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DISTRIBUTIVE EFFECTS OF BALANCE-OF-PAYMENTS CONSTRAINTS: A THEORETICAL AND EMPIRICAL ANALYSIS OF ARGENTINA (2004-2022)*

ABSTRACT

The paper studies the distributive effects of the external constraint in Argentina during the 2004-2022 period. We first develop a model inspired by the classical tradition – exogenous distribution – for a small (price taker) open economy with technical and financial dependencies under foreign exchange controls to examine the negative effects of exchange rate depreciations on real wage. Then, we use a Vector Error Correction Model (VECM): a) to show the long-run negative relationship between the real exchange rate and real wages in Argentina during the period under analysis; b) to identify the autonomous – or weakly exogenous – role played by the nominal exchange rate in the determination of income distribution; and, c) to capture the influence that, in the short-run, the financial exchange rate exerts on the official exchange rate.

Keywords: Argentina; External Constraint; Income Distribution; Small Open Economy; Vector Error Correction Model
JEL Classification: B51; C32; D33; F41

RIASSUNTO

Gli effetti distributivi dei vincoli della bilancia dei pagamenti: un'analisi teoretica ed empirica del caso Argentina (2004-2022)

Questo articolo studia gli effetti distributivi dei vincoli esterni sull'Argentina nel periodo 2004-2022. Dapprima si sviluppa un modello ispirato alla tradizione classica – distribuzione esogena – per una piccola economia aperta in concorrenza perfetta con dipendenze tecniche e finanziarie

* The views and opinions expressed in this paper are those of the authors and do not necessarily reflect the views or positions of the BCRA.

con controlli sui cambi, al fine di esaminare gli effetti negativi del deprezzamento del tasso di cambio sui salari. Poi si utilizza un modello VECM per: a) dimostrare la relazione negativa di lungo periodo tra il tasso di cambio reale e i salari reali in Argentina nel periodo in esame; b) identificare il ruolo autonomo – o debolmente esogeno – svolto dal tasso di cambio nominale nella determinazione della distribuzione del reddito; c) cogliere l'influenza esercitata nel breve periodo dal tasso di cambio di mercato sul tasso ufficiale.

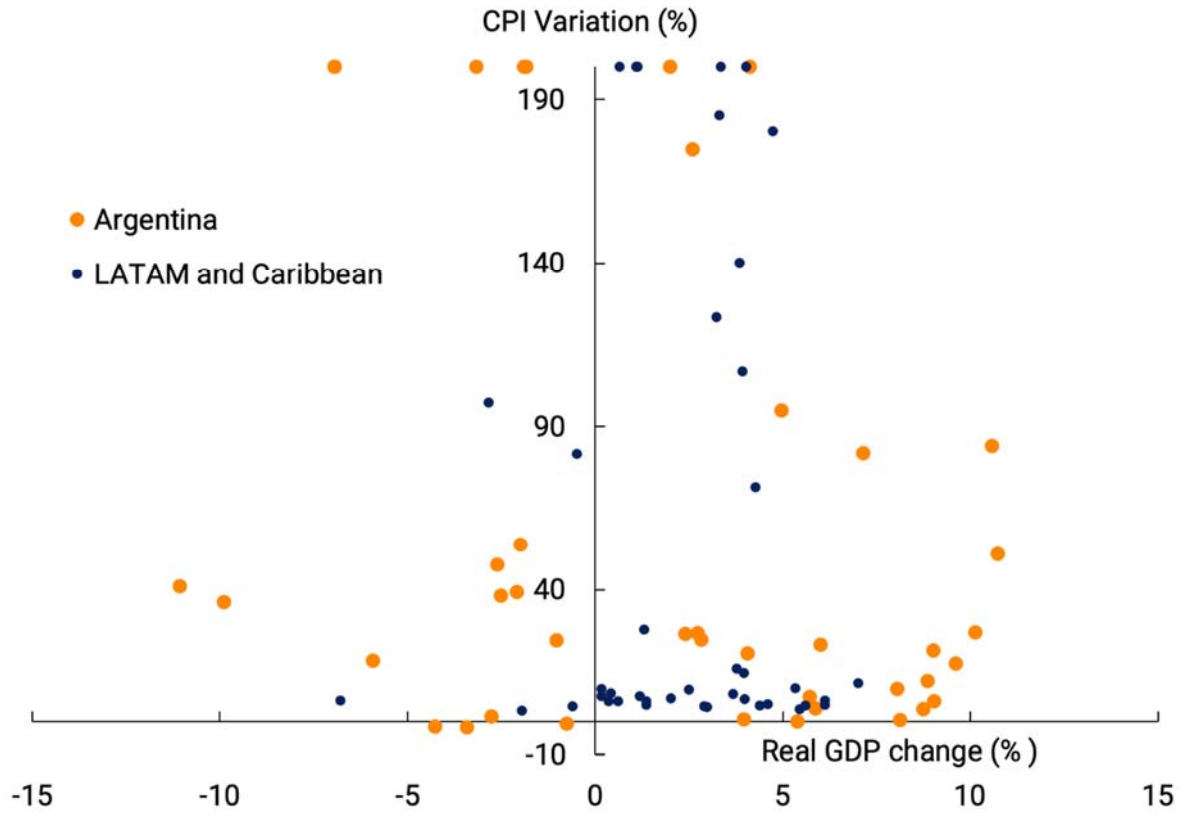
1. Introduction

The Argentine economy is characterized by its high macroeconomic volatility. This feature was shared by other countries of the Latin American (LA) region until the end of the 1990s. However, since the early 2000s, it has become a distinctive factor of this economy. A quick glance at real GDP growth and annual inflation is enough to illustrate this point. When we compare Argentina's performance with the rest of Latin America and the Caribbean between 1982 and 2022, we observe that Argentina tends to experience periods of more intense growth, but also to suffer recessions more frequently than the rest of the region. In terms of price dynamics, higher and more volatile inflation is observed in Argentina compared to the rest of Latin America.

It is worth noting that this macro instability has coexisted with alternative monetary and exchange rate regimes[1]. The fact that none of them has managed to eliminate it suggests that, in addition to these institutional factors, there are structural elements that must be taken into consideration as well. In this paper, we examine the role traditionally exerted by recurrent external imbalances. Our contribution is founded on the literature about the external constraint on economic growth (hereinafter EC) by Thirlwall (1979), although here we focus on a particular manifestation of this restriction: its *distributive implications*. We consider the central role played by the exchange rate on income distribution in Argentina (Vernengo, 2001; Dvoskin and Feldman, 2018b), which is distinguished from other economies open to capital and trade flows by four distinctive characteristics.

[1] To illustrate the point, it is enough to note that over the last 30 years, Argentina has implemented systems as diverse as the so-called "Convertibility"– a fixed exchange rate regime established by law during the 1990s, free floating systems and deregulation of the capital and financial accounts (during the brief period of implementation of the inflation targeting regime between 2016 and 2018), and managed exchange rates that have coexisted, on some occasions, with targets on monetary aggregates and exchange rate controls.

FIGURE 1 - *Inflation and Economic Growth (1982-2022)**



Source: Own elaboration based on INDEC and WEO (IMF).
*Episodes when annual inflation rate surpassed 200% were censored at that level.

In the first place, Argentina is a *small* economy, that is, it takes international prices as given. In the second place, it presents significant *structural heterogeneity*. At the risk of some simplification, it has, on the one hand, a highly productive sector that exports wage goods, or inputs of these goods, capable of competing at current international prices. On the other hand, there is a relatively backward industrial sector, which is highly dependent on imported inputs that cannot be produced domestically due to lack of technical knowledge – or *technological dependency* – and which needs protection to survive. In the third place, it is an economy in which local currency hardly fulfils the role of reserve of value for the domestic private sector as it exhibits high *financial dependency*. The last characteristic that distinguishes it from other open economies is that, from 2011 onwards, with the exception of the 2016-2019 period , the country has implemented foreign exchange controls, whose persistence over time has given rise to parallel or "financial" exchange rates – named in this way because their value is determined by

the price of the same financial asset (bond or equity) that can be bought in local currency and then sold in foreign currency, or vice versa, thus resulting in an implicit exchange rate. Although these financial exchange rates do not determine the production costs of imported inputs – whose price is set at the official exchange rate – and therefore do not directly affect income distribution, they do so indirectly by influencing devaluation expectations.

