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Inflation targeting in low-income countries: Does IT work?

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Abstract

Previous research on inflation targeting (IT) has focused on high-income countries (HICs) and emerging market economies (EMEs). Only recently has enough data accumulated for the performance of IT in low-income countries (LICs) to be assessed. We show that IT has not so far been as effective in reducing inflation in LICs as in EMEs. Relatively weak institutions, a typical feature of LICs, help explain this result. Our interpretation is that poor institutions, leaving fiscal policy unconstrained, impair central banks' ability to conduct monetary policy in a way consistent with IT.

JEL Classification: E52, E58, O23

Keywords: Inflation targeting, Low-income countries, Institutions

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Outline

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1 Introduction

Inflation targeting (IT) was first adopted in 1990 by New Zealand, followed by a number of other high-income countries (HICs) and emerging market economies (EMEs). Existing empirical studies suggest that IT has significantly reduced inflation in EMEs, but has made little difference in HICs (see Walsh (2009) for a useful survey).[1] Only in the twenty-first century have low-income countries (LICs) begun to adopt IT as a new monetary policy framework to pursue low inflation. This paper, using an updated dataset covering up to 182 countries for the 1980-2016 period, evaluates empirically the effectiveness of IT in reducing the level of inflation in LICs. In particular, we examine *how* and *why* the effectiveness of IT in LICs may differ from in EMEs, an income group where IT is known to be generally effective in reducing inflation.

Our main findings are as follows. First, we find that IT is *not* effective in reducing inflation in LICs, *unlike* in EMEs. Since IT has also been less effective in HICs than in EMEs, these results suggest that the relation between the effectiveness of IT and income levels is non-monotonic. Next, we explore why IT effects are different between LICs and EMEs, paying particular attention to the role of institutional quality.[2] We show that, within a pooled sample of LICs and EMEs, institutional quality is positively associated with the effectiveness of IT. Since LICs are generally associated with relatively poorer institutions, this result is consistent with ineffective IT in LICs. Our interpretation is that poor institutions, leaving governments unconstrained, brings about the subordination of monetary policy to fiscal requirements, i.e., fiscal dominance. This, in turn, creates inflation pressure of a fiscal origin, making it difficult to align inflation expectations (an intermediate target under IT) with the publicly announced numerical inflation target.

This paper is closely related to previous empirical work on IT effects which highlights the role of income levels. For example, Mishkin and Schmidt-Hebbel (2007), de Mendonça and de Guimarães e Souza (2012), and Samarina et al. (2014) examine the IT effects both in advanced and non-

[1] For example, Batini and Laxton (2006), Brito and Bystedt (2010), Gonçalves and Salles (2008), and Lin and Ye (2009) show that IT is effective in reducing inflation in EMEs, whereas Ball and Sheridan (2004), Ball (2010), von Hagen and Neumann (2002), and Lin and Ye (2007), and Willard (2012) find that IT has an insignificant effect on inflation in HICs.

[2] We define institutions generally as the rules and organizations of a society which affect economic incentives of different agents and thus shape interactions between them. As explained below, we highlight institutions that affect interactions between a government and the general public.

advanced economies, and show that IT is effective in reducing inflation only in the latter. We add to the literature by showing that the IT effects are heterogeneous among non-advanced economies (i.e., LICs vs EMEs), and also by investigating the role of institutions as a possible reason behind it. To note, Gemayel et al. (2011) include some case studies of IT in LICs such as Armenia and Ghana, but their econometric investigation is based on IT-adopting EMEs, because IT in LICs is a relatively new phenomenon and their data run only up to 2008.[3] Using updated data which run up to 2016, we conduct a formal analysis of IT effects in LICs, highlighting the difference from the effects in EMEs.

More broadly, this paper is related to the strands of economic literature which emphasise the relevance of institutions in development. The seminal papers of Hall and Jones (1999) and Acemoglu et al. (2001) examine the effect of institutions on long-run economic outcomes, and various papers shed light on mechanisms behind this relation, for example, by investigating the roles of foreign direct investment (Alfaro et al. (2008)) and public spending (Morozumi and Veiga (2016)). Further, Acemoglu et al. (2008) show that policy reforms aimed at increasing central bank independence do not necessarily help control inflation rates when institutions are weak, because unconstrained policymakers who pursue personal rents may not implement reforms properly.[4] This paper adds to the literature on institutions and development by examining empirically the role of institutions in the effects of IT, an emerging monetary policy framework in LICs.

The rest of the paper is organized as follows. Section 2 describes the adoption of IT in LICs. Section 3 explains the empirical methodology, and Section 4 describes the data. Section 5 presents results. Last, Section 6 offers discussion and concluding remarks.

[3]They define LICs as countries eligible for the Poverty Reduction and Growth Trust. Armenia and Ghana, LICs they consider in their case studies, adopted IT only in 2006 and 2007, respectively.

[4]They also show that the reform does not help when institutions are strong, because existing policies are less distorted and reforms are unnecessary. They thus argue that the reform has a maximum impact when the quality of institutions is intermediate.

2 Background: IT adoption in low-income countries

Table 1 lists the countries with IT experiences, together with their income classes and the adoption dates. To take account of the fact that some countries grow fast while others stay stagnant over decades, our income classification takes the following three steps.

> 1: For each of the years when data on PPP-adjusted GDP per capita are available during the sample period, we sort all the available countries into four groups: the highest 25th percentile, 25th-50th, 50th-75th and 75th-100th.[5]
>
> 2: Based on the number of times each country appears in those four groups, we denote countries that appear in the top 25th percentile most frequently as high-income countries; and countries appearing in the 25th-50th (50th-75th, 75th-100th) most frequently as upper-middle (lower-middle, low) income countries.
>
> 3: We re-categorise the four groups into three by combining the bottom two groups, yielding our final classification of high-income countries (HICs), emerging market economies (EMEs), and low-income countries (LICs).

As a result, 11 (14, 14) IT adopting countries are classified as LICs (EMEs, HICs). For information, Table 1 also shows the income classification used by the World Bank in 2016, which is based on income levels in 2015 alone.

The last two columns in the table give alternative years of IT adoption for each country: strict and loose adoption dates. The difference between these years is that the latter corresponds to the time when countries simply announce inflation targets without strong commitment, possibly using other nominal anchors at the same time. The former, on the other hand, is the year when a strong commitment is made to achieve the target. Those years largely follow Samarina et al. (2014), except that for countries not included in their study, the dates are taken from other sources including respective central bank websites. For some countries such as Israel, Colombia, Chile, Peru and Ghana, the time gap between loose and strict adoption dates is substantial (more than 5 years).

[5]The PPP-adjusted GDP is available from World Bank's World Development Indicator for 1990-2016.

Table 1: Income classification and IT adoption years

	Income classification		IT adoption year	
Country	**This study**	**World Bank 2016**	**Strict IT**	**LooseIT**
Albania	LIC	Upper middle	2009	2009
Armenia	LIC	Lower middle	2006	2006
Georgia	LIC	Upper middle	2009	2009
Ghana	LIC	Lower middle	2007	2002
Guatemala	LIC	Lower middle	2005	2005
Indonesia	LIC	Lower middle	2006	2005
Moldova	LIC	Lower middle	2009	2009
Paraguay	LIC	Upper middle	2013	2013
Peru	LIC	Upper middle	2002	1994
Philippines	LIC	Lower middle	2002	2001
Uganda	LIC	Low	2011	2011
Brazil	EME	Upper middle	1999	1999
Chile	EME	High	2001	1991
Colombia	EME	Upper middle	1999	1991
Dominican Republic	EME	Upper middle	2012	2012
Hungary	EME	High	2001	2001
Mexico	EME	Upper middle	2001	1999
Poland	EME	High	1999	1998
Romania	EME	Upper middle	2005	2005
Russian Federation	EME	Upper middle	2014	2014
Serbia	EME	Upper middle	2006	2006
Slovak Republic	EME	High	2005	2005
South Africa	EME	Upper middle	2001	2000
Thailand	EME	Upper middle	2000	2000
Turkey	EME	Upper middle	2006	2002
Australia	HIC	High	1994	1993
Canada	HIC	High	1995	1991
Czech Republic	HIC	High	1998	1998
Finland	HIC	High	1994	1993
Iceland	HIC	High	2003	2001
Israel	HIC	High	1997	1992
Japan	HIC	High	2013	2013
Korea, Rep.	HIC	High	2001	1998
New Zealand	HIC	High	1993	1990
Norway	HIC	High	2001	2001
Spain	HIC	High	1995	1994
Sweden	HIC	High	1995	1993
Switzerland	HIC	High	2000	2000
United Kingdom	HIC	High	1993	1992

Notes: This study classifies income based on PPP adjusted GDP per capita (from World Development Indicator) over the 1990-2016 period. World Bank's 2016 income classification is based on income levels in 2015 alone. IT adoption dates are from Samarina et al. (2014) except that for countries that they do not cover, we take dates from other sources including respective central bank websites. Finland, Spain and Slovak Republic left IT after adopting the Euro in 1999, 1999 and 2009, respectively.

