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Inflation targeting, disinflation, and debt traps in Argentina

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This paper highlights the role of external indebtedness and the presence of inflationary inertia in order to assess the effectiveness and sustainability of inflation targeting during disinflation episodes. As the recent Argentinian experience illustrates, a sluggish inflation rate and a significant current-account deficit may make the stabilization process difficult. To illustrate the point, we build a model that shows that, when inflation adjusts fast, the target may be achieved without building too much external debt. But if inflation adjusts slowly, an excessive build-up of external debt could lead to an increase in the risk premium, a sudden shortage of foreign exchange, and the eventual collapse of the inflation-targeting regime.

Keywords: *inflation targeting, debt traps, chronic inflation, lack of credibility*

JEL codes: *E31, E52, E58*

1 INTRODUCTION

This paper is motivated by the recent stabilization attempt implemented in Argentina. At the end of 2015, the authorities switched to a more flexible exchange-rate regime, and later adopted inflation targeting (henceforth, IT).[1] During the first two years the performance was disappointing: inflation remained high, and a large and growing current-account deficit emerged. There were increasing concerns regarding the sustainability of IT in the near future, mainly due to the growth rate of foreign debt. Finally, during 2018, while we were writing the first drafts of this manuscript, IT was abandoned and Argentina reached an agreement with the IMF, adopting a more traditional stabilization policy that involved a monetary and fiscal adjustment (although without fixing the exchange rate).

This unsatisfactory state of affairs contrasts with the shared perceptions among the profession about the virtues of IT as a policy framework. Indeed, the empirical records of IT do not look bad. In most cases inflation has remained low, without any significant cost in terms of growth. Some countries experienced hard times fighting inflationary shocks, and occasionally central banks have resorted to changing the official target

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1. The formal beginning of inflation targeting was in September 2016.

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(for example, Brazil during 2002–2003), but almost no country has ever abandoned IT.[2] The implementation of IT in Argentina is an interesting case study: it seems to be the first episode where a monetary policy based on IT (and without any significant exchange-rate anchor) is used to reduce inflation from annual inflation levels higher than 20 percent.[3]

Argentina is well-known for its historically high rates of inflation. However, during the 1990s inflation reached low single digits, though from 2008 onwards, the country has faced stable and moderate rates of inflation (around 20–25 percentage points on average). Also, before (and during) the adoption of IT, the new authorities implemented a series of adjustments of regulated prices (transport and utilities), and a devaluation of 40 percent after the elimination of capital controls. When inflation is moderate or high, typically the rate of inflation exhibits some inertia due to the presence of formal and informal indexation schemes,[4] and consequently these abrupt adjustments of relative prices are associated with an acceleration of the rate of inflation.

The opening of the capital account was another critical ingredient in the stabilization attempt. The removal of capital controls allowed a large inflow of capital that financed a growing and significant current-account deficit of about 4–5 percent of gross domestic product (GDP). Because disinflation has been slow, the dynamics of the current account were a crucial factor defining the sustainability of IT in Argentina.

In a nutshell, the authorities have been struggling with a sluggish rate of inflation (and inflation expectations), frequent and large cost shocks due to the adjustment of public sector prices and the volatility of the nominal exchange rate, and an increasing level of foreign indebtedness. When we started writing this paper, we were motivated by the following questions: Will IT reduce inflation before investors stop lending and global liquidity disappears? Or will a debt crisis emerge while inflation remains well outside the comfort zone? During 2018, Argentina experienced a sudden stop in capital flows, IT was abandoned, and a new agreement with the IMF was established.

The goal of this paper is to shed light on the conditions determining whether IT is more likely to succeed as a disinflationary strategy. This is a relatively unexplored question (with the exception of Calvo 2017), as most countries adopted IT when inflation was already low (see Roger 2009). Our main contribution is to analyse the problems associated with stabilization using IT regimes in the presence of imperfect international capital markets and inertial inflation. Specifically, we argue that slow adjustment of inflation, combined with a fast build-up of external debt, casts doubt on the sustainability of IT in the long run.

Towards that end, this paper is organized in the following way. After this introduction, Section 2 presents a brief review of the literature on chronic inflation, stabilization plans, and IT. Section 3 characterizes the main stylized facts of disinflation episodes using an IT regime and we briefly discuss the Argentinian context. Section 4 presents a simple model to provide insights into the sustainability of disinflation through IT and foreign indebtedness when financial capital markets are imperfect and inflation displays inertia. Finally, we conclude in Section 5.

2. The sole exceptions, before Argentina failed, were Spain and the Slovak Republic, which adopted the euro in 1999 and 2008 respectively, and according to Cobham's (2018) *de facto* classification, Turkey in 2014.
3. Other experiences, such as Chile and Colombia, informally adopted IT, but their exchange-rate policies were based on exchange-rate bands systems.
4. For different discussions about inertia, see Pazos (1972), Frenkel (1983; 1986), Arida/Lara-Resende (1985), and Heymann/Leijonhufvud (1995).

2 LITERATURE REVIEW

This section comments briefly on the main issues and the related contributions. The role of IT as a stabilization policy remains relatively unexplored, most likely because there are few case studies where inflation was stopped by using the nominal interest rate as the main tool, especially in less developed economies: other than the 'Volcker shock' during the late 1970s, it is hard to find a successful disinflation policy based mainly on an aggressive increase in the interest rate. This section provides some hints to explain why.

The literature distinguishes between varieties of inflationary regimes. So-called 'moderate' and 'high' inflations are usually more resilient and stable than 'hyperinflations'; hence most authors include them under the rubric of 'chronic inflations.' However, some authors distinguish between 'moderate' (roughly 15–30 percent annual rates) and 'high' inflation (above 30 percent, but not 'hyperinflation'), as we will discuss below.

The literature has claimed that a moderate or high rate of inflation induces the introduction of explicit or implicit indexation of contracts to past inflation. This is probably because the adaptation to inflation through formal or informal indexation moderates the rise of transaction costs avoiding periodical renegotiations. As long as inflation remains moderate or high, price settings will remain non-synchronized and the rate of inflation will probably display a stable and inertial behavior (Dornbusch/Fischer 1993). As long as agents do not fully believe in the ability of central bankers to meet the targeted inflation, they will forecast the future rate of inflation. These computations might be quite costly for them, and agents might prefer to follow simple heuristics, that is, project the past inflation rate in the absence of large shocks. Consequently, IT may fail to anchor expectations. For an extensive review of inflation expectation analysis, see Lima et al. (2014).

Indexation, however, implies a series of undesirable features. The rate of inflation becomes highly dependent on its recent history. Thus, any disruptive event, such as a large depreciation or an increase in the price of food or public utilities may permanently increase the rate of inflation, particularly when contracts have been shortened (see Frenkel 1979; 1983; Dornbusch/Simonsen 1983; 1987; Bruno 1988).[5] Bruno (1993) highlights that in episodes of 'chronic' inflation it is hard to establish a nominal anchor because inflation 'may live a life of its own,' divorced (at least temporarily) from the evolution of the nominal exchange rate or the money supply, showing a high level of inertia and persistence of the inflation rate. In hyperinflations, however, prices usually follow the nominal exchange rate, so there is an open door for a quick stabilization of inflation, most likely by adopting a hard peg (see Heymann/Leijonhufvud 1995).

The main take-home point from this literature is that stabilizing each type of inflation may require different approaches. Most of the time, IT was adopted when inflation was already low or moderate, and in the former case, the policy-makers adopted a cautious approach by adopting a very gradual reduction of inflation and by combining monetary policy with frequent interventions in the foreign-exchange (FX) markets, capital controls, and so on. In fact the literature has distinguished between monetary-based and exchange-rate-based stabilization plans, depending on the instrument which is used as a nominal anchor. 'Interest-based stabilization plans' are really uncommon and are usually not mentioned in studies of stabilization plans.

Kiguel/Liviatan (1992) and Reinhart/Vegh (1994) claim that the most important lessons are that exchange-rate-based plans usually show boom–bust cycles, while

5. Notice that if the duration of contracts becomes very short, the economy can easily move into the hyperinflation terrain. The shorter the duration of contracts, the larger the impact of any shock on the level of inflation (see Taylor 1991: ch. 4).

money-based plans work the other way around. Calvo/Vegh (1994) find that lack of credibility is more disruptive under fixed exchange rates than under floating exchange rates. Calvo/Vegh (1999) favor more flexible exchange-rate regimes because balance-of-payments crises are less likely.[6]

The degree of inertia is closely related to the cost of disinflation. When inflation is closely related to its past level, a large recession may be required to reduce inflation. When this connection is weak, it may be easier to stabilize inflation. Empirical works, for example Ball (1994), have estimated sacrifice ratios in disinflation episodes in moderate-inflation OECD countries. The author finds that this ratio decreases with the velocity of the disinflation ('cold turkey' would be better than 'gradualism') and the degree of labor market flexibility, while the openness of the economy has no effect on the ratio. Income policies and initial level of inflation are unclear. Hofstetter (2008) finds similar results from moderate and low disinflation in a sample of 18 Latin American countries between 1973 and 2000 (38 episodes).

However, most of these research studies about inflation are from before 1990, prior to the beginning of the IT regimes. During recent years IT has become a common approach to the conducting of monetary policy. The main features of IT are: (a) an announcement of a numerical inflation target; (b) a major role in an inflation forecast; and (c) a high degree of transparency and accountability (Svensson 2010). Due to the so-called 'trilemma,' in order to increase the degrees of freedom of monetary policy, the exchange rate should be allowed to float as freely as possible. Usually, a short-term interest rate becomes the main policy tool (see also Bernanke/Mishkin 1997).

Although there is a growing literature on the effects of IT on macroeconomic performance, there is little discussion about the role of IT as a policy to combat chronic inflation, apart from a few interesting exceptions. Following Calvo (2007; 2017), the recent Argentinian experience may be described as an interest-rate-based stabilization plan. The inflation target announced by the central bank plays the role of the nominal anchor. Calvo has shown that, if the target is not credible, IT may fail to produce long-lasting and effective stabilization.

