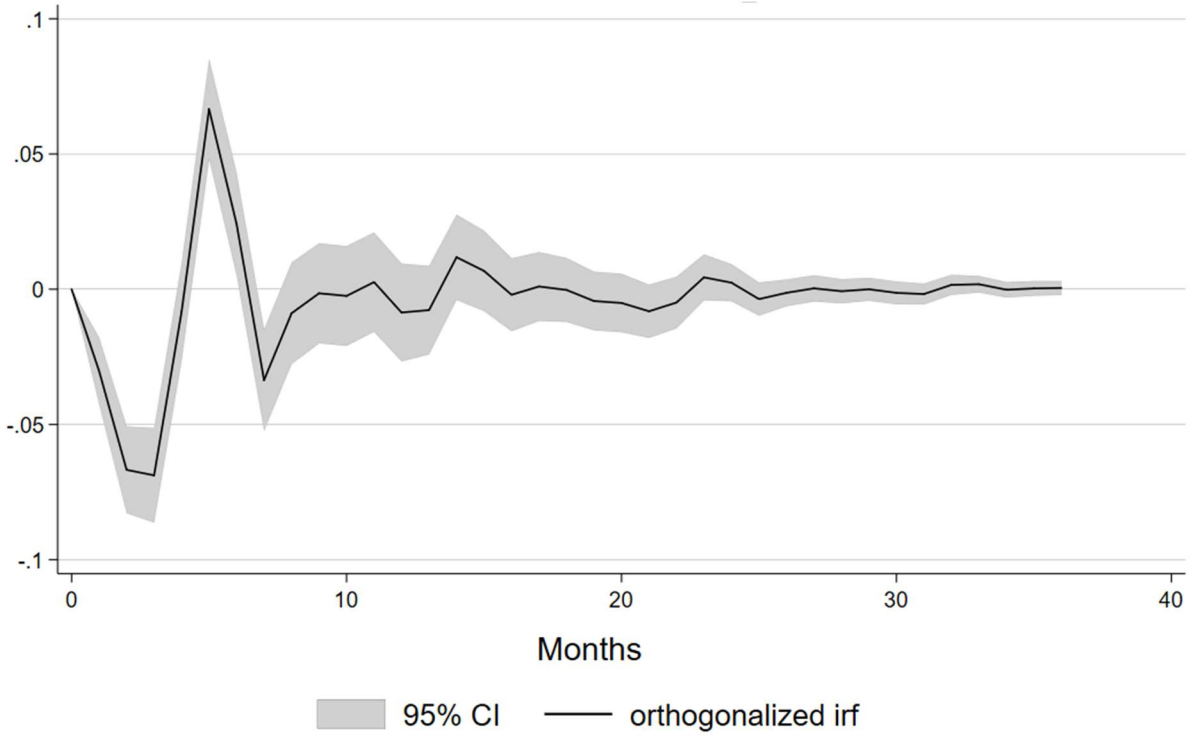


Argentina
One s.d. shock of EMPI on M1/P growth rate



Argentina

One s.d. shock of EMPI on ratio USD/ total growth rate



11. References

Barbosa-Filho, N. H. (2015). Monetary policy with a volatile exchange rate: The case of Brazil since 1999. *Comparative Economic Studies*, *57*, 401-425.

Bastian, E. F., & Setterfield, M. (2020). Nominal exchange rate shocks and inflation in an open economy: Towards a structuralist inflation targeting agenda. *Cambridge Journal of Economics*, *44*(6), 1271-1299. https://doi.org/10.1093/cje/beaa008

Blecker, R. (2011). Open economy models of distribution and growth. En *A modern guide to Keynesian macroeconomics and economic policies* (Eckhard Hein and Engelbert Stockhammer, pp. 215-239). Cheltenham, UK and Northampton, MA: Edward Elgar Publishing.

Blinder, A. S., & Solow, R. M. (1973). Does fiscal policy matter? *Journal of public economics*, *2*(4), 319-337.

Bortz, P. (2016). *Inequality, growth and 'hot' money*. Cambridge: Edward Elgar.