Importantly, Table 1 clarifies that IT is a recent phenomenon in LICs, regardless of the definition of adoption dates. For example, according to strict IT adoption years, 9 out of 11 LICs adopted IT after the end of 2004, and 5 adopted IT after the end of 2008. Since only recently has enough data accumulated for the performance of IT in LICs to be assessed, little is known about the effects of IT in those countries. This paper aims to fill in this gap.

3 Empirical methodology

To examine the role of income levels in the effectiveness of IT, we apply a panel regression method, which allows us to control for unobserved country characteristics (through country fixed effects) and variations in the speed of disinflation in different countries (through country-specific time trends). Using country fixed effects helps mitigate not only an endogeneity problem caused by omitted variables, but also a self-selection problem of IT adoption which arises when countries that are not likely to make a success of IT are less likely to adopt it (thus making the sample of IT adopters biased towards success). The use of country-specific time trends helps address so-called "regression-to-the-mean", the possibility that initially high-inflation countries converge to the mean irrespective of implemented policies, including IT (see Ball and Sheridan (2004)). Although the alternative method such as propensity score matching (PSM) also helps tackle endogeneity and selection problems (e.g., Lin and Ye (2007) and Samarina et al. (2014)), we prefer to use a panel regression method for simplicity and greater robustness.[6]

The standard specification tests for an IT effect by adding to an inflation regression a dummy variable that is equal to one when an IT regime is in place, and zero otherwise. The reference regression model for inflation in country i in year t is of the form:

$$\pi_{i,t} = \alpha\, \pi_{i,t-1} + \beta\, IT_{i,t} + \sum_{j=1}^{n} \theta_j\, z_{i,j,t} + \mu_i + \gamma_i\, t + \epsilon_{i,t}, \tag{1}$$

[6]To note, PSM has its own weaknesses, including 1) it is more open to omitted variable bias than panel regressions, because it does not control for other determinants of inflation that may affect the result but are not related to the IT adoption decision, and 2) it cannot control for unobserved country fixed effects.

The lagged inflation term, $\pi_{i,t-1}$, is expected to be always positive and significant, reflecting the persistence of inflation shocks. $IT_{i,t}$, a dummy variable, which takes the value of one if an IT regime is in place in country i in year t, and $z_{i,j,t}$ represent a vector of control variables, including exchange rate regime dummies (for a hard peg and for a float, so the omitted category is a soft peg); a dummy for a parity change (usually a devaluation) in a pegged regime in the current or previous year; and a dummy for a currency crisis in the current or the previous year. The latter two variables reflect the fact that devaluations and currency crises tend to be associated with spikes in the inflation rate, and also possibly affect IT adoption decisions (since countries who have experienced currency crises often adopt IT, including UK, and Sweden). Further, we control for world oil and food price inflation as a possible common source of inflationary pressures in the world economy.[7] μ_i is the country fixed effect, capturing unobserved time-invariant country characteristics. As mentioned, a country-specific linear time trends mitigates regression-to-the-mean.

Based on Eq.1, the following model allows us to investigate how the effects of IT may differ across different income groups:

$$\begin{aligned}\pi_{i,t} = \alpha\pi_{i,t-1} + \beta_L LIC_i * IT_{i,t} + \beta_E EME_i * IT_{i,t} + \beta_H HIC_i * IT_{i,t} \\ + \sum_{j=1}^{n} \theta_j z_{i,j,t} + \mu_i + \gamma_i\, t + \epsilon_{i,t},\end{aligned} \tag{2}$$

where LIC_i is a time-invariant dummy variable, which takes the value of one if country i is LIC (as defined above) and zero otherwise. EME_i and HIC_i are also dummies defined likewise. Our primary interest is to compare coefficients on the interaction between LIC_i and IT and the one between EME_i and IT (i.e., β_L and β_E), to investigate the possible heterogeneity in IT effects within non-HICs. However, to be in line the previous works which compare IT effects in HICs and in EMEs, we also include the interaction between HIC_i and IT in the model.

[7] Even when we include time dummies (to capture global variations in inflation in general) instead, key results on the effectiveness of IT in LICs and EMEs stay the same.

For robustness, we further consider the following equation which complements Eq.2 by examining the relation between IT effects and income levels more directly:

$$\begin{aligned}\pi_{i,t} = \alpha\pi_{i,t-1} + \beta IT_{i,t} + \delta y_{i,t} + \zeta y_{i,t} * IT_{i,t} + \chi y_{i,t}^2 + \psi y_{i,t}^2 * IT_{i,t} \\ + \sum_{j=1}^{n} \theta_j z_{i,j,t} + \mu_i + \gamma_i\, t + \epsilon_{i,t},\end{aligned} \tag{3}$$

where $y_{i,t}$ is the log of real GDP per capita (in US dollar) in country i in year t. This way, Eq.3 makes use of the time-variation of income levels to estimate how they interact with the IT effect. Notice that to allow for possible non-monotonicity between income levels and the IT effect, we add the interaction between squared income and the IT dummy as well. The coefficients of our interest are the ones on interaction terms, i.e., ζ and ψ.

Having clarified the regression equations, it is important to realize that the estimation of the above dynamic panel data models using ordinary least squares (OLS) produces biased coefficients, because the lagged dependent variable is endogenous with respect to the fixed effects. However, this dynamic panel bias becomes smaller as the number of time periods rises. Therefore, the fact that our sample of annual data spans a comparatively long panel (1980-2016) makes it reasonable to estimate a fixed effects model. To illustrate, in the reference estimation below with 182 countries (Table 3), the average number of annual observations per country is 32.6.

4 Data

Annual CPI inflation rate is measured as the annual log difference of the CPI multiplied by 100 (i.e., inflation=100*$\triangle$logcpi). To avoid disproportionately large inflation rates affecting estimation results, our reference dataset excludes countries with average consumer price index (CPI) inflation of over 50% per year (over the sample period, 1980-2016), yielding a cross-country panel dataset of up to 182 countries over the 1980-2016 period, of which 90 countries are categorized as LICs and 46 each as EMEs and HICs. Out of 37 IT countries included, 10 are LICs, 13 are EMEs, and 14

are HICs.[8] Also, to address the dynamic panel bias mentioned above, the reference analysis only uses countries which offer at least 10 observations over the sample period. The data for inflation are from the World Bank's World Development Indicators (WDI), complemented by IMF's World Economic Outlook (WEO) when WDI does not provide data.[9]

Because LICs are known to be characterised by weak institutions (confirmed below), this paper also investigates the role of institutions in the effectiveness of IT. The type of institutions we consider are the ones that prompt a government to be more accountable to the general public. Thus, in essence, these are the type of institutions classified by Acemoglu and Johnson (2005) as "property rights institutions", defined as "the rules and regulations protecting citizens against the power of the governments and elites (page 955 of their paper)".[10] They use "executive constraints (constraints, for short)" from Polity IV as their preferred measure for property rights institutions, and we follow their choice. This variable measures the extent of institutionalized constraints on the decision-making powers of chief executives.[11] For robustness, we also consider "democracy/autocracy (democracy)" from Polity IV, which measures not only the extent of institutionalized constraints (as in "constraints") but also other democratic elements such as the extent to which citizens' political participation is guaranteed.[12] To note, while corruption measures may also seem relevant proxies for government accountability, our view is that institutional features such as constraints on politicians and citizens' political participation are more relevant in relation to fiscal dominance than corruption, which may be regarded as an *outcome* of such features.[13]

[8] Peru and Brazil (both IT adopters) are excluded from the reference dataset due to the high average inflation rates (cf. Table 1).

