When it Rains, it Drizzles: Capital Flows and Inflation Targeting*

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Abstract

In this paper we analyze the procyclical nature of debt inflows over the business cycle with an emphasis on the policy oriented solution. Based on data from the IMF we disaggregate the total debt inflows into portfolio debt and other investment debt. We show that behind the documented procyclicality of debt inflows lies an important distinction based on the credibility of the monetary policy. In particular, we find that the adoption of inflation targeting as a monetary framework allows developing countries to counterbalance and overcome the procyclicality of debt inflows. Our results show that inflation targeting countries receive significantly higher (lower) amount debt inflows during recessions (booms) compared to non-targeting countries. This result is especially important for other investment debt inflows. Further disaggregating by sector, we find that the result is driven predominantly by private sector debt. We use a difference-in-differences estimation strategy in conjunction with entropy balancing to address the self-selection associated with inflation targeting policies. The results remain robust to alternative specifications and methodologies.

JEL classification: F02, F34, F41, G15

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1 Introduction

Economic theory argues that the movement of capital flows across countries should benefit all parties resulting in efficient allocation of resources, enhanced productivity and economic growth. However, after almost three decades of capital flows to and from developing countries, historical experience fails to provide definite evidence that financial integration has a positive effect on their economies. Notably, large and volatile capital flows contribute to boom-bust cycles. After opening their capital accounts to global financial markets, developing countries experienced substantial capital inflows, later followed by "sudden stops" and sharp reversals of flows, causing significant financial instabilities **instability? Are there multiple financial stabilities?** and further capital outflows. These swings in capital flows have frequently culminated in financial crises.

In this paper we focus on the amplification of the business cycle associated with the procyclical nature of capital flows. In particular, as Kaminsky et al. (2004) argue, procyclical capital flows may lead to deeper recessions and overinflated expansions, increasing the vulnerabilities of countries' financial systems and destabilizing the macroeconomic environment. While the consumption and spending would increase significantly on the upswing of the cycle, they have to adjust correspondingly when capital flows drop following the downswing. Reinhart & Reinhart (2009) argue that a lack of access to world capital markets can reduce government's ability to implement countercyclical fiscal policy when trying to ease the recession, resulting in a potentially deeper recession.

A large body of literature emphasizes the role of global factors as the most important drivers behind large movements of capital flows.[1] With the exception of domestic growth rates, domestic factors were found to have a very limited effect on capital volatility. For example, domestic policies, like implementing capital controls, were found to be insufficient when trying to isolate economies from large swings in capital flows. Therefore, the lack of a policy-oriented solution is particularly disturbing when many developing countries continue to rely heavily on capital inflows as a major source of financing.

In this paper we argue that the introduction of inflation targeting can help developing

[1] See for instance Burger et al. (2015), Forbes & Warnock (2012).

countries either change or reduce the procyclical nature of capital inflows. Previous research has found that inflation targeting significantly contributes to overall macroeconomic stability, improves the credibility of the central banks, and mitigates the dynamic inconsistency problem often faced by developing countries. In particular, inflation targeting has been found to reduce inflation and and inflation volatility, reduce interest and exchange rate volatility, improve fiscal discipline, and reduce the exposure to sudden stops of capital flows.[2] Because inflation targeting increases transparency, a number of studies have found that the adoption of inflation targeting results in the convergence of the forecast errors leading to the reduction in the dispersion of private sector forecasts of inflation.[3] And finally, in case of a crisis, assuming a credible inflation targeting regime, a central bank might chose to implement greater monetary easing while maintaining a stable inflation outlook, making inflation targeting a better suited monetary framework when dealing with a financial crisis.[4]

There can be many reasons behind a decline in capital inflows during crises. One such reason is an increase in information asymmetry. A retrenchment episode during crises can occur because foreign agents are less informed about the returns on domestic assets and/or because they are more risk-averse than domestic agents. Thus inflation targeting that brings price stability, and central bank transparency and credibility should lead to more predictable returns and reduce the likelihood of "sudden stops".[5]

Until recently, most of the literature has been focused on aggregate capital flows separated by type of flow, or rarely, type of investor. However, the global financial crisis of 2008-2009 brought attention to the importance of differentiating between the various behaviors of different types of capital flows as their cyclical nature remains under question. For example, Broner et al. (2013) and Avdjiev et al. (2017) show that the procyclical pattern holds for both direct investment and debt-type inflows, while Contessi et al. (2013) argue that that procyclicality is mostly associated with debt inflows.[6]

In this paper we focus on debt-type capital inflows for two reasons. First, previous literature

[2]See for instance, Mishkin (2004), Rose (2007), Lin & Ye (2009), Lin (2010), and Minea & Tapsoba (2014).
[3]Crowe (2010), Cecchetti & Hakkio (2009).
[4]Krugman (2000).
[5]Fazio et al. (2015)
[6]The differences in these findings can easily be attributed to differences in countries and year spans used for these studies. Furthermore, Broner et al. (2013) and Avdjiev et al. (2017) present simple correlations between GDP growth and capital inflows.

agrees that debt-type inflows rather than direct investment are responsible for the boom-bust cycles that plague developing economies. Second, the data allows us to decompose total debt not only into other investment and portfolio debt inflows, but also differentiate between different types of investors. We begin our empirical analysis by verifying that a particular type of capital flow is indeed procyclical. Then, we differentiate between inflation-targeting (IT) and non-targeting countries, allowing for the interaction term between the IT dummy and a cycle-variable of choice.

We start by estimating the effect of inflation targeting using difference-in-differences methodology. However, because the inflation-targeting policy is subject to self-selection, it is possible that targeting and non-targeting countries have distinct underlying characteristics. Thus, to address the endogeneity associated with inflation targeting we use entropy balancing in conjunction with the difference-in-differences specifications to create better counterfactuals. Entropy balancing is an alternative to conventional matching methods for pre-processing data in observational studies with binary treatment variables (Hainmueller 2012). After we specify a set of moment conditions that must hold between targeting (treatment) and non-targeting (control) countries, for each observation in the control group, the algorithm searches for weights that satisfy these moment conditions. This procedure ensures that once the weights are generated, both targeting and non-targeting countries show parallel trends in their capital flows in the pre-treatment period.

First, we present our results for the total debt inflows. Using GDP growth as a measure of the domestic business cycle, we verify that total debt flows are procyclical.[7] However, after we introduce the interaction between the inflation-targeting dummy and GDP growth, we find that inflation targeting can play an important role in reducing the procyclicality of debt inflows. Across all specifications, we find that inflation-targeting countries have higher levels of debt inflows during times of distress while having lower levels of debt inflows during booms, compared to non-targeting countries.

Second, because the data allows us to differentiate between the type of inflow, we separate total debt inflows into other investment debt inflows (e.g. loans, deposits, trade credit, etc.) and portfolio investment debt(e.g. bonds). We find that (1) procyclicality is an issue for other

[7]While GDP growth is commonly used in this literature, as a robustness check we also use deviations of GDP per capita from the trend as estimated by Hodrick-Prescott filter.

investment debt inflows, while we do not find evidence of procylicality for portfolio debt; (2) implementation of inflation targeting significantly reduces the procyclical nature of other investment debt inflows, while it has no significant effect on portfolio debt inflows.

Third, we break down both other investment debt inflows and portfolio debt inflows into public sector represented by general government and private sector represented by banks and corporates***is corporates a thing?. We find that our main results are driven by the private sector, while no significant effect of inflation targeting on public sector debt inflows has been found.

Because debt inflows constitute a very large share of capital inflows in most developing countries, these results have important policy implications. Procyclical and volatile capital flows can have large economic costs, especially for developing countries. Previous episodes of capital surges resulted in sudden stops, currency, banking, and debt crises, ***further exacerbated financial instability***this chunk doesnt seem to fit. Thus, finding a policy option that can help countries reduce these vulnerabilities and mitigate negative outcomes is essential. We find that inflation targeting allows countries to use debt inflows more effectively in a much less procyclical and for some flows even countercyclical way, as initially intended by proponents of globalization.

2 Data

2.1 Data Description

The keystone of our dataset is the IMF's *Balance of Payments* (BOP), which, to date, is the most comprehensive source of international capital flow data across countries.[8] The BOP splits capital inflows into three main categories: *direct investment, portfolio investment*, and *other investment*.[9] Each of these categories can also be divided into debt and equity components.[10] In this paper we focus only on debt inflows. *Portfolio debt* include investment in bonds, notes, money market, or

[8] In BOP terms, capital flows are measured as asset flows (outflows), liability flows (inflows), and net flows (inflows-outflows). We follow the sixth edition of the Balance of Payments Manual (BPM6) published by the IMF. Hence, transactions are recorded on a net basis for financial assets and liabilities: "net acquisition of financial assets" and "net incurrence of liabilities".

[9] Direct investments are classified by the BPM6 when a foreign investor holds at least 10 percent of a local firm's equity. The remaining equity purchases are registered as portfolio equity.

[10] Although, other investment equity is negligible.

negotiable debt instruments, while *other investment debt* include loans, transactions in currency, deposits, financial leases, and trade credits. Additionally, these debt inflows can be also be divided by sector. Although the BOP reports the transactions by central bank, deposit-taking corporations, general government, and other sectors, Avdjiev et al. (2017) and Alfaro et al. (2014) argue that for most developing countries and years before 2005 the reporting of such data tends to be sparse.[11] These authors emphasize that this observation only holds for the sectoral breakdowns since the aggregate data are well reported.

To supplement the missing data on capital inflows from the BOP we incorporate the data from the Bank for International Settlements (BIS).[12] We proceed in two steps. First, to fill in the missing data for *portfolio debt inflows* we use the International Debt Securities (IDS) dataset that reports securities issued in a market other than the local market of the country where the borrower resides (Gruić & Wooldridge 2013). Using individual reports of debt securities issued for the general government, public and private banks, public and private other financial corporations, and public and private non-financial corporations, we construct issuances by sector using the same sector definitions as the BOP.[13] Second, to fill in the missing data for *other investment debt*, we follow Avdjiev et al. (2017) and use the Locational Banking Statistics (LBS) and the Consolidated Banking Statistics (CBS).[14] The LBS captures lending from banks in the BIS reporting countries.[15] We focus on the loan component from the LBS and add the IMF credit (not included in the LBS) to capture the official lending.[16] To determine a breakdown for public and private flows, we use the CBS and the LBS by nationality, following the methodology by Arslanalp & Tsuda (2014) and Avdjiev et al. (2017).[17] Following these steps, we put together a dataset that covers 65 developing

[11] Alfaro et al. (2014) also mention the differences in terms of time coverage, as well as the missing, unreported, or misreported data, for developing countries.

[12] Because it is not clear whether a zero is a true zero or a missing value in the BOP dataset, we fill the missing values using the BIS data.