Our paper is also related to the post-Keynesian perspective. Traditionally, post-Keynesians have always been skeptical of any policy mix that attempts to fine-tune the economy by setting a short-term interest rate, including IT. While some authors believe that the best approach is to park the interest rate at a low level, others think that some counter-cyclical adjustment is desirable, provided that other policies are also implemented (see Rochon 2007 for a summary of these two views). In an open-economy set-up, Libman (2018a) emphasizes that, when devaluations are contractionary, a standard Taylor rule does not work, and parking the short-term interest rate may be preferable.

Recent post-Keynesian studies on IT in an open economy have suggested that it is important to keep track of the path of foreign indebtedness (Porcile et al. 2011) and to add an endogenous risk premium (Rocha/Oreiro 2013). Such models are consistent with the evidence that shows that after some threshold level, debt can hurt growth. Pattillo et al. (2002) and Clements et al. (2003) have found that the average effect of debt on growth becomes

6. Calvo/Vegh (1994) also enumerate the stylized facts. Both money-based and exchange-rate-based plans share real appreciation and deterioration of the current account. Additionally, both show a slow convergence of inflation to the rate of devaluation/monetary growth, while interest-rate-based plans show a slow disinflation rate. However, the big difference is with respect to economy activity. A monetary-based stabilization plan usually shows an initial contraction in economy activity while an exchange-rate-based stabilization plan shows an initial increase in real activity followed by a later contraction.

negative at 35–40 percent of GDP. Rocha/Oreiro (2013) developed a toy model and they also found non-linear effects on external debt on growth.[7]

When frictions and imperfections are absent and financial markets are complete, a small open economy can finance any current-account deficit as needed. However, real-world financial markets are far from perfect and both the level of the current-account deficit and external debt matter. Céspedes et al. (2003) offer a plausible formalization using a standard IS–LM–BP model. They endogenize the premium risk showing that a depreciation of the domestic currency could be expansionary or contractionary, depending on the level of indebtedness.

Other approaches have been followed in the post-Keynesian tradition in order to analyse IT and its interactions in a general framework. Cordero (2008) compares the different effects of adopting a monetary regime based on inflation targeting with respect to a system based on real exchange-rate targeting in the short and long run. Furthermore, Drumond/Porcile (2012) study the short- and long-run implications of adopting IT regimes in small open economies. Their approach is quite similar as ours, despite the fact that our focus is in inflation stabilization and endogenous crisis as a consequence of imperfect capital markets.[8]

Our paper is also related to Vera (2014). He builds a model where the policy authorities are committed to hitting inflation and/or output targets, and also to the achievement of the external equilibrium. His paper concludes that in order to maintain the inflation to target, the monetary authority should rely on higher interest rates and the strong effect of the unemployment channel. Finally, Summa (2016) incorporates an IT regime in a Sraffian supermultiplier model where inflation is assumed to be a cost-push phenomenon and the monetary authority can manage the nominal exchange rate through targeting interest-rate differentials. The author concludes that IT regime adoption is not neutral in terms of long-run growth and functional income distribution.

In short, a quick look at the literature suggests that IT in Argentina faced several challenges. The rate of inflation displays inertial behavior and (as we will discuss shortly) some relative prices are under a process of adjustments, so disinflation will be slow and possibly subject to ups and downs. In the presence of imperfect international capital markets, a growing current-account deficit was proven difficult to sustain. This may cast some doubts on the sustainability of the inflation targets, and possibly of the entire IT regime. To sum up, we will assess how these trade-offs interact under the adoption of an IT regime, when the starting point is a moderate inflation rate with high persistence and capital-market imperfections.

3 STYLIZED FACTS

This section reviews some of the stylized facts about disinflation, IT, and the recent Argentine experience. We discuss the dynamics of inflation, growth, and the current account during the disinflation phase. We show that the level of inflation at which IT is typically adopted is usually much lower than the levels at which Argentina adopted IT. Alternatively, some countries started at similar levels of inflation, but none of them adopted a strict version of IT.

Our first step is to highlight the initial conditions when IT is adopted. Because some countries may adopt IT informally, we draw on Cobham's (2018) *de facto* classification of

7. Our model builds on this evidence of capital market imperfections. In a world of perfect capital mobility and perfect assets, substitutability would not be relevant to take account of country differences of premium risk. See Edwards (1986) for a longer review on the topic.
8. They analyse four monetary regimes: a mixed regime (a combination of inflation target and a target for capacity utilization), a regime that gives priority to external stability, a conservative regime, and a Keynesian regime.

monetary policy regimes (based on IMF Article IV consultations). In Table 1a, we show a complete list of countries which adopted some variety of IT as a monetary framework and the initial inflation at the moment of their adoption. Table 1b shows Cobham's classification. In total we found 34 countries, which, at a given moment in their history, adopted one form of IT or another.

Table 1 (a) Inflation targeting – de facto *classification*

Country/ Group	Years	Regime	Average annual CPI rate			
			t–1	*t*0	*t*–*T*	*T*
Australia	1993–1996	Loose inflation targeting	1%	2%	3%	3%
Australia	1997–2014	Full inflation targeting	3%	0%	3%	3%
Brazil	1999–2000	Loose converging inflation targeting	3%	5%	6%	7%
Brazil	2004–2014	Loose inflation targeting	15%	7%	6%	6%
Canada	1992–2014	Full inflation targeting	6%	2%	2%	2%
Chile*	1991–1999	Loose converging inflation targeting	26%	22%	10%	3%
Chile*	2000–2014	Full inflation targeting	3%	4%	3%	5%
Colombia**	1992–1998	Loose/converging inflation targeting	31%	27%	22%	19%
Colombia**	1999–2014	Full inflation targeting	19%	11%	6%	3%
Czech Rep.	1998–2005	Loose converging inflation targeting	8%	11%	4%	2%
Czech Rep.	2006–2014	Full inflation targeting	2%	3%	2%	0%
Euro area***	1999–2014	Loose inflation targeting	1%	1%	2%	0%
Finland	1993–1996	Full inflation targeting	3%	2%	1%	1%
Finland	1997–1998	Inflation with exchange rate targeting	1%	1%	1%	1%
Hungary	2001–2006	Loose converging inflation targeting	10%	9%	6%	4%
Hungary	2007–2014	Loose inflation targeting	4%	8%	4%	0%
Iceland	2001–2005	Loose inflation targeting	5%	6%	4%	4%
Iceland	2013–2014	Loose inflation targeting	5%	4%	3%	2%
Indonesia	2006–2014	Loose converging inflation targeting	10%	13%	7%	6%
Israel	1992–1994	Exchange rate with inflation targeting	19%	12%	12%	12%
Israel	1995–1996	Inflation with exchange rate targeting	12%	10%	11%	11%
Israel	1997–2003	Loose converging inflation targeting	11%	9%	4%	1%
Israel	2004–2014	Full inflation targeting	1%	–2%	2%	1%
Italy	1995–1996	Monetary plus inflation targeting	4%	5%	5%	4%
Italy	1997–1998	Exchange rate, monetary, inflation targeting	4%	2%	2%	2%
Japan	2006–2012	Loose inflation targeting	–1%	0%	0%	0%
Japan	2013–2014	Full inflation targeting	0%	0%	2%	3%
Mexico	2001–2003	Loose converging inflation targeting	10%	6%	5%	5%
Mexico	2004–2010	Loose inflation targeting	5%	5%	4%	4%
Mexico	2011–2014	Full inflation targeting	4%	3%	4%	4%
New Zealand	1990–2014	Full inflation targeting	6%	6%	2%	1%
Norway	2001–2014	Full inflation targeting	3%	3%	2%	2%
Peru	2002–2014	Full inflation targeting	2%	0%	3%	3%
Philippines	2002–2008	Loose inflation targeting	5%	3%	5%	8%
Philippines	2009–2014	Full inflation targeting	8%	4%	4%	4%
Poland	1998–2003	Loose converging inflation targeting	15%	12%	6%	3%
Poland	2004–2014	Full inflation targeting	3%	4%	3%	0%
Romania	2014	Loose inflation targeting	4%	1%	1%	1%
Romania	2006–2013	Loose converging inflation targeting	9%	7%	6%	4%

(continues opposite)

Table 1 (a) (continued)

Country/ Group	Years	Regime	Average annual CPI rate			
			t–1	t0	t–T	T
Singapore	1986–2014	Loose inflation targeting	1%	–1%	2%	1%
S. Korea	1998–2014	Full inflation targeting	4%	8%	3%	1%
Slovakia	2005–2008	Inflation plus exchange rate targeting	8%	3%	4%	5%
Slovenia	2002–2003	Inflation with exchange rate targeting	8%	8%	7%	6%
Slovenia	2004–2006	Exchange rate with inflation targeting	6%	4%	3%	3%
South Africa	2003–2014	Loose inflation targeting	9%	6%	6%	6%
Spain	1995–1998	Inflation plus exchange rate targeting	5%	5%	3%	2%
Sweden	1993–2014	Full inflation targeting	2%	5%	1%	0%
Switzerland	2000–2010	Loose inflation targeting	1%	2%	1%	1%
Switzerland	2011–2014	Inflation with exchange rate targeting	1%	0%	0%	0%
Thailand	2000–2009	Loose inflation targeting	0%	2%	3%	–1%
Thailand	2010–2014	Full inflation targeting	–1%	3%	3%	2%
Turkey	2003–2013	Loose inflation targeting	47%	26%	10%	8%
UK	1993–1996	Loose inflation targeting	4%	3%	2%	3%
UK	1997–2014	Full inflation targeting	3%	2%	2%	2%
USA	1996–2011	Loose inflation targeting	3%	3%	3%	3%
USA	2012–2014	Full inflation targeting	3%	2%	2%	2%

Note: Highlighted are the countries with moderate inflation when they adopted some kind of IT regime. The darkness of the tints reflects higher initial level of inflation rate. The distinction is between inflation rate levels higher than 15 percent, and inflation rates between 15 and 10 percent.
Sources:
* Consumer price index from Chile was taken from Central Bank web page.
** Colombia does not appear in Cobham (2018)'s classification, however from Chang (2008) we can distinguish two periods.
***Harmonized index.