[9] In our dataset, correlation of inflation data (log difference of CPI) between WDI and WEO is 99 percent.

[10] As another type of institutions, they consider "contracting institutions", defined as "the rules and regulations governing contracting between ordinary citizens, for example, between a creditor and a debtor or a supplier and its customers (page 955)".

[11] In Polity IV, the variable name is "XCONST". As alternative measures for property rights institutions, Acemoglu and Johnson (2005) use "protection against expropriation" from Political Risk Services, and Heritage Foundation's private property index. However, the former is not available for the recent time series (they use the average over 1985-95) and the latter variable becomes available only in 1995.

[12] The variable name in Polity IV is "POLITY2".

[13] This view is in line with Keefer and Knack (2007), who find that the level of capital spending increases in the worsening of institutional quality. They argue that what is associated with the level of capital spending is institutions that restrict government's rent seeking (e.g., competitive elections), rather than the level of corruption.

Table 2: Descriptive statistics across different income groups

Variable	Mean	Std. Dev.	Min.	Max.
Low-income countries (LICs)				
CPI inflation rates	11.18	22.28	-129.94	477.49
Real GDP pc (US dollars)	1582.73	1241.6	131.65	9650.57
Executive constraint	3.89	1.95	1	7
Democracy/autocracy	0.31	6.22	-10	10
Hard peg (dummy)	0.18	0.39	0	1
Soft peg (dummy)	0.56	0.5	0	1
Float (dummy)	0.25	0.44	0	1
Parity change (dummy)	0.12	0.32	0	1
Currency crisis (dummy)	0.29	0.45	0	1
Emerging market economies (EMEs)				
CPI inflation rates	13.31	27.12	-17.58	298.44
Real GDP pc (US dollars)	7521.32	3514.75	1216.08	19275.09
Executive constraint	5.42	1.91	1	7
Democracy/autocracy	4.87	5.88	-9	10
Hard peg (dummy)	0.2	0.4	0	1
Soft peg (dummy)	0.49	0.5	0	1
Float (dummy)	0.31	0.46	0	1
Parity change (dummy)	0.1	0.3	0	1
Currency crisis (dummy)	0.23	0.42	0	1
High-income countries (HICs)				
CPI inflation rates	3.98	7.93	-19.41	155.57
Real GDP pc (US dollars)	34405.05	18338.83	486.98	111968.35
Executive constraint	5.65	2.27	1	7
Democracy/autocracy	5.34	7.59	-10	10
Hard peg (dummy)	0.18	0.39	0	1
Soft peg (dummy)	0.55	0.5	0	1
Float (dummy)	0.27	0.44	0	1
Parity change (dummy)	0.05	0.22	0	1
Currency crisis (dummy)	0.19	0.39	0	1
World variables				
World oil price inflation rates	1.02	25.84	-65.82	45.12
World food price inflation rates	0.64	9.42	-18.91	21.77

Notes: Statistics correspond to the reference dataset where countries with the average CPI inflation of over 50% are excluded. The number of countries covered in LICs (EMEs, HICs) are up to 90 (46, 46) countries. The sample period is up to 1980-2016. Clarifications required on each variable are given in the text. Statistics for world variables are based on the entire reference dataset.

Table 2 presents descriptive statistics for different income levels, showing that average inflation rates in LICs (EMEs, HICs) are 11.18, 13.31, 3.98%, respectively. Annual real GDP per capita (in US dollars) is from WDI. The average figure is highest in HICs (34,405 dollars) and lowest in LICs (1,583 dollars). Regarding institutional variables, "constraints" range 1 and 7, and "democracy" range -10 and 10. For both variables the larger value corresponds to the higher institutional

quality, which makes a government more accountable to the public. It can be confirmed that institutional quality is positively associated with income levels. The difference in the institutional quality between EMEs and LICs is particularly large. For example, the average of "constraints" takes the value of 3.89 in LICs, compared with 5.42 in EMEs and 5.65 in HICS.

Exchange rate regime data and information on parity changes are dummy variables based on Bleaney and Tian (2017).[14] When countries are estimated to adopt a hard peg, soft peg, or floating regime in a given year, the respective variable takes the value of 1 (0 otherwise). In LICs, the average of the hard peg dummy is 0.18, meaning that 18 percent of the observations (across all the LICs and years) are categorised as hard peg. The parity change dummy takes the value of one in the case of parity changes in fixed exchange rate regimes. The currency crisis variable created by Bleaney et al. (2018) takes the value of one when an exchange market pressure index (EMPI), the sum of the percentage depreciation in the exchange rate and the percentage loss in foreign exchange reserves, is large.[15] Across LICs and years in our dataset, 29 percent of all observations take the value of one. Last, world oil and food price inflation (common across countries) take the average of 1.02 and 0.64 percent respectively, with the former showing a much larger standard deviation.[16]

5 Results

This section first examines how the effectiveness of IT differs across income levels, particularly between LICs and EMEs. Next, we investigate the possible reason why the effectiveness of IT may differ between the two income groups, highlighting the role of institutional quality.

[14] An alternative is Reinhart and Rogoff (2004), which tends to under-record floats, as discussed in Bleaney and Tian (2017).

[15] Specifically, the authors define that this takes 1 when the EMPI is in the upper quartile of their dataset (spanning 1980-2012).

[16] World oil price inflation rate is calculated as a log difference (times 100) using world crude petro price index from IMF's International Financial Statistics (IFS), whereas world food price is a log difference (times 100) using world food price index from IMF's IFS.

5.1 IT effects across different income levels

Table 3 shows estimation results of Eq.1 for an unconditional effect of IT on inflation, and also results of Eq.2 for conditional effects upon income levels. The conditional effects are estimated using time-invariant country group dummies. Acknowledging the difficulty of defining IT adoption dates, we estimate equations using both strict and loose adoption dates. While controlling for both world oil and food price inflation rates routinely, because using other extra control variables restricts the sample size substantially, results are shown with and without them.[17] Country-fixed effects and country-specific linear trend are always included. Here, the possibly disproportionate effects of hyper-inflation cases are addressed by excluding countries with an average inflation rate of over 50% over the sample period.

The first two columns estimate the equations without the extra controls, using the strict IT adoption dates. Column (1) shows the unconditional IT effects, based on all the observations regardless of country's income levels. The coefficient on the IT dummy of -0.47 is insignificant, implying that the adoption of IT is *not* associated with a change in inflation rates when using the entire set of observations. However, Column (2), which estimates the IT effects conditional on income levels, shows that for EMEs, the adoption of IT is significantly associated with lower inflation by 4.56 percentage points, while for LICs and HICs, the effect is insignificant. In fact, the coefficient on IT*EME is significantly smaller than the one on IT*LIC, indicating that IT is more effective in EMEs than in LICs (see the p-value of 0.013 from testing the equality of those coefficients in the row on LIC_EME). Also, when comparing EMEs and HICs, IT is again more effective in the former (see the row on HIC_EME, which gives p-values from testing the equality of coefficients between IT*HIC and IT*EME). Columns (3) and (4) add extra control variables, and confirm the heterogeneous effects of IT across income levels: only for EMEs is the IT dummy negatively associated with inflation rates, and the coefficient is significantly more negative than in LICs and HICs. Columns (5) to (8) present results using loose IT adoption dates. The results are quite similar, ex-

[17] Exchange rate variables (regime dummies and a dummy for a parity change) are available from 1980 to till 2014 (inclusive), and a currency crisis dummy is available from 1980 to till 2012.