[13] Public and private other financial and public and private non-financial corporations are assigned to the corporate sector, aligned with the definition of the BOP.

[14] We use the LBS since most of the components of other investment debt are loans (for governments and corporates).

[15] According to BIS (2015), it covers about 95% of all cross-boarder interbank business.

[16] According to the BPM6, the IMF credit is a component of the *loan* instrument from *other investment debt* for general government and central banks. We identify this figure from the individual position of each country with the IMF.

[17] Prior to 2013, the LBS reported outstanding stocks for bank and non-bank debtors, where non-bank captures both non-bank private and public sectors. Hence we use the share of international bank debt for each sector from the CBS to estimate the split of the non-bank LBS into public and private components. As Avdjiev et al. (2017) explain, this methodology relies on the assumption that sectoral shares for international bank debt for each sector remain relatively stable over time. With the estimated stocks, we compute the change in each period to get the estimated

countries examined over the period from 1990 through 2015.

As of 2013, sixteen developing countries have adopted inflation targeting. Table A1 provides a list of these countries and the years when inflation targeting was introduced. The inflation targeting date captures the year when a central bank makes an explicit announcement to pursue price stability as the primary objective of their monetary policy by adopting a quantitative target for inflation. The dates used in our analysis come from Hammond (2012) and Roger (2010). Table A2 lists the remaining non-targeting developing countries used for this analysis.

The other key variable in this project is our measure of business cycle. Following the literature, we use two different measures. First, we use real GDP growth rate, which captures the state of the economy over the business cycle, measured in constant units. Second, as an alternative measure, we also use the output gap based on the Hodrick-Prescott filter (1997). That is, we use the cyclical component of the real GDP as a share of the trend. This variable comes from the World Bank's (WB) *World Development Indicators* (WDI).

Most of the remaining variables are drawn from the WB and the International Monetary Fund (IMF) databases. We use real GDP per capita as a proxy for the overall level of development. A higher level of development may attract more capital flows. To measure financial development we use the ratio of private credit to GDP, as the financial resources provided to the private sector by financial corporations. Countries with a deeper financial system can probably manage higher capital flows. The sum of exports plus imports as a share of GDP is our measure for trade openness. To measure the size of the sovereign liabilities we use the general government gross debt as a share of GDP. All these variables are from the WDI. We use a measure of inflation volatility to account for possibly importance of stable inflation in non-targeting countries. Inflation volatility is calculated from the IMF's *World Economic Outlook* (WEO). Rose (2014) argues about potential channels and effects that could be at play when developing countries face an inflow of capital. Some of those are associated with capital controls or the degree of capital account openness, a real exchange rate appreciation, a fiscal contraction, an offsetting change in the current account, or accumulating reserves.

flows for the public and private components.

We include the index of financial or capital account openness from Chinn & Ito (2006) to control for capital controls. The Chinn-Ito index measures the extent of openness in cross-border financial transactions as reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER) with a higher number indicating a lower overall level of restrictions (ranging between 0 and 1). It is the first standardized principle component of variables indicating the presence of multiple exchange rates, restrictions on current account and capital account transactions, and the requirement to surrender export proceeds. The nature of this index allows us to take into account the intensity of capital account liberalization policies.

To control for a real exchange appreciation, we include a measure of exchange rate flexibility as the growth rate of the real effective exchange rate. This measure comes from the IMF's *International Financial Statistics*, based on the consumer price index and nominal effective exchange rates.[18] To capture the government's budget we include fiscal balance from the IMF's WEO, measured as the difference between revenues and expenditures as a share of GDP.

To account for all channels, we also include the current account and the total amount of reserves, both as a share of GDP. This enables us to control for an additional monetary variable and Aizenman et al. (2010) observation that developing countries have increased their exchange rate flexibility while simultaneously holding high levels of international reserves. These variables come from the IMF's BOP.

Finally, we include multiple measures of of institutional quality: democratic accountability, ethnic tensions, religious tensions, law and order, military in politics, corruption, external conflict, internal conflict, government stability, and socioeconomic conditions. The data come from the International Country Risk Guide (ICRG) compiled by the Political Risk Services Group. We also include the financial freedom index from the Heritage Foundation, which measures the degree of independence from government control and interference in the financial sector.

Table A4 details the definitions and sources of all variables used in the empirical analysis.

[18] We also considered the de facto exchange rate regime classification by Reinhart & Rogoff (2004) extended by Reinhart & Rogoff (2009) and Ilzetzki et al. (2017).

2.2 Descriptive Statistics

To give the idea of the relative sizes of different types of capital inflows, Figure 1 plots the evolution of aggregate debt inflows and its 2 components: other investment debt and portfolio debt. According to the figure, the other investment debt constitutes the largest share of total debt, with the size of the portfolio debt being significantly smaller. Thus, we expect to see a significant correlation between results found for total debt and the results for the other investment debt.

To visually inspect different behavior of inflation targeting and non-targeting countries, Figure 2 plots total debt inflows for targeting and non-targeting countries separately. With the exception of the financial crisis, we see that during the rest of the sample inflation-targeting and non-targeting countries follow a different pattern.

3 Empirical Analysis

3.1 Estimation Strategy

We begin our analysis by exploring the cyclical properties of capital inflows. For this, we use a fixed-effects specification with the focus on the response of aggregate debt inflows to the domestic business cycle:

$$y_{i,t} = \alpha_i + \gamma_t + \beta_1 \cdot Growth_{i,t} + \delta \cdot X_{i,t} + \epsilon_{i,t}, \tag{1}$$

where $y_{i,t}$ is a measure of capital inflows scaled by trend GDP.[19] α_i is a country fixed effect to control for time invariant country-specific characteristics and γ_t is a year fixed effect to control for common time trends. The vector of controls, $X_{i,t}$, includes: GDP per capita, trade openness (export plus imports as a share of GDP), capital account openness index, private credit as a share of GDP, government debt as a share of GDP, inflation volatility, the change of the real effective exchange rate, fiscal balance as a share of GDP, the amount of international reserves as a share of GDP, and the current account as a share of GDP. Additionally, all the regressions also include

[19] We follow Broner et al. (2013) and adjust total capital inflows by trend GDP rather than actual GDP, as is commonly used in the literature. Adjusting GDP by trend rather than actual GDP keeps the variation in capital inflows associated with the cycle. We also perform a robustness check and scale by actual GDP. The results stand.

various measures of institutional quality: democratic accountability, law and order, corruption, external conflict, internal conflict, government stability, socioeconomic conditions, and financial freedom.[20]

Because we are interested in understanding the role inflation targeting plays in alleviating the procyclical nature of capital inflows, we augment equation (1) by including an IT dummy and an interaction term between IT and the domestic business cycle. To correctly estimate the effect of the policy (treatment), we use the inflation targeting countries as the treatment group and the non-inflation targeting countries as the control group.

$$y_{i,t} = \alpha_i + \gamma_t + \beta_1 \cdot IT_{i,t} + \beta_2 \cdot Growth_{i,t} + \beta_3 \cdot IT_{i,t} \cdot Growth_{i,t} + \delta \cdot X_{i,t} + \epsilon_{i,t}, \tag{2}$$

where $IT_{i,t}$ is a dummy variable equal to 1 if a country i in year t is an inflation-targeter and zero otherwise. The coefficient β_1 describes the effect of inflation targeting when the economy is in neither boom nor recession, i.e. $Growth = 0$; the coefficient β_2 measures the response of capital flows to the business cycle in non-targeting countries; and the coefficient β_3 measures the differential response of the capital flows to the business cycle in targeting versus non-targeting countries. Since $Growth$ is a continuous variable, we can analyze the effect of inflation targeting depending on the magnitude of $Growth$. Thus the marginal effect of inflation targeting is: $\partial y_{i,t}/\partial IT_{i,t} = \beta_1 + \beta_3 Growth_{i,t}$.

The decision leading to the adoption of inflation targeting relies on many factors, some associated with the central bank but others associated with countries' characteristics.[21] In other words, the decision to adopt inflation targeting is not completely exogenous. For instance, in addition to the goal of low inflation, central bankers might believe that the adoption of an inflation targeting framework will be interpreted as a commitment to stability and allow them to attract more capital flows. However, some of this relevant factors are unobservable (for example, the strategic behavior of central banks, political decisions, etc.), and thus cannot be accounted for. As a result, we could be facing a self-selection problem associated with the policy. Thus, our baseline

[20] The choice of the controls comes from the determinants of capital flows literature.

[21] See for instance, Samarina & De Haan (2014).

specification, equation (2), is subject to endogeneity concerns.

To strengthen the validity of our identification strategy, we proceed by re-weighting the sample so that the covariate distribution of the non-targeting countries looks similar to the covariate distribution of the targeting countries. Following the methodology by Hainmueller (2012), we use *entropy balancing* to generate the observation-level weights. Entropy balancing can be viewed as a generalization of the commonly used propensity score weighting methods. However, in comparison to the propensity score matching where weights are estimated first followed by the balance checks, the entropy balancing algorithm works as a reweighting scheme. In entropy balancing, the weights are derived from the imposed balance constraints which imply that in finite samples, the sample moments in the reweighted control group match exactly the corresponding moments in the treatment group.

Thus, entropy balancing has a number of advantages over the conventional propensity score methods. First, propensity score matching does not uniformly improve the balance across all the covariates (Iacus et al. 2012). Furthermore, as Caliendo & Kopeinig (2008) argue, conventional matching has a cost in terms of efficienty, as the number of observations used decreases. This can be particularly relevant for small samples leading to biased estimates. Hainmueller & Xu (2011) shows that entropy balancing outperforms conventional matching and does not discard units from the treatment or the control groups. Second, to preserve the information in the reweighted data, entropy balancing retains the weights as close as possible to the uniform base weights, allowing for more efficiency in the subsequent estimations, i.e. when using difference-in-differences. Third, because entropy balancing searches for a set of weights directly from the imposed balance constraints, it does not require continuous adjustments in specifications between different stages: propensity score estimation followed by the balance checks. In other words, the is no need to check for the balancing of both groups.

Operationally, we first obtain the weights from the entropy balancing and then use them to estimate equation (2). These weights are computed minimizing a loss function under predetermined balance constraints imposed on the moments (mean, variance, and skweness) of a set of control variables. This way, both treatment and control groups have the same mean and variance. We use the adoption of inflation targeting as the treatment variable, hence we follow Svensson (2002)

and Mishkin (2004) for the selection of the variables that determine whether a country meets the necessary pre-conditions to adopt such framework. Specifically, the goal is to achieve balance in the following set of covariates: the lagged inflation rate, broad money growth, trade openness, fiscal balance, real GDP per capita growth, exchange rate regime, and a lagged measure of the outcome variable. Table A3 in the Appendix compares the means and the standardized difference in means of the targeting and non-targeting groups before and after entropy reweighing. As expected, after the reweighing, a sufficient degree of balance is reached since both groups have almost identical means and standardized difference in means.