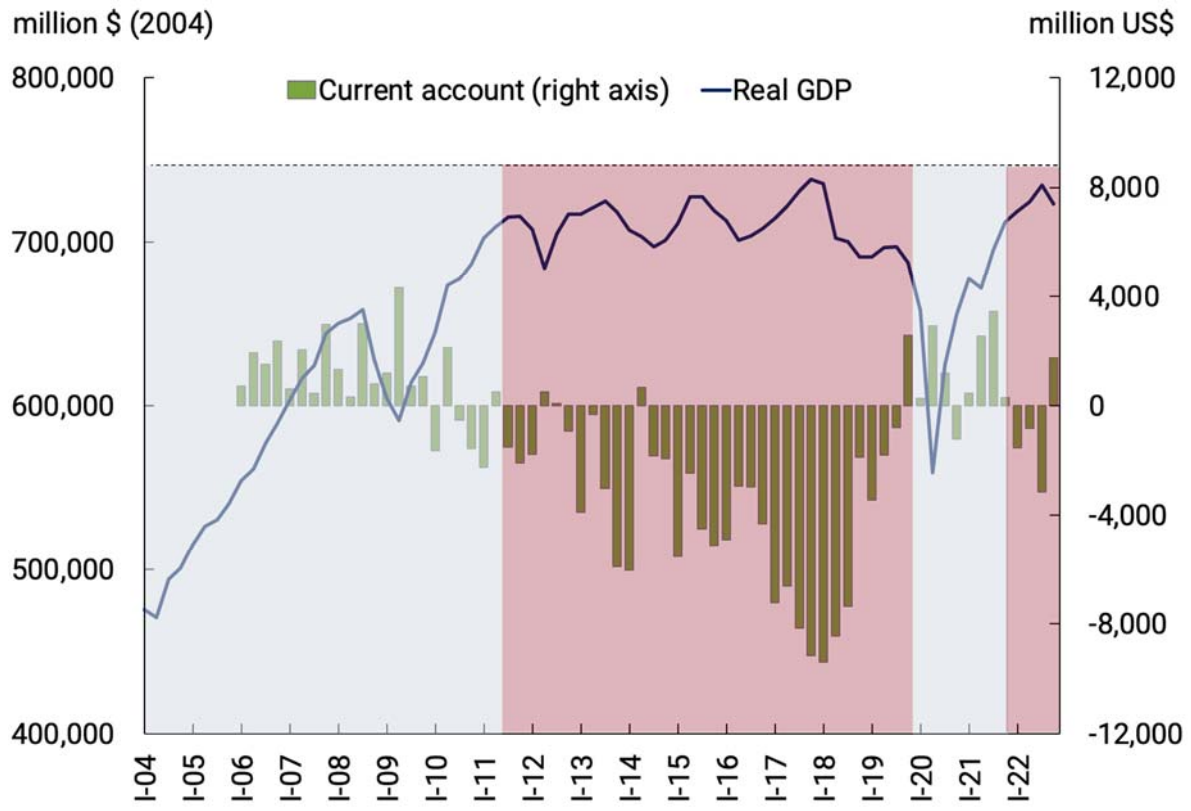
To examine how all these elements particularly shape the relationship between the external sector and the distribution of income in Argentina, we present three stages. In section 2, we identify the main channels, the real and financial ones, through which the EC has manifested itself in our country over the last 20 years, with special emphasis on its disruptive effects on exchange rate stability. In section 3, we formalize a model inspired by the classical tradition – exogenous distribution – that illustrates the negative effects on real wages of exchange rate depreciations in small open economies, with EC and foreign exchange controls. Finally, in section 4, we use a VECM that allows us: a) to quantify the long-run negative relationship between the real exchange rate and real wages in a small open economy; b) to identify the autonomous – or weakly exogenous – role played by the nominal exchange rate in the determination of income distribution in Argentina during the 2004-2022 period; and c) to capture the influence that, in the short-term (i.e., by means of an exercise of temporal anticipation or Granger causality), financial exchange rate fluctuations exert on the official parity. Section 5 summarizes the argument.

2. The external constraint in Argentina

2.1. Growth and External Constraint

One can clearly see how sustained growth in Argentina is possible when there is external space, while growing current account deficits generally end up in balance of payments crises and strong currency devaluations. If we focus on what has happened over the last 20 years, we see that real output has recurrently reached a GDP maximum level in around 2011. This suggests that when the economy approaches that level, tensions emerge in the external front, which limit growth and have regressive effects on income distribution.

FIGURE 2 - *Current Account and Output (2004-2022)*



Source: Own elaboration based on INDEC.

It is important to remark that, from a demand-led growth perspective, nothing ensures that the external constraint must be binding. Indeed, the fact that the economy has recurrently clashed against the ceiling imposed by the foreign sector shows that, differently from other LA countries, fiscal policy – the most important autonomous component of aggregate demand – has vigorously used this external space, when such space was available. A particularly clear example occurred during the first decade of the 2000s when, on account of the "commodity boom", the economy faced very favourable terms of trade that allowed it to finance public consumption and transfers to the private sector. Between 2004 and 2011, the average output growth was 6%, whereas the average in Latin America was around 4%. Additionally, Figure 2 shows four valleys during the 2010s. The first one coincides with a draught in 2011 that led to a decrease in exports, while the other three (2014, 2016 and 2018) are concurrent with devaluations in a context of decreasing terms of trade that blocked fiscal expansion by making real wage drop (more on this, below). The

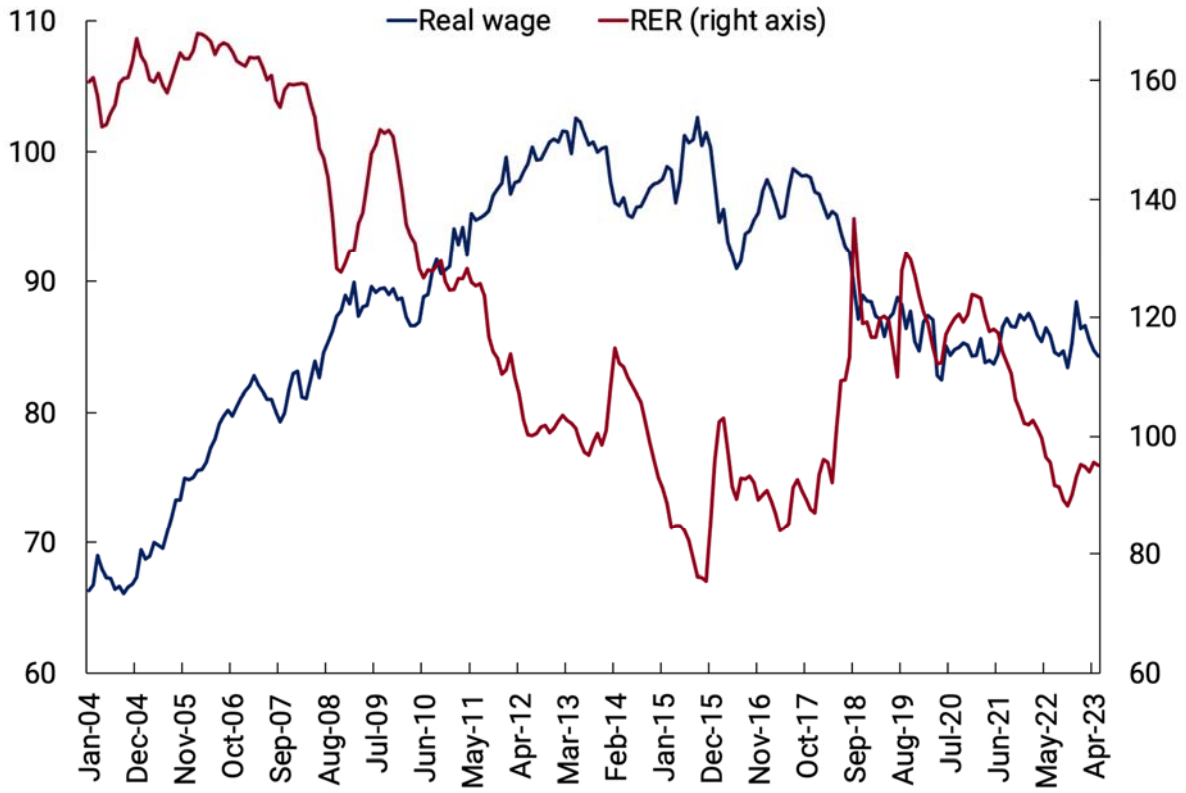
other two valleys seen in the same figure refer to the Global Financial Crisis of 2008-2009, and the Covid-19 pandemic.

However, from a supply side, the *low* ceiling itself cannot be understood without analysing Argentina's *pattern of international trade*. On the one hand, the country has "natural" advantages[2] in the production of raw materials, basically food (but also mining and petroleum), which allows it to be internationally competitive in the production of this type of commodities. On the other hand, due to an incomplete industrial development, the country presents "holes" in its input-output matrix; that is, there are capital goods and inputs that, due to lack of technical knowledge or economies of scale, the country does not produce or is not capable of producing in the short or medium runs.