Table 3: IT effects on inflation across different income levels

Adopt dates	Strict				Loose			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: 100*△logcpi								
L.Infl	0.529***	0.527***	0.438***	0.436***	0.529***	0.527***	0.438***	0.436***
	(19.754)	(19.731)	(8.923)	(8.825)	(19.754)	(19.744)	(8.927)	(8.842)
IT	-0.472		-2.166		-1.739		-3.604**	
	(-0.411)		(-1.496)		(-1.347)		(-2.284)	
IT*LIC		3.854		-0.212		3.357		0.045
		(1.420)		(-0.112)		(1.194)		(0.022)
IT*EME		-4.557**		-7.541***		-5.778**		-8.017**
		(-2.294)		(-2.845)		(-2.316)		(-2.342)
IT*HIC		0.240		1.481		-1.393		-2.040
		(0.344)		(1.073)		(-1.327)		(-1.436)
Oil infl	-0.002	-0.002	0.017**	0.017*	-0.002	-0.002	0.017**	0.017**
	(-0.233)	(-0.212)	(1.979)	(1.932)	(-0.235)	(-0.182)	(1.985)	(2.014)
Food infl	0.073***	0.074***	0.112***	0.115***	0.073***	0.074***	0.111***	0.112***
	(2.958)	(3.014)	(5.237)	(5.359)	(2.967)	(2.992)	(5.203)	(5.237)
Hard peg			-5.316	-5.331			-5.322	-5.348
			(-1.377)	(-1.380)			(-1.378)	(-1.381)
Float			3.261***	3.296***			3.294***	3.360***
			(3.708)	(3.788)			(3.738)	(3.853)
Parity chg			3.272***	3.303***			3.263***	3.302***
			(3.008)	(3.036)			(2.996)	(3.027)
L.Parity chg			-0.895	-0.878			-0.902	-0.898
			(-1.521)	(-1.506)			(-1.525)	(-1.522)
Cur crisis			3.234***	3.219***			3.216***	3.167***
			(5.350)	(5.375)			(5.351)	(5.343)
L.Cur crisis			2.358***	2.350***			2.355***	2.293***
			(5.191)	(5.264)			(5.168)	(5.167)
LIC_EME		0.0134		0.0227		0.0159		0.0399
HIC_EME		0.0230		0.00295		0.107		0.109
Observations	5,928	5,928	4,536	4,536	5,928	5,928	4,536	4,536
Countries	182	182	167	167	182	182	167	167
IT adopters	37	37	33	33	37	37	33	33
Adj. R2	0.532	0.532	0.455	0.456	0.532	0.533	0.456	0.456

Notes: Fixed-effect estimations. Countries with the average inflation of over 50 percent are omitted. Constant and country-specific linear trends, included in all the models, are not shown for brevity. LIC_EME (HIC_EME) gives p-value from testing the equality of coefficients on IT between LIC and EME (HIC and EME). Inflation rate (dependent variable) is calculated as a log difference of CPI. t-statistics are in parentheses. Clustered standard errors are used to adjust for correlation of error terms within countries. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

cept that the difference in the effectiveness of IT between EMEs and HICs becomes marginally insignificant (with the p-values of just above 0.1).

Regarding the control variables, higher world food price inflation is always associated with higher inflation, while world oil price inflation is positively associated with (CPI) inflation only when the other extra controls are added. A floating exchange rate is (always) related to significantly higher inflation than the omitted category of a soft peg with no parity change, and the coefficient on a hard peg is negative, though insignificant. A currency crisis in the current and the previous years is associated with significantly higher inflation, as is a current (but not lagged) parity change in a pegged regime. The lagged inflation variable is significant, showing that inflation is persistent.

The above analysis excludes countries with the average inflation rate of over 50% over the sample period. For robustness, Table 4 presents results excluding countries with an average inflation of over 30%, which makes the results less susceptible to disproportionately large inflation rates, although the sample size becomes smaller (covering 168, instead of 182 countries, when the extra controls are omitted). For brevity, only coefficients on the income interaction terms (cf. even-numbered columns in Table 3) are presented. Even with this alternative threshold, results are essentially the same for the two definitions of IT adoption dates, with or without extra controls: IT is effective in reducing inflation only in EMEs, and it is in fact significantly more effective in EMEs than in LICs as well as in HICs (in case of strict adoption dates). Overall, results indicate that IT is more effective in reducing inflation in EMEs than in LICs, and below we explore the possible reason why this is the case.[18]

As a further robustness check on the role of income levels in the effectiveness of IT, we estimate Eq.3, which makes use of within-country variations in income levels (instead of time-invariant income dummies). As in Table 3, countries with the average inflation of over 50 percent are omitted. This exercise is useful because there is inherent arbitrariness in classifying countries into different income groups when panel data covers a long time period, albeit our income classification ad-

[18]To note, IT being ineffective in reducing inflation level in HICs unlike in EMEs is firmly in line with the aforementioned previous studies. One possible explanation, pointed out by Walsh (2009), is related to the so-called good luck hypothesis of the Great Moderation, the substantial fall in macroeconomic volatility advanced economies had experienced since the mid-1980s till 2007, the start of the Global Financial Crisis (see, for example, Galí and Gambetti (2009)). That is, if the greater macroeconomic stability was primarily due to smaller shocks striking advanced economies during those two decades (i.e., the good luck hypothesis), it may not be easy to identify the marginal contribution of good policies, including the one of IT. In such a benign economic environment, inflation performance might have been satisfactory regardless of the type of a monetary policy regime.

Table 4: IT effects across different income levels: hyper-inflation thresholds of 30%

Adopt dates	Strict		Loose	
	(1)	(2)	(3)	(4)
Dependent variable: 100*△logcpi				
IT*LIC	4.000	0.918	3.428	1.135
	(1.318)	(0.498)	(1.090)	(0.588)
IT*EME	-5.232**	-6.567**	-5.509**	-5.725**
	(-2.257)	(-2.366)	(-2.454)	(-2.063)
IT*HIC	0.215	1.658	-1.686	-1.963
	(0.265)	(1.130)	(-1.323)	(-1.281)
Extra controls	No	Yes	No	Yes
LIC_EME	0.0179	0.0236	0.0223	0.0401
HIC_EME	0.0259	0.00903	0.146	0.239
Observations	5,542	4,261	5,542	4,261
Countries	168	154	168	154
IT adopters	34	31	34	31
Adj. R2	0.430	0.404	0.431	0.403

Notes: Countries with the average inflation of over 30 percent are omitted. For brevity, only coefficients on interactions between IT and income dummies are shown. Extra controls are exchange rate regime dummies, a dummy for a parity change in a pegged regime in the current or previous year, and a dummy for a currency crisis in the current or the previous year. For further relevant information, see Notes for Table 3.

dresses this issue to some degree. Table 5 presents results for both strict and loose adoption dates, and with and without extra control variables. Denoting y (in Eq.3, the log of real GDP per capita in US dollars) as *Income*, the marginal effect of the IT dummy on inflation, incorporating the interaction with *Income* squared, is given by $\beta + \zeta * Income + \psi * Income^2$. In Column (1), the marginal effect is $114.48 - 25.10 * Income + 1.36 * Income^2$, which indicates that the IT effect is non-monotonic, with the maximum negative effect occurring at $Income = 9.23$, corresponding to 10,198.5 US dollars. Likewise, Column (2) implies that with the extra controls, the relation is again non-monotonic with the maximum negative effect occurring at $7,186.8$ dollars. These values are reasonably close to the mean of real GDP per capita among EMEs (7,521.3 dollars, see Table 2).[19] Columns (3) and (4) show that the results are robust to the use of loose IT adoption dates. The above result that IT is more effective in reducing inflation in EMEs than in LICs appears robust.

[19]The maximum negative IT effects at $Income = 9.23$ and $Income = 8.88$ in Columns (1) and (2) are -1.3% and -3.3%.

