HOW ARE INFLATION TARGETS SET?

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Abstract

This paper aims to contribute to a better understanding on how inflation targets are set. For this reason, we first gather evidence from official central bank and government publications and from a questionnaire sent to central banks on how inflation targets are set; we then estimate the determinants of the level of inflation target in 19 inflation targeting countries using unbalanced panel interval regressions (to deal with the issue that targets are typically set as a range rather than as a point). Inflation targets are found to reflect macroeconomic fundamentals. Higher level as well as higher variability of inflation are associated with higher target. The setting of the inflation target is also found to have an important international dimension, as higher world inflation is positively correlated with inflation targets. Rapidly growing countries exhibit higher inflation targets. Our results also suggest that the larger width of inflation target is set in a more volatile macroeconomic environment. We find that central bank credibility is negatively associated with the level of inflation target, suggesting that less credible central banks are likely to recognize the risks related to anchoring inflation expectations at low levels. On the other hand, government party orientation does not matter even in less independent central banks.

Abstrakt

Tento článek má za cíl přispět k porozumění procesu jakým jsou tvořeny a nastavovány inflační cíle. Za tímto účelem nejdříve sbíráme informace z oficiálních publikací centrálních bank, vlád a z dotazníku zaslaného centrálním bankám v zemích cílujících inflaci. Dále odhadujeme determinanty inflačního cíle v 19ti zemích cílujících inflaci za pomoci intervalových regresí na nevyvážených panelových datech (protože inflační cíl bývá nastaven ve formě intervalu). Výsledky ukazují, že inflační cíle reflektují stav makro-ekonomiky. Vyšší hladina, stejně jako vyšší variabilita inflace se váže s vyšším inflačním cílem. Nastavení inflačního cíle take závisí na mezinárodním vývoji: inflace v zahraničí je korelovaná s domácím inflačním cílem. Země rostoucí vysokým tempem mívají vyšší inflační cíle. Naše výsledky také naznačují, že širší pásmo inflačního cíle se objevuje v zemích a obdobích s vyšší makroekonomickou volatilitou. Dále nacházíme, že kredibilita centrální banky má negativní vztah k výšce inflačního cíle, což naznačuje, že méně kredibilní centrální banky vnímají rozika spojená s příliš nízkými inflačními očekáváními. Na druhou stranu, politická orientace vládní strany nehraje roli ani v případech méně nezávislých centrálních bank.

1 Introduction

Monetary policy transparency has increased substantially over the course of the last 10 to 20 years and the communication policies of central banks have changed dramatically (Blinder et al., 2009, Crowe and Meade, 2008, Dincer and Eichengreen, 2010). While some central banks did not even announce changes in their monetary policy rate in the 1980s, they now provide detailed information about their monetary policy conduct and find transparency as important factor for building central bank credibility in order to manage inflation expectations more effectively (van der Cruijsen and Demertzis, 2007).

More than 20 countries adopted an inflation targeting regime in the 1990s and 2000s. A characteristic feature of this monetary policy regime is an explicit numerical target for inflation, as well as a high degree of accountability and transparency and a major role for inflation forecast in monetary policy conduct due to lags in monetary transmission (see Walsh, 2009 and Svensson, 2010 for a recent survey on inflation targeting). Nevertheless, as we find, the amount of information that central banks provide about how one of their most important policy variables – the inflation target – is set varies considerably. While some central banks provide very detailed statements, others do not give *any* explanation for the process of inflation target setting and merely state the numerical target. Similarly, the academic community has extensively examined the effect of inflation targeting on various macroeconomic variables, but the inflation target setting process is virtually untouched.

Economic models consider inflation targets an exogenous factor, but inflation targets differ from country to country. While the Reserve Bank of Australia specifies its inflation target between 2-3%, the Bank of England defines its target as 2% with +/- 1 percentage point tolerance band and the Bank of Thailand targets inflation between 0-3.5%. In addition, there are countries that implement an inflation targeting regime as a disinflation strategy. For example, the Central Bank of Brazil adopted this regime in 1999 with the target of 8% with +/- 2 percentage point tolerance interval and decreased the target step by step to 4.5% (with +/- 2 percentage point tolerance interval). Similarly, the Bank of Israel started with a 14-15% target in 1992 and then decided on a downward path for inflation targets at the end with a 1-3% inflation target.

We aim to bridge the gap in the literature by analyzing which factors matter for the apparent heterogeneity in inflation target setting. First, we analyze official central bank and government documents together with the answers to our questionnaire on inflation target setting that was

sent to all central banks in our sample in order to shed light on which factors are deemed crucial by central bankers in their considerations about inflation targets. Second, we construct an empirical model to investigate the determinants of inflation targets as well as the width of the inflation target. While official central bank documents provide useful guidance on which factors are likely to influence the inflation target setting, we also aim to investigate whether there are some additional, predominantly institutional, factors that matter for the process of setting the target. For example, we examine whether central banks that are viewed as less credible feature a higher inflation target in order to decrease the risk that they will not be able to meet the target, as they manage inflation expectations less effectively or whether central bank independence matters to the process of inflation target setting.

Anticipating our results, we find that not only are macroeconomic fundamentals important for the level of inflation targets, but some institutional characteristics are as well. Notably, our results stress the importance of central bank credibility in delivering low inflation (see Blinder, 2000, for supporting evidence based on surveys): we find credibility to be negatively correlated with the level of inflation target. On the other hand, government party orientation is not found to matter even in less independent central banks. This likely reflects the fact that inflation targeters typically exhibit a high degree of independence already before the adoption of an inflation targeting regime and a sufficient degree of independence is viewed as one of the pre-conditions for successful adoption of inflation targeting (Amato and Gerlach, 2002). Finally, our results also suggest that central banks set a larger width of inflation target in a more volatile macroeconomic environment.

The paper is organized as follows. Section 2 provides a detailed overview of what central banks say about inflation target setting. Section 3 describes the data and the empirical methodology. We present our results in section 4. Concluding remarks are provided in section 5. An Appendix with additional descriptive statistics and regression results follow.

2 What Do Central Banks Say about Inflation Targets?

This section presents a brief survey of central bank official publications related to the setting of inflation targets and summarizes the results of the short questionnaire on inflation target setting that we sent to all central banks in our sample in March 2010. The amount of information that central banks provide in their official publications varies bank by bank. Some banks explain how

the target is set in detail. On the other hand, other central banks in our sample remain largely silent on this issue and merely state the numerical target without further comment.

Table 1 displays the information on which authority is responsible for inflation target setting as well as information on the factors that central banks find important for setting the inflation target. Although the degree of goal independence of central banks the inflation target is predominantly set by the central bank and government jointly. Central banks frequently state that past domestic inflation as well as economic growth matter in considering how to set the target. Several central banks mention more specific factors such as price convergence or zero interest rate bound. Detailed information on what central banks state about inflation target setting is provided in the Appendix.

Based on the results of our questionnaire as well as official central bank publications, it seems that economic variables play a role in setting the target. It is typically (domestic and foreign) inflation rate, stability of the macroeconomic environment, and the degree of economic activity that are mentioned. Sometimes, price convergence and statistical overvaluation in inflation measurement is noted. As regards the latter, central banks refer to it as one of the factors for targeting positive inflation. In the following sections, we investigate empirically whether these factors contribute to inflation target setting. We also examine a broader set of indicators, especially those related to the institutional setting of central banks, i.e. indicators such as central bank credibility or central bank independence, since the government participates in inflation target setting in most countries in our sample.