Table 1 (b) Cobham's monetary frameworks definitions

Code regime	Regime	Target	Description
LIT	Loose inflation targeting	ITs	Narrow stationary targets not well hit or wider targets attained
FIT	Full inflation targeting	ITs	Narrow announced stationary targets typically attained
LCIT	Loose converging inflation targeting	ITs	Converging narrow targets not well hit or wider targets attained
ERwIT	Exchange rate with inflation targeting	MixedTs	Inflation targets and exchange-rate (fixes or) targets, exchange rate dominant
IwERT	Inflation with exchange rate targeting	MixedTs	Inflation targets and exchange-rate (fixes or) targets, inflation dominant
M&IT	Monetary plus inflation targeting	MixedTs	Monetary and inflation targets, primacy unclear
ER&M&IT	Exchange rate, monetary, inflation targeting	MixedTs	Three full targets (or fixes), whichever dominant
I&ERT	Inflation plus exchange rate targeting	MixedTs	Inflation targets and exchange-rate (fixes or) targets, primacy unclear

Several lessons emerge from Table 1a. Despite the fact that most countries adopted IT when their inflation rate was already low, a few cases are similar to Argentina (that is, they adopted IT while trying to reduce the inflation rate significantly). An interesting example is Turkey. This is the only country that adopted IT with an inflation rate above the 30 percent range, averaging 47 percent during the previous year. Turkey converged to an inflation rate of 8 percent in 2013, but following Cobham's classification, IT was then abandoned.

Colombia, Chile, Brazil, Israel, and Poland are also cases where IT was adopted with an average inflation rate above 15 percent. Hungary, Mexico, and Indonesia started with an inflation rate above 10 percent but below 15 percent. These cases provide some insights about the process of disinflation using IT. Tables 2a and 2b show some of the stylized facts, dividing between episodes where the inflation rate at the beginning was above 15 percent (moderate/high inflation), and those where it was between 15 percent and 10 percent (moderate/low inflation). We show the evolution of the real exchange rate, the current account, and economy activity.

The gray-tinted rows are the relevant episodes of disinflation which are delimited by a shift of the monetary frameworks. None of these countries has chosen a full inflation targeting (FIT) regime when they had to reduce inflation starting from high or moderate levels. When the inflation rate was already controlled, they then shifted to a FIT. The speed of disinflation[9] in those cases is around 1 percent per quarter during the first two years, with the exception of Turkey, which reached 4.5 percent per quarter on average.

During the implementation year and the following years the growth rates are usually positive, with very few quarters of negative growth. The only exception is Colombia in 1999, after the shift to FIT, and Israel in 1992. Most of the cases show a real exchange appreciation after the adoption of IT.[10] They also accumulated sizeable current-account deficits. Towards the end of the disinflation period, the current-account deficits were very large in some cases – for instance, about 6.7 percent of GDP in Turkey, 5.2 percent in Colombia, and around 4 percent in Brazil and Israel.

Patterns are less clear when inflation rates start below an annual rate of 15 percent. Inflation deceleration is slower but so is the urgency of disinflation. The performances in terms of growth are at least acceptable and the real exchange rates tend to appreciate in some cases while in others they remain stable at the end of the period. Current accounts are usually in deficit and/or worsen over time in most of these cases.

To summarize, stabilization of moderate or high inflation usually involves the adoption of a less strict IT regime. The episodes feature a slow convergence of the rate of inflation towards low levels. Growth is usually positive and the current account deteriorates.

3.1 Initial conditions in Argentina

We will now briefly consider the case of Argentina. From 2008 to 2015 the average annual inflation rate was around 27 percent. The real exchange rate appreciated continuously from 2009, and capital controls were imposed in October 2011 to prevent capital

9. We follow Ball (1994), who measures the average speed of disinflation as the total change in inflation divided by the time length of the disinflation phase.

10. All of the identified cases, including Colombia and the rest of the sample, are consistent with the contractionary devaluation hypothesis (real exchange appreciation is associated with GDP growth). See García Lázaro/Perrotini (2014) for a detailed analysis of Mexico, Brazil, and Chile; Chang (2008) for Colombia, Brazil, and Chile; Calvo/Mendoza (1999) for Chile; and Morra (2014) for Chile and Colombia.

Table 2 (a) Disinflation from moderate/high inflation using IT regimes. Descriptive variables

Country	Y0	YT	Regime	Average annual CPI rate				Inflation deceleration	
				t–1	t0	t–T avge	T	(t1–t–1)/8	(t–1–T)/q
Turkey	2003	2013	LIT	47%	26%	10%	8%	–4.5%	–0.99%
Colombia	1992	1998	LCIT	31%	27%	22%	19%	–1.0%	–0.49%
Colombia	1999	2014	FIT	19%	11%	6%	3%	–1.2%	–0.26%
Chile	1991	1999	LCIT	26%	22%	10%	3%	–1.3%	–0.71%
Chile	2000	2014	FIT	3%	4%	3%	5%	0.0%	0.02%
Israel	1992	1994	ERwIT	19%	12%	12%	12%	–1.0%	–0.84%
Israel	1995	1996	IwERT	12%	10%	11%	11%	–0.1%	–0.25%
Israel	1997	2003	LCIT	11%	9%	4%	1%	–0.9%	–0.44%
Israel	2004	2014	FIT	1%	–2%	2%	1%	0.1%	–0.01%
Poland	1998	2003	LCIT	15%	12%	6%	3%	–1.0%	–0.60%
Poland	2004	2014	FIT	3%	4%	3%	0%	–0.1%	–0.08%
Brazil	2004	2014	LIT	15%	7%	6%	6%	–1.0%	–0.21%

Country	Y0	YT	GDP growth (constant prices)					REER path					
			t–1	t0	t1	t–T avge	% q neg	t–2	t–1	t0	t+1	t+2	t0–T accum
Turkey	2003	2013	6.2%	5.6%	9.8%	6.0%	10.0%	25.5%	–9.3%	–7.6%	–2.8%	–9.0%	–15.7%
Colombia	1992	1998	2.3%	5.0%	2.4%	3.5%	–	13.8%	0.5%	–0.4%	–7.2%	–17.3%	–27.2%
Colombia	1999	2014	0.6%	–4.2%	4.4%	3.8%	–	–5.6%	6.5%	10.6%	10.3%	3.1%	–0.5%
Chile	1991	1999	3.3%	7.9%	11.2%	6.4%	12.5%	–2.5%	4.4%	–2.2%	–5.3%	–1.9%	–15.2%
Chile	2000	2014	–0.4%	5.4%	3.3%	4.3%	5.4%	1.9%	5.1%	0.8%	10.4%	0.5%	–0.4%
Israel	1992	1994	6.2%	6.8%	3.2%	5.6%	12.5%	2.2%	–1.4%	2.8%	1.3%	–1.1%	1.4%
Israel	1995	1996	6.8%	5.8%	6.0%	5.9%	0.0%	1.3%	–1.1%	–0.9%	–4.6%	–4.5%	–4.8%
Israel	1997	2003	6.0%	4.1%	4.1%	3.1%	20.8%	–0.9%	–4.6%	–4.5%	3.2%	5.0%	18.3%
Israel	2004	2014	–0.1%	1.1%	5.0%	4.2%	2.5%	10.7%	5.5%	6.3%	2.3%	0.3%	–7.4%
Poland	1998	2003	7.0%	5.1%	4.4%	3.2%	10.0%	–7.9%	–3.1%	–6.1%	3.2%	–9.2%	–6.2%
Poland	2004	2014	3.5%	5.2%	3.4%	4.0%	5.0%	4.5%	11.7%	1.0%	–10.3%	–2.1%	–14.5%
Brazil	2004	2014	1.2%	5.7%	3.2%	3.7%	15.0%	–1.5%	7.3%	–4.8%	–17.7%	–10.3%	–32.4%

(continues overleaf)

Table 2 (*a*) (continued)

Country	*Y*0	*YT*	Current account % GDP					
			t–2	*t*–1	*t*0	*t*+1	*t*+2	*T*
Turkey	2003	2013	1.9%	–0.3%	–2.4%	–3.5%	–4.2%	–6.7%
Colombia	1992	1998	1.3%	5.7%	1.8%	–3.8%	–4.5%	–4.9%
Colombia	1999	2014	–5.4%	–4.9%	0.8%	0.8%	–1.1%	–5.2%
Chile	1991	1999	–2.3%	–1.5%	–0.3%	–2.1%	–5.2%	0.1%
Chile	2000	2014	–4.8%	0.1%	–1.2%	–1.5%	–0.8%	–1.7%
Israel	1992	1994	0.3%	–1.9%	–1.2%	–3.3%	–4.0%	–4.0%
Israel	1995	1996	–3.3%	–4.0%	–4.8%	–4.7%	0.0%	–4.7%
Israel	1997	2003	–4.8%	–4.7%	–2.9%	–0.9%	–1.6%	0.5%
Israel	2004	2014	–1.1%	0.5%	1.7%	3.2%	4.5%	3.8%
Poland	1998	2003	–2.0%	–3.6%	–4.0%	–7.4%	–6.0%	–2.5%
Poland	2004	2014	–2.8%	–2.5%	–5.4%	–2.6%	–4.0%	–2.1%
Brazil	2004	2014	–1.5%	0.7%	1.8%	1.6%	1.2%	–4.2%

Sources: Own elaboration using Cobham (2018), International Financial Statistics for REER and GDP, World Development Indicators for current account. Chile: Consumer price index and constant GDP were taken from Central Bank web page. Indonesia and Turkey: REER from BIS database. GDP at constant prices from national statistics office.