Table 5: IT effects across different income levels: Alternative approach

Adopt dates	Strict		Loose	
	(1)	(2)	(3)	(4)
Dependent variable: 100*△logcpi				
L.Infl	0.517***	0.428***	0.517***	0.428***
	(16.850)	(7.886)	(16.849)	(7.880)
IT (β)	114.479*	148.055**	117.938*	169.387**
	(1.929)	(1.980)	(1.736)	(2.493)
IT*Income (ζ)	-25.104*	-34.094**	-26.030*	-37.942**
	(-1.918)	(-2.003)	(-1.744)	(-2.444)
IT*Income_squared (ψ)	1.359*	1.923**	1.404*	2.069**
	(1.913)	(2.027)	(1.744)	(2.403)
Income	-9.990	-15.551	-9.856	-15.533
	(-0.828)	(-1.004)	(-0.815)	(-1.003)
Income_squared	0.803	0.887	0.802	0.892
	(1.248)	(1.021)	(1.242)	(1.027)
Oil infl	-0.004	0.015*	-0.004	0.015*
	(-0.424)	(1.654)	(-0.417)	(1.693)
Food infl	0.076***	0.114***	0.076***	0.112***
	(3.076)	(5.202)	(3.067)	(5.140)
Extra controls	No	Yes	No	Yes
Observations	5,649	4,330	5,649	4,330
Countries	180	165	180	165
IT adopters	37	33	37	33
Adj. R2	0.532	0.467	0.532	0.467

Notes: Fixed-effect estimations. Countries with the average inflation of over 50 percent are omitted. Constant and country-specific linear trends are not shown for brevity. Coefficients on the extra controls are also not shown in Columns 2 and 4. Inflation rate is calculated as a log difference of CPI. Real GDP per capita, US Dollar (Income) is log transformed. t-statistics are in parentheses. Clustered standard errors are used to adjust for correlation of error terms within countries. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

5.2 What makes IT ineffective in LICs (unlike EMEs)?

Having found robust evidence that IT is less effective in reducing inflation in LICs than in EMEs, we now investigate what may explain this result. Realising that the quality of institutions is generally lower in LICs than in EMEs (cf. Table 2), we explore the role of institutions as a possible explaining factor.

5.2.1 Institutions and fiscal dominance

Why may relatively weak institutions help explain less effective IT? Our rationale is based on the apparent tendency that under weak institutions where governments are left unaccountable,

monetary policy is subordinated to fiscal requirements — a phenomenon known as "fiscal dominance". Under fiscal dominance a government independently sets its budgets and thus determines the amount of revenue that must be raised, which, in turn, may force a central bank to finance it through money creation, i.e., seigniorage. One possible measure of the *lack* of fiscal dominance (i.e., constraints on fiscal policy) is the extent to which legal restrictions limit a central bank's lending to the government. Cukierman et al. (1992) quantify this for a large sample of countries for the period 1980-89, and Crowe and Meade (2007) repeat this exercise using data for 2003.[20]

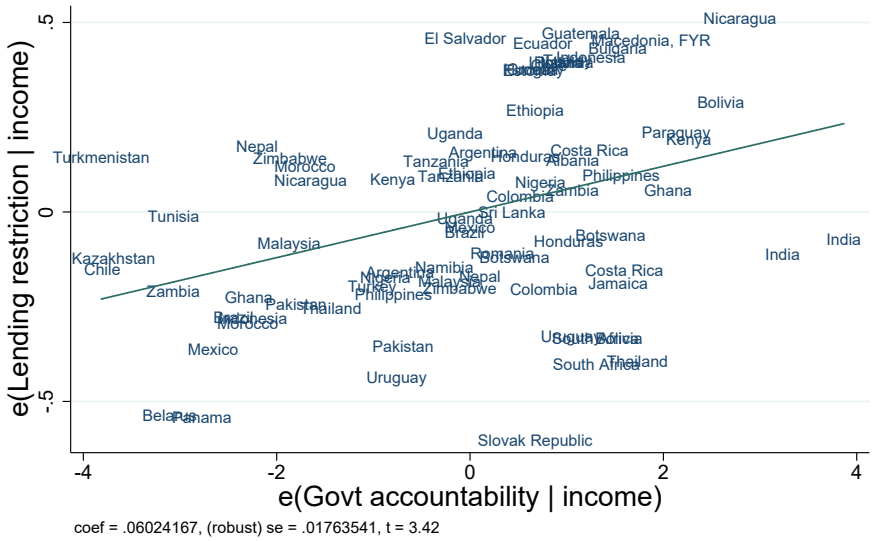
Figure 1 plots this measure against "executive constraints", the aforementioned proxy for institutions affecting government accountability, for a pooled sample of 81 observations from 52 LICs and EMEs.[21] The larger values of the institutional proxy and lending restrictions indicate a more accountable government and more restricted fiscal policy, respectively. Since the estimated regression line is positive and per-capita income is included as a control, the message is that within the pooled sample of LICs and EMEs, low government accountability is associated with large fiscal dominance for a given income level. This remains the case when using the alternative institutional proxy of "democracy/autocracy" (not shown for brevity).

Fiscal dominance under weak institutions, in turn, is expected to impair central banks' ability to conduct monetary policy in a way consistent with IT. To explain, an IT central bank, which has price stability as its overriding objective, publicly announces a medium-term numerical target for inflation and commits to it using inflation expectations as an intermediate target. However, as Masson et al. (1997) argue, to the extent that government borrowing from the central bank is not properly restricted, inflationary pressures of a fiscal origin are present, inducing the creation of formal and informal indexation mechanisms in the private sector. This undermines the effectiveness of IT, because it makes it difficult for the central bank to align inflation expectations, an intermediate target under IT, with its publicly announced target rate. Therefore, even if IT has a potential to

[20]Legal restrictions that limit a central bank (CB)'s lending to government is one of the four aspects of a central bank's independence they measure. Other three aspects of independence are 1) whether CB's management is protected from political pressure by secure tenure and independent appointment, 2) whether the government can participate in or overturn the CB's policy decisions, and 3) whether the legal mandate of the CB sets a clear objective for monetary policy.

[21]Only for a limited number of countries, two observations (1980-90, and 2003) are available.

Figure 1: Government accountability and fiscal dominance in LICs and EMEs



coef = .06024167, (robust) se = .01763541, t = 3.42

Notes: Added variable plots based on OLS estimations, with standard errors clustered by country.
Institutions affecting government accountability is measured by executive constraints.
Lending restriction reflects the degree of restrictions that limit central bank's lending to governmnet.
Source: Authors' calculations

help reduce inflation (as shown by the previous studies for EMEs), fiscal dominance under a less accountable government may hinder the potential from being fulfilled.

5.2.2 Institutions and IT effects in LICs and EMEs

Having discussed why institutions might affect the effectiveness of IT, we now estimate their relevance formally. Analysis below focuses on the sub-sample of LICS and EMEs. The reference equation is given as:

$$\pi_{i,t} = \alpha\pi_{i,t-1} + \beta IT_{i,t} + \eta Account_{i,t} + \lambda IT_{i,t} * Account_{i,t} + \sum_{j=1}^{n} \theta_j z_{i,j,t} + \mu_i + \gamma_i t + \epsilon_{i,t}, \quad (4)$$

where $Account_{i,t}$ is an institutional variable which measures the degree to which governments are accountable to the public in country i in period t.

Table 6 presents the results, using "executive constraints (constraints for short)" as a proxy for institutions affecting government accountability. Columns (1) and (2) use strict IT adoption

Table 6: Institutions and IT effects within LICs and EMEs (Executive constraints)

Adopt dates	Strict		Loose	
	(1)	(2)	(3)	(4)
Dependent variable: 100*△logcpi				
L.Infl	0.526***	0.424***	0.526***	0.424***
	(18.147)	(7.826)	(18.144)	(7.841)
IT	14.950**	14.794	14.736**	15.250
	(2.603)	(1.657)	(2.415)	(1.608)
IT*Account	-2.477***	-2.998**	-2.666***	-3.115*
	(-2.726)	(-2.032)	(-2.779)	(-1.914)
Account	0.872**	0.604	0.892**	0.667*
	(2.136)	(1.619)	(2.189)	(1.765)
Oil infl	-0.013	0.015	-0.013	0.015
	(-0.849)	(1.156)	(-0.852)	(1.199)
Food infl	0.099**	0.133***	0.099**	0.131***
	(2.474)	(4.317)	(2.476)	(4.248)
Extra controls	No	Yes	No	Yes
Observations	3,555	2,871	3,555	2,871
Countries	114	107	114	107
IT adopters	23	20	23	20
Adj. R2	0.525	0.445	0.525	0.445

Notes: Based on the sub-sample of LICs and EMEs. Countries with the average inflation of over 50 percent are omitted. Constant and country-specific linear trends are not shown for brevity. Coefficients on the extra controls are also not shown in Columns 2 and 4. Executive constraints ranges from 1 to 7. Inflation rate is calculated as a log difference of CPI. t-statistics are in parentheses. Clustered standard errors are used to adjust for correlation of error terms within countries. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

dates, without and with the extra controls, respectively. In both cases, coefficients on the interaction between the IT dummy and constraints are negative and significant, indicating that when a government is more accountable, IT is more effective in reducing inflation rates. Results hold when using loose IT adoption dates (Columns 3 and 4).