Once the weights are generated, we incorporate them into the difference-in-differences specification from equation (2). Marcus (2013) explains that this methodology is similar to Heckman et al. (1997)'s strategy of using matching with difference-in-differences. The resulting entropy weighted fixed effects specification controls for time-invariant country-specific characteristics such as geographical proximity as well as aggregate trends such as global liquidity crunch while entropy balancing addresses self-selection associated with inflation-targeting by balancing the targeting and non-targeting countries on a set of pre-determined variables.

3.2 Results

We begin this section with the discussion of the dynamics of capital inflows over the business cycle. Column (1) in Table 1 reports the results of estimating equation 1 using fixed-effects for total debt inflows. Consistent with the previous literature, Kaminsky et al. (2004), Broner et al. (2013), and Avdjiev et al. (2017) among others, we find that our measure of aggregate debt inflows is procyclical, hence positively correlated with GDP growth. That is, during expansions, developing countries experience a surge of capital inflows, while they decline during contractions. Columns (4) and (7) report the results by type of inflow: other investment and portfolio debt. As expected, the results for the aggregate debt are driven by other investment debt inflows. Our estimates show a strong positive correlation between other investment debt and GDP growth, while we do not find a significant relationship between portfolio debt inflows and GDP growth.[22] We find that

[22]Regarding the procyclicality of other investment debt, our results are in line with Broner et al. (2013), Avdjiev et al. (2017), and Blanchard et al. (2017). However, the findings in the literature in terms of procyclicality of portfolio debt inflows are mixed. While Broner et al. (2013) find that portfolio debt is procyclical, Avdjiev et al. (2017) and

during booms developing countries experience an increase of their inflows of capitals in the form of purchases of domestic assets (e.g. loans, transactions in currency, financial leases, and trade credits). Our results complement the widely documented evidence on the procyclicality of capital flows.

To analyze the differential effect between targeting and non-targeting countries, we introduce our measure of IT and allow for an interaction term between GDP growth and the IT variable. Columns (2) and (3) in Table 1 present the results for total debt. We separately present the estimates for a simple fixed-effects model followed by the entropy weighted fixed effects model. First, our results show that the procyclical nature of debt inflows persists in non-targeting countries: the coefficient on GDP growth remains positive and significant. This result was expected because most of the countries in our sample –49 out of 65– are non-targeting developing countries. Second, the coefficient on the interaction term between GDP growth and the IT dummy is negative and significant. This suggests that the adoption of inflation targeting reduces the positive correlation between GPD growth and total debt inflows, in other words. Based on the fixed effects difference-in-differences specification, inflation-targeting countries receive about 32% more (less) total debt inflows if their GDP growth decreases (increases) by one percentage point compared to non-targeting countries. Based on the sample average, this represents a total debt inflow of 0.8% of GDP. Consider the following example for two non-targeting countries like Botswana and Bolivia. The average growth rate over the period 1990-2015 is 7.8% for Botswana while 3.5% for Bolivia. Now suppose Bolivia decides to adopt an inflation targeting framework. *Ceteris paribus*, adopting inflation targeting decreases total debt inflows to Bolivia by 0.02 percentage points, reducing the procyclicality of such flows.[23] Furthermore, if the growth rate of Bolivia was to increase to the growth rate of Botswana, then adopting inflation targeting would decrease total debt inflows to Bolivia by 1.39 percentage points, which implies a further reduction in procyclicality.

In Column (3) we address the possible self-selection associated with the inflation-targeting policy by re-estimating equation (2) using fixed effects with entropy balancing. We find that inflation-targeting countries receive almost 38% more (less) total debt inflows if their GDP growth decreases (increases) by 1 percentage point compared to non-targeting countries. Our estimates

Blanchard et al. (2017) find that portfolio debt flows are acyclical.

[23]Based on Column (2) in Table 1, $\partial y_{i,t}/\partial IT_{i,t} = (0.011 - 0.319\text{x}0.035) = -0.0002$

using the weights generated by entropy balancing are in line while slightly larger than those from the simple fixed-effects methodology. Based on this specification, Figure 3 shows the effect of inflation targeting and GDP growth on total debt for inflation targeting and non-targeting countries separately. This approach allows us to disentangle the point estimate from Table 1. Our results show that non-targeting countries exhibit a clear procyclicality, particularly significant during periods of expansion. In contrast, the adoption of inflation targeting turns this relationship negative. That is, total debt inflows respond negatively (positively) to a domestic expansion (contraction), implying countercyclicality.

In Table 1 Columns (4) through (9), we present the results for other investment debt and portfolio debt. In line with the (aggregate) total debt inflows, we find that inflation-targeting countries receive between 26 and 30% more (less) other investment debt inflows if their GDP growth decreases (increases) by 1 percentage point compared to non-targeting countries.[24] Similar to Figure 3, Figure 4 shows that non-targeting countries exhibit a clear procyclicality in their other investment debt inflows while inflation targeting countries exhibit a countercyclical relationship. Consistent with our analysis of aggregate flows, most of the effect in total debt inflows is driven by other investment debt inflows. This result is also consistent with the descriptive statistics, where we show that other investment debt constitutes a large fraction total debt inflows. As expected, when considering portfolio debt, we find no significant effect of inflation targeting.

Regarding the other regressors, we find a modest significance of the level of development, the degree of trade openness and financial freedom, and inflation volatility. All are consistent with our priors for developing countries. Maybe the strongest effect comes from the current account, where we find negative significant estimates. This is consistent with Rose (2014), where he describes a potentially offsetting change in the current account from capital flows.

Finally, in Table 2 we further disaggregate other investment and portfolio investment debt inflows into public and private sectors. The layout of this table is similar to Table 1. For each type of capital inflow we present two columns for public flows and two other columns for private flows. Results for all types of inflows by sector are estimated separately, first, using fixed effects with the difference-in-differences specification and then, using the weights from entropy balancing

[24] Based on the sample average, this represents a total debt inflow of 0.6% of GDP.

with the fixed effects difference-in-differences specification. Our results can be summarized as follows. First, we find the private sector is driving the results of other investment debt inflows. This can be explained by the fact that most of other investment debt falls within instruments like loans, transactions in currency, financial leases, and trade credits, mostly used by the private sector. Second, our estimates suggest that the private sector in inflation-targeting countries receive between 26 and 39% more (less) other investment debt inflows if their GDP growth decreases (increases) by one percentage points compared to non-targeting countries. Third, our results for portfolio debt in inflation targeting countries remain insignificant independent of the sector. Panel A and Panel B in Figure 6 show public and private other investment debt inflows, respectively. We find that non-targeting countries exhibit procyclicality, particularly significant during periods of positive growth. On the other hand, inflation targeting countries show countercyclicality, for most of the values of GDP growth. These figures are consistent with our results for aggregate other investment debt and for total debt inflows. Interestingly, Panel B in Figure 7 shows that private portfolio debt inflows are procyclical for non-inflation targeting countries. Adopting inflation targeting seems to reduce such procyclicality, however this effect does not seem to be statistically strong.

Our results highlight the importance of disaggregating capital inflows. While we confirm the procyclical nature of total debt inflows and the role of inflation targeting in helping developing countries overcome/reduce such procyclicality, we also find that most of that effect is driven by other investment debt inflows from the private sector.

3.3 Sensitivity Analysis

This section extends the main results and explores their robustness to alternative specifications. In particular, we first address the endogeneity associated with the business cycle using an instrumental variable approach. Second, we analyze the robustness of our results to alternative measures for domestic business cycle and the adoption of inflation targeting. Third, we check the sensitivity of our estimates to the inclusion of a measure of crises, interest rates, central bank independence, and the share of foreign currency in international sovereign debt.

3.3.1 Instrumental Variables

Our main specification addresses the endogeneity associated with the adoption of inflation targeting by using entropy balancing. However, there might still be a concern regarding with the domestic business cycle. Specifically, because capital inflows can fuel economic growth, reverse causality is also possible. Thus, we use instrumental variable to address the endogeneity of GDP growth.

Conley & Ligon (2002) and Panizza & Jaimovich (2007) find that there is a significant relationship between a country's GDP per capita and that of the region. That is, there is a regional effect that affects individual countries, probably linked their trading patterns. Thus, we follow this literature and use the average GDP growth rate of the region, weighted by the corresponding trade shares (we assume that larger countries have more influence over smaller countries in the region), as an instrument for the GDP growth. Basically, the regional average GDP growth influences a country's individual GDP growth, but it is unlikely to affect a country's capital flows.[25]

The results are presented in Table 3. Similar to previous tables, for each type of capital inflow we present two columns for public flows and two other columns for private flows. In this case, results for all types of inflows by sector are estimated separately, first, using the instrumental variable approach and then, using the weights from entropy balancing with the instrumental variable methodology. The joint *F-statistics* of the first stage of the IV regressions show that the instruments are relevant and greater that Staiger & Stock (1997) rule of thumb of 10. Regarding the second stage, our main result holds: inflation-targeting countries receive significantly more other investment debt inflows when GDP growth declines compared to non-targeting countries, with this result being driven by private sector. Interestingly, we also find that the private sector from portfolio debt inflows in inflation-targeting countries receive between 7 and 9% more (less) other investment debt inflows if their GDP growth decreases (increases) by one percentage points compared to non-targeting countries. However this result is not robust across specifications. Additionally, when using instrumental variables we find a positive interaction term for other investment debt inflows from the public sector. Although this result is not robust across specifications, it

[25]Operationally, this implies computing a regional average GDP growth for each country i (excluding country i), weighting by the trade shares. Furthermore, since our baseline specification has an interaction term, we follow **?** and use the interaction between the average regional GDP growth and inflation targeting as an additional instrument.

provides evidence that complements the findings by Alfaro et al. (2014) and Avdjiev et al. (2017) on the countercyclicality of public flows due primarily to the sovereign-to-sovereign flows.