Table 2 (*b*) *Disinflation from moderate/low inflation using IT regimes - descriptive variables*

Country	*Y*0	*YT*	Regime	Average annual CPI rate				Inflation deceleration	
				t–1	*t*0	*t*–*T* avge	T	(*t*1–*t*–1)/8	(*t*–1–*T*)/*q*
Indonesia	2006	2014	LCIT	10%	13%	7%	6%	–0.5%	–0.12%
Hungary	2001	2006	LCIT	10%	9%	6%	4%	–0.6%	–0.30%
Hungary	2007	2014	LIT	4%	8%	4%	0%	0.3%	–0.15%
Mexico	2001	2003	LCIT	10%	6%	5%	5%	–0.6%	–0.61%
Mexico	2004	2010	LIT	5%	5%	4%	4%	–0.1%	–0.02%
Mexico	2011	2014	FIT	4%	3%	4%	4%	0.0%	–0.02%
Czech Rep	1998	2005	LCIT	8%	11%	4%	2%	–0.8%	–0.24%
Czech Rep	2006	2014	FIT	2%	3%	2%	0%	–0.1%	–0.04%

(*continues opposite*)

Table 2 *(b)* (continued)

Country	$Y0$	YT	GDP growth (constant prices)					REER path					
			t–1	t0	t1	t–T avge	% q neg	t–2	t–1	t0	t+1	t+2	t0–T accum
Indonesia	2006	2014	5.7%	5.5%	6.3%	5.8%	0%	4.8%	2.1%	–13.7%	0.6%	4.2%	–3.6%
Hungary	2001	2006	4.3%	3.9%	4.5%	4.24%	0%	–2.2%	–0.7%	–7.2%	–9.5%	–2.5%	–24.6%
Hungary	2007	2014	3.9%	0.5%	0.9%	0.22%	43%	–1.9%	4.9%	–10.4%	–3.3%	6.5%	2.9%
Mexico	2001	2003	4.9%	–0.4%	0.0%	0.3%	50%	–7.6%	–7.6%	–6.0%	0.2%	11.7%	11.4%
Mexico	2004	2010	1.5%	3.9%	2.3%	2.0%	21%	0.2%	11.7%	4.0%	–4.1%	–0.2%	2.0%
Mexico	2011	2014	5%	4%	4%	3%	0%	14.4%	–8.0%	–0.1%	3.0%	–5.7%	0.1%
Czech Rep	1998	2005	–0.6%	–0.3%	1.4%	3.11%	11%	–6.1%	–1.3%	–8.0%	1.8%	–1.7%	–28.4%
Czech Rep	2006	2014	6.5%	6.9%	5.6%	1.8%	31%	–1.2%	–5.5%	–5.3%	–3.1%	–13.3%	–9.1%

Country	$Y0$	YT	Current account % GDP					
			t–2	t–1	t0	t+1	t+2	T
Indonesia	2006	2014	0.6%	0.1%	2.8%	2.3%	0.0%	–3.1%
Hungary	2001	2006	–7.9%	–8.4%	–5.8%	–6.4%	–8.0%	–7.0%
Hungary	2007	2014	–7.0%	–7.0%	–7.1%	–6.9%	–0.8%	1.5%
Mexico	2001	2003	–2.4%	–2.7%	–2.4%	–2.0%	–1.2%	–1.2%
Mexico	2004	2010	–2.0%	–1.2%	–0.9%	–1.0%	–0.3%	–0.5%
Mexico	2011	2014	–1.0%	–0.5%	–1.1%	–1.3%	–2.5%	–1.8%
Czech Rep	1998	2005	–6.2%	–5.9%	–2.0%	–2.3%	–4.4%	–2.1%
Czech Rep	2006	2014	–3.7%	–2.1%	–2.6%	–4.7%	–1.9%	0.2%

Sources: Own elaboration using Cobham (2018), International Financial Statistics for REER and GDP, World Development Indicators for current account. Chile: Consumer price index and constant GDP were taken from Central Bank web page. Indonesia and Turkey: REER from BIS database. GDP at constant prices from national statistics office.

flight, creating a parallel market. Regulated prices such as public services and transport were almost frozen from 2003. The fiscal stance was clearly negative, with a fiscal deficit of 5.1 percent of GDP in 2015. External debt was also in a pseudo-default because of an adverse court ruling with bondholders, after a series of restructuring attempts and the economy was running short of foreign exchange.

The new government elected towards the end of 2015 had very few options other than stabilization. However, there was some room for choosing the type of stabilization plan. Shortly after the new government took the office, a new debt-restructuring attempt was implemented and the capital controls were removed. A more flexible exchange-rate regime was also adopted. The liberalization of the capital account caused an important devaluation of about 36 percent in December 2015, which accelerated inflation (reaching an annual rate of 38.6 percent in 2016).

The government also signaled its intention to cut the fiscal deficit, re-establishing a coherent system of public-service tariffs. Unfortunately, this also accelerated the inflation rate. As we are writing this paper in 2018, Argentina has experienced an annual rate of inflation above 15 percent for 11 years in a row. Table 3 provides some statistics.

In September 2016 the central bank formally announced the implementation of IT. The inflation target was set between 12 percent and 17 percent for 2017, 8 percent and 12 percent for 2018, and between 3.5 percent and 6 percent for 2019. Since inflation in 2016 was 39 percent (on average), the rate of disinflation required to meet the higher bound targeted in 2017 was around 5.4 percent each quarter. This is even higher than during Turkey's disinflation, which is the fastest disinflation episode in our sample. The annual average inflation rate in 2017 was 25.7 percent and the authorities decided to change the target to 15 percent in 2018.

Table 3 Argentina descriptive statistics

						Debt			
Year	Inflation	REER (Dec-2003 = 100)	Fiscal result	GDP growth	Current account balance in % GDP	Total in % of GDP	External in % GDP	Foreign currency in % int. reserves	Foreign currency in % exports
2003	14.9%	95.97	–	–	6.4%	139.2%	79.2%	959.6%	393.4%
2004	4.4%	100.26	2.2%	–	2.0%	118.0%	68.5%	736.2%	362.8%
2005	9.6%	102.20	1.6%	8.9%	2.7%	68.0%	31.8%	236.8%	141.4%
2006	10.9%	104.78	1.5%	8.0%	2.8%	59.1%	24.1%	222.2%	130.5%
2007	17.5%	101.53	0.9%	9.0%	2.1%	51.4%	21.8%	165.4%	115.5%
2008	27.2%	92.21	0.9%	4.1%	1.5%	44.5%	16.7%	165.3%	94.0%
2009	14.9%	91.05	–0.9%	–5.9%	2.2%	45.5%	16.7%	165.8%	119.9%
2010	23.6%	82.43	–1.0%	10.1%	–0.4%	40.0%	14.6%	185.1%	119.1%
2011	26.8%	77.00	–1.8%	6.0%	–1.0%	35.9%	12.0%	231.9%	110.2%
2012	24.6%	65.95	–2.4%	–1.0%	–0.4%	37.4%	11.2%	268.9%	123.4%
2013	23.8%	63.56	–2.9%	2.4%	–2.4%	40.1%	11.8%	410.2%	140.0%
2014	37.0%	67.00	–4.1%	–2.5%	–1.6%	41.4%	12.6%	457.6%	175.8%
2015	26.6%	52.56	–5.1%	2.7%	–2.9%	48.6%	13.9%	582.4%	212.6%
2016	38.6%	59.80	–7.1%	–1.8%	–2.7%	51.7%	17.8%	464.0%	254.4%
2017	25.7%	56.03	–6.4%	2.9%	–4.9%	52.9%	19.4%	420.0%	293.1%

Source: Own elaboration from national sources.

To summarize, the authorities were committed to attempting an interest-rate-based stabilization plan using IT. After the large depreciation in December 2015, there were significant pressures towards appreciation, which explains why the current-account deficit was rising (Figure 1 shows the correlation between current-account deficit and exchange rate, and between exchange rate and inflation in Argentina). The initial low level of external debt reduces some of the concerns, but during 2016–2017 foreign-currency-denominated debt started to increase and the ratio between debt and exports did not look as good as before.[11] Additionally, as Table 4 shows, public expectations and a professional forecast of inflation kept at least 5 percentage points higher than the inflation target during 2017 and the beginning of 2018, reflecting a combination of inertia and imperfect credibility. The IT regime collapsed in 2018 after an abrupt reversal of capital flows and a large depreciation that put inflation in the 40–50 percent range, about four or five times the original target.

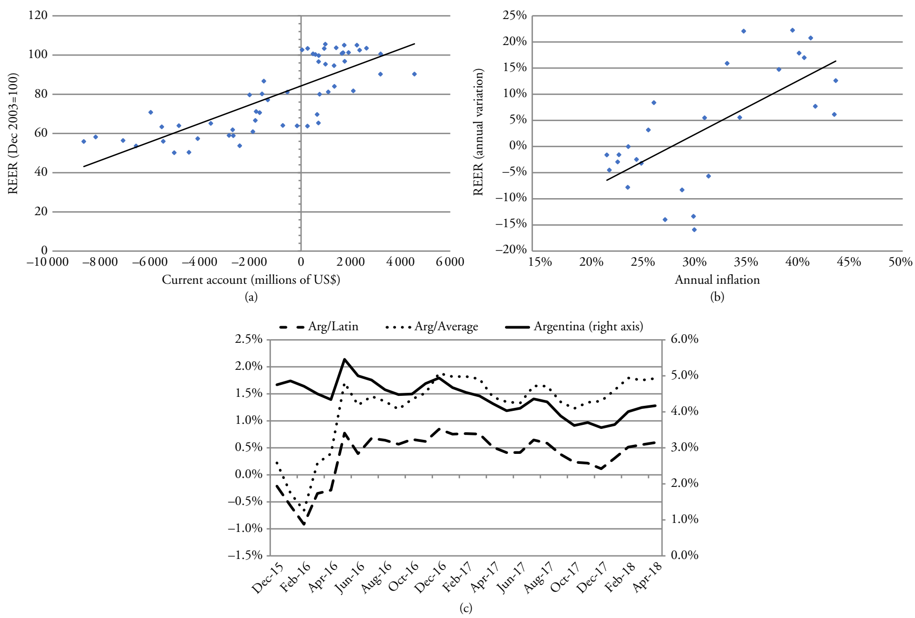

Figure 1 (a) Current account and real effective exchange rate (2004–2017); (b) Real effective exchange rate and inflation rate (December 2015–February 2018); (c) EMBI plus: Argentina; spread vs Latin countries and spread vs simple average of Brasil, Uruguay, Chile, Ecuador, Mexico, Peru, and Colombia

11. The situation was aggravated by the fiscal deficit of 6.4 percent of GDP and the repressed inflation due to the frozen tariff of public services. Sooner rather than later, these dynamics can be disruptive through an increase of the premium risk (EMBI+) and a sudden-stop episode.