These specificities are expressed in the low exchange rate elasticities of Argentina's exports and imports as well as in its low-income elasticity of exports and its high-income elasticity of imports[3]. As a result, movements in the real exchange rate do not have significant effects on the quantities exported, nor are they effective in inducing import substitution. This does not imply, however, that devaluations fail to correct external imbalances; this occurs through a compression of imports, which is associated with significant adjustments in the activity level. As it has been widely documented in the structuralist literature (Braun and Joy, 1968), being a small economy – price taker – which produces and exports wage goods, devaluations in Argentina reduce real wages, with negative consequences on the activity level and, thus, on imports.

[2] Since Sraffa's (1960) contribution it is known that the productivity of a sector cannot be determined independently from income distribution. However, in the case of an economy that presents the degree of structural heterogeneity of the Argentine economy, it is possible to think that the primary sector is more profitable than the industrial sector for any distributive configuration.
[3] For a recent analysis of the elasticities of Argentina's foreign trade, see Dogliolo *et al.* (2023).

FIGURE 3 - *Real Wage and Real Exchange Rate (2004-2022) (2013=100)*



Source: Own elaboration based on INDEC and BCRA.

Indeed, there are at least three channels through which an exchange rate depreciation can positively affect domestic prices, and therefore negatively affect real wages. Firstly, it increases the production costs of imported inputs, which are difficult to replace in the short-term due to the aforementioned incomplete productive matrix. Secondly, it rapidly increases the selling price – and therefore the profitability – of tradable goods, basically wage goods, whose international price is set in the world market (it should be reminded that Argentina takes international prices as exogenously given). Finally, by virtue of competition, higher profitability in the tradable sector also impacts, eventually, on the trajectory of the prices of non-tradable goods and services. Thus, the exchange rate has a positive impact on normal profitability and a negative impact on real wages (Dvoskin *et al.*, 2020), which contributes to exacerbating the distributive conflict (see section 2.4. below).

2.2. Financial Dollarization

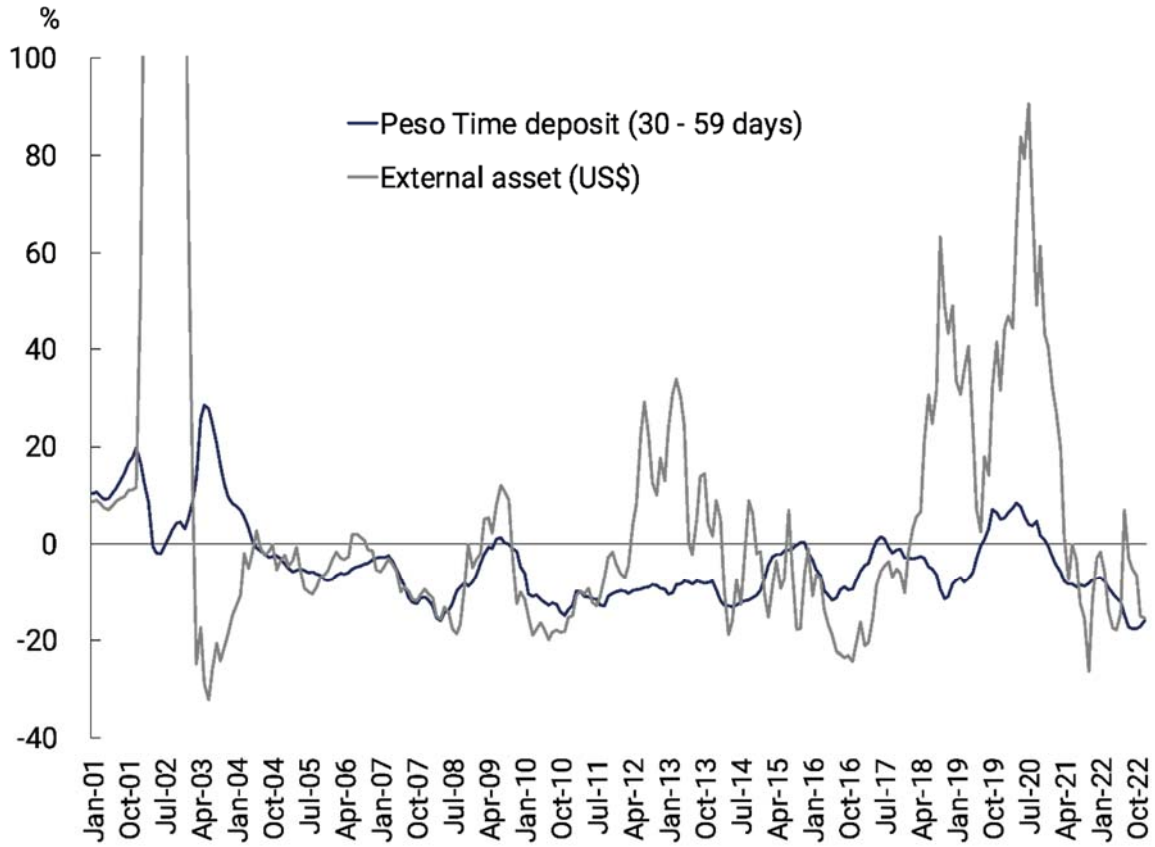
The influence of external imbalances (and the implied exchange rate fluctuations) on income distribution in Argentina are not limited to real channels. As a result of a history of recurrent devaluations and persistently high inflation – initially caused by the same real Stop&Go-type of channels during the 1950s and 1960s –, the abandonment of exchange controls and the financial liberalization phase started in the mid-1970s created the ideal conditions for the domestic private sector to resort to the US dollar as a refuge to preserve its financial wealth.

Thus, a strong demand for dollars by Argentineans became part of the picture, which we can call "structural" demand, because it is still observed in periods in which the short-term vulnerabilities of the foreign exchange market are not evident. Furthermore, this is exhibited even when the short-term real returns of peso assets are higher than those of external assets. Thus, having positive real returns on assets denominated in local currency is certainly a necessary condition to prevent the dollarization of portfolios, but in contexts of persistently high macro instability, it may not be sufficient. The perception of unsustainability of the exchange rate regime makes it difficult, at least in relatively short periods, to think of the existence of a differential of returns capable of compensating the expectation of depreciation of the official parity.

Behind private sector's portfolio decisions lies the fact that these decisions tend to assign a positive probability of occurrence to an episode of exchange rate disruption within their investment horizon (Corso and Sangiácomo, 2023). If *ex post* real returns are a relevant part of the information used by agents when forming their expectations, recurrent exchange rate disruptions can positively bias the perceived probability distribution of dollar-denominated assets. In other words, higher exchange rate volatility may be associated with a "rightward" bias in the real returns of dollar assets.

Figure 4 shows the evolution of the *ex post* accumulated real returns of a deposit in pesos at 30/59 days for the 2001-2022 period, as well as the evolution of foreign assets denominated in dollars for the same period, both in terms of the local consumption basket.

FIGURE 4 - *Ex Post Real Returns: Time Deposits (30-59 Days) and External Assets Annually Accumulated (2001-2022)*



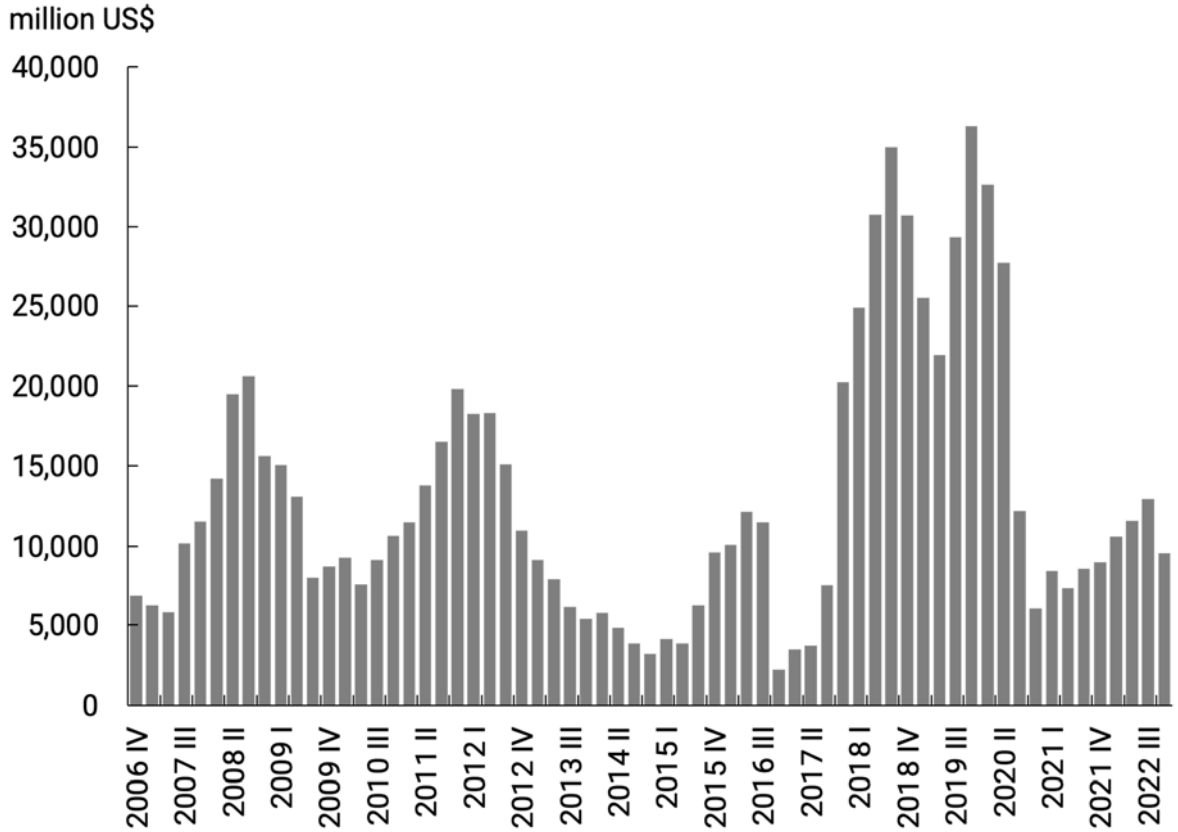
Source: Own elaboration based on BCRA and Reuters.