Country	Who sets the target?	Determinants of inflation targets
Australia	Central bank and government jointly	Business cycle fluctuations
Brazil	Central bank and government jointly	n.a.
Canada	Central bank and government jointly	Costs of inflation, Measurement error, Wage rigidities, Zero interest rate bound
Chile	Central bank	Deflation risk
Colombia	Central bank and government jointly	n.a.
Czech Republic	Central bank	Past inflation, Inflation expectations, Price convergence, Wage rigidities, Zero interest rate bound, Measurement error
Finland	Central bank and government jointly	n.a.
Israel	Government	Measurement error, Wage and price rigidities, Zero interest rate bound
Mexico	Central bank	Foreign inflation
New Zealand	Central bank and government jointly	Past Inflation, Foreign Inflation, Target Expectations
Peru	Central bank and government jointly	n.a.
Poland	Central bank and government jointly	Economic growth, Maastricht inflation criterion for euro adoption
South Africa	Central bank	n.a.
South Korea	Central bank and government jointly	Past inflation, Economic fundamentals, Monetary policy flexibility
Spain	Central bank and government jointly	n.a.
Sweden	Central bank	Past inflation, Costs of inflation, Risks of deflation, Measurement error
Switzerland	Central bank	Measurement Error
Thailand	Central bank and government jointly	Foreign inflation, Economic growth
United Kingdom	Government	Sustainable growth

Source: The column 'Who sets the target?' is based on our questionnaire sent to central banks in March 2010, Mahadeva and Sterne (2000), Mishkin and Schmidt-Hebbel (2001) and Baltensperger et al. (2007). The column 'Determinants of inflation targets' is based on our questionnaire sent to central banks in March 2010, various central bank official publications and web pages.

3 Data and Empirical Methodology

We collect the data from 19 countries targeting inflation, each series covering the period from the year when the country adopted the inflation targeting regime until 2008.[1] As a result, our panel is

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[1] More specifically: Australia (1994-2008), Brazil (1999-2008), Canada (1991-2008), Chile (1991-2008), Colombia (1999-2008), Czech Republic (1998-2008), Finland (1993-1998), Israel (1992-2008), Mexico (1999-2008), New Zealand (1990-2008), Peru (1994-2008), Poland (1999-2008), South Africa (2000-2008), South Korea (1998-2008),

unbalanced. The cross-sectional dimension of our data matrix is the same as in Mishkin and Schmidt-Hebbel (2001), but more recent data on these countries are included as well. Several developing countries that adopted inflation targeting only recently are thus not included, as the time coverage is too short. Our sample consists of developed as well as emerging economies. Yearly data are used, as inflation targets do not change more frequently. The current inflation targets are presented in Figure 1.

Figure 1: Inflation Targets, as of 2008
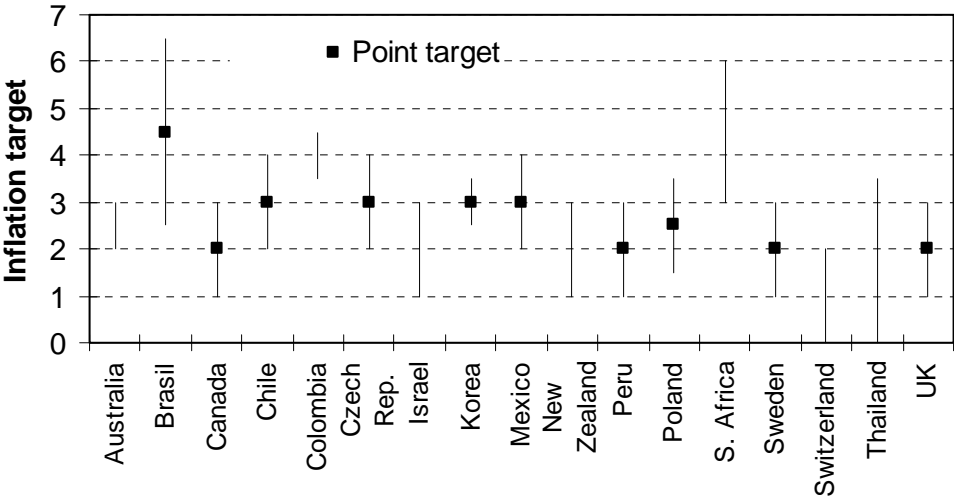
Note: The figure presents the annual inflation target for our sample countries (Finland and Spain are not reported, as they do not target inflation any longer and currently, they are members of the euro area).

A vast majority of countries revise their inflation targets from time to time and inflation targets are typically defined in terms of range with or without some central value. Central banks evaluate inflation to be consistent with their inflation target, if it develops within the target band. For this reason, we employ panel interval regression with random effects, where the dependent variable is defined as an interval (Cameron and Trivedi, 2005). Moreover, this technique also deals with the issue that the dependent variable is censored. For robustness checks, we use a target midpoint[2] as the dependent variable and estimate the standard random effects model. Nevertheless, it is important to emphasize that in this case the analysis would not reflect uncertainty concerning the nature of the exact values within each interval correctly, nor would it deal adequately with the left- and right-censoring.

Spain (1996-1998), Sweden (1995-2008), Switzerland (2000-2008), Thailand (2000-2008), United Kingdom (1992-2008).

[2] Some central banks specify only a target band and do not provide a central target (see Figure 1). In this case, we calculate the mid-point of the target band. The regression results are largely in line with baseline estimates and are available upon request.

Our baseline empirical model takes the following general form

$$[\pi_{i,t}^{T(L)}, \pi_{i,t}^{T(U)}] = \beta \mathbf{X}_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

where $\pi_{i,t}^{T(L)}$ and $\pi_{i,t}^{T(U)}$ are inflation target lower and upper bounds, respectively, in country i and time t. $\mathbf{X}_{i,t-1}$ is a vector of explanatory variables in country i and time $t-1$. Finally, β is a vector of parameters to be estimated and $\varepsilon_{i,t}$ is a residual.

In our baseline model, the explanatory variables are lagged by one period to deal with potential endogeneity. This is adequate in our view, as there is evidence that inflation targets have an effect on at least some of our explanatory variables.[3] Many central banks, especially those which adopted inflation targeting as a disinflation strategy such as Colombia and Peru as well as Israel, Korea, Chile or Mexico in the past set their inflation target one year ahead. In the UK, the government's inflation target is announced each year by the Chancellor of the Exchequer in the annual Budget statement. Nevertheless, other central banks announce the target more years in advance. For example, the Central Bank of Brazil announced its target several times two years in advance. To deal with this issue, we re-estimate all regressions with explanatory variables lagged by two as well as three periods. In addition, we estimate our empirical model based on the restricted sample, where we include only those countries in those time periods for which we know the exact date when the decision about inflation target was made and when it came into effect. The lag of explanatory variables is thus time and country specific in the 'Exact lag' model, i.e. the lag exactly conforms to the announcement of the target and makes it fully robust to the endogeneity concerns.

Our explanatory variables, $\mathbf{X}_{i,t-1}$, are, to a certain extent, motivated by the findings of Section 2. These are typically variables capturing the state of the economy such as inflation or the degree of economic activity. In addition, we include variables that are deemed to influence central bank

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[3] The empirical literature typically analyzes the impact of introducing inflation targeting on other macroeconomic variables (such as: development of actual and expected inflation, and GDP) or their characteristics (such as volatility or persistence of inflation). Mishkin and Schmidt-Hebbel (2006), for example, have analyzed the impact of inflation targeting on the level of inflation, as well as intensity of inflation response to various shocks. Levin et al. (2004), Vega and Winkelried (2005) and Yigit (2007) have examined whether introducing an inflation target has lowered the persistence and volatility of inflation. Johnson (2002, 2003), de Mello and Moccero (2006) and Cerisola and Gelos (2009) have evaluated the inflation target impact on the level of expected inflation. Babecky et al. (2009) and Franta et al. (2007) have inter alia analyzed the impact of introducing the inflation target on inflation persistence. Demir and Yigit (2008) find that inflation targeting matters for central bank credibility.

policies in general such as the institutional setup of the central bank, i.e. whether the banks are granted independence or how credible their policies are perceived by the public.