Table 4 Monetary policy interest rate, targets, public expectations and expert forecasts

Date	Interest rate *t*–12	Actual inflation	Public expectations *t*–12: Median	Public expectations *t*–12: Real interest *ex ante*	Professional forecast *t*–12: Median	Professional forecast *t*–12: Real interest *ex ante*	Target low bound	Target high bound
Dec-17	25%	25%	25%	–0.2%	20%	4.3%	12%	17%
Dec-18	29%	–	20%	7.3%	17.4%	9.7%	8%	12%
Jan-19	28%	–	20%	6.7%	18.6%	7.9%	15%	15%

4 A MODEL

This section lays out a basic model that captures some of the fact of the Argentinian stabilization attempt using an interest-based plan. Our model is simple but it captures some of the lessons of the paper: when disinflation is slow and external debt accumulates fast (or the level of indebtedness is already high), IT may fail: disinflation requires a prolonged period of current-account deficit which may become unsustainable.

Specifically, we show that the real exchange rate that is consistent with an inflation rate equal to the target is not necessarily consistent with external equilibrium. If the real exchange rate that is consistent with the disinflation process is too low (that is, a large real appreciation is required), pressures towards depreciation may emerge and the central bank may lose control over the rate of inflation. Eventually, they could be forced to abandon IT.[12]

By contrast, when inflation adjusts fast or external debt is low enough, stabilization using IT may work, albeit some corrections may be needed after the stabilization periods ends. As the evidence reviewed shows, a real appreciation may be required. However, once inflation is stabilized, it is possible to adjust relative prices without much impact on inflation.[13] Fast adjustment of inflation is related three main factors: (a) fast adjustment of expectations to changes in inflation; (b) strong effects of monetary policy on wages and prices through changes in the level of activity; and (c) strong effects of monetary policy on wages and prices through direct changes in the real exchange rate. Regarding (b), notice that, broadly speaking, an interest-based rule will affect demand due to changes in the real interest rates and on the real exchange rate.

One of the key assumptions that we made is that the economy can operate on a two-regime framework. In the first regime, the stock of external debt is small and international liquidity is plentiful. Thus, the domestic economy can finance large current-account deficits. Financial investors know that a reversal of capital flows is not likely, so the expected ‘equilibrium’ real exchange rate is determined by domestic conditions (that is, the state of the goods market and wage claims). In the second regime, the stock of external debt is large and the domestic economy may suffer from balance-of-payments pressures. Financial investors are no longer

12. IT may not be abandoned, but it may be modified on the move. As shown by Davig/Leeper (2006), the monetary policy rules may change after certain variables, such as the output gap or inflation, surpass some critical threshold. Moreover, Kim/Yim (2016) show that the target is often increased after inflation exceeds the upper level of the band.

13. Recently, in Latin America, IT cases such as Brazil, Chile, Colombia, Mexico, or Peru have witnessed large currency depreciations with small (in a historical perspective) impacts on the rate of inflation. See Gosh (2013) for evidence which documents that the decline in the pass-through in Latin America is related, among other things, to the decline in the rate of inflation.

willing to finance any external deficit unless they are properly compensated by a risk premium, and they also expect the real exchange rate to revert towards a level that is consistent with current-account equilibrium. In this scenario a currency crisis may develop.

To model the disinflation process we rely on three main ingredients: (a) an expectations-augmented Phillips curve that features sticky inflation due to indexation; (b) a Taylor rule; and (c) stylized external sector dynamics, which combines a highly open capital account and an endogenous risk premium that is an increasing function of the level of external indebtedness. While the elements (a), (b), and (c) are standard, our modeling assumptions depart from conventional models in several ways. The most noticeable is that the economy does not necessarily reach full employment and it may be difficult to attain a level of the real exchange rate that is consistent with full employment, external equilibrium, and price stability (that is, the central bank may fail to meet the inflation target).

To keep the algebra simpler, all the variables, except for interest rates, are defined in natural logarithms. The first equation specifies the equilibrium condition for asset markets. We assume that the private sector can hold domestic assets that pay some interest rate i or foreign assets that pay i^f. In equilibrium, yields should be equalized, including risk premium $\varnothing$ and expected capital gains/losses:

$$i = i^f + \dot{s}^e + \varnothing. \tag{1}$$

The expected rate of depreciation satisfies $\dot{s}^e = s^e - s$, so the expected rate of depreciation is equal to the nominal rate expected to prevail (tomorrow) minus the exchange rate today. The risk premium will depend on the stock of foreign debt (as a proportion of domestic output), but we assume that it is zero for a low level of external indebtedness.

The role of equation (1) when the central bank targets inflation using the interest rate is to pin down the path for the nominal exchange rate, which together with the path of inflation determines the path for the real exchange rate. To see this, add and subtract domestic inflation π and foreign inflation π^f from both sides:

$$i - \pi = i^f - \pi^f + \dot{s}^e + \pi^f - \pi + \varnothing. \tag{1a}$$

Let the real interest rate be defined as the domestic nominal rate minus the rate of inflation $r = i - \pi$, and the international real rate as the domestic nominal rate minus foreign inflation $r^f = i^f - \pi^f$. From its definition, the expected rate of real depreciation satisfies the following law of motion $\dot{Q}^e = \dot{s}^e + \pi^f - \pi$. We then obtain:

$$\dot{Q}^e = r - r^f - \varnothing. \tag{1b}$$

Equation (1b) is a real interest parity that includes a risk premium. To simplify, let us assume that expectations in financial markets are regressive,[14] so investors expect the real exchange rate to exhibit mean reversion at some constant speed towards some equilibrium real exchange rate:

$$\dot{Q}^e = \theta(\bar{Q} - Q) \quad \text{with} \quad \theta > 0. \tag{2}$$

14. Regressive expectations are consistent with different approaches, for instance rational expectations. The main goal of this specification is to capture a negative relation between the real rate interest and the real exchange rate (holding constant the equilibrium real exchange rate, the foreign rate, and the risk premium). Alternatively, we can follow Porcile et al. (2011) and adopt adaptive expectations with similar results: high (low) real rates relative to the international real rate are associated with a real appreciation (depreciation).

The equilibrium real exchange rate should be consistent with the rest of the model and it will be defined below. When liquidity is plentiful (that is, the balance-of-payments constraint is not binding), it would be governed by the combination of the level of domestic activity and wage claims. When investors see that the level of external debt surpasses a critical threshold, they will start to incorporate that into their calculations of the equilibrium real exchange rate.

Combining (1b) with (2), we obtain:

$$Q = \bar{Q} - \theta'(r - r^f - \varnothing) \quad \text{where} \quad \theta' = \frac{1}{\theta}. \tag{3}$$

According to (3), the real exchange rate is below its long-run expected equilibrium whenever the real yield of domestic assets is higher than the real yield of foreign assets adjusted for risk. In other words, when $r > r^f - \varnothing$ we have $Q < \bar{Q}$. Likewise, it is above equilibrium whenever the opposite is true, or $r < r^f - \varnothing$.

Notice that equation (3) is consistent with the empirical evidence which suggests that the real exchange rate eventually reverts back to equilibrium, barring some extreme episodes such as a hyperinflation (see Taylor 1988). The empirical evidence does not favor the uncovered interest parity (UIP) hypothesis (Zhou 2002), but we basically want to capture a negative relation between the real interest rate and the real exchange rate (holding everything else constant).[15]

The domestic real interest rate is set according to the following Taylor rule:

$$r = i - \pi = \gamma_0 + \gamma_1(\pi^e - \pi^T), \tag{4}$$

where the real interest rate is adjusted whenever expected inflation departs from the inflation target.[16] We assume that the international real rate is exogenously given for the domestic economy. Notice that when $\pi^e = \pi^T$, the real rate is equal to the constant $r = \gamma_0$. This real rate of interest is what the central bank considers the 'equilibrium' real interest rate. Then the most reasonable and common assumption is to set the domestic natural rate of interest equal to the foreign real rate plus the risk premium, so $\gamma_0 = r^f + \varnothing$.

It is standard to assume that equation (4) fully represents how the central bank conducts monetary policy. Implicitly it is assumed that any discrepancy between money supply and money demand is automatically corrected by the central bank, so there is no need to keep track of the money stock (see Woodford 2003: chs 2 and 3). It is also important to point out that equations (3) and (4) define not only the real interest rate and the real exchange rate, but also the nominal interest rate and the nominal exchange rate.

15. Finally, it is possible to stick to a dynamic equation such as (2), but this increases the dimension of the dynamic system without drastically modifying the main plot. This same strategy is adopted, for example, in the classical *overshooting* paper (Dornbusch 1976).