The observed "volatility clusters" of real returns in dollars are associated with episodes of exchange rate jumps[4,5]. Such events have their correlate in portfolio dollarization (net accumulation of foreign assets by the private sector, as seen in Figure 5). The accumulated net flows of foreign assets were positive practically throughout the entire sample, reaching an average of USD13 billion per year, based on accrual data from the balance of payments.

[4] Five episodes can be identified in Figure 4. The first one is the 2001-2002 crisis. The second one is the devaluation and increase in the interest rate associated with the impact of the global financial crisis. The third one is the period of foreign exchange controls that lasted from October 2011 to December 2015. The fourth one is the 2018-2019 period of exchange rate disruptions and, finally, the recent period of re-imposition of exchange controls.

[5] In periods of FX controls, the return on foreign assets is measured based on the variation in the financial exchange rate.

FIGURE 5 - *External Asset Build-Up. Non-Financial Private Sector*
Annually Accumulated Flows (2006-2022)



Source: INDEC.

2.3. Foreign Exchange Controls

The Argentine economy is also distinguished from the rest of LA countries in that it has implemented FX controls during a relevant part of the period under analysis, that is, from the last quarter of 2011 to the present – with the exception of the liberalization experience of 2016-mid 2019. In a context of growing scarcity of foreign currency, due to the real and financial reasons discussed above, the adoption of controls is aimed at avoiding the regressive and contractionary effects of devaluations. These controls usually take the form of restrictions to access the official foreign exchange market for import payments, invisible transactions (profits and dividends to non-resident shareholders and other current account transfers like travel services), payments on amortization on external loans and residents' external asset build-up. Once this kind of restrictions are imposed, a parallel foreign exchange system emerges; that is, a

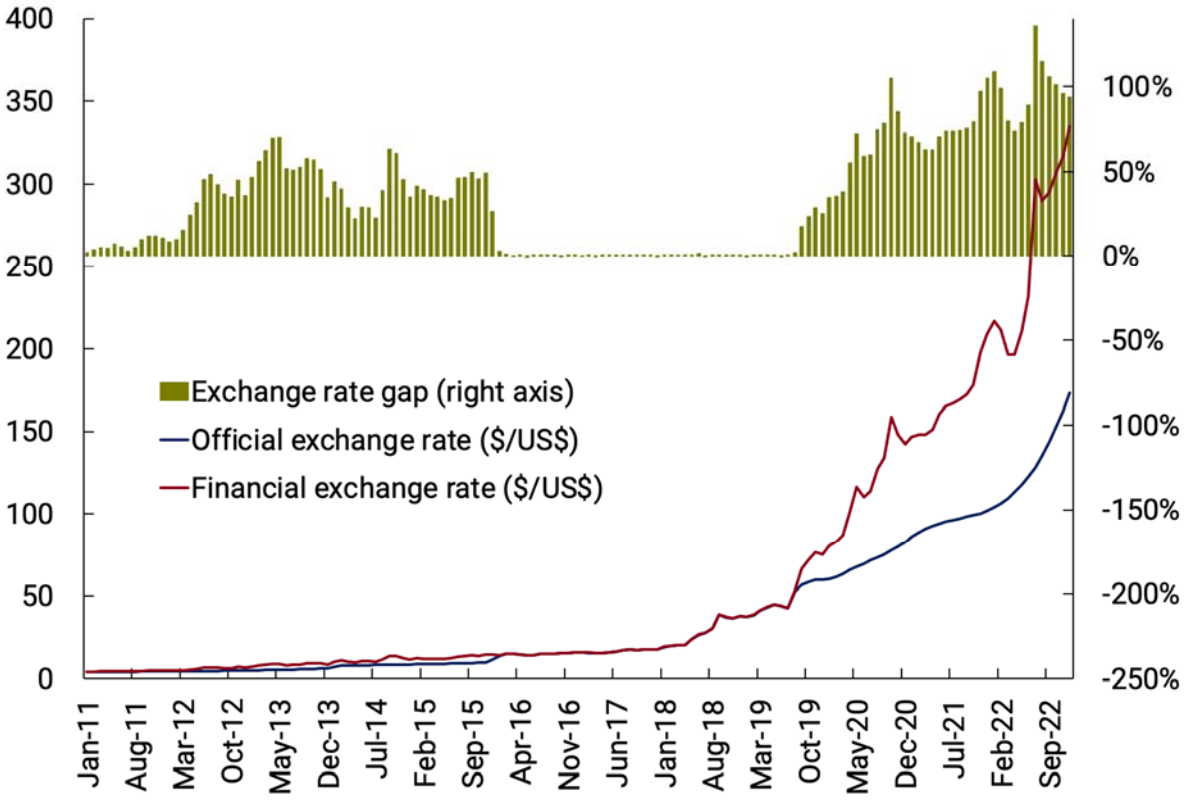
scheme in which a market-determined exchange rate, typically used to settle financial transactions, coexists with one or more official and generally managed exchange rates (see Feldman and Moldován, 2023, for an in-depth analysis of stylized facts of foreign exchange controls with a focus on Argentina).

Nevertheless, it should be noted that the relevant exchange rate to determe income distribution is the official one in principle, because this is the reference value for commercial transactions which, in turn, determine the normal costs of production. However, in a context of chronic foreign exchange scarcity, the financial exchange rate dynamics and the corresponding exchange rate gap between the parallel and official exchange rates exert an indirect, but not less concrete, role by determining the expectations over the future value of the official exchange rate. Particularly relevant is the behaviour of exporters, in their role as foreign currency providers, and that of importers, as foreign currency demanders. Indeed, if the gap is persistent and/or becomes wider, the former may be induced to delay the settlement of exports in the official FX market, while exports bet for a devaluation to materialize. Symmetrically, importers will have incentives to anticipate their import payments in the expectation that their price will be higher in the future. This kind of behaviour can exacerbate the crisis due to a shortage of foreign currency and precipitate, like a *self-fulfilling prophecy*, a devaluation of the official dollar[6,7]. Figure 6 plots the dynamics of the official and financial exchange rates, using the implicit parity of the most representative securities traded in the domestic capital market (known as "CCL" ER) to measure the latter. The two sub-periods with a relevant ER gap are easily identified. The first one goes from 2011 to 2015, with an average gap of around 34%, which ended up in the devaluation of the official exchange rate in December 2015. The second one covers the 2019-2023 period. The average gap during these years is considerably higher, around 77%, with peaks of 136% in July 2022.

[6] See De Lucchi *et al.* (2024) for an analysis of these mechanisms in Argentina during the COVID-19 pandemic.

[7] There is another channel through which the foreign exchange gap can affect prices and distribution, in this case by altering the behaviour of non-tradable sectors, not directly exposed to international competition. When the financial exchange rate increases, these sectors are the first ones to transfer the expected increases in their production costs to prices due to the increase in the cost of imported inputs, even before devaluation takes place. As long as devaluation expectations are maintained, but the devaluation does not materialize, exchange-rate pass through will have the effect of increasing the realized profit rate of the non-tradable sector vis-à-vis that of the non-tradable sectors, and will reduce the real wage (for an analysis of this second mechanism, see Dvoskin *et al.*, 2023).