Next, we provide a full list of our explanatory variables, $\mathbf{X}_{i,t-1}$. These are both variables capturing the state of the economy as well as institutional variables such as central bank independence or credibility.

Inflation

Consumer price index inflation measured as year-on-year change is included in order to assess whether the central bankers take into account past inflation developments when setting the target. We hypothesize that higher inflation is associated with a higher inflation target. This can be so as central bankers may believe that inflation expectations are at least to a certain extent formed by past inflation.[4] The source of data is the IFS database of the International Monetary Fund.

Inflation volatility

As a measure for inflation volatility (being of utmost importance in the debate about optimal inflation, see Billi and Kahn, 2008) we use the sample variance of past detrended inflation record. Inflation is detrended using the Hodrick-Prescott filter in order to reflect the fact that some countries adopted the inflation target as a disinflation strategy and experienced a higher inflation rate for some parts of our sample. For sensitivity analysis, we also calculate inflation volatility based on inflation series that are not detrended.[5] As we expect that policymakers who decide the inflation target value more recent developments, we make an average of sample variances in the past 5 and 10 years (where the inflation measures π are already Hodrick-Prescott-detrended).

$$var(\text{inflation})_t = \frac{1}{2}\sum_{i=t-5}^{t}\frac{(\pi_t - \overline{\pi})^2}{5} + \frac{1}{2}\sum_{i=t-10}^{t}\frac{(\pi_t - \overline{\pi})^2}{10} \tag{2}$$

The choice of 5 and 10 years is somewhat arbitrary, but alternative specifications such as a simple 10 year sample variance resulted in a largely similar estimated effect of inflation volatility on inflation target in our econometric exercises. The source of data is the IFS database of the International Monetary Fund.

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[4] We prefer actual inflation to inflation expectations data, which are typically based on surveys due to data availability as well as to the fact that the accuracy of expectations data may be an issue; see Caskey (1985), Evans and Gulamani (1984), Jeong and Maddala (1996), Evans and Honkapohja, (2001), among others. Note that the inflation measure includes the measurement error of inflation and there are no reliable estimates of the measurement error to model the effect of this error separately from inflation.

[5] Nevertheless, our regression results are largely unchanged irrespective of the measure of inflation volatility we use.

World inflation

We also use world CPI inflation, as central banks especially in small open economies may understand world inflation as a certain leading indicator for domestic inflation. This supposition is supported by recent empirical evidence from Mojon and Cicarelli (2010), who document that nearly 70% of variance of inflation in OECD countries is due to common shocks. The source of data is the Federal Reserve Bank of Cleveland.

Price level

We include the price level measured by PPP to test the hypothesis of price convergence: Do countries with a lower price level set a higher inflation target to reflect the expected price convergence towards more developed countries? Price level may also serve as an useful indicator to assess if inflation target are set differently in emerging market countries. The source of this data is the Penn World Table.

GDP per capita

Similarly to the price level, GDP per capita is included to investigate whether inflation targets are higher in poorer countries. Poorer countries also tend to have a more volatile macroeconomic environment (as financial markets are typically underdeveloped, see Coricelli and Roland, 2008) and central bankers are more likely set to wider tolerance intervals for inflation target. Alternatively, we use a dummy for emerging market economies instead of GDP per capita. The source of data is the IFS database of the International Monetary Fund.

GDP growth

We hypothesize that a higher inflation target is set in fast-growing economies, as these countries typically exhibit higher inflation at least in the short and medium-term (this can be rationalized by the New Keynesian Phillips curve, see Gali and Gertler, 1999). The source of data is the IFS database of the International Monetary Fund.

Credibility

Central bank credibility is likely to affect the formation of inflation expectations. Private sector long-term inflation expectations are found to give greater weight to inflation target under a credible central bank (Bomfim and Rudebush, 2000). Typically, credibility is defined as the difference between inflation target and inflation expectations (Svensson, 1999). Blinder (2000)

also argues that the difference between inflation target and inflation expectations can be taken as an objective measure of central bank credibility.[6] For this reason, we use the cross-sectional index of central bank credibility developed by Cecchetti and Krause (2002). The credibility index has no time-series dimension, so it will only serve to explain cross-country variation. This might be sufficient for our empirical exercise as central bank credibility is unlikely to change abruptly over time (Holub and Hurnik, 2008). The index is based on the data before the inflation targeting was introduced in our sample countries. We hypothesize that more credible central banks, especially those in developed countries, can manage inflation expectations more effectively and set inflation targets below the targets typical for emerging market economies.

Central bank independence

Less independent central banks may be more prone to government influence and, knowing that they are likely to deliver higher inflation, may eventually prefer a higher inflation target (see Siklos, 2008, for a recent survey of theories and empirical evidence on central bank independence and inflation). There are various measures of central bank independence and various studies cover different sets of countries (for a survey of central bank independence measures see Arnone et al., 2006). Cukierman (1992) sets up a central bank independence (CBI) index, which is a composite measure based on both legal and real indicators. We use several recently developed CBI indexes that build on the original Cukierman (1992) contribution. First, we employ the central bank autonomy index by Arnone et al. (2008), who developed the index for a large group of central banks for the late 1980s and 2003. We use the index only for 2003, as our sample countries adopted an inflation targeting regime later than in the 1980s. The Arnone et al. (2008) index distinguishes between political (goal) and economic (instrument) independence. Political independence refers to the extent to which the central bank can set the objective of monetary policy, while economic independence refers to the degree of freedom the central bank has in selecting its instruments. Arnone et al. (2008) show that political and economic independence can differ sharply for certain central banks; we therefore examine the impact of political and economic central bank independence jointly as well as separately. Alternatively, we also use data from Guillén and Polillo (2005), who extend the Cukierman central bank independence index up to 2000 and their country coverage is comprehensive. Their measure is time-varying and more recent data that are not available are extrapolated using the last observation in each country.

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[6] The difference between inflation expectations and inflation target is likely to be a better indicator of credibility than the difference between actual inflation and inflation target. Short-term developments in inflation are influenced, to a certain extent, by temporary shocks, while long-term inflation expectations are likely to be immune to the short-term disturbances. For instance, Holub and Hurnik (2008) document that although inflation targets were missed relatively often in the Czech Republic, inflation expectations remained anchored, i.e. close to the inflation target.

Government party orientation

Finally, we include a measure of government party orientation. In principle, government may influence the setting of the inflation target, as the targets are typically set based on a joint agreement between central bank and government. In some countries such as the United Kingdom it is the government who sets the target and the central bank does not have goal independence. We hypothesize that left-leaning governments favor greater expenditures and higher inflation (Hibbs, 1977, Alesina, 1988) and in consequence, may support higher inflation targets. The data are taken from the World Development Indicators database. The variable is coded is follows: -1 for left wing (UK labour, US democratic), 0 for center and other orientation, 1 for right wing (UK conservative, US republican).

Because government party orientation may be more influential in less independent central banks, we construct an additional interaction term capturing the joint effect of government party orientation and central bank independence. As we work with two different indexes of independence, we consequently have two corresponding measures of joint effect of government party orientation and independence. Moreover, for the Arnone et al. (2008) index we are also able to distuinguish political and economic central bank independence. In this respect, Alesina, Roubini and Cohen (1997), Boix (2000), Clark (2003), Sakamoto (2008) and Belke and Potrafke (2009) study whether government party orientation matters for interest rate setting in less independent central banks. Their research shows that party orientation is of limited importance probably due to the high degree of central bank independence. In contrast to these studies, we examine the effect of government party orientation on setting the inflation target and also distinguish between political and economic central bank independence, as political independence can clearly be more relevant in our case. The scatter plots of inflation target (central value) and explanatory variables are presented in Figures 2 and 3 in the Appendix.

