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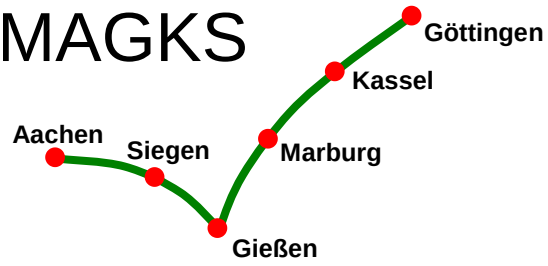

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Monetary Policy Committee Transparency: Measurement, Determinants, and Economic Effects

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Monetary Policy Committee Transparency: Measurement, Determinants, and Economic Effects

Abstract

This paper studies monetary policy committee transparency (MPCT) based on a new index that measures central bankers' educational and professional backgrounds as disclosed through central bank websites. Based on a novel cross-sectional data set covering 75 central banks, we investigate the determinants of MPCT as well as its economic consequences. We find that past inflation, quality of institutional setup, and extent of Internet use in a country are important determinants of MPCT. MPCT has a robust and significantly negative impact on inflation variability, even after controlling for important macroeconomic variables and institutional transparency, as well as instrumenting MPCT in various ways.

JEL Classification: E52, E58, D12, D83.

Keywords: Monetary Policy Committee, Transparency, Monetary Policy Transparency, Monetary Policy, Central Banks

'As a general rule, it can be stated that the greater the publicity, the greater the effectiveness of monetary policy actions. Publicity thus becomes a means of psychological influence on the public in a price stabilizing direction.' [Erik Lindahl, *The Means of Monetary Policy*, 1929, p. 27]

1. Introduction

Central bank (CB) transparency has become an important component of monetary policy institution design (Cukierman 2008) for at least two reasons. The first is the global trend toward greater central bank independence (CBI) over the last two decades. By its very nature, CBI implies that the central bank is insulated from the influence of other parts of the government. In democratic countries, this means that central banks have a potentially serious legitimacy problem. Arguably, one way to achieve an acceptable degree of legitimacy is to make central banks publicly accountable for their actions. Thus, accountability can be viewed as a substitute, albeit an imperfect one, for democratic legitimacy. Hence, transparency could facilitate CB accountability (Geraats 2002). And, indeed, many central banks have taken advantage of the possibility of providing information online in a cost-effective and timely fashion to release extensive amounts of information about their operations.

The second reason for the interest in transparency derives from changes in the framework of monetary policy analysis, as special importance is attached to the management of private agents' expectations (Woodford 2003). The basic argument is that a persistent deviation of inflation expectations from their long-term path may lead to suboptimal levels of inflation and, thus, can cause notable welfare costs for society. One approach to anchoring these expectations is to reduce the information asymmetry about monetary policy between the central bank and private economic agents. Hence, if the central bank becomes highly predictable, private agents' expectations will better match actual monetary policy decisions and inflation rates can be kept close to the optimal level. Reflecting these considerations and taking into account financial markets' increased demand for information, central banks have increased communication with the aim of influencing expectations (Blinder et al. 2008, Hayo et al. 2010).

In light of these developments, the academic literature has begun to analyse both the determinants of transparency and its impact on economic outcomes (Dincer and Eichengreen 2007, 2009). Working in parallel to this institutionally focussed literature are researchers interested in studying the 'human factor' in the determination of monetary policy. For instance, there is empirical evidence that the personalities of monetary policy committee members tend to have an influence on policy making that is independent of the concrete institutional design (Göhlmann and Vaubel 2007). In fact, in the context of

US Federal Reserve, Adolph (2003) shows that institutional autonomy has made monetary policy more dependent on, rather than independent of, subjective factors.

This paper synthesises these hitherto distinct lines of research by combining the issue of transparency with the personal background of policymakers. Employing a novel cross-sectional data set on monetary policy committees and their members, our study takes a look at monetary policy transparency that goes beyond the institutional features of central banks primarily analysed in extant literature to include specific characteristics of the monetary policy committee (MPC) and its members.