3.3.2 Alternative Measures

Output Gap. While GDP growth is commonly used in the literature as a measure of the domestic business cycle, as an alternative we apply the Hodrick-Prescott filter (1997) to decompose the GDP trend from the cycle. Basically, we first compute the business cycle deviation from the trend using the cyclical component of GDP. This is our measure of *output gap*. Second, we re-estimate equation (2) using output gap instead of GDP growth. Table 4 presents the results by type of capital inflows.Overall our results remain in line with those presented in Table 1. First, total debt inflows and other investment debt inflows exhibit a procyclical nature. In this set of results, we also find some evidence of procyclicality for portfolio debt inflows, although not robust across specifications. Second, inflation targeting countries receive between 20 and 26% more (less) total debt inflows if their output gap decreases (increases) by one percentage point compared to non-targeting countries. Those figures are between 14 and 30% for other investment debt inflows. These estimates are slightly larger than those from Table 1. Third, using output gap we also find that the significant effect of inflation targeting holds both for other investment debt and portfolio debt, albeit the effect varies with the specification. Table 5 presents the results when decomposing the different types of debt inflows by sector. Consistent with Table 2 we find that the results for private sector are driving the overall findings. Private sector other investment inflows for inflation-targeting countries exhibit a significantly higher (lower) effect compared to non-targeting countries.[26]

Constant target. Mishkin (2004) argues that some of the effects of the adoption of inflation targeting could be delayed since the benefits do not materialize immediately. That is, only after having an inflation targeting framework in place for some time, countries might start observing the benefits of such adoption. To address this effect, we follow Ball & Sheridan (2004), Mishkin (2004), Lin & Ye (2007), and Ogrokhina & Rodriguez (2018) defining a *constant target* as the first year in which an inflation targeting countries has an unchanging target or target range for an indefinite

[26] We also find some evidence of an effect of inflation targeting in public sector portfolio flows, but this result does not survive when controlling for the endogeneity of the policy.

period of time (until the end of our sample). While some countries might fall in this category since the first year of adopting inflation targeting, some other will require some time before reaching that point.[27] By using this definition, we identify twelve countries with a constant inflation target by 2015. Table 6 presents the results using the constant inflation targeting dates by type of capital inflows. Our results remain in line with those presented in Table 1. First, we identify a procyclical nature of total debt inflows, mostly driven by other investment debt inflows. Second, our estimates show a stronger effect of inflation targeting. This result is not surprising. After all, it is probably capturing the time to build credibility in the monetary policy. In particular, inflation targeting countries receive between 32 and 34% more (less) total debt inflows if their GDP growth decreases (increases) by one percentage point compared to non-targeting countries. Similar to our baseline results, in Table 7 we find that most of the effect comes from (the private) other investment debt inflows.

3.3.3 Additional Controls

Currency Crises. Most developing countries experience an increase pressure in inflation and volatility during currency crises. Furthermore, while inflation targeting aims at stabilizing medium term inflation expectations, facing a currency crisis can potentially redirect central bank objectives to exchange rate and financial stability.[28] To address the potential effect of currency crises, we include a dummy variable from Aizenman & Ito (2014) that controls for rare but sever episodes of currency instability. Table 8 and Table 9 present the results by type of capital inflows and sector, respectively. Accounting for crises has no significant effect on our results. Our main findings remain unchanged: (i) there is a strong procyclicality of total debt inflows, mostly driven by other investment debt, (ii) inflation targeting countries receive between 30 and 35% more (less) total debt inflows if their GDP growth decreases (increases) by one percentage point compared to non-targeting countries, and (iii) most of the effect of other investment debt comes from the private sector.

Interest Rates. The relationship between interest rates in developing countries and advanced economies can give evidence of another aspect of monetary policy independence. To account for

[27] For instance, Chile has had a constant inflation target since 2001, while Brazil has had a constant target since 2005.

[28] See for instance, Berganza & Broto (2012) and Coulibaly & Kempf (2019).

this effect, following Aizenman et al. (2010), we include the interest rate differential between each country's interest rate and the average of the US, the UK and the Euro area. Table 10 and Table 11 present the results by type of capital inflows and sector, respectively. Our results remain robust and consistent with Table 1 and Table 2. In this case, we also have a significant reduction in our sample size, that could be affecting our point estimates.

Share of Foreign Currency in International Sovereign Debt. There is an extensive literature that analyzes the inability of developing countries to borrow abroad in their own currency.See Hausmann & Panizza (2003) and Eichengreen et al. (2007), among others The main consequence of this "original sin" is that countries accumulate debt in foreign currency –as opposed to domestic currency– leaving them exposed to currency mismatches and balance sheet effects associated with currency volatility. In fact, foreign currency denominated debt limits the capacity of central banks to conduct monetary policy. To control for such effect, we include the *share of foreign currency in international sovereign debt* that comes from the currency composition of sovereign debt from the BIS *Debt Securities Statistics* (DSS). Table 12 and Table 13 present the results by type of capital inflows and sector, respectively. Our results and main findings hold when controlling for the reliance of developing countries on foreign currency debt. The main observation in this case, is that our point estimates are affected by the sample size that is considerably reduced.

Central Bank Independence. From our discussion on the empirical strategy, we highlighted that Svensson (2002) and Mishkin (2004) discuss the required conditions for countries to adopt inflation targeting. Based on this discussion, some scholars, like Samarina & De Haan (2014), emphasize the different aspects –macroeconomics, fiscal, financial, and institutional– needed to have an inflation targeting framework in place. Following this literature we expand our entropy balancing variables to account for institutional factors. For this, we include the central bank governor's turnover rate from Dreher et al. (2010) as an inverse proxy of central bank independence. Table 14 and Table 15 present the results by type of capital inflows and sector, respectively. Notice that in these tables we only report the results from using entropy balancing with a fixed effects difference-in-difference methodology. Accounting for this factor leaves our results qualitatively and quantitatively similar to those from Table 1 and Table 2. We find that (i) inflation targeting countries receive about 34% more (less) total debt inflows if their GDP growth decreases (increases)

by one percentage point compared to non-targeting countries, and that (ii) most of the effect of other investment debt comes from the private sector.

4 Concluding Remarks

After almost three decades of steady inflows of capital flows to developing countries, historical experience fails to provide evidence that financial integration has a positive effect on economic growth. It now appears to be recognized that large and volatile capital flows also create challenges for policymakers. As developing countries opened their capital accounts to global financial markets, they saw significant inflows of capital followed by "sudden stops" and sharp reversals of flows, causing significant financial instabilities that resulted in financial crises. While there are many reasons why policymakers might be concerned about the volatility of capital flows, in this paper we focus on the amplification of the business cycle associated with the procyclicality of capital flows.

Our empirical analysis addresses the self-selection associated with the adoption of inflation targeting by combining entropy balancing with a difference-in-difference estimation strategy. We find robust evidence that inflation targeting can play an important role in reducing the procyclicality of debt inflows. Across all specifications, we find that inflation-targeting countries have higher levels of debt inflows during times of distress while having lower levels of debt inflows during booms, compared to non-targeting countries. In particular, we find that procyclicality is an issue for other investment debt inflows, while we do not find evidence of procylicality for portfolio debt. Furthermore, the implementation of inflation targeting significantly reduces the procyclical nature of other investment debt inflows, while it has no significant effect on portfolio debt inflows. Overall, we find that our main results are driven by the private sector, while no significant effect of inflation targeting on public sector debt inflows has been found.

Our findings extend the discussion on the cyclicality of capital flows and the policies that allow countries to alleviate business cycles. We find inflation targeting to be a promising solution. Further research is still required to fully understand and rationalize what other complementary policies can potentially alleviate such procyclicality.

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Figure 1: Composition of External Debt Liabilities by Debt Type, Percentage of Trend GDP.

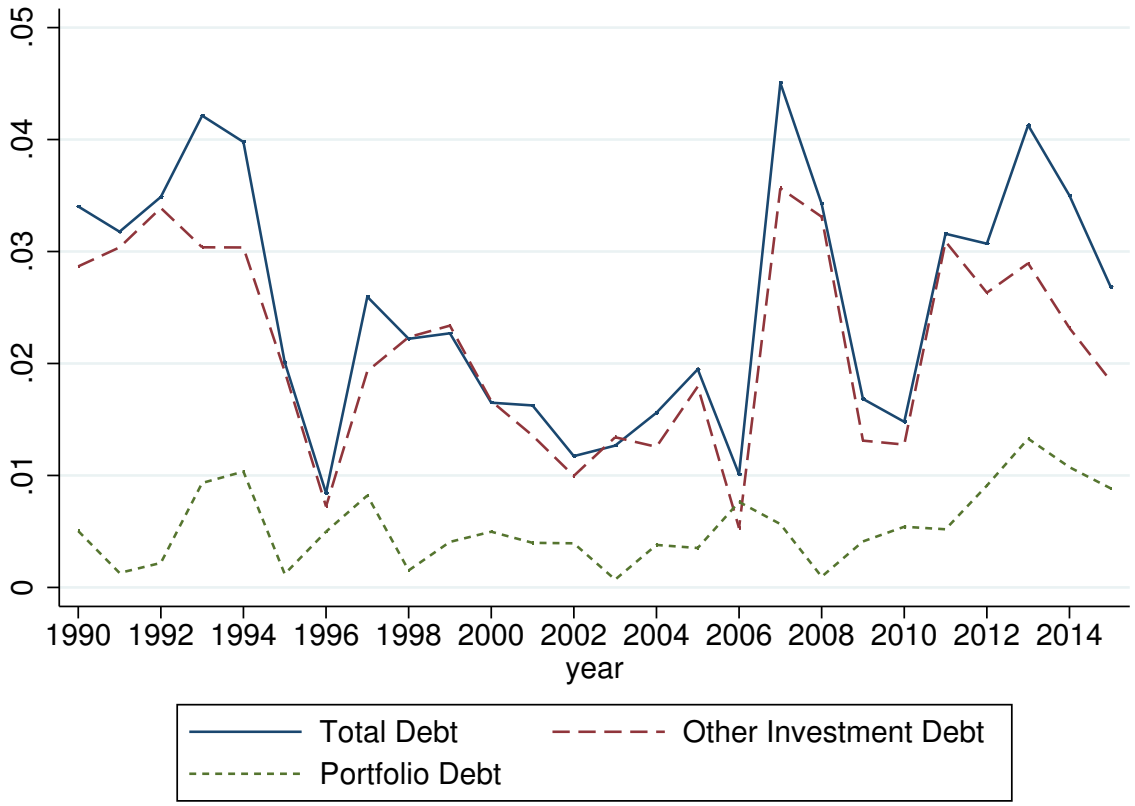


Figure 2: Total Debt Inflows in Inflation Targeting and Non-Targeting Countries, Percentage of Trend GDP.

Figure 3: Effect of Inflation Targeting and GDP growth on Total Debt.