4 Results

We present our baseline estimates in Table 2 and focus in detail on the effects of central bank independence in Table 3. The results unambiguously suggest that actual inflation rate matters for the setting of inflation targets. Similarly, policy makers also take the variability of inflation into account and set higher targets in an environment with more volatile inflation. This likely reflects their concerns about deflation risk. Alternative measures of inflation variability yield largely similar results (these are available upon request). The degree of economic activity is also found to

matter. Higher growth is likely to go hand-in-hand with higher inflation at least in the short to medium-term horizon. This corresponds to the reasoning based on the New Keynesian Phillips curve. Higher world inflation delivers higher inflation targets, as policy makers recognize that a substantial part of the price index is often driven by world prices. This finding conforms with Cicarelli and Mojon (2010), who document the prominent role of global inflation for domestic inflation developments in the OECD countries.

The results indicate that central bank credibility influences the level of inflation target. This is probably so, as less credible central banks (i.e. those with a less impressive track record) may be more concerned about their ability to anchor the inflation expectations of the public and thus prefer a higher target. This corresponds to the findings of Blinder (2000), whose survey indicates that central bankers recognize credibility as a very important factor for maintaining low inflation. Similarly, more credible central banks can set a lower target during disinflation with the same output loss (Nikolae and Nolan, 2006).

On the other hand, although some central banks mention price convergence as a factor for the choice of inflation target (see Table 1), we do not find it to be a general phenomenon. Neither central bank independence nor government party orientation is found to influence the level of inflation targets. As Belke and Potrafke (2009) note, government party orientation may still matter for the interest rate setting process if the degree of central bank independence is low. Therefore, we construct an interaction term of government party orientation and central bank independence, but like Belke and Potrafke (2009) we fail to find it significant.

Table 2: Determinants of Inflation Targets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CPI inflation	0.50***	0.49***	0.55***	0.49***	0.49***	0.49***	0.50***
	(15.75)	(14.47)	(15.83)	(15.15)	(15.05)	(15.47)	(15.55)
Inflation volatility	0.29**	0.29***	0.23***	0.23***	0.24***	0.22***	0.31***
	(2.61)	(2.46)	(2.67)	(2.64)	(2.68)	(2.51)	(2.71)
GDP growth	0.15***	0.16***	0.16***	0.15***	0.15***	0.15***	0.16***
	(3.96)	(3.76)	(4.11)	(3.77)	(3.77)	(3.75)	(4.03)
World inflation	0.12**	0.11*	0.13**	0.13**	0.13**	0.12**	0.11*
	(2.13)	(1.75)	(2.29)	(2.19)	(2.24)	(2.15)	(1.91)
Credibility	-0.51**	-0.53*	-0.49**	-0.58**	-0.60**	-0.48	-0.65**
	(-2.21)	(-1.76)	(-2.13)	(-2.30)	(-2.39)	(-1.56)	(-2.15)
Price level		-0.01					
		(-0.16)					
Independence			-0.50				
			(-1.01)				
Gov. party orientation				-0.07			
				(-0.66)			
(Independence + Gov. p. or.)					-0.09		
					(-0.68)		
GDP per capita						-2.50	
						(-0.19)	
Emerging markets dummy							-0.19
							(-0.73)
Constant	0.63*	0.76*	0.88**	0.66**	0.72**	0.65*	0.77**
	(1.95)	(1.86)	(2.16)	(2.03)	(2.13)	(1.86)	(2.04)
No. of observations	134	114	130	130	130	130	130
Pseudo R-squared	0.78	0.80	0.78	0.78	0.79	0.77	0.77

Note: * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level. Panel interval random effects estimation. Inflation volatility, GDP per capita and price level coefficient premultiplied by 10^6 and 10^3, respectively. T-statistics in parentheses. All explanatory variables are lagged by one period. Independence refers to the central bank independence index developed by Arnone et al. (2008).

Next, we examine if inflation target setting is different in emerging countries (i.e. those countries that often implemented inflation targeting as a disinflation strategy), proxied by GDP per capita. GDP per capita may be preferable to a dummy for emerging countries, as it gives richer information on the state of economic development (the group of emerging market economies is rather heterogeneous; for example, Israel is often considered an emerging economy, but its GDP per capita is at the level of industrialized countries, while some countries that are typically regarded as emerging economies have a GDP per capita about ten times lower than Israel not far from the levels of some developing countries). The results suggest that although the inflation targets are typically higher in emerging countries, the inflation target setting process is largely similar. This is also confirmed by the regression in Table 2, column 7, where we use the dummy for emerging market economies instead.

Table 3: Determinants of Inflation Targets:

Different Measures of Central Bank Independence

	(1)	(2)	(3)	(4)	(5)	(6)
CPI inflation	0.50***	0.50***	0.49***	0.49***	0.50***	0.50***
	(15.97)	(15.66)	(15.01)	(15.10)	(15.71)	(15.07)
Inflation volatility	0.29***	0.30***	0.31***	0.31***	0.23***	0.23***
	(2.56)	(2.51)	(2.75)	(2.68)	(2.57)	(2.65)
GDP growth	0.16***	0.15***	0.14***	0.15***	0.16***	0.15***
	(4.17)	(3.96)	(3.73)	(3.79)	(4.02)	(3.85)
World inflation	0.13**	0.12**	0.13**	0.13**	0.11**	0.12**
	(2.30)	(2.12)	(2.28)	(2.218)	(1.96)	(2.00)
Credibility	-0.49**	-0.51**	-0.63**	-0.56**	-0.44	-0.54**
	(-2.14)	(-2.12)	(-2.50)	(-2.29)	(-1.57)	(-1.97)
Independence 1	-0.45					
(Arnone et al. index – political part)	(-1.51)					
Independence 2		0.01				
(Arnone et al. index – economic part)		(0.02)				
(Independence 1 + Gov. p. or.)			-0.13			
			(-1.21)			
(Independence 2 + Gov. p. or.)				-0.06		
				(-0.64)		
Independence 3					0.11	
(Guillén and Polillo index)					(0.21)	
(Independence 3 + Gov. p. or.)						-0.05
						(-0.50)
Constant	0.77**	0.62	0.74**	0.71**	0.55	0.70**
	(2.34)	(1.23)	(2.23)	(2.205)	(1.09)	(2.01)
No. of observations	130	130	130	130	123	123
Pseudo R-squared	0.78	0.77	0.78	0.77	0.78	0.78

Note: * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level. Panel interval random effects estimation. Inflation volatility, GDP per capita and price level coefficient premultiplied by 10^6 and 10^3, respectively. T-statistics in parentheses. All explanatory variables are lagged by one period.

A large body of research has focused on the effect of central bank independence on inflation performance (see Klomp and de Haan, 2010, for a quantitative survey of this issue). Although there is a lively debate and empirical results are to a certain degree mixed, the literature puts forward that central bank independence is negatively associated with inflation. As Siklos (2008) points out that no single definition of central bank independence is right for all countries at all times, we use various measures of central bank independence to provide more robust evidence on the effect of independence on inflation targets. As noted in the data description we employ the Arnone et al. (2008) and Guillén and Polillo (2005) measures of independence that have appropriate country and time coverage for us. Our results suggest that central bank independence does not matter for inflation targets in our sample. This finding, however, may be driven by the fact that sufficient central bank independence is, in general, one of the pre-conditions for the adoption of inflation targeting (Amato and Gerlach, 2002) and that the degree of central bank independence is thus typically high in inflation targeting countries. We also interact central bank

independence indexes with government party orientation (as government party orientation would play a role possibly in the case of less dependent central banks) and fail to find any systematic role for government interference, despite it mostly being the case that central banks do not have full goal independence and set the inflation target jointly with the government.