Broda, C., & Yeyati, E. L. (2006). Endogenous Deposit Dollarization. *Journal of Money, Credit and Banking*, *38*(4), 963-988. JSTOR.

Burdisso, T., & Corso, E. A. (2011). Incertidumbre y dolarización de cartera. El caso argentino en el último medio siglo. *Ensayos Economicos*, *63*.

Cagan, P. (1956). The monetary dynamics of hyperinflation. En *Studies in Quantity theory of Money* (M. Friedman (eds), pp. 25-117). University of Chicago Press.

Calvo, G. A. (2002). On dollarization. *The Economics of Transition*, *10*(2), 393-403. https://doi.org/10.1111/1468-0351.00117

Calvo, G. A. (2017). Fighting chronic inflation with interest rates: Cutting a hydra's heads with a Swiss army knife. *Mimeo, New York, NY: Columbia University*. http://www.columbia.edu/~gc2286/

Calvo, G. A., & Vegh, C. A. (1994). Inflation stabilization and nominal anchors. *Contemporary Economic Policy*, *12*(2), 35-45. https://doi.org/10.1111/j.1465-7287.1994.tb00421.x

Calvo, G. A., & Vegh, C. A. (1999). Inflation stabilization and bop crises in developing countries. En *Handbook of Macroeconomics* (Vol. 1, pp. 1531-1614). Elsevier. https://doi.org/10.1016/S1574-0048(99)10037-5

Charles, S., Bastian, E. F., & Marie, J. (2021). *Inflation Regimes and Hyperinflation. A Post-Keynesian/Structuralist typology* (32; Discussion Paper). https://www.ie.ufrj.br/publicacoes-j/textos-para-discussao.html

Charles, S., & Marie, J. (2016). Hyperinflation in a small open economy with a fixed exchange rate: A post Keynesian view. *Journal of Post Keynesian Economics*, *39*(3), 361-386. https://doi.org/10.1080/01603477.2016.1200950

Charles, S., & Marie, J. (2017). Bulgaria's hyperinflation in 1997: Transition, banking fragility and foreign exchange. *Post-Communist Economies*, *29*(3), 313-335. https://doi.org/10.1080/14631377.2017.1339476

Charles, S., & Marie, J. (2021). How Israel avoided hyperinflation. The success of its 1985 stabilization plan in the light of post-Keynesian theory. *Review of International Political Economy*, *28*(3), 528-558. https://doi.org/10.1080/09692290.2019.1699146

Desai, M., Patnaik, I., Felman, J., & Shah, A. (2017). A cross-country Exchange Market Pressure (EMP) dataset. *Data in Brief*, *12*, 652-655. https://doi.org/10.1016/j.dib.2017.04.059

Dornbusch, R., Sturzenegger, F., Wolf, H., Fischer, S., & Barro, R. J. (1990). Extreme Inflation: Dynamics and Stabilization. *Brookings Papers on Economic Activity*, *21*(2), 1-84. https://doi.org/10.2307/2534504

Drumond, C. E., & De Jesus, C. S. (2016). Monetary and fiscal policy interactions in a post Keynesian open-economy model. *Journal of Post Keynesian Economics*, *39*(2), 172-186. https://doi.org/10.1080/01603477.2016.1147332

Ferreres, O. (2010). *Dos Siglos de Economia Argentina 1810-2004: Historia argentina en cifras*. Editorial El Ateneo.

Guerrero, F., & Kawamura, E. (1994). Expectativas, rezagos fiscales y la trampa de alta inflación. *Económica*, *40*.

Hammond, G. (2012). *State of the art of inflation targeting* (29; CCBS Handbook). Centre for Central Banking Studies, Bank of England. https://www.bankofengland.co.uk/ccbs/state-of-the-art-of-inflation-targeting

Ize, A., & Yeyati, E. L. (2003). Financial dollarization. *Journal of International Economics*, *59*(2), 323-347. https://doi.org/10.1016/S0022-1996(02)00017-X

Kaminsky, G. L., & Reinhart, C. M. (1999). The twin crises: The causes of banking and balance-of-payments problems. *American Economic Review*, *89*(3), 473-500.