16. As pointed out by an anonymous referee, it could be hard for the central bank to estimate π^e when expectations are heterogeneous. As shown by Lima et al. (2014), inflation can also converge to the target even under that scenario. We simplify the model by assuming that expectations are homogeneous and that the central bank can easily forecast the rate of expected inflation. Alternatively, we can derive a similar model with inflation (and foreign debt) as the state variable(s), assuming that the central bank reacts to the gap between the actual inflation and the target $\pi - \pi^T$, and setting $\pi^e = \pi_{-1}$, which is another way to introduce inertia into the dynamics (see, for example, Dornbusch/Simonsen 1987).

The Taylor rule assumes that, for a given rate of inflation, the central bank sets the nominal interest rate to achieve a certain real interest rate. In turn, this defines a nominal exchange rate that is consistent with arbitrage in assets markets.

Equation (4) may also include output as an argument, but this only complicates the algebra without adding any new insights. We are assuming that the central bank's overriding objective is to reduce inflation.[17] Combining (3) and (4) we obtain:

$$Q = \bar{Q} - \theta' \gamma_1 (\pi^e - \pi^T). \tag{5}$$

Thus the real exchange rate is consistent with investors' long-run expected equilibrium whenever inflation is equal to the target.

Domestic prices are set according to a mark-up rule, assuming constant labor productivity, which is normalized and set equal to one (so its log is equal to zero):

$$P = m + w, \tag{6}$$

where P is the domestic price level, W is the nominal wage, and m is the mark-up.[18] We assume that wage setting is based on imperfect information because workers do not know the price level so they bargain based on their expectations. In other words, the nominal wage satisfies:

$$w = CPI + \omega = \psi P + (1 - \psi) sP^* + \omega, \tag{7}$$

where CPI is the consumer price index level, which is a weighted average of domestic and foreign prices, and ω is the real wage (in terms of domestic goods), where ψ and $(1 - \psi)$ are the shares of domestic and foreign goods in CPI. We should notice that in our set-up, the rate of inflation that is relevant for the central bank is the rate of growth of P, and not the rate of growth of CPI. Thus, in equation (4) we are assuming that monetary policy targets what we may call 'core inflation.'[19]

From (6) and (7) it follows that the (log of the) real wage satisfies:

$$\omega = -m - (1 - \psi)(sP^* - P) = (\psi - 1)Q - m. \tag{8}$$

17. More precisely, let us assume that output is a negative function of the real interest rate only, and the real interest rate is a positive function of inflation and output. Then the reduced form solution implies that output is a negative function of inflation, regardless of the weight of output on the central-bank reaction function, provided that the real rate is a positive function of inflation and output. In any case, excluding the output gap does not seem to be a bad assumption for Latin American countries. For example, Moura/Carvalho (2010) show that the output gap matters only for Chile (see Libman 2018b for additional estimations).

18. Open-economy post-Keynesian models follow a 'consumer approach' (Blecker 2011) or a 'producer approach' (Bhaduri/Marglin 1990: sec. 3). In the latter, the exchange rate affects prices because workers consume imported goods, while in the former, the same effect is present because firms produce using labor and imported intermediated inputs. For our purposes, both approaches yield similar insights, so we stick to the simpler specification, which is the 'consumer approach.'.

19. Consider what happens if the price of imported goods increases. In our set-up, this creates inflationary pressures through wages because workers consume imported goods. The central bank will increase the nominal and the real interest rate to offset that shock. If we assume that the central bank targets total inflation, we are only adding an additional reason to tighten monetary policy. The usual stability conditions associated with the so-called 'Taylor principle' are slightly modified, but nothing substantial changes (see, for example Calvo 2017).

Thus the real wage is a negative function of the mark-up and the real exchange rate (because $\psi < 1$). Differentiating (6) with respect to time and assuming a constant mark-up, we obtain:

$$\pi = \dot{w} \tag{9}$$

We model the law of motion of the wages as a function of expected inflation and the gap between the target real wage ω^* and the actual real wage. We adopt the following specification:

$$\dot{w} = \pi^e + \Omega(\omega^* - \omega) \quad \text{with} \quad \Omega > 0. \tag{10}$$

We assume that the target real wage is an increasing function of output $\omega^*(Y) = \omega_1 Y$. Because prices are formed assuming a constant mark-up over labor cost, and labor productivity is assumed to be constant and equal to one, output and employment are equal. A high level of output means that employment is also high, so workers' real wage target tends to increase. Likewise, when output is low, employment is low, so the real wage target tends to fall.

Combining (9) and (10) we obtain an expectations-augmented Phillips curve for an open economy:

$$\pi = \pi^e + \Omega(\omega_0 + \omega_1 Y + \omega_2 Q) \quad \text{with} \quad \omega_0, \omega_1, \omega_2 > 0, \tag{11}$$

where $\omega_0 = m$ and $\omega_2 = (1 - \psi)$. We can verify that the level of the real exchange rate plays a key role in affecting inflation, and that real appreciation may play a critical role during the disinflation process (as highlighted by García Lázaro/Perrotini 2014). A higher real exchange rate (for a given level of output) lowers the purchasing power of wages in terms of foreign goods triggering social unrest, strikes, and so on. In contrast, a lower real exchange rate lowers the relative price of imported goods, increasing the purchasing power of wages and decreasing the gap with the target real wage (see Gerchunoff/Rapetti 2016; Razmi 2018).

Output is demand-determined and defined by the following equation:

$$Y = \beta_0 - \beta_1 r + \beta_2 Q \quad \text{with} \quad \beta_0, \beta_1, \beta_2 > 0. \tag{12}$$

Equation (12) says that the real interest rate has a negative effect on demand, production, and employment, while the real exchange rate has a positive effect. Contractionary effects from depreciations can be easily accommodated by assuming that $\beta_2 < 0$.[20] Other factors, such as foreign demand, animal spirits, or fiscal policy, are included in the parameter β_0.

A quick inspection of the system that we have so far shows that (11) and (12) can be solved for output and inflation, taking expected inflation as given. To see this, use (4) and (5) to substitute and to obtain:

$$\pi = \pi^e + \Omega(\omega_0 + \omega_1 Y) + \Omega\omega_2[\bar{Q} - \theta'\gamma_1(\pi^e - \pi^T)] \tag{13}$$

$$Y = \beta_0 - \beta_1[\gamma_0 + \gamma_1(\pi^e - \pi^T)] + \beta_2[\bar{Q} - \theta'\gamma_1(\pi^e - \pi^T)]. \tag{14}$$

20. Alternatively, they can be included by making the risk premium a positive function of the real exchange rate, provided that this effect is stronger than the traditional expansionary effects captured by β_2 (see Céspedes et al. 2003).

Equations (13) and (14) define an aggregate-demand–aggregate-supply framework, given the parameters and the exogenous variables ($\bar{Q}$, π^e, and π^T). Imposing the consistency of expectations we obtain $\pi^e = \pi = \pi^T$ and thus the system boils down to:

$$0 = \Omega(\omega_0 + \omega_1 Y) + \Omega\omega_2\bar{Q} \tag{15}$$

$$Y = \beta_0 - \beta_1\gamma_0 + \beta_2\bar{Q}. \tag{16}$$

Substituting (15) into (16) and solving for $\bar{Q}$:

$$\bar{Q} = -\varepsilon[\omega_0 + \omega_1(\beta_0 - \beta_1\gamma_0)], \tag{17}$$

where $\varepsilon = \frac{1}{\omega_2+\omega_1\beta_2}$. Thus, the equilibrium real exchange rate is a function of the parameters of the model. Exogenous wage pressures ω_0, fiscal policy, and the foreign real rate γ_0, all affect the equilibrium real exchange rate.

It is important to notice that this equilibrium real exchange is not necessarily consistent with balance-of-payments equilibrium. Moreover, the resulting level of output does not need to imply full employment. Inflation can be stabilized (see equation (20) below), provided that whatever combination of output and the real exchange rate do not imply an unsustainable current account for too long. If the resulting current account does not lead to an excessive accumulation of foreign debt, it could make sense for private investors to expect (17) to prevail. Additionally, because capital inflows are short term in nature, it may make sense to a have a short-term planning horizon as well.

But if inflation falls very slowly and the level of the external debt reaches a critical threshold – through the exchange-rate appreciation mechanism – they may realize that the economy is placed on an unsustainable path. In this case, they might require a premium risk and might build expectations about long-run real exchange that should be consistent with a constant level of foreign debt in the long run. We will discuss how this real exchange rate is defined, but for now we assume that debt is low enough (or that there is a current-account surplus even when $\bar{Q}$ as defined by (17) prevails).

Inflation expectations are not exogenous, and need not be aligned with the target, at least in the short run. We assume that expectations are formed using an adaptive scheme:

$$\dot{\pi}^e = \sigma(\pi - \pi^e) \quad \text{with} \quad \sigma > 0. \tag{18}$$

Thus the rate of change of expected inflation is an increasing function of the 'expectation gap' (the distance between inflation and expected inflation). There are different ways to rationalize equation (18). We can assume that it works as a simple form of adaptive expectations, but it is also possible that formal and informal indexation schemes may prevent the expected rate of inflation to adjust instantaneously, for instance after the central bank announces a new inflation target. The presence of some inertia in the rate of expected inflation, and consequently on the rate of inflation, is key to illustrating the dynamics of disinflation with IT, and more precisely the Argentinian case.

Inserting (13) into (14) and the resulting equation into (18) yields the dynamic equation that governs expectations as a function of the parameters and expected inflation:

$$\dot{\pi}^e = \sigma[\vartheta_1 - \vartheta_2(\pi^e - \pi^T)] \tag{19}$$

with:

$$\vartheta_1 = \Omega[\omega_0 + \omega_1\beta_0 + (\omega_2 + \omega_1\beta_2)\bar{Q} - \beta_1\gamma_0\omega_1] \geq 0^{21}$$

$$\vartheta_2 = \Omega\gamma_1[(\omega_2 + \omega_1\beta_2)\theta' + \beta_1\omega_1] > 0.$$

It is straightforward to show that, unless depreciations are strongly contractionary (and hence $\beta_2 < 0$ which may imply $\vartheta_2 < 0$), the system is always stable. Contractionary depreciations imply that a higher real rate promotes a real appreciation that expands demand, but inflation can be stabilized if the effect of the changes in exchange rate on wages and prices are more important than the effects of changes in output.