Finally, we also examine the determinants of the width of inflation target. Typically, central banks set the point inflation target with a tolerance band of +/- 1 percentage point. Nevertheless, some central banks such as the Bank of Korea have chosen narrower tolerance bands, while others such as the Central Bank of Brazil set the tolerance bands at a wider range. As we have seen in Section 2, central banks note the volatility of the macroeconomic environment as a factor they consider when setting the width of their target. Indeed, our results, as presented in Table 4, indicate that controlling for other factors, the volatility of the macroeconomic environment together with the level of inflation is likely to be the primary cause for the width of the target. We find that inflation volatility is positively associated with the width of the inflation target. Additional evidence for the supposition that the volatility of the macroeconomic environment matters is that the width of the inflation target is greater in emerging market economies (i.e. those countries that typically exhibit a more volatile environment).

Table 4: Determinants of Inflation Target Band Width

	(1)	(2)	(3)	(4)	(5)	(6)
CPI inflation	0.03***	0.03***	0.04***	0.03***	0.03***	0.03***
	(3.13)	(3.00)	(3.32)	(3.13)	(2.84)	(3.04)
Inflation volatility	0.01*	0.01*	0.01	0.01*	0.01*	0.01*
	(1.77)	(1.76)	(1.60)	(1.70)	(1.95)	(1.78)
Credibility	0.35	0.35	0.64	0.35	0.86	1.05**
	(0.69)	(0.70)	(1.34)	(0.66)	(1.57)	(1.99)
World inflation		-0.01				
		(-0.11)				
Price level			-0.01			
			(-1.35)			
GDP growth				0.02		
				(0.15)		
GDP per capita					-35.2**	
					(-2.03)	
Emerging markets dummy						0.91**
						(2.13)
Constant	1.70***	1.70***	1.93***	1.69***	1.93***	1.00***
	(5.13)	(5.16)	(5.31)	(4.86)	(5.72)	(2.32)
Observations	139	139	124	139	139	139
R-squared	0.08	0.08	0.15	0.08	0.19	0.20

Note: * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level. Inflation volatility and GDP per capita coefficient premultiplied by 10^6. T-statistics in parentheses. All explanatory variables are lagged by one period. Random effects estimation.

We also conduct further robustness checks. First, our inflation volatility measure is based on inflation, rather than detrended inflation as in our baseline model. Second, we lag all explanatory variables by two periods to reflect the fact the inflation targets in some countries are set two years ahead. The results, which are available in Table A1-A6 in the Appendix, largely support our baseline estimates to a large extent.

In addition, we also estimate the model with explanatory variables lagged by three periods. The results remain largely unchanged and are available upon request. Finally, we estimate our empirical model based on a restricted sample, where we include in the data matrix only those countries in those time periods for which we know the exact date when the decision about inflation target was made and when it came into effect. The lag of explanatory variables is thus time and country specific, i.e. the lag exactly conforms to the difference between the announcement of the target and when the target becomes effective. While this approach tackles endogeneity well, the disadvantage is that the sample size is reduced by about one third. Despite the lower number of observations, these regressions largely confirm our previous findings. The results are available is Table A7 in the Appendix. Inflation as well as GDP growth is again a robust determinant of inflation targets. The degree of central bank credibility is negatively

associated with the level of inflation targets. Although the world inflation and inflation variability keep their expected signs, they are no longer significant at conventional levels (even though world inflation is statistically significant in one specification and its p-values are about 0.15 in the remaining specifications). All in all, the sensitivity analysis largely supports our baseline estimates.

5 Concluding Remarks

In this paper we analyze how inflation targets are set. Despite its high policy relevance, this issue is virtually untouched by the academic community. This is despite the fact that more and more countries have adopted an inflation targeting regime and inflation targets sometimes differ largely among countries. First, we gather evidence on what central banks and government publications say about how inflation targets are set. We complement this with the findings of a questionnaire on how inflation targets are set that was sent to all central banks in our sample. Second, we provide panel interval regressions to shed light on which factors matter for the setting of inflation targets.

We find that higher level as well as higher variability of inflation makes central banks set higher targets. The setting of the inflation target is found to have an important international dimension, as higher world inflation is positively correlated with inflation targets. Rapidly growing countries exhibit higher inflation targets. Our results also suggest that central banks set a larger width of inflation target in a more volatile macroeconomic environment.

Next, central bank credibility is negatively associated with the level of inflation target, suggesting that less credible central banks recognize the risks of anchoring inflation expectations at low levels. This corrensponds to the findings of Blinder (2000), whose survey indicates that central bankers recognize credibility as very important in order to keep low inflation. On the other hand, government party orientation does not matter even in less independent central banks. This likely reflects the fact that inflation targeters typically exhibit a high degree of independence already before the adoption of an inflation targeting regime and a sufficient degree of independence is viewed as one of the pre-conditions for successful adoption of inflation targeting.

In terms of future research, we believe it would be vital to analyze inflation targets on a theoretical grounds and to clarify the links between optimal inflation and inflation target.

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Appendix

Statements of central banks on how inflation targets are set

Bank of Canada

The bank notes that inflation is typically not targeted close to zero for three main reasons: "*(i) the measurement error embedded in existing price indexes; (ii) the labour market consequences of the presence of downward nominal wage rigidities; and (iii) the problems posed by the constraint that nominal interest rates cannot go below zero.*" (see http://www.bankofcanada.ca/en/press/background_nov06.pdf).

Bank of England

The bank states that the inflation target is chosen to be consistent with economic stability and growth: "*the role of price stability in achieving economic stability more generally, and in providing the right conditions for sustainable growth in output and employment.*"

(see http://www.bankofengland.co.uk/monetarypolicy/framework.htm).

Bank of Israel

The banks gives several arguments for how the target is chosen: "*the aberration in measuring inflation that stems from not taking into account the improvement in quality of goods; a positive inflation reduces the risk of being constrained by the zero bound on nominal interest rates; a small inflation rate is the oil in the wheels of the relative price system—when there is a general upward trend in prices it is easier to change relative prices of goods by raising prices by more or less than the general rate of inflation*". Next, it is also noted that: "*When both prices and wages are sticky downwards, lowering a relative price could be delayed and thus cause distortion in the allocation of resources. We have no basis to think that in Israel one of these factors is any different from that in other developed countries*" (see Bank of Israel, 2007, page 19).

Bank of Korea

The Bank of Korea states that : "*In setting the inflation target itself at the range of 3.0 ± 0.5%, the Bank aims to reflect the appropriate rate of inflation consistent with Korean economic fundamentals and to allow itself flexibility in conducting monetary policy to deal with short-term economic fluctuations.*" (http://www.bok.or.kr/broadcast.action?menuNaviId=631). This suggest that inflation as well as the degree of economic activity has come into considerations when setting the inflation target.

Bank of Poland

The bank states in the document on their monetary policy strategy that the target is chosen to be consistent with economic growth as well as with Maastricht inflation criterion for euro adoption: "*the above-defined continuous inflation target is consistent with strong economic growth. At the same time, the predefined inflation target comes close to the expected reference value for the inflation criterion*" (Bank of Poland, 2003).