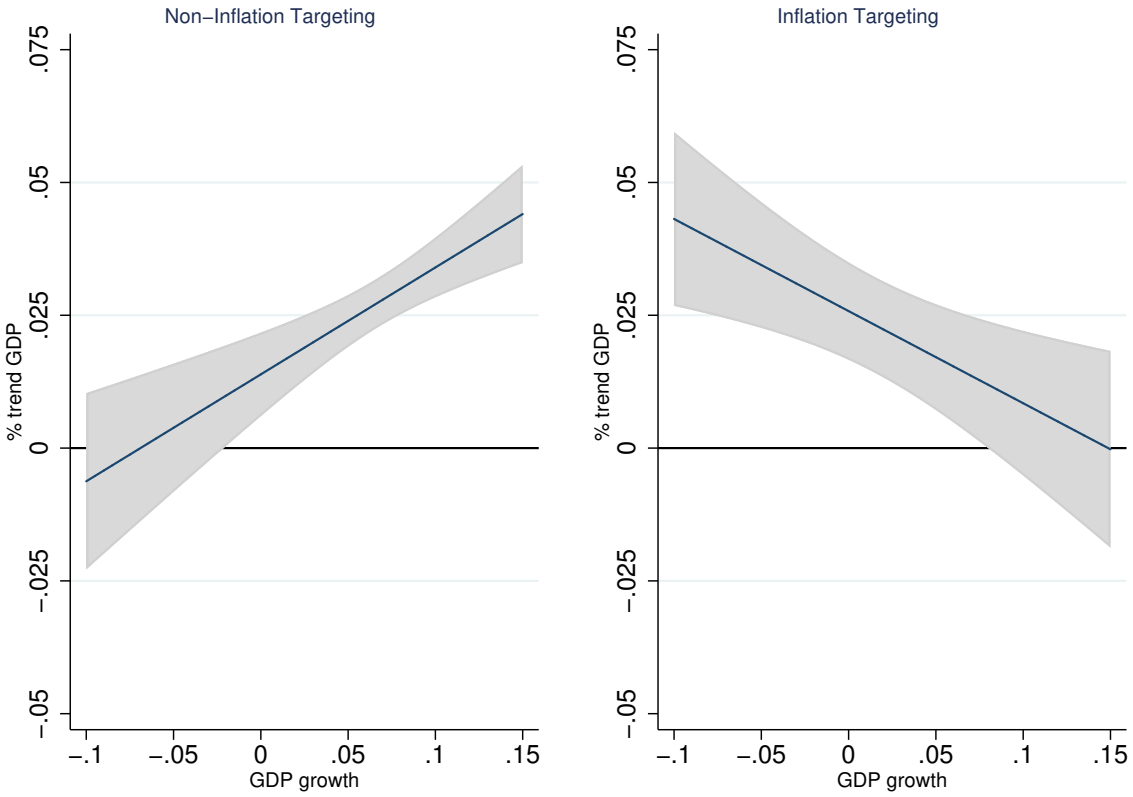


Figure 4: Effect of Inflation Targeting and GDP growth on Other Investment Debt.

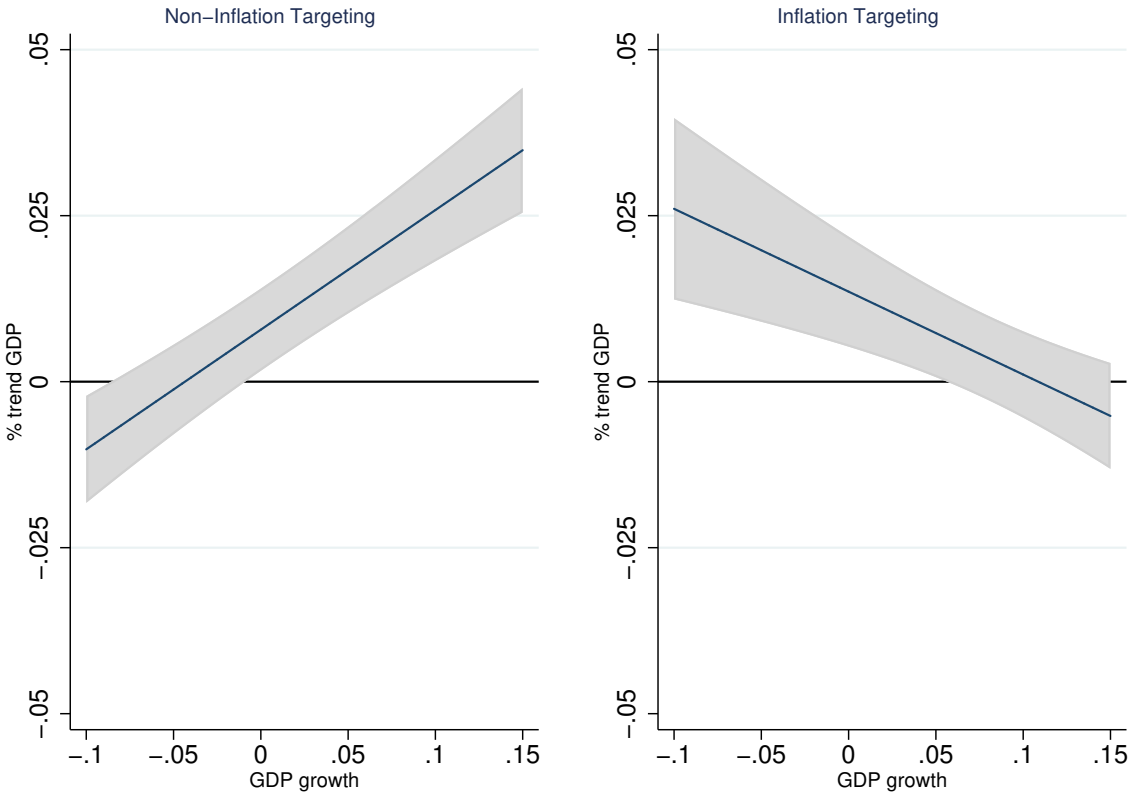


Figure 5: Effect of Inflation Targeting and GDP growth on Portfolio Debt.

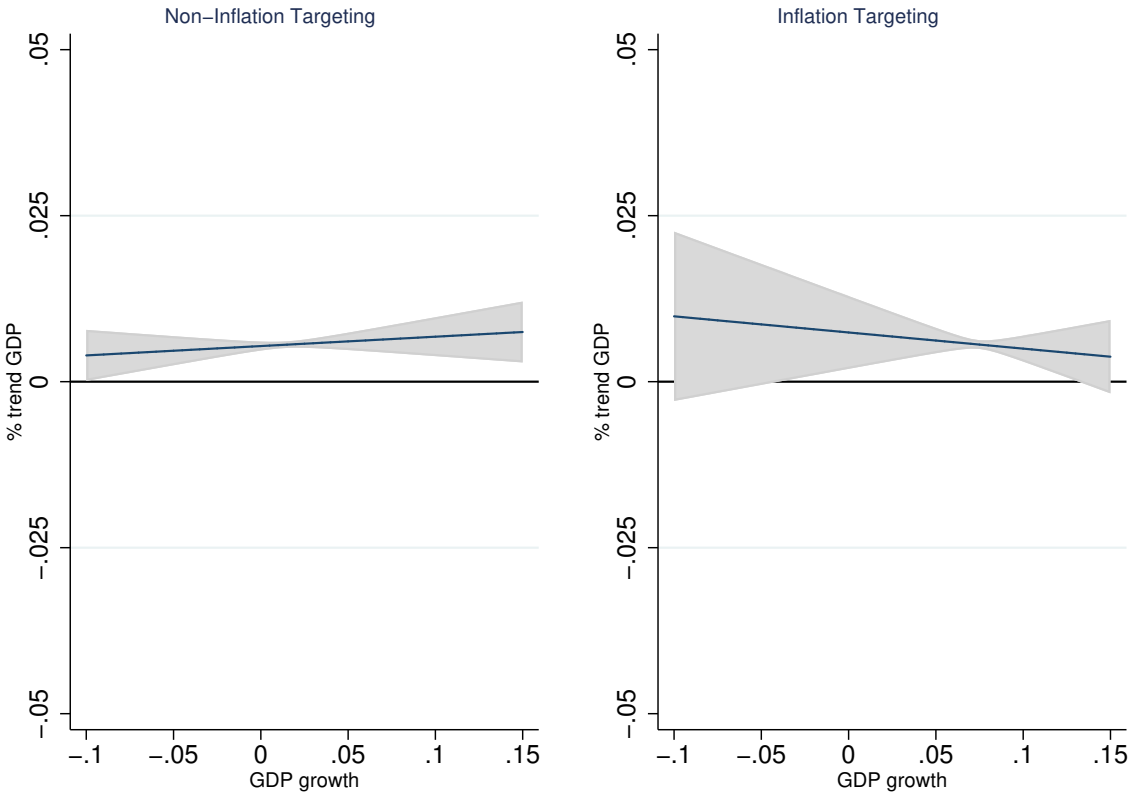
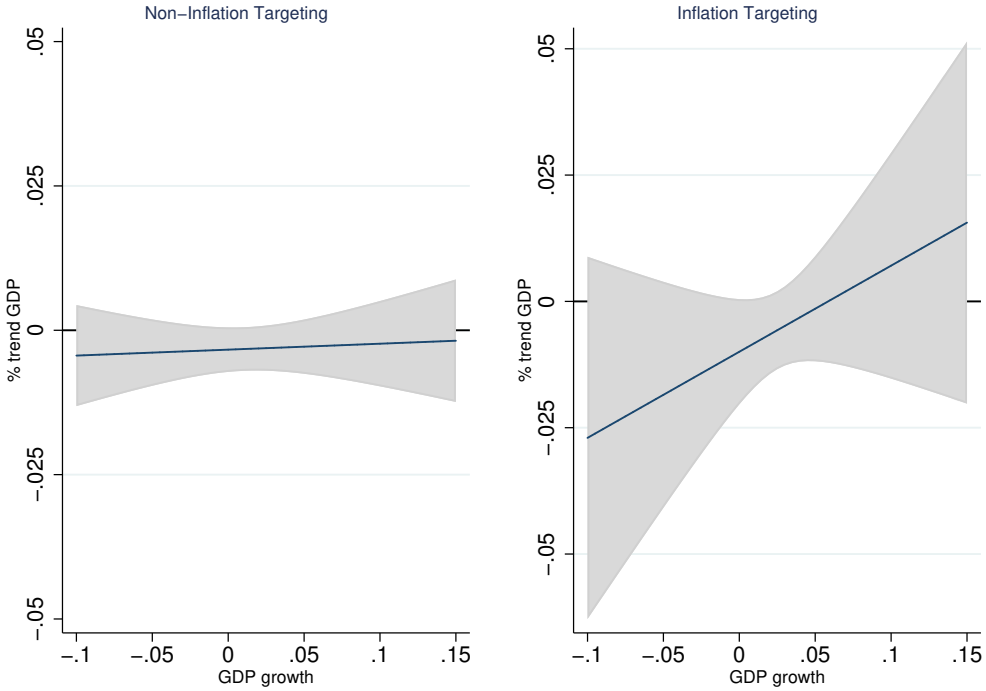


Figure 6: Effect of Inflation Targeting and GDP growth on Other Investment Debt.