The speed of adjustment towards equilibrium is governed by the combined parameter ϑ_2 and the speed of adjustment of expectations σ (that is, they define the size of $\frac{\partial \dot{\pi}^e}{\partial \pi^e}$). Large elasticity of demand to interest rate, large sensitivity of monetary policy with respect to inflation, and large effects of output and real exchange rate on wage claim will increase the size of ϑ_2.

Consider now what happens if the inflation target π^T is reduced. Notice that neither output, the real exchange rate, nor the real interest rate are affected in equilibrium, but because $\pi^e > \pi^T$, both the real interest rate increases and the real exchange rate appreciates on impact. More precisely, if we denote the solution to (19) by:

$$\pi^e(t) = (\pi^T - \pi^e_0)(\exp)^{-\sigma\vartheta_2 t} + \pi^T. \tag{20}$$

Then notice that by equation (20),[22] the deviation from equilibrium $\pi^e(t) - \pi^T$ is larger the larger the initial gap between target and expectations $\pi^T - \pi^e_0$, and the smaller the speed of adjustment $\sigma\vartheta_2$. Consider the equation of equilibrium real exchange rates (5), repeated below:

$$Q = \bar{Q} - \theta'[\gamma_1(\pi^e - \pi^T)]. \tag{5}$$

Substituting (20) into (5), it is possible to see that deviations from the inflation target feed directly into the real exchange rate. Specifically, the more ambitious the reduction in the target $\pi^e_0 - \pi^T$ and the smaller the size of $\sigma\vartheta_2$, the larger the required size of the real appreciation on impact. A similar logic applies to the real interest rate. A very tight monetary policy (that is, one that implies a very ambitious reduction in inflation) in a world of low adjustment speeds requires a high real interest rate. In a nutshell, when IT is applied to reduce inflation by a lot at short notice, and where inertial factors are very important, the required changes in relative prices would be large.

This problem is obviously absent when there is no need to adjust relative prices during the disinflation phase (that is, the initial conditions feature a slightly depreciated real exchange rate or are close to equilibrium), or when the rate of inflation is already low and there is no internal inflation. Unfortunately, neither of these conditions was present in the Argentinian case.

The previous model would be complete in the presence of perfect international capital markets and assuming that the domestic economy did not follow an unstable trajectory that required excessive indebtedness in foreign currency. This assumption is not necessarily bad when applied to a stable economy that is not suffering from drastic adjustments. Moreover, it certainly is not that bad for Latin American economies during the 2000s,

21. $\vartheta_1 = 0$, as long as $\bar{Q}$ is defined by (17).
22. The expression $\pi^e(t)$ is a reminder that expected inflation evolves over time (we omitted time everywhere else to simplify the notation).

a period when the external account showed an important surplus due to the high commodity prices and historically low international interest rates. However, only during a very specific (and most likely short) time span does it seem to be a good idea to rely on external financing to achieve disinflation.

4.1 Adding an endogenous risk premium

Now let us explore the role that the balance-of-payment constraint may impose on the stabilization process. We show that, barring some special cases, a stable equilibrium may fail to exist. This is due to the nature of our model: more precisely, the fact that the level of the real exchange rate that reduces wage demands and is consistent with the stabilization of inflation is not necessarily consistent with external equilibrium. If the real exchange rate that creates the condition for stabilization is very low and a large stock of external debt is accumulated during the disinflation phase, IT will most likely fail.

Since from now on we will assume that the risk premium is an increasing function of foreign indebtedness, we need to keep track of the stock of external debt. More precisely, we let the ratio of foreign debt to productive capacity[23] in domestic currency (evaluated using the equilibrium real exchange rate) be given by $F = \bar{Q} + D - \bar{Y}$. Then, if the flow of new debt $\dot{D} = \dot{F}$ (assuming that equilibrium real exchange rate and productive capacity remain constant) is governed by interest payments and the trade deficit:

$$\dot{F} = (i^f + \varnothing)F - TB(Y, Q), \tag{21}$$

where TB is the ratio of the trade balance to productive capacity measured in domestic currency. In a nutshell, the rate of change of foreign debt is a function of interest payments on existing debt $(i^f + \varnothing)F$ minus the trade balance.

The trade balance is assumed to be a negative function of output (because imports increase with output) and a positive function of the real exchange rate. We stick to the following specification:

$$TB = -\varphi_1 Y + \varphi_2 Q \quad \text{with} \quad \varphi_1, \varphi_2 > 0. \tag{22}$$

The risk premium is endogenous and defined by the function:

$$\varnothing = \varnothing(F) \quad \text{with} \quad \varnothing = 0 \quad \text{for} \quad F < \bar{F} \quad \text{and} \quad \varnothing' > 0 \quad \text{for} \quad F \geq \bar{F}. \tag{23}$$

Presumably, (23) applies for a sufficiently high level of debt $F > \bar{F}$. For low levels of debt we are back to the previous model where the external constraint does not bind, and for a reasonable span of time the domestic economy can tap the international capital market for funds.

From (21), (22), and (23) it is possible to define the level of the real exchange rate that is consistent with current-account balance $\dot{F} = 0$ for a given level of output. Suppose investors' estimations assume that potential output prevails:

$$Q^{BP} = \frac{\varphi_1 \bar{Y} + [i^f + \varnothing(F)]F}{\varphi_2} = \chi(F) \quad \text{with} \quad \chi' > 0 \quad \text{and} \quad \chi'' > 0. \tag{24}$$

23. A more realistic approach will involve actual output, but this will needlessly complicate an already complex model. The assumption used in the text could be justified, assuming that investors calculate the capacity to pay using the past evolution of output, which was not very far away from potential.

Notice that the real exchange rate that is derived by investors from (24) may not be consistent with social peace and constant inflation. If investors become increasingly concerned about sustainability, then $\bar{Q}$ will not be derived from (17), but it will be consistent with (24). This creates an enormous strain for IT when $Q^{BP} > \bar{Q}$. This was emphasized, for example, by Olivera (1991), Dornbusch (2000), and Gerchunoff/Rapetti (2016): the real exchange rate that is consistent with 'social peace' need not be equal to the real exchange rate that is consistent with external equilibrium. As we will see, an equilibrium for the dynamic system may fail to exist, but the trajectories that do not imply an explosion of indebtedness or those that imply that the target can be achieved when international liquidity is plentiful are possible outcomes.

Now, solving the system by assuming that investors expect (24) to prevail implies that the bliss point – that is, a steady state such that $\pi^e = \pi^T$, $Q = \bar{Q}$ (and also $Y = \bar{Y}$) – cannot be achieved. If we write down the evolution of the trade deficit assuming that the old equilibrium real exchange rate holds, after substitution using (4), (5), and (12) becomes:

$$-TB = \varphi_1\beta_0 - \varphi_1\beta_1\gamma_0 + (\varphi_1\beta_2 - \varphi_2)\bar{Q} + \gamma_1(\varphi_2\theta' - \varphi_1\beta_1 - \varphi_1\beta_2\theta')(\pi^e - \pi^T). \quad (25)$$

During the disinflation phase, debt will accumulate due to the effect of tight policies to reduce inflation only if the following condition holds: $\varphi_2\theta' > \varphi_1\beta_1 + \varphi_1\beta_2\theta'$. This requires that the effect of real appreciation on net exports is stronger than the negative effect of higher real interest rates on output, which cuts imports (and thus might create a surplus). Notice that it is usually assumed that depreciations are expansionary, but assuming for instance that $\beta_2 < 0$ reinforces the point:[24] disinflation will worsen the trade balance and will lead to an accumulation of debt, as a higher real interest rate may decrease net exports not only through the direct effect of real appreciation, but also due to the expansionary effects on demand. The previous insights thus hold: low speed of adjustment and a large gap between expected inflation and the target will lead to the build-up of a large trade deficit (see equation (15)).

Suppose now that a reduction of the inflation target is adopted.[25] It follows that a low level of debt and a relatively high speed of adjustment reduces the likelihood of the debt threshold $\bar{F}$ being hit during the disinflation phase. Interestingly, and in line with our model, higher inflation and smaller debt levels seem to increase the probability of the adoption of IT regimes (see, for example, Gonçavles/Carvalho 2009). Thus, the empirical success of IT could be contingent on the initial conditions and the structural conditions.

Then, for the general dynamic system, we need to assume the case where $\bar{Q} = Q^{BP} = \chi(F)$ and $\gamma_0 = r^f + \phi(F)$. Combining (21)–(24) and using (24) in the original model we will have a dynamic system with expected inflation and foreign debt as state variables:

$$\dot{\pi}^e = \sigma[\mu_1 - \mu_2(\pi^e - \pi^T)] \quad (26)$$

$$\dot{F} = \mu_3 + [i^f + \varnothing(F)]F + \varphi_1[-\beta_1\varnothing(F) + \beta_2\chi(F)] - \varphi_2\chi(F) - \mu_4(\pi^e - \pi^T) \quad (27)$$

24. See Céspedes et al. (2003) for a review and a microfounded model showing why it could be reasonable to assume that depreciations are contractionary in Latin America.
25. Also, it could be interpreted as the beginning of inflation targeting in the context of a moderate and stable inflation regime, pursuing a disinflation path.

with:

$$\mu_1 = \Omega[\omega_0 + \omega_1\beta_0 + (\omega_2 + \omega_1\beta_2)\chi(F) - \beta_1\omega_1(r^f + \varnothing(F))]$$

$$\mu_2 = \Omega\gamma_1[(\omega_2 + \omega_1\beta_2)\theta' + \beta_1\omega_1]$$

$$\mu_3 = \varphi_1(\beta_0 - \beta_1 r^f)$$

$$\mu_4 = \gamma_1(-\varphi_1\beta_1 + \varphi_1\beta_2\theta' - \varphi_2\theta').$$

Notice that $\mu_2 = \vartheta_2$ and that $\mu_1 = \vartheta_1 = 0$ for $F < \bar{F}$, and thus we are back to the original system. The general solution of the system, $\dot{\pi}^e = 0$ and $\dot{F} = 0$, is given by:

$$\pi^e = \pi^T + \frac{\mu_1}{\mu_2} \tag{28}$$

$$\pi^e = \pi^T + \frac{\mu_3 + [i^f + \varnothing(F)]F + \varphi_1[-\beta_1\varnothing(F) + \beta_2\chi(F)] - \varphi_2\chi(F)}{\mu_4}. \tag{29}$$

These equations represent the combinations of expected inflation and foreign debt such that expected inflation is equal to the target (28) and foreign debt is constant (29). They are a function of expected inflation and foreign debt. Expected inflation affects $\dot{\pi}^e = 0$ in the same way as in the original system: changes in expected inflation trigger a change in the real interest rate (because the central bank follows a Taylor rule). Expected inflation also affects the level of foreign debt because changes in the real interest rate affect employment and the level of the real exchange rate, which together affect the trade balance.