The monetary policy committee transparency indicators (MPCTIs) are designed to quantify the transparency of central banks with respect to the personal background of monetary policy committee members. We construct MPCTIs using as a foundation the general transparency index of Eijffinger and Geraats (2006), which has become a standard tool for gauging central bank transparency. Our indicators cover 75 national central banks and quantify the degree of central bank information disclosure based on the committee members' name, age, education level, and professional background. Analysing monetary policy committee transparency (MPCT) is a worthwhile pursuit given empirical evidence that the preferences of policymakers are systematically influenced by their professional experience, age, gender, and education. Thus, rational private agents may find this information an important predictor of future policy action.

This paper makes several contributions to the literature. First, it introduces novel indicators measuring MPCT in a large cross-section of countries. Second, it compares this indicator with the institutional transparency indicator of Eijffinger and Geraats (2006). Third, to better understand the cross-country variation of MPCT, we study its monetary policy, institutional, and developmental determinants in a multivariate framework. Fourth, we investigate the impact of MPCT on inflation variability, employing new as well as previously used instruments to ensure valid inference.

We find that the range of information disclosure varies significantly across different national central banks and different categories of MPCT. Regarding the latter, the least transparent area is the policymaker's educational background. Regarding the former, the least transparent central banks tend to be located in low-income countries. We discover that a higher degree of monetary policy committee transparency is facilitated by high inflation rates in previous years. The monetary policy regime has a systematic influence on transparency preferences, as central banks pursuing monetary targeting are systematically less transparent. The number of Internet users in a country relative to its total population

has a strong positive influence on monetary policy committee transparency. Regarding the effects of transparency on economic outcomes, we find that MPCT has a robust and significantly negative impact on inflation variability, even after controlling for important macroeconomic variables and institutional transparency. This effect is robust to variations in the sample and different sets of instrumental variables.

The remainder of the paper proceeds as follows. In the next section, we discuss the extant literature in more detail. Section 3 explains the construction of the new indicator for MPCT and provides descriptive statistics. Theoretical hypotheses as to the determinants of MPCT are discussed in Section 4. Section 5 is concerned with the empirical analysis of determinants of MPCT and Section 6 looks at the economic effects of MPCT on inflation variability. Section 7 summarises the main results and derives policy conclusions.

2. Aspects of Transparency in Monetary Policy

Earlier literature on transparency and policymaker preferences is summarised by Geraats (2002). Van der Cruijsen and Eijffinger (2008) trace the chronological evolution of transparency, focussing on economic benefits. The main message of these surveys is that transparency not only helps address the legitimacy problem of independent economic institutions in democratic societies, but also works to anchor inflation expectations, thereby generating direct economic benefits. The most widely used framework for the analysis of monetary policy transparency is that of Eijffinger and Geraats (2006), who construct a transparency score based on five aspects of transparency: political, economic, procedural, policy, and operational. Geraats (2009) and Dincer and Eichengreen (2007, 2009) assess the determinants as well as the economic effects of the Eijffinger and Geraats transparency index by relating the transparency scores of various countries to economic and political variables. They find that GDP and, to some extent, political variables determine the degree of central bank transparency. They report that transparency reduces inflation variability as well as inflation persistence.

However, one problem with Eijffinger and Geraats's (2006) transparency index is that it might not be very relevant for (most) economic agents. For example, control error transparency or transparency about the econometric model is unlikely to be of interest to non-experts. Indirect evidence supporting this point is provided by van der Cruijsen and Eijffinger (2010), who find a significant gap between actual and perceived transparency of the ECB based on a representative sample of Dutch households. Such a

perception gap raises the question of relevance to and/or comprehensibility by households regarding the institutional transparency indicators and suggests the need for supplementary indicators. Quite often, it is the chairman or the relevant decision-making body who is recognised by the general public rather than the institution itself. For instance, Alan Greenspan apparently had a strong personal influence on the public (Blinder et al. 2008) and there is evidence that Fed presidents feel visible to their respective regional audiences and target their speeches accordingly (Hayo and Neuenkirch 2011). MPCT provides additional information about monetary policymakers and increases the amount of information available to economic agents, thus allowing them to better predict monetary policy decisions. These considerations suggest that transparency with respect to personal characteristics might improve the effectiveness of monetary policy.