Panel A: Public



Panel B: Private

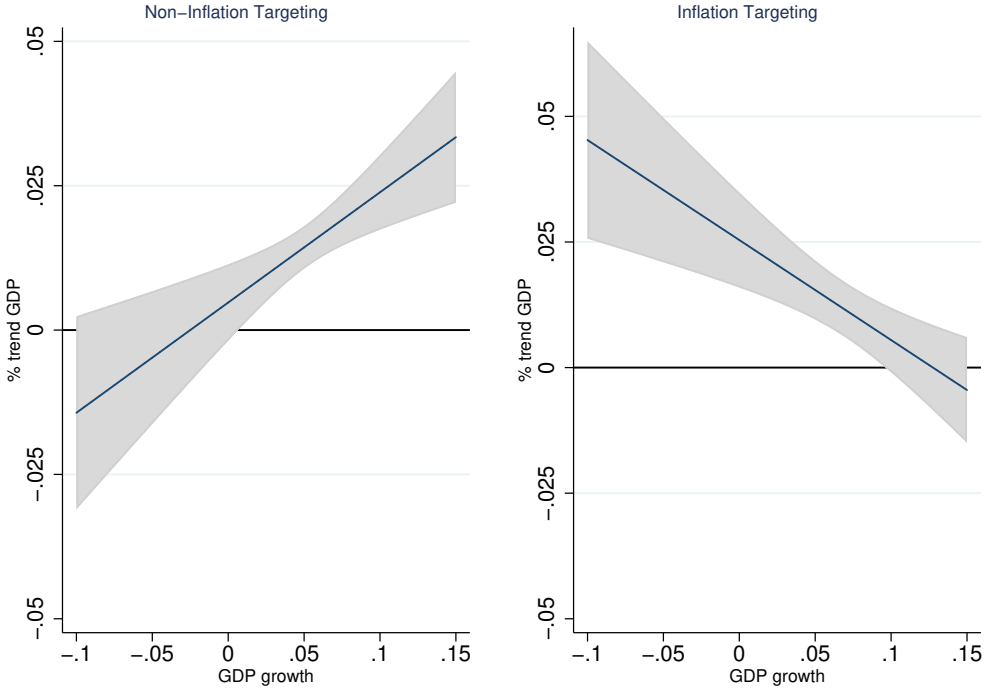
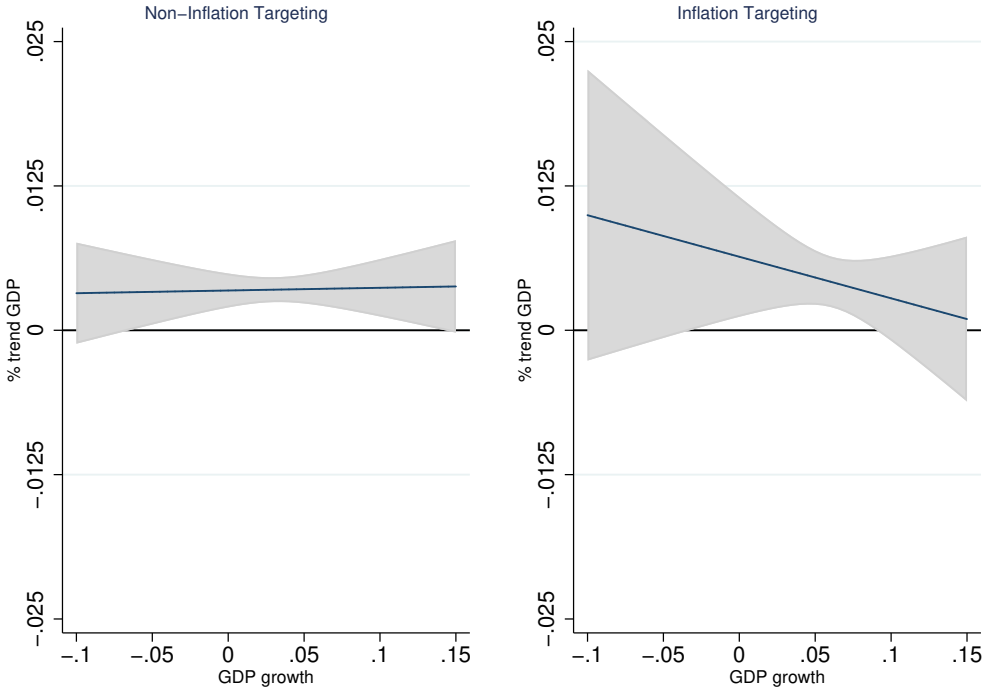


Figure 7: Effect of Inflation Targeting and GDP growth on Portfolio Debt.

Panel A: Public



Panel B: Private

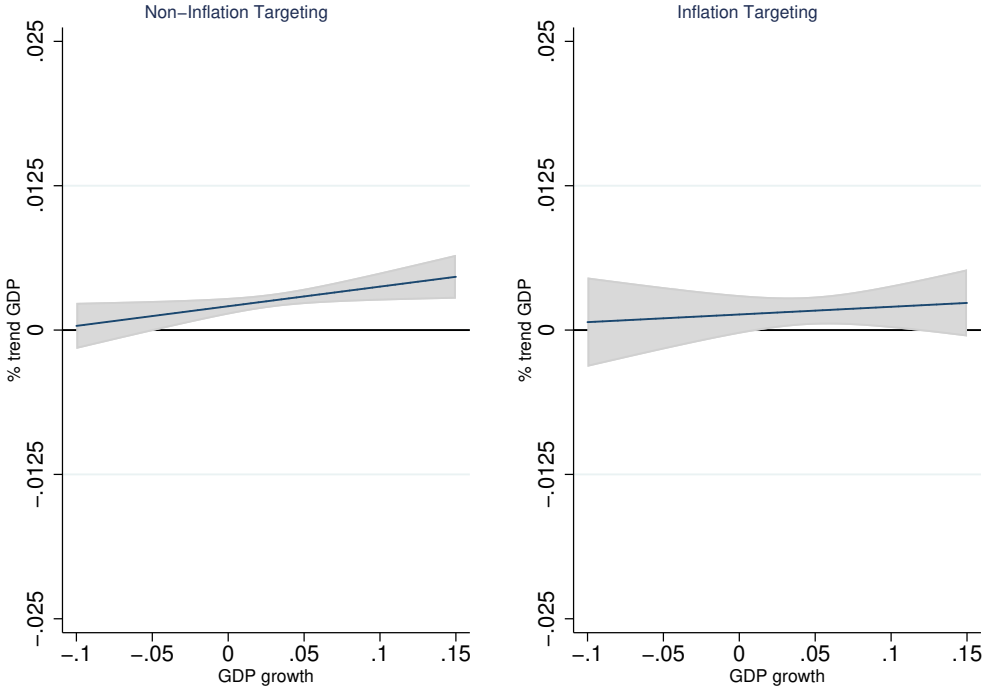


Table 1: The effect of inflation targeting over the business cycle: Baseline, 1990-2015

	Total Debt			Other Investment Debt			Portfolio Debt		
	(1) FE	(2) FE	(3) Entropy Balance	(4) FE	(5) FE	(6) Entropy Balance	(7) FE	(8) FE	(9) Entropy Balance
IT		0.011	0.011		0.010	0.006		0.002	0.002
		(0.009)	(0.009)		(0.008)	(0.008)		(0.004)	(0.003)
GDP growth	0.181***	0.200***	0.190***	0.145***	0.161***	0.180***	0.033	0.036	0.014
	(0.068)	(0.072)	(0.061)	(0.053)	(0.057)	(0.030)	(0.028)	(0.029)	(0.020)
IT x GDP growth		-0.319***	-0.380***		-0.262***	-0.305***		-0.051	-0.038
		(0.114)	(0.029)		(0.087)	(0.017)		(0.052)	(0.026)
GDPpc	0.023*	0.024*	0.039	0.025*	0.026**	0.027**	-0.002	-0.002	0.004
	(0.013)	(0.013)	(0.020)	(0.013)	(0.013)	(0.008)	(0.006)	(0.006)	(0.008)
Trade openness	0.012	0.010	0.036*	0.005	0.004	0.020	0.003	0.003	0.011
	(0.017)	(0.017)	(0.016)	(0.017)	(0.017)	(0.023)	(0.007)	(0.007)	(0.008)
Inflation vol	0.000	0.000	0.002*	-0.006***	-0.006***	-0.005***	0.006***	0.006***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
REER growth	0.001	0.002	0.039	0.007	0.008	0.037	-0.003	-0.003	-0.007**
	(0.026)	(0.026)	(0.030)	(0.026)	(0.026)	(0.019)	(0.007)	(0.007)	(0.003)
Ka openness	-0.008	-0.007	0.001	-0.010	-0.010	0.001	0.003	0.003	0.009
	(0.010)	(0.010)	(0.007)	(0.009)	(0.009)	(0.008)	(0.007)	(0.007)	(0.007)
Private credit	0.019	0.018	-0.023	0.006	0.006	-0.029	0.014***	0.014***	0.010
	(0.016)	(0.015)	(0.018)	(0.016)	(0.016)	(0.016)	(0.005)	(0.005)	(0.007)
Financ freedom	0.005	0.005	0.052***	-0.015	-0.016	0.047***	0.010	0.010	0.006
	(0.023)	(0.023)	(0.010)	(0.023)	(0.022)	(0.009)	(0.010)	(0.009)	(0.010)
Gov debt/GDP	-0.027	-0.027	-0.025	-0.012	-0.012	-0.006	-0.012	-0.012	-0.010**
	(0.017)	(0.017)	(0.022)	(0.018)	(0.018)	(0.018)	(0.009)	(0.009)	(0.003)
Fisc balance	0.001	0.001	0.001	0.001*	0.001*	0.002*	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Curr acct/GDP	-0.002***	-0.002***	-0.004***	-0.002***	-0.002***	-0.003***	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Reserves/GDP	0.031	0.029	0.042	0.041	0.039	0.073	-0.012	-0.012	-0.015
	(0.024)	(0.024)	(0.040)	(0.026)	(0.026)	(0.039)	(0.008)	(0.008)	(0.011)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE both	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.172	0.176	0.444	0.173	0.177	0.357	0.131	0.132	0.180
Observations	1016	1016	1016	1024	1024	1024	1016	1016	1016

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: The effect of inflation targeting over the business cycle: Other Investment and Portfolio Debt, 1990-2015

	Other Investment Debt				Portfolio Debt			
	Public		Private		Public		Private	
	(1) FE	(2) Entropy Balance	(3) FE	(4) Entropy Balance	(5) FE	(6) Entropy Balance	(7) FE	(8) Entropy Balance
IT	-0.001	-0.007	0.011	0.021**	0.002	0.003	-0.000	-0.001
	(0.004)	(0.007)	(0.008)	(0.009)	(0.004)	(0.003)	(0.001)	(0.001)
GDP growth	0.041	0.010	0.120***	0.191***	0.021	0.002	0.016*	0.017*
	(0.043)	(0.043)	(0.040)	(0.066)	(0.027)	(0.020)	(0.009)	(0.009)
IT x GDP growth	-0.006	0.160	-0.256***	-0.390***	-0.049	-0.038	-0.004	-0.010
	(0.050)	(0.176)	(0.082)	(0.091)	(0.048)	(0.041)	(0.020)	(0.019)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.111	0.272	0.311	0.572	0.109	0.157	0.140	0.237
Observations	1024	1024	1024	1024	995	995	995	995

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: The effect of inflation targeting over the business cycle: Other Investment and Portfolio Debt, 1990-2015. Robustness checks, instrumental variables.