The level of foreign debt affects the system mainly through its effects on the risk premium. A higher level of foreign debt increases the risk premium, which in turn leads to an increase in the real exchange rate, which affects output, inflation, and the trade balance.

More importantly, notice that from (28) and (29) it does not follow that there is solution that involves $\pi^e = \pi^T$, and not even a reason why both equations will hold simultaneously: they may not intersect in the π^e/F space. We do know that when debt is low ($F < \bar{F}$), equation (28) implies that expected inflation satisfies $\pi^e = \pi^T$, but this is not necessarily true for (29). In the rest of the section we characterize the dynamic of the system under different scenarios, briefly touching upon the issue of whether an equilibrium exists.

Is the non-existence of equilibrium a problem? Not necessarily, because one plausible implication is that external debt shrinks over time. In several instances, countries were able to successfully pursue IT in a context of a current-account surplus, a reduction of external debt, and so on.

To grasp intuitively the global behavior of the system, Figure 2 displays the case where two equilibriums exist. Appendix 1 discusses the conditions under which the system will be characterized by Figure 2.

Figure 2 shows that the economy will reach the good equilibrium only by fluke, but if the economy starts at the left of the dashed line, IT is still sustainable: the inflation target is achieved and debt shrinks. This requires a fast adjustment of inflation and a slow build-up of debt: in other words the economy should be located at the left of the stable arm of the system. If these conditions are not meet, or if the initial position is to the right of the saddle-path, the economy will eventually sit down at the bad equilibrium where expected inflation and inflation are always above the target.

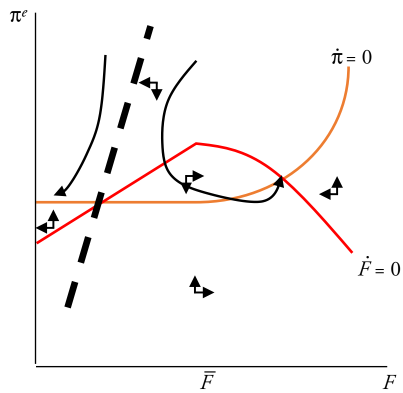

Figure 2 Phase diagram

However, the conditions that are required to obtain the case illustrated in Figure 2 are very special. They require that higher expected inflation improves the trade balance. As expected inflation increases, the real interest rate increases and the real exchange rate appreciates. To create a current-account surplus, the effect of the real exchange rate on foreign trade should be mild and the real exchange-rate appreciation should not be expansionary. If this is not the case, then $\dot{F} = 0$ has an upward slope (for all values of external debt and expected inflation) and the good equilibrium may fail to exist.

Alternatively, if the parameters that govern the exogenous component of demand are very large (β_0) or the equilibrium real exchange rate when liquidity is plentiful, $\bar{Q}$ is very low, then $\dot{\pi}^e = 0$ will start below $\dot{F} = 0$ and the good equilibrium no longer exists. Violations of the conditions (A1) and (A2) will reverse the slope of the curves once we have $F \geq \bar{F}$, and the bad equilibrium will disappear or it may be unstable.

Finally, notice that the good equilibrium is unstable. If the economy starts to the right of the saddle-path (the dashed line in Figure 2), then debt and expected inflation will follow an explosive path. Only if the economy starts to the left can IT succeed in reducing inflation without creating too much external debt (in fact external indebtedness falls).

To summarize, the conditions to obtain two equilibriums seem to be very special. Even if they are present, it is possible that the economy will settle down at the bad equilibrium (which implies that the target is always missed). When one equilibrium or none exist, avoiding an explosion of debt seems unlike if the speed of adjustment of inflation is low and debt builds up fast.

5 CONCLUSIONS

This paper has discussed the role of IT as a stabilization policy in the Argentinian case. Specifically, we have highlighted the role of external indebtedness dynamics in order to assess the effectiveness and the sustainability of IT as a stabilization policy. Although the regime performed reasonably well in terms of inflation and growth everywhere else, Argentina is one of the very few cases where IT was abandoned.

Our paper suggests that fast adjustment of inflation and a slow build-up (or a low initial level) of external debt are preconditions to implementing and sustaining IT in the long run. When inflation adjusts slowly or external debt builds up quickly, IT may collapse. This paper has thus contributed to a large literature on stabilization policies, and shares some skepticism regarding the role of a monetary framework that relies on a short-term interest rate as the main stabilization tool (in the context of an extremely open capital account).

Our narrative and our model also draw heavily on the literature on the effects of IT. More precisely, we have relied on the evidence that shows that, under IT, disinflation is usually a gradual process, and that a current-account deficit is likely to emerge. In fact, none of these trends is specific to IT, as almost all the stabilization attempts that start from moderate levels of inflation seem to display similar trends. However, the literature has questioned whether IT is special. Our answer, based on a revision of the facts, seems to be no. This suggests that the authorities made a mistake adopting an IT regime in Argentina, and the success of an IT regime should not be taken for granted as a disinflation tool, considering that inflation seems to fall very slowly and current-account deficits may become unsustainable.

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APPENDIX 1

This appendix discusses the specific conditions under which (23) and (24) have two equilibria. The constant inflation locus (23) is, for low values of external debt, a straight line, but it becomes upward-sloped once $F \geq \bar{F}$, assuming $\mu_2 > 0$ (the condition for stability assumed in equation (19)), and provided the following condition holds:

$$\omega_1 \beta_1 \varnothing'(F) < (\omega_2 + \omega_1 \beta_2)\chi'(F). \tag{A1}$$

To see this, consider (23) and calculate $\frac{\partial \pi^e}{\partial F}$ using the definitions of μ_1 and μ_2. This is the likely case when depreciations exert a strong effect on inflation (captured by ω_2), even if there exist strong contractionary effects from depreciations and the level of output is an important determinant of inflation (this is captured by ω_1 and β_2). Notice that, because of equation (24), the ratio $\chi'(F)/\varnothing'(F)$ is increasing in F, so (A1) becomes more likely as external debt increases.

Due to the effect of interest payments i^f on existing debt, and if $\mu_4 < 0$, the $\dot{F} = 0$ locus (24) has a positive slope for low levels of debt, but becomes downward-sloping once $F \geq \bar{F}$, if:

$$i^f + \varnothing' F + \varnothing(F) + \varphi_1 \beta_2 \chi'(F) > \varphi_2 \chi'(F) + \varphi_1 \beta_1 \varnothing' F, \tag{A2}$$

which will be less likely if contractionary effects of depreciation ($\beta_2 < 0$) prevail and if trade and income elasticities are large enough. Notice that if this condition does not prevail, $\dot{F} = 0$ will show a positive slope and only one equilibrium or two steady states may exist, but the equilibrium of high debt and high inflation will also be unstable. In order to be short, we will continue the analysis assuming that the condition (26) holds. Otherwise $\dot{F} = 0$ becomes upward-sloped after $F \geq \bar{F}$.

Notice that (A1) and (A2) are not enough to establish the existence of an equilibrium with low debt and where the target is attained. The two curves will cross if for low levels of external debt the previous conditions holds and (23) lies above (24) for a low level of debt. We know that the constant inflation locus is defined by $\pi^e = \pi^T$. Will (24) lie above or below π^T? That depends on the sign of the second part of equations (23) and (24). When evaluated at low levels of F, the risk premiums are gone and $\bar{Q}$ is the long-run expected real exchange rate (the level where international liquidity is plentiful). Barring the interest payments, the model is no longer a function of F; but it depends on the structural conditions that define the trade account and investors expect the equilibrium real exchange rate $\bar{Q}$ to prevail.

With expansionary depreciations, for a sufficiently high $\bar{Q}$ this will push down the locus $\dot{F} = 0$ (so we will have $\pi^e > \pi^T$) below the $\dot{\pi}^e = 0$ locus (which by definition starts at $\pi^e = \pi^T$). In this case, the curves eventually intersect. This is the only combination that features a stable equilibrium (when the two curves cross after the critical threshold level), but is one where the target is systematically missed. While we were revising this manuscript, Argentina abandoned its IT regime, and interestingly, the central bank failed to deliver the target during all the years in which the regime lasted. It can be shown that the Jacobean has the following structure:

$$\begin{bmatrix} \frac{\partial \dot{\pi}^e}{\partial \pi^e} & \frac{\partial \dot{\pi}^e}{\partial F} \\ \frac{\partial \dot{F}}{\partial \pi^e} & \frac{\partial \dot{F}}{\partial F} \end{bmatrix} = \begin{bmatrix} - & + \\ - & - \end{bmatrix}, \tag{A3}$$

which implies that the equilibrium where the target is not achieved is locally stable.