Bank of Thailand

The Bank of Thailand states that "*The Monetary Policy Committee considers the 0 - 3.5 per cent target range for core inflation to be appropriate for the Thai economy, while at the same time providing sufficient flexibility for economic growth*". The Bank of Thailand also describes explicitly the width of the target: "*The target band width of 3.5 per cent will help cushion temporary economic shocks and minimize the need for the MPC to adjust monetary policy frequently, thereby reducing short-term interest rate volatility and promoting financial stability.*" (see http://www.bot.or.th/ENGLISH/MONETARYPOLICY/TARGET/Pages/Target.aspx). This suggests that the degree of economic activity may potentially act as a determinant of inflation target. As concerns the determinants of target band width, the volatility of the macroeconomic environment is likely to be positively associated with the width.

Central Bank of Chile

The bank notes that the inflation target is set in order to avoid the risk of deflation: " *The Central Bank of Chile does not aim for an inflation level below the specified range because of the risk of deflation, which could be very costly in terms of employment and production*" (see http://www.bcentral.cl/eng/about/functions/05.htm).

Czech National Bank

The Czech National Bank provides an extensive explanation about how the target is set. The Bank has revised the target several times from its introduction in 1998 in order to support the disinflation process (Holub and Hurnik, 2008). Initially, the CNB states: ``*The long-term inflation target must be consistent with the strategy for our integration into European institutions, and above all with the demands of EU and EMU accession*`` and ``*the rate of progress towards price and monetary stability and the anticipated time horizon for achieving this must take into account necessary structural adaptations, particularly the adjustment of relative prices.*" (CNB, 1999). Current and expected inflation as well as general macroeconomic environment are mentioned as determinants: ``*The inflation target for 2001 reflects*

the low inflation level achieved so far and expresses the monetary policy intention to maintain this low level in the next period. The target level is in line with the predictions for inflation factors in 2001 and conforms with the inflation expectations of economic agents. The forecasts also indicate that this inflation target is consistent with the expected favourable characteristics of the Czech macroeconomic environment." (CNB, 2000). Next, price convergence towards the euro area is noted as a reason for higher inflation target, as compared to the definition of price stability of the European Central Bank: ``*The suggested headline inflation target is in line with the CNB Monetary Strategy. ... The proposed trajectory for the inflation target can meanwhile be expected to leave sufficient room for price adjustment in connection with EU convergence.*" (CNB, 2001). Similarly : ``*This small inflation differential reflects the long-term real convergence of the Czech economy towards the euro area average.*" (CNB, 2004). More recently, statistical overvaluation in measuring inflation, wage rigidity, and zero nominal interest rate bound are explicitly mentioned as factors taken into account: ``*The inflation target ... also conforms to the limitations stemming from statistical overvaluation in measuring inflation. The target takes into account also the zero nominal interest rate bound and the potential downward inflexibility of wages.*" Finally, the target for 2010 onwards is set to 2% with a 1% tolerance band. The determinants mentioned are the same as in previous cases: ``*the need to keep open a positive inflation differential as one of the channels for raising the Czech price level to the level of the advanced countries will gradually subside.*" (CNB, 2007).

Reserve Bank of Australia

In a series of statements on the conduct of monetary policy, the bank's formulation of inflation target is noted: " *allows for the natural short-run variation in inflation over the cycle while preserving a clearly identifiable performance benchmark over time* ".
(http://www.rba.gov.au/MonetaryPolicy/statement_conduct_mp_4_06122007.html)

Reserve Bank of New Zealand

The Reserve Bank of New Zealand provides the following arguments about how the inflation target is chosen: "*The agreement [about inflation target] is broadly as the markets have been anticipating and is consistent with the publicly stated advice of expert commentators. I expect it to be well-received by the financial markets and by other stakeholders in the economy.*"
(see http://www.rbnz.govt.nz/news/2002/0124629.html). "*The raising of the bottom of the band brings the overall target more in line with New Zealand's inflation outcomes in recent years and those in other countries.*" (RBNZ, 2002). As we read these lines, the first statement suggests the role of financial market expectations, while the second points to the importance of both domestic and foreign inflation developments.

Sveriges Riksbank

The Sveriges Riksbank states in a press release to the introduction of inflation target in 1993 that "*This objective corresponds to the current underlying rate of inflation.*" (Sveriges Riksbank, 1993). The only determinant referred to is current inflation. Recently, a more elaborate description of the target appeared on the Riksbank webpages. Similarly to the main arguments of optimal inflation theory (see Billi and Kahn, 2008), the Riksbank describes the target as the result of a trade-off between high volatile inflation: "*Too high inflation is harmful to the economy, as inflation usually varies substantially when it is high.*" and deflationary risks: "*But too low inflation is not good either. A too low inflation target increases the risk of deflation, that is, the general price level falls. Deflation has historically been proved to create problems.*", also pointing out the consumer price index (CPI) bias: "*There is a tendency for the CPI to overestimate the actual rate of increase in the general price level. This is because it is difficult to entirely exclude the effects of quality changes in the CPI. To avoid deflation there is thus reason to set the target at a positive figure.*" (see http://www.riksbank.com/templates/Page.aspx?id=10596). The Riksbank sees a 2% inflation target as consistent with the above arguments.

Swiss National Bank

The bank states that it takes measument error of inflation into consideration for choosing the target: "*Measurement problems arise, for example, when the quality of goods and services improves. Such changes are not properly accounted for in the CPI; as a result, measured inflation tends to be slightly overstated*" (see http://www.snb.ch/en/iabout/monpol/id/monpol_strat/6).

We were unable to find the potential determinants of inflation target for other central banks. It is noteworthy that the Bank of Finland and Bank of Spain no longer target inflation, as they are now part of the euro area. Therefore, information about previous monetary policy regime is no longer available. Some other central banks such as the Central Bank of Colombia or South African Reserve Bank do not clarify how the inflation target is set, but explain the benefits of a low inflation environment.

Figure 2: (Mid-point) Inflation Targets and Explanatory Variables

Mid-point inflation target and inflation

Mid-point inflation target and inflation volatility

Mid-point inflation target and GDP growth

Mid-point inflation target and world inflation

Mid-point inflation target and CB credibility

Mid-point inflation target and price level

Mid-point inflation target and GDP per capita

Mid-point inflation target and government party

Figure 3: (Mid-point) Inflation Targets and Central Bank Independence

Mid-point inflation target and CBI Guillen Pollilo

Mid-point inflation target and CBI Arnone et al.