FIGURE 6 - *Official and Financial Exchange Rates (2011-2022)*



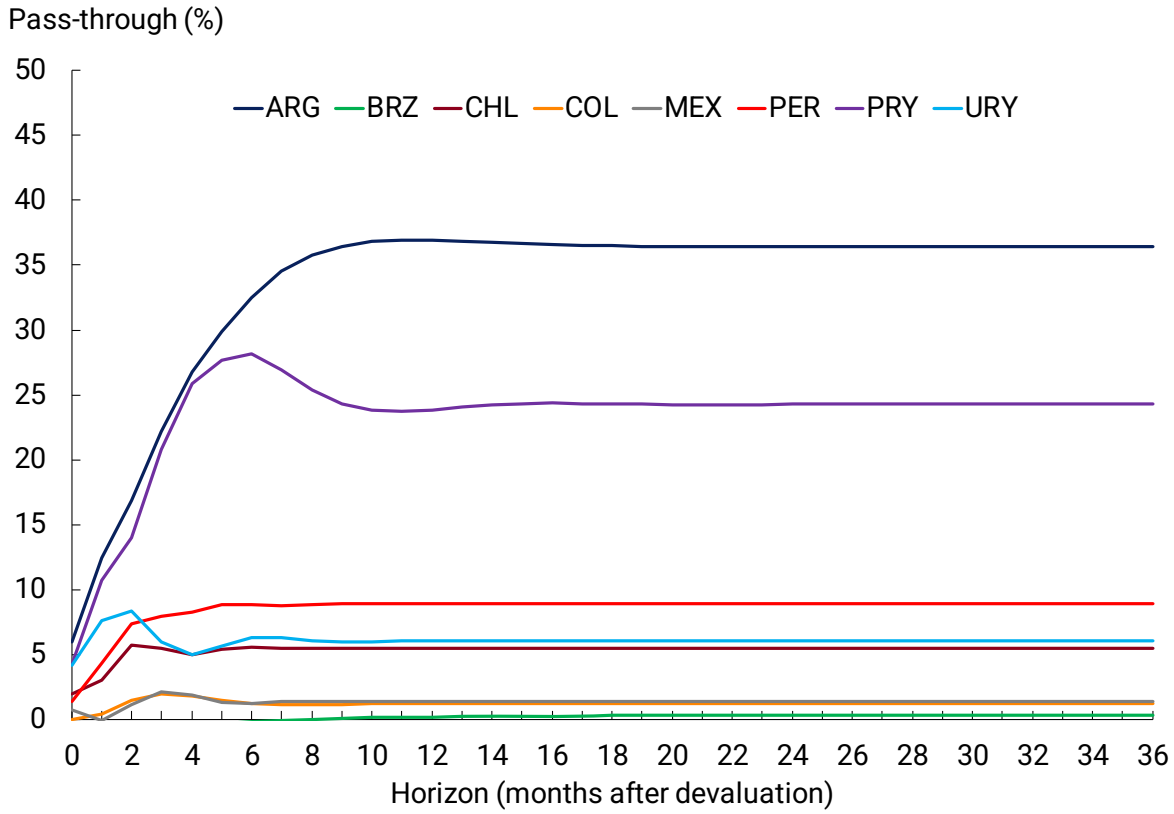
Source: Own elaboration based on BCRA and REUTERS.

2.4. Relation between the Nominal Exchange Rate and Money Wages as a Specific Manifestation of Distributive Conflict in Argentina

In the previous sections, we have identified four channels through which, directly or indirectly, the exchange rate positively affects domestic prices (and profitability) in Argentina and, therefore, reduces real wages. Hence, the exchange rate is a *key* variable to understanding the specific way in which conflict over income distribution is resolved; that is, as a spiral between the nominal exchange rate and money wages, which will have a greater intensity, *ceteris paribus*, the greater power of workers. This long tradition of strong trade unions is an aspect that distinguishes our country from the rest of the region (Trajtemberg *et al.*, 2015; García-Cicco *et al.*, 2023). Thus, if the imbalance in the domestic productive structure explains the initial positive effect of the exchange rate on money prices, its high degree of unionisation helps to

understand the relevance of second-round effects which, in turn, ends up explaining the comparatively high pass-through of the exchange rate to money prices in Argentina relative to the rest of the countries in the region.

FIGURE 7 - *Exchange Rate Pass-Through in Latin America*



Source: Own elaboration based on INDEC and BCRA.

It is not surprising, then, that inflation expectations are fundamentally anchored in exchange rate expectations[8].

[8] It is worth noting that the emphasis put on the main text on exchange rate shocks as one of the drivers of inflation acceleration in Argentina does not mean that there are no other shocks, not related to the exchange rate, such as the increase in international food prices and energy, as occurred recently in the context of the war in Ukraine, or the international price of imported inputs and capital goods, which also impact on the growth rate of money prices. It is also necessary to stress that understanding the nature of inflationary shocks is only part of the story. It must also be understood why inflation in Argentina exhibits such levels of persistence. In other words, what is known as "inflationary inertia". This last concept refers to the formal and informal mechanisms for adjusting nominal contracts to past inflation that prevent inflation from falling (or not falling fast enough), even when the shock that generated the inflationary acceleration has disappeared. Behind these mechanisms (which, in general, are not complete), the

In conclusion, both the current and financial accounts of the balance of payments tend to move in the same direction in times of output expansion, precipitating external imbalances and exchange rate adjustments, with regressive effects on income distribution during the period under analysis in view of the imbalance in the domestic productive structure and the dollarization of portfolios.

3. A SIMPLE MODEL TO STUDY THE DISTRIBUTIVE EFFECTS OF DEPRECIATIONS

The present section aims to formalize the different channels through which the exchange rate affects income distribution by means of a simple model that captures the aforementioned distinctive features of Argentina (a price-taker country with structural heterogeneity and financial dollarization under foreign exchange controls).

Consider a two-sector, small – price-taker – open economy with persistent unemployment. Sector T produces a tradable commodity (commodity T), a primary product that is exported ("corn"), while sector N produces an item of non-tradable consumer goods[9] (commodity N). Commodity N can be also thought as an item of industrial goods that must be protected from international competition because it is produced with backward methods of production.

To simplify the exposition, commodity T is produced by labour alone, while commodity N is produced by labour and an imported input (M), which *cannot* be domestically produced at any level of the exchange rate, to highlight the phenomenon of technical dependency. The methods of production are:

$$l_t \rightarrow T$$
$$l_n * m \rightarrow N$$

Under free competition, the price of a commodity must eventually cover its average cost of production, which includes the normal rate of profit on capital invested (r). If we assume money

attempts of the different social classes appear once again to protect themselves from the negative redistributive effects of inflation. The price-wage spiral is the mechanism on which the literature has focused the most and shows, once again, the resistance of the working class to the fall in real wages generated by the initial increase in the general level of prices, and the subsequent increase in prices by capitalists not to see their normal profitability reduced, once nominal wages have increased. These aspects of inflationary dynamics will not be analysed in this paper, which focuses exclusively on the distributional effects of exchange rate depreciations.

[9] We could have assumed that commodity N is also an input of sector T, as in Dvoskin and Feldman (2022). Since the aim of this work is to study the distributive implication of exchange rate depreciations, the simplifying assumption that N is only an item of consumer goods, would not alter the main results.

wages (w) are paid *ante factum*, the prices of T (p_T) and N (p_N) are:

$$p_T = wl_t(1 + r) \tag{1}$$

$$p_N = (wl_n + mp_M)(1 + r) \tag{2}$$

where p_M is the domestic price of the imported input. Since the economy is "small," the price of the tradable goods, T and M, must equal their internationally given price p_j^* $j = T, M$ expressed in domestic currency:

$$p_T = Ep_T^* \tag{3}$$

$$p_M = Ep_M^* \tag{4}$$

Where E is the exchange rate (the quantity of domestic currency needed to buy one unit of foreign currency)[10].

It is useful to define variable $e \equiv E/W$, i.e., the inverse of money wages in foreign currency. For given money wages, a depreciation of the currency is equivalent to a rise in e. From conditions (1) and (3) one can derive the following condition:

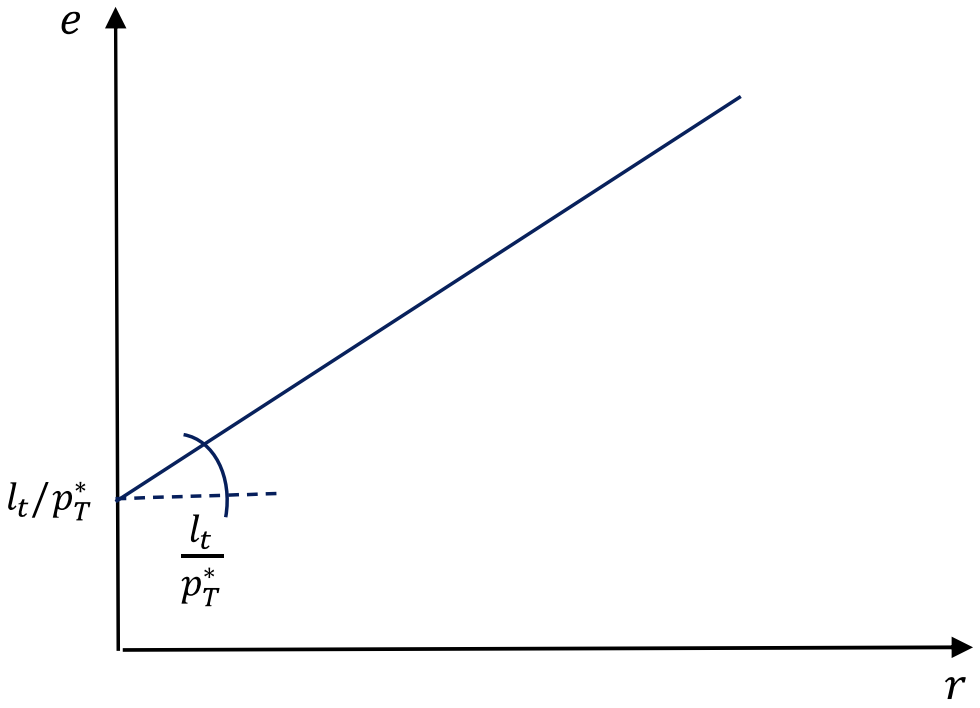
$$e = \frac{l_T}{p_T^*}(1 + r) \tag{5}$$

Condition (5) shows, for each level of e, the maximum profit rate that can be afforded by sector T (or the maximum wage in foreign currency that can be paid by sector T for a given profit rate). Note that a higher profit rate than this maximum is not affordable by sector T for a given level of money wages in foreign currency, since this would violate condition (3). The $e - r$ relationship is *positive* (and also linear, under the current conditions of production assumed[11]). As further discussed in section 3.1, the curve could be interpreted as *a wage curve* for the small open economy under study.

[10] If one thinks of commodity N as a tradable commodity, we will have $p_N > Ep_N^*$, that is why the sector should be protected against foreign competition, otherwise commodity N will not be produced.

[11] Under more general conditions of production, the relationship will still be positive but not necessarily linear. It could be concave due to the existence of a maximum rate of profit that sector T can afford (see Dvoskin and Feldman, 2022).

FIGURE 8 - *The $e - r$ Curve*



Let us suppose e rises. The first effect is a rise in the tradeable sector profit rate. This is because, on impact, the selling price of T increases by the exact magnitude of devaluation, while costs of production do not change[12], i.e., $Ep_T^* > p_T$. Yet, competition will soon start exerting its effects, and condition (3) must therefore be restored. For given technical coefficients and money wages, r must, accordingly, rise.

Moreover, over sufficient time, competition will also raise the profit rate in sector N[13]. At this point, two things are worth mentioning. First, the rates of profits of sectors N and T do not need to be strictly uniform. For the mechanism to work, the existence of some connection between them is enough. Second, note that commodity N can raise its selling price, p_N, to accommodate

[12] Had we assumed commodity T is produced by labour and imported inputs – or by an item of non-tradable goods that employs imported inputs – production costs would rise only by the weight of imported inputs in the costs of the production of T, which is less than the magnitude of devaluation if labour were employed in production.
[13] As we shall see below (section 3.2.), this is a first channel through which depreciation increases money prices and decreases the real wage in a small open economy.

the rise in r because it is not directly exposed to international competition – unlike commodity T, whose selling price is strictly determined once e and p_T^* are known.

If, for the sake of argument, one refers to r_T and r_N as the rates of return on capital invested in sectors T and N, respectively, the sequence of events after devaluation can be summarized as follows:

$$\uparrow e \rightarrow \uparrow p_T \rightarrow \uparrow r_T \rightarrow \uparrow r_N \rightarrow \uparrow p_N$$

This means that, for given money wages, the real wage should fall in terms of any commodity, as we further discuss below.

3.1. Real Wage

To analyse the different effects of devaluation on the real wage, first consider the wage bundle $(\delta_T; \delta_N)$, whose price (p_ω) is given by:

$$p_\omega = \delta_T p_T + \delta_N p_N \tag{6}$$

Then, the real wage is given by:

$$\omega = w/p_\omega \tag{7}$$

If we insert (2) and (4) in (6) and differentiate with respect to e, we obtain:

$$\frac{dp_\omega}{de} = \delta_T p_T^* + (\delta_N k p_k^*)(1 + r) + \delta_N (l_N + ekp_k^*)\frac{dr}{de} > 0 \tag{8}$$

The three terms of (8) are positive, which means that:

$$\frac{d\omega}{de} < 0 \tag{9}$$

The three terms on the right-hand side of (8) summarize the main three aforementioned mechanisms (see section 2.1.) through which a depreciation of the official exchange rate increases the price of the wage bundle and, therefore, *decreases* the real wage. The first one is the direct effect of e on p_T. Since Argentina exports tradable wage goods whose prices are

internationally given, a depreciation increases their domestic price (p_T) and decreases the real wage. The second one is the effect of e on N through the price of imported inputs. In view of the fact that Argentina's input-output matrix is incomplete, devaluation increases the production costs of those commodities that need imported inputs to be produced. Finally, the third term shows the previously mentioned indirect (usually neglected) effect on commodity N of a rise in sector T profit rate, through the action of competition.

Notice that, to the extent that money wages do not react in the same proportion to devaluation (we have assumed given money wages), the nominal exchange rate will increase in terms of the wage bundle, i.e., the *real exchange rate* ($\epsilon = E/p\omega$) *will rise*.

A last remark is worth making. The fact that, on the one hand, the rise in e increases the profit rate, r, and the real exchange rate, ϵ, and, on the other hand, it decreases the real wage, ω, implies that the $e - r$ curve presented above can be interpreted as a *wage curve* for the small open economy.

3.2. The External Constraint

3.2.1. Real (and Distributive) Constraints

We finally incorporate into the model the real and financial manifestations of the external constraint. To formalize the real constraint, while the current account (CA) – assumed to coincide with the trade balance – can be persistently positive (in principle, there is no limit to the amount of FX that the Central Bank can accumulate), it *cannot be persistently negative*. Even if foreign investors are willing to finance the trade deficit, they will not do it indefinitely (Lavoie, 2014).

$$CA = X(Y^*) - M(Y(\omega(e), Z)) \geq 0 \qquad \text{[RC]}$$

The export (X) and import (M) functions of RC exhibit some of the structural features of the Argentine economy documented in section 2. Given their low real exchange rate elasticity, exports are expected to depend only on the income of foreign countries (Y^*) , whereas imports only depend on domestic income (Y) – as they have a low-price elasticity, as well. In turn, income is a function of the real wage and of the autonomous components of aggregate demand, Z. Let us remember that the real wage ω is a *negative monotonic* function of e. Then, setting [RC] equal to

zero, one can derive the *maximum* level of the real wage, ω^M – the *minimum* level of the exchange rate to money wage ratio, e^m. Namely, this is the level of the real wage that ensures equilibrium in the trade balance. It should be noticed, however, that ω^M is not independent from the level of autonomous components of aggregate demand, Z. In other words, a rise in Z may imply a lower ω^M[14], considering its positive effect on imports.

On the same footing, the moment the consumption bundle is composed by tradable necessary goods, there is also a maximum level of e, e^M, or a minimum real wage, ω^m, that the average worker can tolerate. To see this, suppose that δ_{T_m} is the minimum quantity of commodity T that workers must consume to satisfy their physiological needs. Then, $E^M = \frac{W}{p_T^* \delta_{T_m}}$ is the level of the nominal exchange rate that allows workers to afford this consumption basket. So, $e^M = \frac{1}{p_T^* \, \delta_{T_m}}$ is the maximum level of the exchange rate the economy can tolerate. The real and distributive constraints can be represented in the $e - r$ space by the following condition:

$$e \in [e^m \, ; e^M \,] \qquad \text{[RDC]}$$

3.2.2. The Financial Constraint

Consider now the financial restrictions faced by the economy. We assume a given level and composition of output, namely, a period not considerably long. The underlying claim is that capital inflows – if duly managed by macro-prudential regulations – can be sustained, while outflows cannot. Of course, if these inflows increase the magnitude of the debt in foreign currency *pari passu*, they will not be sustainable in the long-run, unless they are sufficiently backed by a rise of exports (on the conditions that ensure the sustainability of the debt in foreign currency in the long-run, see Dvoskin and Torchinsky Landau, 2023). However, over shorter periods of time, outflows are much more dangerous to the extent that they create an immediate pressure in the FX market, and may force a currency devaluation, with the negative distributive effects discussed above. To formalize this idea in a relatively simple manner, we consider the following condition [FC]:

[14] One could therefore derive a curve, negatively sloped, that shows different combinations of ω and Z that ensure trade balance (see Dvoskin and Feldman, 2018a).

$$r \geq r^* + \delta^e_{exp} \qquad \text{[FC]}$$

The restraint [FC] highlights that a *necessary, yet no sufficient* (find further reading on this below), condition to avoid capital outflows is that the domestic interest rate – which for simplicity is assumed to be equal to the domestic profit rate[15] – is greater than or equal to the international one, r^*, adjusted by devaluation expectations, δ^e_{exp}. When [FC] is binding, the opportunity cost of capital rises and, therefore, capitalists find it more profitable to invest abroad (therefore their demand for foreign currency increases) rather than to allocate their own funds in domestic assets with a net return equal to r^* (for simplicity, we are assuming that there is not a risk premium between both assets). If we consider the asymmetry between capital inflows and outflows in terms of their effects in the economy, the reason why the condition holds as a restriction and not as an equilibrium condition should be clear: while a positive net differential between domestic and foreign assets (net of devaluation expectations) is sustainable if the monetary authority is committed to buying foreign reserves to avoid the appreciation of the exchange rate, a negative differential is not, at least over some time. The reason for this is that, as in the real constraint, the defence of the parity is limited by the amount of available international reserves[16].