To visualise the results, Figure 2 plots marginal effects of IT together with the 90 percent confidence interval for different levels of "constraints". Sub-figures (a) to (d) correspond to Columns (1) to (4) of Table 6. Apart from sub-figure (a), IT is associated with a significantly negative marginal effect when the proxy takes the values of 6 or 7 (signifying high government accountability).[22] Figure 3, the histograms of "constraints" for LICs and EMEs, show that about 45 percent of observations from EMEs take the values of 7, while only just above 10 percent of observations from

[22]Though not robust, there is an indication that low accountability is associated with a positive (i.e., inflation-increasing) effect of IT (sub-figures (a) and (c)).

LICs do so.[23] The indication is thus that institutional quality works as a driving factor behind the different IT effects between LICs and EMEs. A similar result is obtained when government accountability is proxied by "democracy/autocracy (democracy for short)" (see Table 9, Figure 4 and Figure 5 in Appendix A).[24]

5.2.3 Alternative explanation: difference in initial inflation

Having shown that the impact of institutions on government accountability helps explain why IT may not be effective in LICs, unlike in EMEs, we here examine an alternative possible explanation. That is, one may argue that, in line with "regression-to-the-mean", IT is associated with lower inflation in EMEs than in LICs (and HICs), simply because the pre-IT inflation rate in EMEs was higher than in other countries. Indeed, Table 7 shows that in EMEs initial inflation, calculated as a 5-year average before the strict adoption of IT, is 18.19% on average (13.69% without Brazil), much higher than 7.32% in LICs and 4.44% in HICs.[25] Meanwhile, the 5-year average after IT adoption in EMEs is 5.53% (5.31% without Brazil), rather close to the corresponding figures of 5.31% in LICs and 2.17% in HICs. Table 10 in Appendix A shows figures country by country.

Table 7: Inflation rates before and after IT adoption: Strict IT dates

		5 year averages		
Income group	**Average IT adoption year**	**Before IT**	**After IT**	**Change**
LICs	2007.2	7.32	5.31	-2.01
EMEs (without Brazil)	2003.5 (2003.9)	18.19 (13.69)	5.53 (5.31)	-12.67 (-8.39)
HICs	1998	4.44	2.17	-2.27

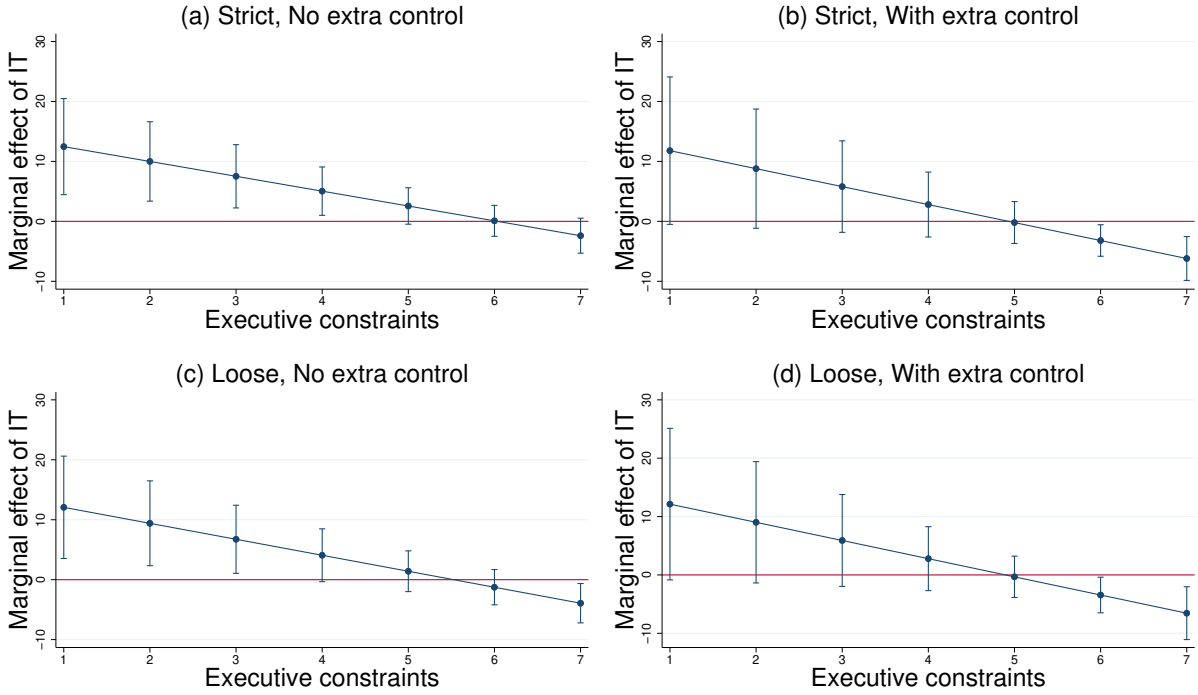
Notes: Initial inflation is the 5-year average of inflation rates just before the strict adoption of IT. "Change" is obtained as the 5-year average just after the adoption minus the average of inflation just before IT adoption. When inflation data is not available for 5 years after IT adoption (e.g., Japan), the average is calculated using as many observations as available.

[23] These histograms are based on the observations used to create sub-figures (a) and (c).

[24] That is, 1) the signs of the interaction coefficients (between IT dummy and "democracy") are negative in Table 9 (though the coefficient is not significant when the extra controls are added), 2) In Figure 4, only when "democracy" takes a high value (corresponding to high government accountability), the effect of IT on inflation tends to be negative and significant, and 3) "Democracy" taking a high value in EMEs rather than in LICs (Figure 5) suggests that institutions are a driving factor behind the different IT effects between LICs and EMEs.

[25] Brazil has a particularly high level of initial inflation: 76.63%.

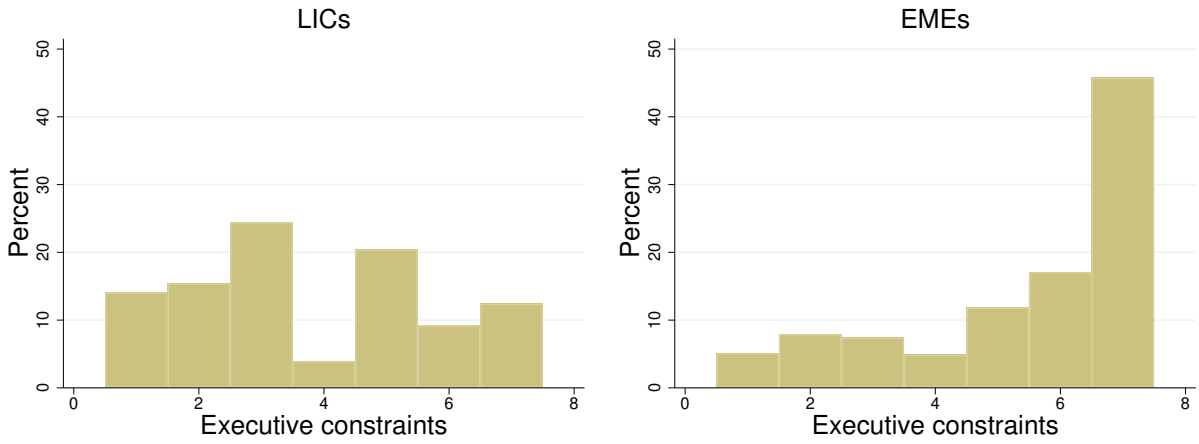
Figure 2: Institutions and marginal effects of IT (Executive constraints)



Note: A marginal effect with 90% confidence interval is shown.

Source: Authors' calculations

Figure 3: Distribution of executive constraints



Notes: Executive constraints are used as a proxy for government accountability.
Executive constraints range from 1 to 7. The higher the value is, the more government is constrained.