Mid-point inflation target and CBI Arnone et al. – economic part

Mid-point inflation target and Arnone et al. – political part
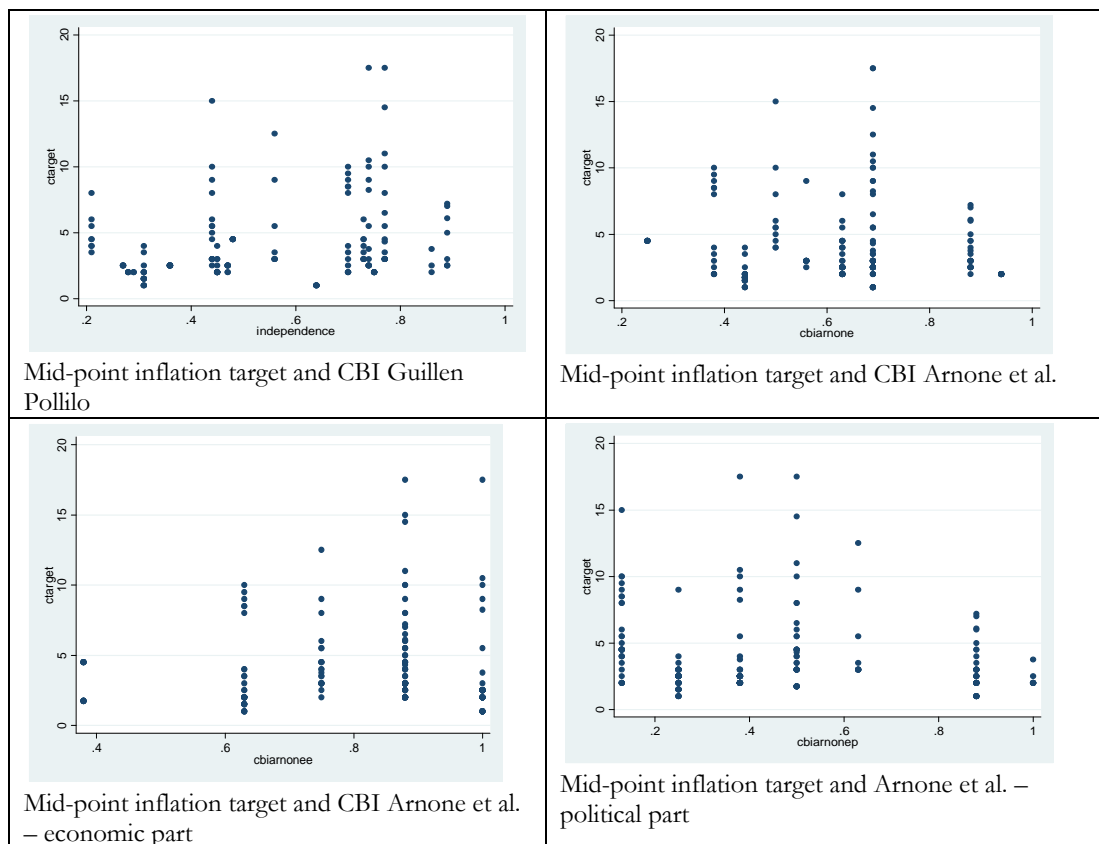
Additional Regression Results

1. Different Measure of Inflation Volatility

Table A1: Determinants of Inflation Targets

	(1)	(2)	(3)	(4)	(5)	(6)
CPI inflation	0.50***	0.49***	0.50***	0.49***	0.49***	0.49***
	(15.75)	(14.47)	(15.64)	(15.12)	(14.92)	(15.35)
Inflation volatility	0.44**	0.44***	0.45**	0.46***	0.46***	0.46***
	(2.51)	(2.43)	(2.54)	(2.60)	(2.61)	(2.47)
GDP growth	0.15***	0.16***	0.16***	0.14***	0.15***	0.15***
	(3.93)	(3.76)	(4.00)	(3.73)	(3.82)	(3.75)
World inflation	0.12**	0.11*	0.12**	0.13**	0.12**	0.12**
	(2.15)	(1.77)	(1.96)	(2.22)	(2.02)	(2.16)
Credibility	-0.52**	-0.53*	-0.44	-0.58**	-0.55**	-0.49
	(-2.22)	(-1.77)	(-1.56)	(-2.26)	(-1.96)	(-1.54)
Price level		-0.72				
		(-0.17)				
Independence			-0.50			
			(-0.98)			
Gov. party orientation				-0.07		
				(-0.67)		
(Independence + Gov. p. or.)					-0.10	
					(-0.92)	
GDP per capita						-2.29
						(-0.17)
Constant	0.62*	0.75*	0.56	0.65**	0.71**	0.64*
	(1.92)	(1.85)	(1.09)	(2.00)	(2.01)	(1.83)
No. of observations	134	114	123	130	134	130
Pseudo R-squared	0.77	0.79	0.78	0.78	0.77	0.77

Note: * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level. Panel interval random effects estimation. Inflation volatility, GDP per capita and price level coefficient premultiplied by 10^6 and 10^3, respectively. T-statistics in parentheses. All explanatory variables are lagged by one period. Independence refers to the central bank independence index developed by Arnone et al. (2008). Inflation is not detrended for the calculation of inflation volatility.

Table A2: Determinants of Inflation Targets:

Different Measures of Central Bank Independence

	(1)	(2)	(3)	(4)	(5)	(6)
CPI inflation	0.50***	0.50***	0.49***	0.49***	0.50***	0.49***
	(15.84)	(15.55)	(14.85)	(14.93)	(15.64)	(14.92)
Inflation volatility	0.22**	0.22**	0.24***	0.23**	0.45**	0.46***
	(2.49)	(2.43)	(2.68)	(2.60)	(2.54)	(2.61)
GDP growth	0.16***	0.15***	0.14***	0.15***	0.16***	0.15***
	(4.15)	(3.94)	(3.71)	(3.76)	(4.00)	(3.82)
World inflation	0.12**	0.12**	0.13**	0.13**	0.12**	0.12**
	(2.33)	(2.15)	(2.31)	(2.23)	(1.96)	(2.02)
Credibility	-0.50**	-0.53**	-0.65**	-0.58**	-0.44	-0.55**
	(-2.12)	(-2.13)	(-2.49)	(-2.27)	(-1.56)	(-1.96)
Independence 1	-0.46					
(Arnone et al. index – political part)	(-1.48)					
Independence 2		0.03				
(Arnone et al. index – economic part)		(0.07)				
(Independence 1 + Gov. p. or.)			-0.13			
			(-1.23)			
(Independence 2 + Gov. p. or.)				-0.07		
				(-0.67)		
Independence 3					0.10	
(Guillén and Polillo index)					(0.18)	
(Independence 3 + Gov. p. or.)						-0.06
						(-0.55)
Constant	0.77**	0.59	0.74**	0.71**	0.56	0.71**
	(2.31)	(1.16)	(2.20)	(2.03)	(1.09)	(2.01)
No. of observations	130	130	130	130	123	123
Pseudo R-squared	0.78	0.77	0.78	0.77	0.78	0.77

Note: * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level. Panel interval random effects estimation. Inflation volatility, GDP per capita and price level coefficient premultiplied by 10^6 and 10^3, respectively. T-statistics in parentheses. All explanatory variables are lagged by one period. Inflation is not detrended for the calculation of inflation volatility.

Table A3: Determinants of Inflation Target Band Width

	(1)	(2)	(3)	(4)	(5)	(6)
CPI inflation	0.03***	0.03***	0.04***	0.03***	0.03***	0.03***
	(3.17)	(3.04)	(3.36)	(3.17)	(2.88)	(3.04)
Inflation volatility	0.01*	0.01*	0.01	0.01*	0.01*	0.01*
	(1.76)	(1.75)	(1.58)	(1.69)	(1.93)	(1.78)
Credibility	0.35	0.35	0.64	0.35	0.86	1.05**
	(0.69)	(0.70)	(1.34)	(0.66)	(1.57)	(1.99)
World inflation		-0.01				
		(-0.11)				
Price level			-0.01			
			(-1.35)			
GDP growth				0.02		
				(0.15)		
GDP per capita					-35.2**	
					(-2.02)	
Emerging markets dummy						0.91**
						(2.13)
Constant	1.70***	1.70***	1.93***	1.69***	1.93***	1.93***
	(5.12)	(5.16)	(5.31)	(4.85)	(5.72)	(5.72)
Observations	139	139	124	139	139	139
R-squared	0.08	0.08	0.15	0.08	0.19	0.20

Note: * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level. Inflation volatility and GDP per capita coefficient premultiplied by 10^6. T-statistics in parentheses. All explanatory variables are lagged by one period. Random effects estimation. Inflation is not detrended for the calculation of inflation volatility.