Two remarks are worth making at this juncture. First, the reason why [FC] is only necessary, but not sufficient, to avoid capital outflows in a small open peripheral economy like Argentina has to do with the aforementioned history of recurrent devaluations and high inflation, which gradually consolidated a demand for foreign currency. This leads to a particular case of capital outflows that can be considered "structural", i.e., relatively inelastic with respect to the interest rate differential. This means that, at least in the medium term, one should observe portfolio dollarization even when condition FC is fulfilled[17].

[15] That is, we are assuming that the objective elements of "risks and trouble" of investing in the different sectors are equal to zero (on the different elements that conform the rate of profits, see Panico, 1988, and Pivetti, 1991) .

[16] Clearly, the fact that capital inflows can be neutralized by the actions of the monetary authority through the accumulation of international reserves is not equivalent to asserting that any capital inflow attracted by a high return differential is sustainable. If these inflows are intended to realize very short-term profits, for example, and their entry is not accompanied by adequate regulations, their counterpart will be, in the near future, the outflow of capital itself and a potential currency run. This was precisely what happened during 2016 and 2017, when not only the inflow of short-term capital was encouraged, but also all existing regulatory measures were eliminated which, among others, had the objective of managing an eventual orderly exit of capitals. For a detailed analysis on these regulatory measures and their dismantling during 2016 and 2107, see Feldman and Formento (2019) .

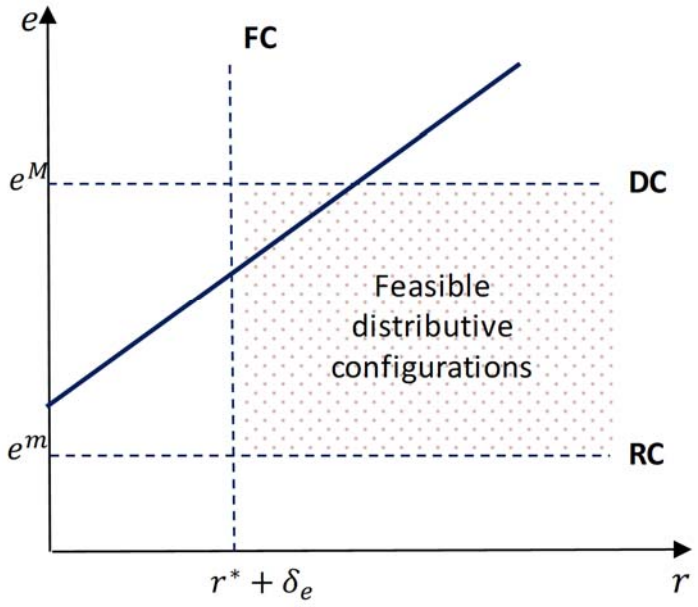
[17] We could think that domestic and foreign assets are *imperfect substitutes* for domestic investors. This implies that relative returns are not enough to explain the demand for the different assets. In this case, even if domestic assets are more attractive than foreign ones, a demand for foreign assets will persist (Lavoie, 2014, chapter 7).

Regarding the second remark, undoubtedly, since FC depends on the *expectation* about the future value of the spot exchange rate, it may be affected by all those factors that, at a given time, also affect those expectations (political events, etc.). They are, by their own nature, subject to a high degree of *indeterminacy*. It is reasonable to assume that, over time, these expectations will be conditioned by more *structural* factors (e.g. the capacity of the economy to generate foreign currency through exports) and that they will endogenously adjust to actual experience. However, in the short or very short runs—precisely due to the variety of factors that may affect them—, the economy may abruptly shift from a sustainable to an unsustainable situation (that is, a violation of the financial constraints). However, under foreign exchange controls and parallel exchange rates (f), it is possible to conjecture that devaluation expectations, δ^e_{exp}, are at least partly influenced by the exchange rate gap, $gap = f - e$. Hence, we can postulate the following condition that relates financial and official exchange rates:

$$\delta^e_{exp} = h(gap) \tag{10}$$

With $\frac{dh}{d(gap)} > 0$. We will explore this connection in section 4 below since it gives us the fourth aforementioned channel through which the exchange rate can affect income distribution. As mentioned above, a persistent and increasing gap may create the expectation of a future devaluation that may have the effect of reducing the supply of FX in the official market and force a devaluation of the currency. The different restraints faced by the peripheral economy are plotted in Figure 10.

FIGURE 10 - *The Different Constraints in the Small Open Economy*



4. EMPIRICAL ANALYSIS

The model presented in the previous section shows that, in a small open economy, distributive conflict is expressed in terms of a negative relationship between the nominal exchange rate and money wages, or between the real exchange rate and real wages. In this section, we estimate a VECM to test, as a first hypothesis, this negative long-run relationship. However, the classically inspired theoretical model is, in principle, compatible with different distributive closures[18].

In this sense, the second hypothesis to be tested in the context of the VECM is that, over long periods of time, the nominal exchange rate is the exogenous – or weakly exogenous – variable in the determination of income distribution. In other words, it is the variable that can be explained without the need to refer to previous changes in the relationship between the level of money wages and money prices. This hypothesis is in line with the idea that balance of payments crises, caused when the external constraint is binding, tend to induce exchange rate adjustments in Argentina, which endogenously generate the response of money wages and money prices afterwards.

[18] For the different closures, see Dvoskin and Feldman (2018b, 2018c).

Although the presence of a parallel exchange rate does not directly alter the role played by the official exchange rate in normal income distribution, such presence does alter it indirectly. That occurs by increasing devaluation expectations, reducing the net supply of foreign currency in the official market, and validating those expectations. Thus, the third and last hypothesis to be tested in the VECM is that the parallel exchange rate Granger-causes, or temporarily anticipates, the official exchange rate.

4.1. Vector Error Correction Model

The long-run or cointegration analysis allows finding relationships that tend to move the joint behaviour of the variables, on average, over long periods. The analysis was performed using the Johansen-Juselius approach. Estimation and testing of VECM can be seen as a general framework within which one can characterize economic behaviour in terms of both the long and the short runs.

In order to build an empirical model, one must previously select the exogenous and endogenous variables. However, in the VECM context, all the variables are considered endogenous until one tests the weak exogeneity of each of them. Basically, the concept of weak exogeneity allows modelling a group of variables (the endogenous ones) without necessarily specifying how the second group of variables (the exogenous ones) is determined. The VECM allows testing weak exogeneity, evaluating which of the system variables respond to the long-run disequilibrium (Johansen, 1992; Urbain, 1992; Juselius, 2006; Engle *et al.*, 1983). Following the Johansen-Juselius approach, the estimation began with an unrestricted system for the 2004-2022 period. For a multivariate setting, the Johansen-Juselius methodology considers the following equation:

$$X_t = \Pi_1 X_{t-1} + \ldots + \Pi_k X_{t-k} + \varepsilon_t \tag{11}$$

where X_t $(\in R^{px1})$ is a sequence of random vectors with components $(X_{1t}, X_{2t}, \ldots, X_{pt})$ and the innovations to this process are drawn from a Gaussian distribution, and Π_i $i = 1, .. k$ $(\in R^{pxp})$ is a matrix of constants. Johansen and Juselius suggest writing the previous equation in the equivalent form:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \cdots + \Gamma_{k-1} \Delta X_{t-k+1} - \Pi X_{t-k} + \epsilon_t \tag{12}$$

where $\Gamma_i = -I + \Pi_1 + \cdots + \Pi_i$ $(i = 1, \ldots k)$ $(\Gamma_i \in R^{pxp})$ and $\Pi = I - \Pi_1 - \cdots - \Pi_k$ $(\Pi \in R^{pxp})$.