Kaminsky, G., Lizondo, S., & Reinhart, C. M. (1998). Leading indicators of currency crises. *Staff Papers*, *45*(1), 1-48.

Kaplan, G., Violante, G., & Weidner, J. (2014). *The Wealthy Hand-to-Mouth* (20073; NBER Working Paper). National Bureau of Economic Research. https://doi.org/10.3386/w20073

Kiguel, M. A. (2015). *Las crisis económicas argentinas: Una historia de ajustes y desajustes*. Editorial Sudamericana.

Kiguel, M. A., & Liviatan, N. (1992). The business cycle associated with exchange rate-based stabilizations. *The World Bank Economic Review*, *6*(2), 279-305. https://doi.org/10.1093/wber/6.2.279

Leijonhufvud, A. (1973). Effective demand failures. *The Swedish Journal of Economics*, 27-48.

Libman, E. (2019a). Asymmetric monetary and exchange-rate policies in Latin American countries that use inflation targeting. *CEPAL Review*, *2018*(125), 29-44. https://doi.org/10.18356/58301876-en

Libman, E. (2019b). Destabilizing Balance Sheet Effects in the New Consensus Model. *Eastern Economic Journal*, *45*(4), 590-611. https://doi.org/10.1057/s41302-019-00146-3

Libman, E., & Palazzo, G. (2020). Inflation targeting, disinflation, and debt traps in Argentina. *European Journal of Economics and Economic Policies*, *17*(1), 78-105. https://doi.org/10.4337/ejeep.2019.0050

Marie, J. (2014). Hyperinflation argentine de 1989: Une interprétation post-keynésienne. *Revue de la régulation*, *15*. https://doi.org/10.4000/regulation.10794

Patnaik, I., Felman, J., & Shah, A. (2017). An exchange market pressure measure for cross country analysis. *Journal of International Money and Finance*, *73*, 62-77. https://doi.org/10.1016/j.jimonfin.2017.02.004

Porcile, G., De Souza, A. G., & Viana, R. (2011). External debt sustainability and policy rules in a small globalized economy. *Structural Change and Economic Dynamics*, *22*(3), 269-276. https://doi.org/10.1016/j.strueco.2011.06.002

Reinhart, C. M., & Vegh, C. A. (1994). *Inflation stabilization in chronic inflation countries: The empirical evidence* (13689; MPRA Paper). https://mpra.ub.uni-muenchen.de/13689/

Rochon, L.-P. (2007). The state of Post Keynesian interest rate policy: Where are we and where are we going? *Journal of Post Keynesian Economics*, *30*(1), 3-11. https://doi.org/10.2753/PKE0160-3477300100

Rochon, L.-P., & Setterfield, M. (2007). Interest rates, income distribution, and monetary policy dominance: Post Keynesians and the «fair rate» of interest. *Journal of Post Keynesian Economics*, *30*(1), 13-42. https://doi.org/10.2753/PKE0160-3477300101

Roger, S. (2010). Inflation Targeting Turns 20: A growing number of countries are making a specific inflation rate the primary goal of monetary policy, with success. *Finance & Development*, *47*(001). https://www.elibrary.imf.org/view/journals/022/0047/001/article-A018-en.xml

Ros, J. (2015). Central bank policies in Mexico: Targets, instruments, and performance. *Comparative Economic Studies*, *57*, 483-510.

Setterfield, M. (2006). Is inflation targeting compatible with Post Keynesian economics? *Journal of Post Keynesian Economics*, *28*(4), 653-671. https://doi.org/10.2753/PKE0160-3477280407

Thomas, L. R. (1985). Portfolio Theory and Currency Substitution. *Journal of Money, Credit and Banking*, *17*(3), 347-357. JSTOR. https://doi.org/10.2307/1992629

Vera, L. (2014). The simple post-Keynesian monetary policy model: An open economy approach. *Review of Political Economy*, *26*(4), 526-548. https://doi.org/10.1080/09538259.2014.969547

Yogo, M. (2004). Estimating the elasticity of intertemporal substitution when instruments are weak. *Review of Economics and Statistics*, *86*(3), 797-810. https://doi.org/10.1162/0034653041811770