2. Explanatory Variables Lagged by Two Periods

Table A4: Determinants of Inflation Targets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CPI inflation	0.37***	0.36***	0.37***	0.37***	0.37***	0.36***	0.37***
	(7.92)	(7.27)	(7.99)	(7.90)	(7.90)	(7.50)	(7.76)
Inflation volatility	1.53	1.33	1.70	1.60	1.66	1.32	1.50
	(1.41)	(1.22)	(1.57)	(1.47)	(1.51)	(1.20)	(1.38)
GDP growth	0.18***	0.18***	0.19***	0.18***	0.18***	0.17***	0.18***
	(6.08)	(6.01)	(6.37)	(5.75)	(5.43)	(6.36)	(6.14)
World inflation	0.14*	0.16**	0.14*	0.14*	0.13*	0.14*	0.14*
	(1.84)	(1.99)	(1.95)	(1.87)	(1.83)	(1.86)	(1.86)
Credibility	-0.33**	-0.18	-0.29*	-0.36**	-0.34*	-0.11	-0.30
	(-2.22)	(-0.97)	(-1.79)	(-2.02)	(-1.65)	(-0.48)	(-1.59)
Price level		-0.01**					
		(-1.98)					
Independence			-0.77**				
			(-2.04)				
Gov. party orientation				-0.04			
				(-0.50)			
(Independence + Gov. p. or.)					-0.04		
					(-0.54)		
GDP per capita						-1.45	
						(-1.33)	
Emerging markets dummy							0.04
							(0.24)
Constant	0.57	0.87**	0.98***	0.65**	0.64	0.71*	0.53*
	(1.36)	(2.08)	(2.63)	(2.00)	(1.36)	(1.90)	(1.25)
No. of observations	134	118	134	130	134	134	130
Pseudo R-squared	0.77	0.80	0.78	0.78	0.78	0.77	0.77

Note: * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level. Panel interval random effects estimation. Inflation volatility, GDP per capita and price level coefficient premultiplied by 10^6 and 10^3, respectively. T-statistics in parentheses. All explanatory variables are lagged by one period. Independence refers to the central bank independence index developed by Arnone et al. (2008). Explanatory variables lagged by two periods.

	(1)	(2)	(3)	(4)	(5)	(6)
CPI inflation	0.37***	0.37***	0.36***	0.37***	0.37***	0.37***
	(8.07)	(7.83)	(7.27)	(7.84)	(8.00)	(7.90)
Inflation volatility	1.42	1.75	1.71*	1.64	1.67	1.66
	(1.31)	(1.59)	(1.65)	(1.51)	(1.52)	(1.51)
GDP growth	0.19***	0.19***	0.18***	0.18***	0.19***	0.18***
	(6.38)	(6.31)	(4.94)	(5.81)	(5.86)	(5.43)
World inflation	0.14**	0.14**	0.14***	0.14*	0.13*	0.13*
	(1.96)	(1.86)	(2.60)	(1.87)	(1.76)	(1.83)
Credibility	-0.30*	-0.28*	-0.43*	-0.37**	-0.41**	-0.34*
	(-1.84)	(-1.77)	(-1.76)	(-2.14)	(-2.39)	(-1.65)
Independence 1	-0.62**					
(Arnone et al. index – political part)	(-2.34)					
Independence 2		-0.34				
(Arnone et al. index – economic part)		(-1.38)				
(Independence 1 + Gov. p. or.)			-0.11			
			(-1.07)			
(Independence 2 + Gov. p. or.)				-0.04		
				(-0.69)		
Independence 3					- 0.45	
(Guillén and Polillo index)					(-1.06)	
(Independence 3 + Gov. p. or.)						-0.04
						(-0.54)
Constant	0.79**	0.82	0.67**	0.63	0.56	0.64
	(2.17)	(1.93)	(2.14)	(1.37)	(1.09)	(1.36)
No. of observations	134	134	134	134	123	134
Pseudo R-squared	0.78	0.77	0.78	0.78	0.78	0.77

Note: * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level. Panel interval random effects estimation. Inflation volatility, GDP per capita and price level coefficient premultiplied by 10^6 and 10^3, respectively. T-statistics in parentheses. All explanatory variables are lagged by one period. Explanatory variables lagged by two periods.

Table A6: Determinants of Inflation Target Band Width

	(1)	(2)	(3)	(4)	(5)	(6)
CPI inflation	0.01*	0.01	0.01*	0.01*	0.01	0.01
	(1.78)	(0.19)	(1.85)	(1.67)	(1.20)	(1.62)
Inflation volatility	0.02***	0.03***	0.02***	0.03***	0.03***	0.02***
	(3.85)	(5.25)	(3.60)	(3.94)	(4.20)	(3.87)
Credibility	0.17	0.13	0.33	0.19	0.84	0.90*
	(0.33)	(0.29)	(0.66)	(0.36)	(1.50)	(1.73)
World inflation		0.01				
		(1.34)				
Price level			-0.01			
			(-0.68)			
GDP growth				0.01		
				(0.93)		
GDP per capita					-46.4***	
					(-2.70)	
Emerging markets dummy						0.95***
						(2.24)
Constant	1.87***	1.88***	1.99***	1.84***	2.18***	1.13***
	(5.58)	(6.81)	(5.30)	(5.39)	(6.29)	(2.68)
Observations	139	139	124	139	139	139
R-squared	0.11	0.11	0.15	0.10	0.22	0.24

Note: * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level. Inflation volatility and GDP per capita coefficient premultiplied by 10^6. T-statistics in parentheses. All explanatory variables are lagged by one period. Random effects estimation. Explanatory variables lagged by two periods.

3. 'Exact Lag' Specification

Table A7: Determinants of Inflation Targets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CPI inflation	0.40***	0.40***	0.40***	0.40***	0.40***	0.40***	0.40***
	(13.24)	(12.91)	(13.24)	(12.93)	(12.94)	(13.28)	(13.99)
Inflation volatility	1.16	0.02	0.04	0.01	0.01	0.08	0.08
	(0.08)	(0.02)	(0.03)	(0.01)	(0.09)	(0.06)	(0.06)
GDP growth	0.11**	0.13**	0.14**	0.11**	0.12**	0.12**	0.09*
	(2.15)	(2.34)	(2.42)	(2.12)	(2.15)	(2.20)	(1.80)
World inflation	0.03	0.02	0.03	0.03	0.03	0.03	0.04*
	(1.48)	(0.99)	(1.42)	(1.50)	(1.43)	(1.41)	(1.80)
Credibility	-1.30***	-1.56***	-1.71***	-1.33***	-1.28***	-1.50***	-1.31**
	(-3.11)	(-3.23)	(-3.14)	(-3.03)	(-2.88)	(-2.83)	(-2.54)
Price level		-0.01					
		(-0.91)					
Independence			-1.42				
			(-1.20)				
Gov. party orientation				-0.05			
				(-0.25)			
(Independence + Gov. p. or.)					0.02		
					(0.06)		
GDP per capita						1.58	
						(0.61)	
Emerging markets dummy							0.31
							(0.71)
Constant	2.04***	1.69***	3.03***	2.06***	2.04***	1.93***	2.16***
	(6.05)	(2.82)	(3.42)	(6.01)	(5.93)	(4.96)	(6.67)
No. of observations	85	81	84	85	85	85	85
Pseudo R-squared	0.41	0.41	0.41	0.41	0.41	0.41	0.46

Note: The lag of explanatory variables is country and time specific and is set exactly to reflect the time lag between the announcement of inflation target and when inflation target becomes effective. * statistically significant at the 10% level, ** statistically significant at the 5% level, *** statistically significant at the 1% level. Panel interval random effects estimation. Inflation volatility, GDP per capita and price level coefficient premultiplied by 10^6 and 10^3, respectively. T-statistics in parentheses. All explanatory variables are lagged by one period. Independence refers to the central bank independence index developed by Arnone et al. (2008).

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