An intriguing aspect of transparency not captured in the traditional index, although studied both theoretically and empirically, is related to policymaker preferences. Well before transparency evolved into a relevant issue, Rogoff (1985) emphasised the importance of individual policymaker preferences and their implications for the conduct of monetary policy in politically independent central banks. Nevertheless, looking at the personal background of central bankers as way of understanding their preferences has received relatively little attention in transparency studies. An exception is the widely debated issue of public disclosure of committee members' voting record, typically interpreted as revealed preferences. One of the arguments made in support of such a practise is that it will allow better public understanding of policymaker preferences (Gersbach and Hahn 2005, 2009). However, there is as yet no consensus as to the implications of disclosing voting records and thereby providing information about preferences. Buiter (1999) and Sibert (2003) identify positive effects through reputation-building incentive for policymakers; Issing (1999) fears that too much transparency will result in regional political pressure on policymakers. Gruener et al. (2009) are among the sceptics, and demonstrate that uncertainty about monetary policymaker preferences can contribute to wage restraint if labour market negotiations are relatively coordinated.

Assuming that committee member preferences are relevant for transparency measurement, it is important to study the determinants of these preferences. Important criteria in this context include, for example, an individual's career and social background, which can affect policy preferences both directly and indirectly: directly in that early socialisation will be instrumental to the development of the future policymaker (Berger and Luckmann 1967), and indirectly in that those responsible for selecting policymakers and even the selection process itself will be looking for certain traits and characteristics

(Goosens and Méon 2010). Thus, information about education and professional experience can help the public predict the policymaker's type. Early evidence on this issue can be found in Gildea (1992), which finds a significant influence of career and social background variables on voting preferences in a study of 21 Federal Reserve (Fed) members. Gerlach-Kristen (2004) investigates inasmuch the voting record of the Monetary Policy Committee can help predict the future course of monetary policy in the UK. Other studies analyse the behaviour of outsiders (Gerlach-Kristen 2009) in the committee and the impact of outside experts (Hansen and McMahon 2010) on the committee.

Chappell et al. (2005) is a comprehensive study employing historical data on Fed voting records that estimates the reaction function of FOMC members using their individual attributes (education, professional background, and political origin of appointment). Göhlmann and Vaubel (2007) investigate the impact on inflation outcomes of the education and occupation history of 391 central bankers from 10 European countries. They find that former central bank employees are likely to produce lower inflation rates than central bankers formerly employed in other occupations. In terms of education, former law students appear to be less inflation averse than economists. Similarly, Farvaque et al. (2009) assess the impact on inflation performance of MPC composition for 10 OECD countries. They provide evidence that the presence of academics and private-sector economists in an MPC significantly reduces inflation.

Moreover, the education and occupation history of policymakers imply specific career goals, which may affect their decisions. For example, Adolph (2005) constructs a central banker career characteristic index for 20 industrialised countries for the post-World War II period. He discovers that differences in career background have a systematic influence on central banker preferences and their post central banking career choices. In a broader context, Dreher et al. (2009), in an analysis of the preferences of more than 500 political leaders from 72 countries, find that professional background matters in the preference for market reform. Moreover, both educational background and specific work environment will trigger specific socialisation processes (Berger and Luckmann 1967) that affect preferences. Gooseens and Méon (2010) provide evidence on this issue based on student surveys.

3. Measuring Monetary Policy Committee Transparency

As a basis for our empirical analysis of monetary policy committee transparency, we gathered information about MPCs of 75 central banks.[1] Using five indicators, we look at the size of the committee, and various attributes of committee members as well as those of the head of the committee. Appendix 1 provides details on how the indicators were constructed. The information was collected from the respective central bank websites through the portal maintained by the Bank for International Settlements (http://www.bis.org/cbanks.htm). Our sample includes central banks from nearly every region of the world. By construction, the MPCT index is a simple sum of the subindices and ranges between 0 and 15, which makes its values comparable to the institutional transparency index (TI) based on Eijffinger and Geraats (2006).

We begin our analysis by providing some descriptive information about the data set. Table 1 displays a comparison between the MPCT and the most recent version of the institutional transparency index published by Dincer and Eichengreen (2009). More than 85 percent of the central banks are common to both indices, which facilitates a comparison of results.