In (12), the only difference with a standard first-difference version of a vector autoregressive model (VAR) is the term ΠX_{t-k}. Π is a matrix that incorporates all the information about the long-run relationship among the X_t variables. The interesting case appears when the rank of $\Pi = r$ is greater than zero, but smaller than p. In this case, there are r cointegrating relations among the elements of X_t. And Π' can be written as $\alpha\beta'$, where β' $(\in R^{rXp})$ is the matrix of cointegrating vectors and α $(\in R^{pxr})$ is a matrix of error correction parameters. That is, the α coefficients represent the response of each variable to the deviations of the long-run relationship.

4.2. Results

Our system included Core CPI (p_W), Nominal Wages (w), Nominal Exchange Rate (E), a new External Price Index (EPI) developed by Dogliolo *et al.* (2023) that captures the influence of imported inputs and capital goods in domestic prices[19], and an Agricultural Commodity Prices Index (API)[20].

4.2.1. First Hypothesis: Cointegration

The result[21] of this estimation indicates that there is only one cointegration relationship, $r = 1$:

$$p_\omega = 0.8w + 0.2E + 0.02EPI + 0.01API \tag{13}$$

All the variables are statistically significant in the long run. There is a positive relationship between External prices (both EPI and API) and domestic prices, but their influence is small. This is why the hypothesis stating that coefficients sum to one cannot be rejected at 1% of significance: 80% of the evolution of domestic prices is associated with the evolution of money

[19] The index presented in Dogliolo, Dvoskin and Garegnani (2023) follows the methodology developed by Morlin (2022). The External Price Index is a weighted average of the Producer Price indexes of Argentina's trading partners. The index captures the shocks in the external costs of inputs and capital goods on domestic inflation.

[20] Domestic price index is the Core Consumer Price Index (INDEC), wages are the average remuneration of registered workers in the private sector (Argentine Ministry of Labour, Employment and Social Security), the exchange rate is the Foreign Exchange Rate (ARS/USD) Communication A 3500 (BCRA), the External Price Index (BCRA) was described in the previous footnote and the Agricultural Commodity Prices Index (BCRA) tracks the prices of Argentina's main agricultural commodity exports.

[21] After considering the extraordinary events over the sample period with dummy variables, the information criteria tests suggest 2 lags for the model, and the system passes the usual diagnostic tests (see Appendix for details on the econometric estimation).

wages, while 20% depends on the exchange rate. The fact that the coefficients sum to one is a sufficient condition to interpret this long-run relationship as a negative relationship between the real wage (ω) and the real exchange rate (e -or ϵ). That is, during the period under analysis, persistent real depreciations have been associated with lower real wage levels on average, and vice versa. This finding validates the first hypothesis.

4.2.2. Second Hypothesis: Weak Exogeneity

The Johansen-Juselius approach also provides a framework in which alternative hypotheses about elements of matrices α and β can be tested. Tests of α include the weak exogeneity test stating that the several speeds of adjustment, α_i, are equal to zero. To test these hypotheses, one compares a model incorporating the test restriction to an unrestricted model. The relevant likelihood-ratio-test statistic is:

$$(-2)\ln(Q) = -T\sum_{1}^{r}\ln\{(1-\hat{\lambda}_i^*)/(1-\hat{\lambda}_i)\} \tag{14}$$

where $\hat{\lambda}_i^*$ and $\hat{\lambda}_i$ are, respectively, the r largest eigenvalues when the restrictions are imposed and under no restrictions. The test statistic is distributed as χ^2 with $r(p-s)$ degrees of freedom.

The results of the exogeneity tests are reported in Table 1. As it can be observed, the hypotheses that domestic prices and money wages do not respond to long-run disequilibria are both rejected, but the ones about the response of the nominal exchange rate and external prices (both capital goods and commodities) are not.

Therefore, these tests show that p_W and w behave as the endogenous variables in the VECM, while E, EPI and API are the weakly exogenous ones. This means that the second hypothesis is also confirmed: over the 2004-2022 period, the nominal exchange rate is a variable that can be explained without the need to refer to previous changes in the relationship between the level of money wages and money prices.

TABLE 1 - *Weak Exogeneity Tests*

Variable	P-value
p_w	[0.0001]**
w	[0.0003]**
E	[0.2891]
EPI	[0.5748]
API	[0.8498]

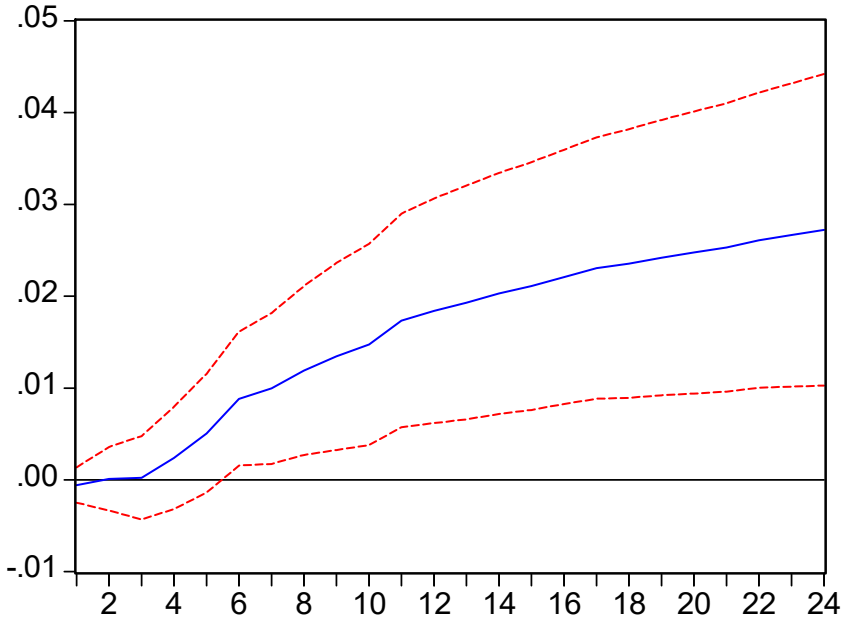
Note: ** significance at 1%

4.2.3. Third Hypothesis: Granger Causality

A great advantage of this approach is the invariance of the cointegration property to the extension of the information set (see Juselius, 2006). This means that cointegration results will remain valid if more variables are added to the system. With this in mind, an additional variable can be incorporated into the system to account for the short-run dynamics: the gap between the parallel and official exchange rates (*gap*). This variable allows us to test the third and last hypothesis: the parallel exchange rate Granger-causes, or temporarily anticipates, the official exchange rate. The hypothesis was conducted by analysing the impulse-response function of E to a positive shock in *gap*, and testing the Granger-causality of this *gap* to E.

The graph shows a positive and significant (from the 6th month) accumulated response of E to a positive shock in *gap*. Also, the Granger-causality test allows us to reject the hypothesis of temporarily non-anticipation of the exchange rate gap to E (the p-value is 0.0038), which means that the parallel exchange rate Granger-causes, or temporarily anticipates, the official exchange rate.

FIGURE 10 - *Accumulated Response of E to Gap*



5. CONCLUSIONS

In the present paper we have first studied the different manifestations of the external constraint to growth in Argentina, and their effects on exchange rate dynamics, with their negative consequences on income distribution and economic activity. Then, we developed a model inspired by the classical tradition, which allowed us to show how these dynamics negatively affect the real wage through, at least, four different channels: first, the rise of tradable goods prices that are part of the wage basket; second, through the production costs rise of imported inputs; third, by virtue of competition, higher profitability in the tradable sector impacts on the money prices of non-tradable goods and services; last, the financial exchange rate eventually affects the official exchange rate. We finally presented a vector error correction model to test three main hypotheses derived from the theoretical model during the 2004-2022 period. In particular, we have shown: a) the long-run negative relationship between the real exchange rate and real wages; b) the autonomous – or weakly exogenous – role played by the nominal exchange rate in the determination of income distribution; and finally, c) the influence that, in the short-run, the financial exchange rates exert on the official exchange rate.

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APPENDIX

This appendix shows tables with details of the econometric estimation.

TABLE A.1. - *Unit-Root Tests*

Variable	ADF
p_w	1,169
w	0,642
E	-0,808
EPI	-2,447
API	-1,932

A constant and a trend are included for the variables; otherwise, only a constant is considered. The null hypothesis of unit-root is not rejected at 1%, 5% and 10% of significance for the five variables.

TABLE A.2. - *Specification Tests*

Specification Tests	
Autocorrelation	0.9546 [0.6394]
Normality	3.6459 [0.1616]
Heteroskedasticity	0.8585 [0.9555]

Notes: p-values are reported in brackets.

Table A.2. shows the specification test for the unrestricted system. The optimal lag order is 2. The system passes the usual diagnostic tests.

TABLE A.3. - *Cointegration Test*

H_0:rank<=	Tests
0	116.71 [0.000]**
1	59.298 [0.113]
2	26.659 [0.703]
3	10.565 [0.893]
4	4.4160 [0.684]

Note: ** significance at 1%.

The test for cointegration supports r=1 for the system.