	Other Investment Debt				Portfolio Debt			
	Public		Private		Public		Private	
	(1) IV	(2) IV w/E Balance	(3) IV	(4) IV w/E Balance	(5) IV	(6) IV w/E Balance	(7) IV	(8) IV w/E Balance
IT	-0.012**	-0.048**	0.015	0.023**	0.001	0.002	0.003	0.002
	(0.006)	(0.023)	(0.010)	(0.011)	(0.004)	(0.005)	(0.002)	(0.002)
GDP growth	0.172	0.663	0.277	0.550***	-0.125	-0.200	0.032	0.043
	(0.188)	(0.452)	(0.201)	(0.195)	(0.088)	(0.129)	(0.049)	(0.044)
IT x GDP growth	0.193**	0.917*	-0.390***	-0.548***	0.013	0.043	-0.071**	-0.086***
	(0.096)	(0.472)	(0.141)	(0.159)	(0.075)	(0.082)	(0.036)	(0.031)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1023	1023	1023	1023	994	994	994	994
First stage (F-stat)	44.29	30.51	44.29	35.30	42.31	42.83	42.31	52.40

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: The effect of inflation targeting over the business cycle, 1990-2015. Robustness checks, output gap

	Total Debt			Other Investment Debt			Portfolio Debt		
	(1) FE	(2) FE	(3) Entropy Balance	(4) FE	(5) FE	(6) Entropy Balance	(7) FE	(8) FE	(9) Entropy Balance
IT		-0.001	-0.006		-0.000	-0.008		0.000	0.000
		(0.007)	(0.009)		(0.007)	(0.008)		(0.002)	(0.002)
GDPcyc_comp	0.206**	0.235**	0.263**	0.119*	0.138*	0.303***	0.077**	0.085**	0.035
	(0.086)	(0.094)	(0.114)	(0.071)	(0.078)	(0.086)	(0.037)	(0.040)	(0.042)
IT x GDPcyc_comp		-0.560**	-0.732***		-0.377*	-0.524***		-0.161**	-0.067
		(0.240)	(0.097)		(0.229)	(0.122)		(0.071)	(0.059)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE both	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.165	0.170	0.444	0.166	0.169	0.358	0.134	0.136	0.180
Observations	1016	1016	1016	1024	1024	1024	1016	1016	1016

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: The effect of inflation targeting over the business cycle: Other Investment and Portfolio Debt, 1990-2015. Robustness checks, output gap

	Other Investment Debt				Portfolio Debt			
	Public		Private		Public		Private	
	(1) FE	(2) Entropy Balance	(3) FE	(4) Entropy Balance	(5) FE	(6) Entropy Balance	(7) FE	(8) Entropy Balance
IT	-0.001	0.002	0.001	0.003	0.001	0.002*	-0.000	-0.001
	(0.004)	(0.008)	(0.006)	(0.009)	(0.003)	(0.001)	(0.001)	(0.001)
GDPcyc_comp	-0.074	-0.138*	0.212***	0.368***	0.042	-0.011	0.027*	0.032*
	(0.048)	(0.065)	(0.071)	(0.058)	(0.040)	(0.045)	(0.015)	(0.017)
IT x GDPcyc_comp	0.103	0.476	-0.479***	-0.806***	-0.132**	-0.040	-0.028	-0.044
	(0.076)	(0.292)	(0.185)	(0.115)	(0.061)	(0.039)	(0.048)	(0.025)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.112	0.277	0.314	0.583	0.124	0.162	0.144	0.243
Observations	1024	1024	1024	1024	997	997	997	997

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: The effect of inflation targeting over the business cycle, 1990-2015. Robustness checks, constant target

	Total Debt			Other Investment Debt			Portfolio Debt		
	(1) FE	(2) FE	(3) Entropy Balance	(4) FE	(5) FE	(6) Entropy Balance	(7) FE	(8) FE	(9) Entropy Balance
IT		0.020***	0.020**		0.025***	0.022***		-0.004	-0.003
		(0.006)	(0.009)		(0.005)	(0.003)		(0.004)	(0.005)
GDP growth	0.181***	0.186***	0.153**	0.145***	0.146***	0.132***	0.033	0.038	0.014
	(0.068)	(0.070)	(0.071)	(0.053)	(0.055)	(0.038)	(0.028)	(0.028)	(0.022)
IT x GDP growth		-0.320***	-0.339***		-0.275***	-0.263***		-0.049	-0.031
		(0.119)	(0.130)		(0.082)	(0.055)		(0.074)	(0.048)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE both	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.172	0.175	0.437	0.173	0.179	0.352	0.131	0.136	0.184
Observations	1016	1016	1016	1024	1024	1024	1016	1016	1016

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: The effect of inflation targeting over the business cycle: Other Investment and Portfolio Debt, 1990-2015. Robustness checks, constant target

	Other Investment Debt				Portfolio Debt			
	Public		Private		Public		Private	
	(1) FE	(2) Entropy Balance	(3) FE	(4) Entropy Balance	(5) FE	(6) Entropy Balance	(7) FE	(8) Entropy Balance
IT	-0.001	-0.011	0.026***	0.034***	-0.005	-0.004	0.001	0.001
	(0.004)	(0.008)	(0.006)	(0.008)	(0.003)	(0.004)	(0.002)	(0.001)
GDP growth	0.028	0.054	0.123***	0.184***	0.009	-0.009	0.014	0.013**
	(0.035)	(0.043)	(0.040)	(0.070)	(0.023)	(0.022)	(0.009)	(0.007)
IT x GDP growth	-0.015	0.097	-0.256***	-0.394***	-0.052	-0.036	0.009	0.002
	(0.060)	(0.132)	(0.090)	(0.096)	(0.060)	(0.037)	(0.031)	(0.026)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.109	0.292	0.312	0.617	0.128	0.169	0.146	0.242
Observations	1029	1029	1029	1029	997	997	997	997

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: The effect of inflation targeting over the business cycle, 1990-2015. Robustness checks, crises

	Total Debt			Other Investment Debt			Portfolio Debt		
	(1) FE	(2) FE	(3) Entropy Balance	(4) FE	(5) FE	(6) Entropy Balance	(7) FE	(8) FE	(9) Entropy Balance
IT		0.009	0.008		0.008	0.003		0.002	0.002
		(0.008)	(0.010)		(0.008)	(0.009)		(0.004)	(0.003)
GDP growth	0.164**	0.184**	0.153*	0.129**	0.145**	0.140**	0.034	0.037	0.016
	(0.073)	(0.078)	(0.083)	(0.057)	(0.061)	(0.041)	(0.030)	(0.031)	(0.021)
IT x GDP growth		-0.300***	-0.346***		-0.244***	-0.263***		-0.052	-0.041
		(0.115)	(0.039)		(0.087)	(0.026)		(0.053)	(0.025)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE both	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.175	0.179	0.451	0.177	0.180	0.367	0.132	0.132	0.180
Observations	1016	1016	1016	1024	1024	1024	1016	1016	1016

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: The effect of inflation targeting over the business cycle: Other Investment and Portfolio Debt, 1990-2015. Robustness checks, crises

	Other Investment Debt				Portfolio Debt			
	Public		Private		Public		Private	
	(1) FE	(2) Entropy Balance	(3) FE	(4) Entropy Balance	(5) FE	(6) Entropy Balance	(7) FE	(8) Entropy Balance
IT	-0.002	-0.010	0.009	0.021**	0.003	0.004*	-0.000	-0.001
	(0.005)	(0.008)	(0.007)	(0.008)	(0.004)	(0.002)	(0.002)	(0.001)
GDP growth	0.012	-0.021	0.133***	0.220***	0.009	-0.011	0.015	0.018***
	(0.039)	(0.029)	(0.044)	(0.077)	(0.025)	(0.024)	(0.009)	(0.007)
IT x GDP growth	0.000	0.249	-0.243***	-0.373***	-0.050	-0.036**	-0.000	-0.009
	(0.049)	(0.198)	(0.080)	(0.085)	(0.047)	(0.016)	(0.021)	(0.017)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.114	0.299	0.308	0.612	0.122	0.163	0.144	0.241
Observations	1029	1029	1029	1029	997	997	997	997

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: The effect of inflation targeting over the business cycle, 1990-2015. Robustness checks, interest rates

	Total Debt			Other Investment Debt			Portfolio Debt		
	(1) FE	(2) FE	(3) Entropy Balance	(4) FE	(5) FE	(6) Entropy Balance	(7) FE	(8) FE	(9) Entropy Balance
IT		0.005	0.003		0.004	0.001		0.002	0.002
		(0.010)	(0.011)		(0.010)	(0.011)		(0.004)	(0.002)
GDP growth	0.183**	0.211**	0.201***	0.126**	0.151**	0.176***	0.054*	0.058*	0.024
	(0.080)	(0.087)	(0.055)	(0.061)	(0.066)	(0.026)	(0.032)	(0.034)	(0.022)
IT x GDP growth		-0.365**	-0.380***		-0.312**	-0.323***		-0.055	-0.019
		(0.170)	(0.063)		(0.133)	(0.062)		(0.071)	(0.037)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE both	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.181	0.189	0.421	0.190	0.196	0.365	0.202	0.202	0.274
Observations	695	695	695	703	703	703	695	695	695

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: The effect of inflation targeting over the business cycle: Other Investment and Portfolio Debt, 1990-2015. Robustness checks, interest rates

	Other Investment Debt				Portfolio Debt			
	Public		Private		Public		Private	
	(1) FE	(2) Entropy Balance	(3) FE	(4) Entropy Balance	(5) FE	(6) Entropy Balance	(7) FE	(8) Entropy Balance
IT	-0.002	-0.014	0.006	0.011	0.004	0.003*	-0.001	-0.002***
	(0.005)	(0.010)	(0.009)	(0.009)	(0.004)	(0.002)	(0.002)	(0.000)
GDP growth	0.007	0.033	0.146***	0.155**	0.025	-0.003	0.015	0.012**
	(0.037)	(0.061)	(0.054)	(0.075)	(0.024)	(0.013)	(0.010)	(0.005)
IT x GDP growth	-0.019	0.225	-0.288***	-0.276***	-0.048	-0.008	-0.002	0.001
	(0.058)	(0.200)	(0.112)	(0.091)	(0.063)	(0.036)	(0.025)	(0.011)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.176	0.388	0.318	0.475	0.177	0.276	0.205	0.297
Observations	708	708	708	708	680	680	680	680