Source: Authors' calculations

Table 8: Role of initial inflation within LICs and EMEs (Executive constraint)

Adopt dates	Strict		Loose	
	(1)	(2)	(3)	(4)
Dependent variable: 100*△logcpi				
L.Infl	0.524***	0.421***	0.524***	0.422***
	(18.024)	(7.675)	(18.006)	(7.712)
IT	21.960***	17.994**	17.238***	14.796*
	(4.233)	(2.254)	(3.090)	(1.815)
IT*Account	-2.098***	-2.174*	-1.671**	-1.807
	(-3.121)	(-1.948)	(-2.066)	(-1.499)
Account	0.859**	0.604	0.886**	0.653*
	(2.145)	(1.626)	(2.240)	(1.772)
IT*Initial Infl	-0.873***	-0.718***	-0.657***	-0.527***
	(-4.841)	(-3.593)	(-7.205)	(-4.319)
Oil infl	-0.013	0.015	-0.013	0.016
	(-0.834)	(1.160)	(-0.829)	(1.220)
Food infl	0.100**	0.134***	0.101**	0.131***
	(2.493)	(4.312)	(2.522)	(4.257)
Extra. controls	No	Yes	No	Yes
Observations	3,555	2,871	3,555	2,871
Countries	114	107	114	107
IT adopters	23	20	23	20
Adj. R2	0.526	0.446	0.527	0.446

Notes: Initial inflation is the 5-year average of inflation prior to the adoption of IT. Columns (1) and (2) ((3) and (4)) use the strict (loose) IT adoption dates. Executive constraints is used as an institutional proxy. For further relevant information, see Notes for Table 6.

The fact that we include a country-specific linear trend does take account of the effects of initial inflation to some degree. However, there is an explicit way to address this issue (though not entirely satisfactory, as explained below), which is simply to interact the IT dummy with initial inflation rates. This is feasible despite the fact that initial inflation rates themselves, being time-invariant, are absorbed into country fixed effects, because for IT adopters, the interaction between the IT dummy and initial inflation shows time variations. What is unsatisfactory with this approach, however, is that for non-IT adopters, initial inflation (inflation before IT adoption) by definition does not exist. Nonetheless, since the IT dummy is always zero for these countries, the level of initial inflation would not matter for an estimation purpose.

With this caveat, Table 8 estimates Eq.4 with the additional interaction term, "IT*Initial Infl", where "Initial Infl" is the 5-year average inflation prior to the IT adoption.[26] Country-specific linear trends are included as before. "Constraints" are used as an institutional proxy, and Columns (1) and (2) ((3) and (4)) use strict (loose) IT adoption dates, without and with the extra controls. The results show that the coefficient on the new interaction variable is always negative, as expected, and significant at the 1 percent level. Still, the interaction term between IT and "constraints" is negative throughout, and significant except for Column (4). Using "democracy" as an alternative institutional proxy gives a similar result, albeit slightly weaker (Table 11 in Appendix A).[27] To sum up, while the initial-inflation effect is significant and thus there is some truth in the alternative explanation, our institutional story is largely robust to its inclusion.

6 Concluding remarks

The standard result in previous research is that inflation targeting has made little difference to the inflation rate in the advanced countries, but has significantly reduced inflation in non-advanced countries. Because LICs have been slower to adopt inflation targeting than EMEs, the samples of non-advanced countries used in previous research have contained very few LICs. Now that more time has passed, it is possible to consider the effectiveness of IT in LICs separately from EMEs. Our basic result is that IT has been far less effective in LICs than in EMEs, highlighting the presence of significant heterogeneity in IT effects within non-advanced countries.

We have presented a story as to why this should be the case. Specifically, we have examined the role of institutions which affect the degree of government accountability in the effectiveness of IT in a sample of LICs and EMEs. Measures of institutional quality based on political arrangements are more structural and less subjective, and also less likely to be endogenous to outcomes, than those based on survey data such as perceptions of corruption. The results indicate that IT was more

[26] For non-IT adopters, we simply set initial inflation to be zero.

[27] Although the interaction term between IT and "democracy" is always negative, it is insignificant when the extra control variables are included.

effective with stronger institutions within LICs and EMEs. This is still largely true even when we control for the significant effect of the pre-IT inflation rate, which has tended to be particularly high in EMEs, on the reduction in inflation achieved under IT. Our interpretation is that poor institutions, leaving fiscal policy unconstrained, undermine central banks' ability to conduct monetary policy in a way consistent with IT. Overall, since institutions are generally weaker in LICs than in EMEs, government accountability helps us understand why IT may be less effective in LICs.

In the estimation of IT effects, there is always a concern about the endogeneity of IT adoption, possibly caused by omitted variables or a self-selection problem. The use of country fixed effects and additional controls which possibly affect the IT adoption decision (such as a parity change in a pegged regime and a dummy for a currency crisis) should alleviate the endogeneity concern. Besides, we think that to the extent that institutional quality affecting government accountability is a key determinant of successful IT performance, the analysis of IT effects for a given level of institutional quality (together with the use of country fixed effects) helps address the self-selection problem. Thus, given that 1) the frequently used alternative of Propensity Scoring Matching is not free from problems either (as indicated above), and 2) fixed effects estimators give us a flexibility such as the use of country-specific time trends, we believe that our decision to use fixed effects methods can be defended.

One possible avenue for future research is to examine empirically the roles of other factors for successful IT performance. For instance, Gemayel et al. (2011) point out that a weak monetary transmission mechanism may reduce the effectiveness of IT. Acknowledging this, it may be fruitful to consider the relevance of factors such as insufficient understanding of the transmission mechanism and impaired transmission channels. For example, if a bank lending channel, which highlights the special nature of bank credit in the financial structure, is impaired, a monetary tightening may not reduce bank lending, making it more difficult for IT to work in general.

Appendix

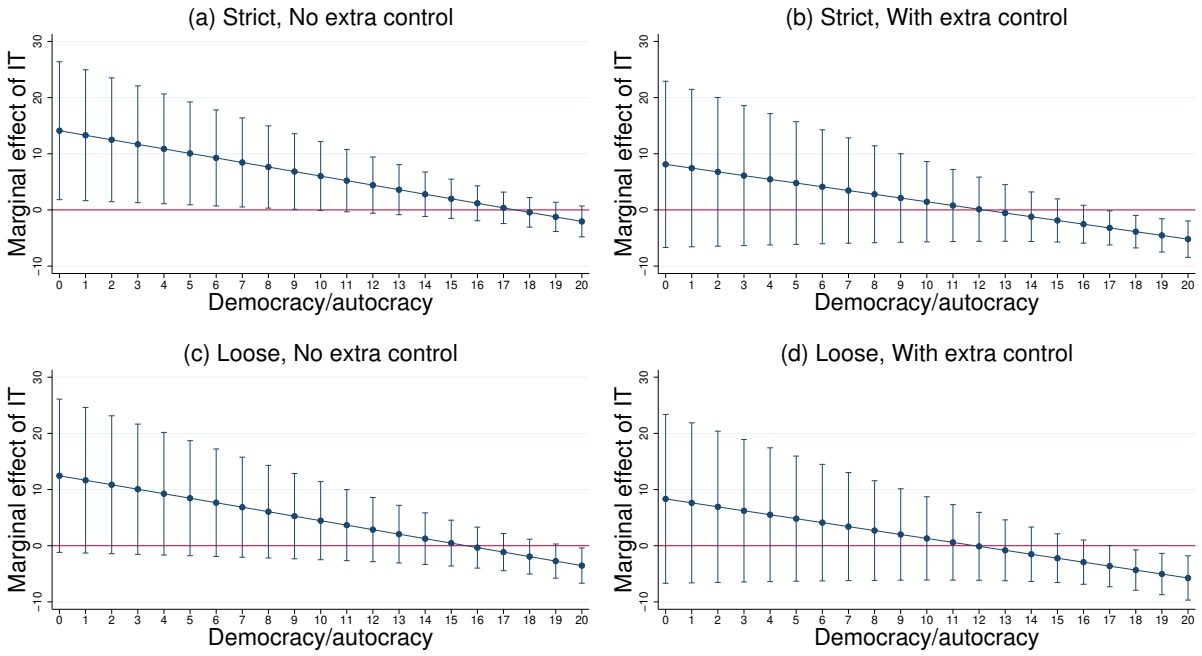
A Supplementary results

Table 9: Institutions and IT effects within LICs and EMEs (Democracy/autocracy)