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: The effect of inflation targeting over the business cycle, 1990-2015. Robustness checks, share of foreign currency in international sovereign debt,

	Total Debt			Other Investment Debt			Portfolio Debt		
	(1) FE	(2) FE	(3) Entropy Balance	(4) FE	(5) FE	(6) Entropy Balance	(7) FE	(8) FE	(9) Entropy Balance
IT		0.020**	0.010		0.015**	0.006		0.005	0.003
		(0.009)	(0.008)		(0.007)	(0.006)		(0.004)	(0.002)
GDP growth	0.210**	0.238**	0.197*	0.177***	0.197***	0.195***	0.033	0.041	0.017
	(0.096)	(0.102)	(0.118)	(0.066)	(0.072)	(0.052)	(0.048)	(0.049)	(0.037)
IT x GDP growth		-0.383***	-0.376***		-0.284***	-0.286***		-0.098	-0.084*
		(0.043)	(0.042)		(0.086)	(0.067)		(0.076)	(0.043)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE both	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.302	0.312	0.541	0.319	0.325	0.461	0.158	0.160	0.221
Observations	668	668	668	668	668	668	668	668	668

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13: The effect of inflation targeting over the business cycle: Other Investment and Portfolio Debt, 1990-2015. Robustness checks, share of foreign currency in international sovereign debt

	Other Investment Debt				Portfolio Debt			
	Public		Private		Public		Private	
	(1) FE	(2) Entropy Balance	(3) FE	(4) Entropy Balance	(5) FE	(6) Entropy Balance	(7) FE	(8) Entropy Balance
IT	0.000	-0.011**	0.014*	0.016**	0.007	0.005**	-0.001	-0.000
	(0.004)	(0.004)	(0.008)	(0.008)	(0.004)	(0.002)	(0.002)	(0.001)
GDP growth	0.029	0.034*	0.188***	0.186**	0.000	-0.016	0.019	0.019**
	(0.038)	(0.019)	(0.073)	(0.089)	(0.040)	(0.037)	(0.013)	(0.008)
IT x GDP growth	-0.023	0.007	-0.255***	-0.338***	-0.081	-0.073	-0.012	-0.015
	(0.040)	(0.034)	(0.091)	(0.079)	(0.068)	(0.044)	(0.024)	(0.011)
Institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within-R^2	0.194	0.378	0.408	0.528	0.177	0.217	0.227	0.309
Observations	668	668	668	668	668	668	668	668

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14: The effect of inflation targeting over the business cycle, 1990-2015. Robustness checks, central bank independence

	Total Debt	Other Investment Debt	Portfolio Debt
	(1)	(2)	(3)
	Entropy Balance	Entropy Balance	Entropy Balance
IT	0.009	0.005	0.003
	(0.010)	(0.008)	(0.003)
GDP growth	0.172**	0.181***	0.012
	(0.060)	(0.039)	(0.021)
IT x GDP growth	-0.338***	-0.303***	-0.040
	(0.032)	(0.017)	(0.027)
Institutions	Yes	Yes	Yes
FE both	Yes	Yes	Yes
Within-R^2	0.457	0.369	0.190
Observations	940	948	940

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 15: The effect of inflation targeting over the business cycle: Other Investment and Portfolio Debt, 1990-2015. Robustness checks, central bank independence

	Other Investment Debt		Portfolio Debt	
	Public	Private	Public	Private
	(1)	(2)	(3)	(4)
	Entropy Balance	Entropy Balance	Entropy Balance	Entropy Balance
IT	-0.005	0.019**	0.004	-0.001
	(0.007)	(0.008)	(0.003)	(0.001)
GDP growth	0.036	0.198**	-0.020	0.017***
	(0.043)	(0.078)	(0.024)	(0.006)
IT x GDP growth	0.192	-0.339***	-0.030	-0.008
	(0.192)	(0.082)	(0.019)	(0.015)
Institutions	Yes	Yes	Yes	Yes
Within-R^2	0.286	0.629	0.178	0.254
Observations	953	953	931	931

Robust standard errors in parentheses. All columns include the covariates defined in the baseline specification.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix

Table A1: Inflation targeting countries and starting years

Countries	Inflation targeting year
Albania	2009
Armenia	2006
Brazil	1999
Chile	1999
Colombia	1999
Ghana	2007
Guatemala	2005
Indonesia	2005
Mexico	2001
Peru	2002
Philippines	2002
Serbia	2006
South Africa	2000
Thailand	2000
Turkey	2006
Uruguay	2002

Notes : The starting dates of inflation targeting come from Hammond (2012) and Roger (2010). Our sample of inflation targeting developing countries excludes Israel and South Korea. Beginning 1997, the World Economic Outlook includes these countries in the list of the advanced economies. The reclassification is explained by the advanced stage of economic development in these countries, IMF (1997).

Table A2: Non-targeting countries – control group [NEED TO UPDATE]

Algeria	Argentina	Azerbaijan	Bahamas
Bahrain	Botswana	Belarus	Belize
Bermuda	Bolivia	China	Congo
Costa Rica	Cote d'Ivoire	Cuba	Dominican Republic
Egypt	Fiji	Gabon	Georgia
Grenada	Haiti	India	Iran
Iraq	Jamaica	Jordan	Kazakhstan
Kenya	Kuwait	Lebanon	Liberia
Macedonia, FYR	Malaysia	Marshall Islands	Mauritius
Morocco	Namibia	Nicaragua	Nigeria
Oman	Pakistan	Papua New Guinea	Paraguay
Qatar	Romania	Russia	Saudi Arabia
Senegal	Seychelles	Sri Lanka	
Suriname	Trinidad and Tobago	Tunisia	Ukraine
United Arab Emirates	Venezuela	Vietnam	Zimbabwe

Table A3: Balancing of covariates between inflation-targeting and non-inflation targeting countries using entropy balancing

Panel A: Total Debt

	BEFORE			AFTER		
	Means		Standarized difference	Means		Standarized difference
	IT	Non-IT		IT	Non-IT	
Lagged total debt	0.027	0.021	0.076	0.027	0.027	0.001
Inflation rate volatility	0.698	0.261	0.136	0.698	0.696	0.000
Inflation rate	0.496	0.106	0.221	0.496	0.493	0.001
Real GDP pc growth	0.026	0.025	0.016	0.026	0.026	0.001
Broad money growth	0.240	0.154	0.377	0.240	0.239	0.001
Trade openness	0.565	0.843	0.887	0.565	0.566	0.003
Exchange rate regime	2.209	1.568	1.047	2.209	2.205	0.012

Panel B: Other Investment Debt

	BEFORE			AFTER		
	Means		Standarized difference	Means		Standarized difference
	IT	Non-IT		IT	Non-IT	
Lagged other invest debt	0.015	0.017	0.031	0.015	0.015	0.000
Inflation rate volatility	0.226	0.183	0.020	0.226	0.226	0.000
Inflation rate	0.167	0.090	0.294	0.167	0.167	0.000
Real GDP pc growth	0.024	0.025	0.032	0.024	0.024	0.002
Broad money growth	0.194	0.147	0.344	0.194	0.194	0.001
Trade openness	0.612	0.832	0.687	0.612	0.612	0.003
Exchange rate regime	2.222	1.547	1.105	2.222	2.216	0.020

Panel C: Portfolio Debt

	BEFORE			AFTER		
	Means		Standarized difference	Means		Standarized difference
	IT	Non-IT		IT	Non-IT	
Lagged portfolio debt	0.009	0.005	0.169	0.009	0.009	0.001
Inflation rate volatility	1.334	0.310	0.237	1.334	1.329	0.001
Inflation rate	1.157	0.139	0.221	1.157	1.151	0.001
Real GDP pc growth	0.025	0.024	0.030	0.025	0.025	0.000
Broad money growth	0.303	0.159	0.437	0.303	0.302	0.001
Trade openness	0.535	0.861	0.875	0.535	0.536	0.005
Exchange rate regime	2.179	1.571	0.928	2.179	2.175	0.011

Table A4: Data Sources and Definitions

Variable	Definition	Source
Foreign Currency Share	Share of foreign currency in international sovereign debt = 1 - (local currency sovereign debt/total international sovereign debt)	Debt Securities Statistics, Bank for International Settlements (BIS)
Inflation Targeting	Binary variable = 1 if in a given year a country operates under inflation targeting, 0 otherwise.	Hammond (2012) and Roger (2010)
GDP growth	Growth rate of Real Gross Domestic Product (constant US$)	World Development Indicators (WDI), World Bank (WB)
Financial Development	Index of the development of both financial institutions and financial markets	Svirydzenka (2016)
	Domestic credit to private sector (% of GDP)	WDI, WB
Trade Openness	Sum of imports and exports (% of GDP)	WDI, WB
Inflation	Consumer price index (annual %)	World Economic Outlook (WEO), IMF
Fiscal Burden	Subcomponent of the index of economic freedom	Heritage Foundation
General Government Consumption	General government expenditure (% of GDP)	WEO, IMF
Financial Openness	Capital Account Openness index	Chinn & Ito (2006) updated from http://web.pdx.edu/ ito/
	Capital Controls index	Fernández et al. (2016)
Exchange Rate Regime	De facto exchange rate classification that varies within 15 categories where a low (high) value indicates a fixed (flexible) regime.	Reinhart & Rogoff (2004) and Reinhart & Rogoff (2009). Updated from www.carmenreinhart.com/data/
Currency Crisis	Dummy that controls for rare but severe episodes of currency instability	Aizenman & Ito (2014)
Reserves	International reserves (% of GDP)	WEO, IMF
Sovereign rating	Sovereign credit rating	Moody's

Variable	Definition	Source
Democratic Accountability	Democratic Accountability index, 0-6	International Country Risk Guide (ICRG), The Political Risk Services Group (PRS Group)
Ethnic Tensions	Ethnic Tensions index, 0-6	ICRG, PRS Group
Religion Tensions	Religion Tensions index, 0-6	ICRG, PRS Group
Law and Order	Law and Order index, 0-6	ICRG, PRS Group
Military in Politics	Military in Politics index, 0-6	ICRG, PRS Group
Corruption	Corruption index, 0-6	ICRG, PRS Group
External Conflict	External Conflict index, 0-12	ICRG, PRS Group
Internal Conflict	Internal Conflict index, 0-12	ICRG, PRS Group
Government Stability	Government Stability index, 0-12	ICRG, PRS Group
Socieconomic Conditions	Socieconomic Conditions index, 0-12	ICRG, PRS Group
Broad Money Growth	Annual growth rate of money and quasi money	WEO, IMF
Real GDP per capita	GDP per capita (constant 2000 US$)	WDI, WB