Adopt dates	Strict		Loose	
	(1)	(2)	(3)	(4)
Dependent variable: 100*△logcpi				
L.Infl	0.524***	0.425***	0.525***	0.425***
	(18.562)	(8.114)	(18.561)	(8.122)
IT	6.029	1.458	4.460	1.298
	(1.616)	(0.336)	(1.055)	(0.288)
IT*Account	-0.808**	-0.666	-0.800*	-0.704
	(-2.062)	(-1.371)	(-1.866)	(-1.428)
Account	0.364***	0.283**	0.361***	0.291**
	(2.625)	(2.311)	(2.626)	(2.370)
Oil infl	-0.016	0.014	-0.016	0.015
	(-1.099)	(1.168)	(-1.110)	(1.205)
Food infl	0.100***	0.141***	0.101***	0.139***
	(2.628)	(4.646)	(2.635)	(4.592)
Extra controls	No	Yes	No	Yes
Observations	3,662	2,978	3,662	2,978
Countries	114	109	114	109
IT adopters	23	20	23	20
Adj. R2	0.526	0.447	0.526	0.447

Notes: Democracy ranges from -10 to 10. For further relevant information, see Notes for Table 6.

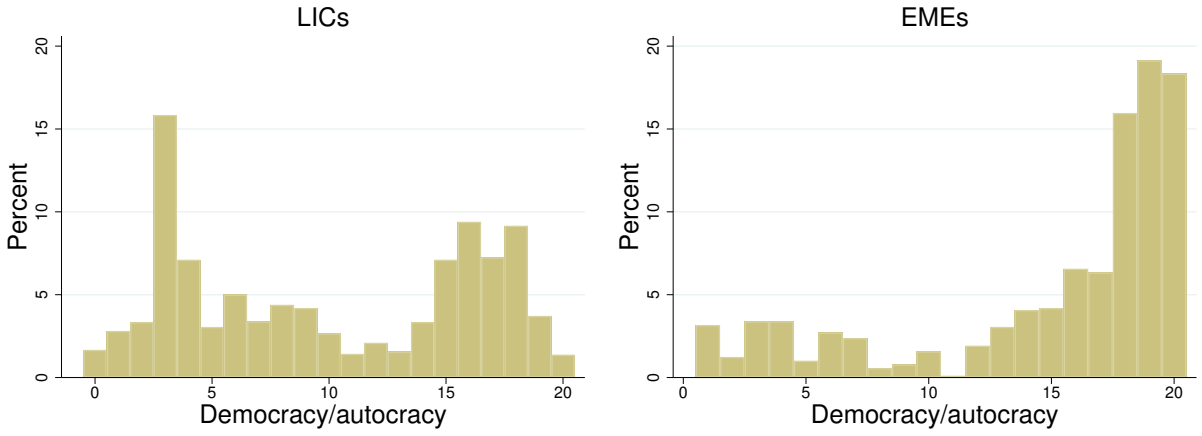
Figure 4: Institutions and marginal effects of IT (Democracy/autocracy)



Notes: A marginal effect with 90% confidence interval is shown.
Democracy/autocracy initially ranges from −10 to 10. The higher the value is, the more government is constrained.
It is rescaled to 0 to 20 to be compatible with "Margins" Stata command.

Source: Authors' calculations

Figure 5: Distribution of democracy/autocracy



Notes: Democracy/autocracy initially ranges from −10 to 10. The higher the value is, the more government is constrained.
It is rescaled to 0 to 20 to be compatible with "Margins" Stata command.

Source: Authors' calculations

Table 10: Initial inflation rates across income levels

			5 year averages		
Country	**Income group**	**Adopt year**	**Before IT**	**After IT**	**Change**
Albania	LIC	2009	2.63	2.49	-.14
Armenia	LIC	2006	3.23	6.29	3.07
Georgia	LIC	2009	8.11	3.33	-4.79
Ghana	LIC	2007	14.76	12.04	-2.72
Guatemala	LIC	2005	6.68	5.87	-.82
Indonesia	LIC	2006	8.9	6.09	-2.8
Moldova	LIC	2009	11.72	5.69	-6.02
Paraguay	LIC	2013	5.66	4	-1.67
Peru	LIC	2002	4.85	2.24	-2.62
Philippines	LIC	2002	5.83	4.3	-1.53
Uganda	LIC	2011	8.11	6.07	-2.04
Average			**7.32**	**5.31**	**-2.01**
Brazil	EME	1999	76.63	8.33	-68.3
Chile	EME	2001	5.01	2.53	-2.49
Colombia	EME	1999	18.5	7.05	-11.45
Dominican Republic	EME	2012	6.35	2.53	-3.83
Hungary	EME	2001	14	4.71	-9.3
Mexico	EME	2001	17.5	4.28	-13.22
Poland	EME	1999	19.33	4.22	-15.11
Romania	EME	2005	22.6	6	-16.6
Russian Federation	EME	2014	7.45	10.62	3.17
Serbia	EME	2006	23.88	8.44	-15.44
Slovak Republic	EME	2005	7.44	3.87	-3.57
South Africa	EME	2001	6.45	4.74	-1.71
Thailand	EME	2000	4.95	2.25	-2.7
Turkey	EME	2006	24.57	7.78	-16.79
Average (without Brazil)			**18.19** (**13.69**)	**5.53** (**5.31**)	**-12.67** (**-8.39**)
Australia	HIC	1994	4.05	1.93	-2.12
Canada	HIC	1995	2.72	1.71	-1.01
Czech Republic	HIC	1998	8.73	2.48	-6.24
Finland	HIC	1994	4.21	1.04	-3.16
Iceland	HIC	2003	4.22	6.07	1.85
Israel	HIC	1997	10.71	3.62	-7.09
Japan	HIC	2013	-.21	1.13	1.34
Korea, Rep.	HIC	2001	3.89	2.93	-.96
New Zealand	HIC	1993	4.25	2.01	-2.24
Norway	HIC	2001	2.28	1.6	-.67
Spain	HIC	1995	5.42	2.42	-3
Sweden	HIC	1995	5.57	.47	-5.1
Switzerland	HIC	2000	.79	.85	.05
United Kingdom	HIC	1993	5.56	2.07	-3.48
Average			**4.44**	**2.17**	**-2.27**

Notes: For further relevant information, see Notes for Table 7.

Table 11: Role of initial inflation within LICs and EMEs (Democracy/autocracy)

Interaction	Strict		Loose	
	(1)	(2)	(3)	(4)
Dependent variable: 100*△logcpi				
ldcpi	0.522***	0.421***	0.521***	0.422***
	(18.435)	(7.938)	(18.403)	(7.951)
IT	15.198***	9.379**	12.749***	9.219**
	(3.940)	(1.986)	(3.613)	(2.085)
IT*Account	-0.750**	-0.539	-0.684**	-0.644
	(-2.489)	(-1.332)	(-2.142)	(-1.575)
Account	0.358***	0.281**	0.362***	0.291**
	(2.634)	(2.335)	(2.672)	(2.395)
IT*Initial Infl	-0.898***	-0.765***	-0.689***	-0.564***
	(-5.091)	(-3.623)	(-7.847)	(-4.213)
Oil infl	-0.016	0.014	-0.015	0.015
	(-1.076)	(1.176)	(-1.071)	(1.234)
Food infl	0.101***	0.141***	0.103***	0.139***
	(2.649)	(4.634)	(2.688)	(4.587)
Extra. controls	No	Yes	No	Yes
Observations	3,662	2,978	3,662	2,978
Countries	114	109	114	109
IT adopters	23	20	23	20
Adj. R2	0.527	0.447	0.527	0.448

Notes: Initial inflation is the 5-year average of inflation prior to the adoption of IT. Columns (1) and (2) ((3) and (4)) use the strict (loose) IT adoption dates. Democracy/autocracy is used as an institutional proxy. For further relevant information, see Notes for Table 6.

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