Table 1: Comparison Between the Monetary Policy Committee Transparency Index (MPCTI) (75 cases) **and the Institutional Transparency Index (TI)** (63 cases)

	Mean	Median	Maximum	Minimum	St.Dev.
MPCTI	8.51	7.5	15	0	5.06
TI	6.28	5.5	14.5	1	3.35

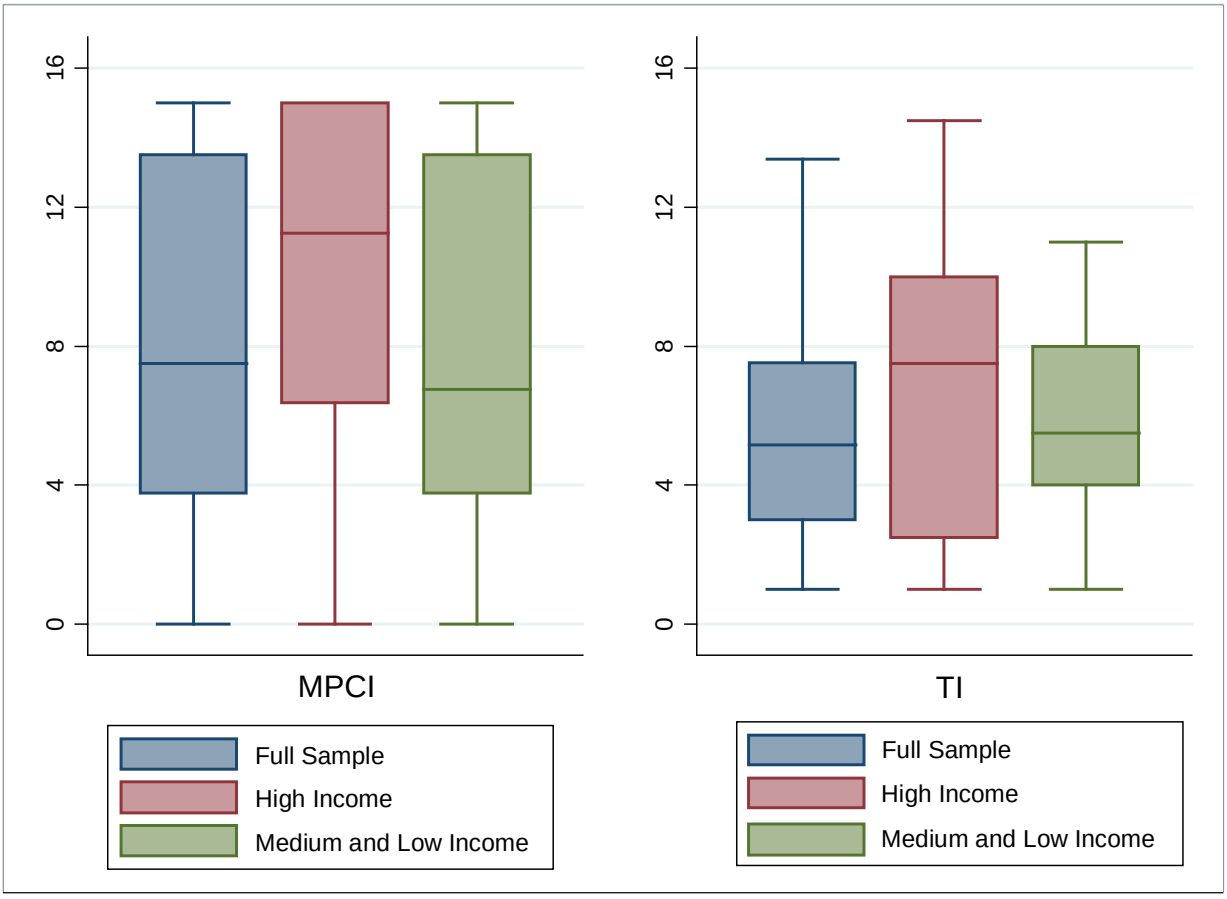
On average, the MPCTI is higher, showing that relatively more countries provide information about the monetary policy committee and its members than about the items relevant for TI. Range and standard deviation indicate relatively greater variation across countries in the case of MPCT. The distribution of MPCT values is somewhat negatively skewed, whereas TI values are positively skewed. The correlation coefficient between the two indicators is 0.41, which is positive but not particularly high. This suggests that monetary policy committee transparency and institutional transparency are related but that the MPCTI contains a substantial amount of information that is not present in the TI.

Sorting our sample countries with regard to real per capita income according to the World Bank classification shows that the sample contains 28 high-income countries, 24 upper-middle-income

[1] Our criteria for sample selection are: (a) the central bank has an updated version of its website in English, and (b) the economy is not experiencing abnormal monetary conditions, as in Iraq, Afghanistan, Zimbabwe, or Yemen.

countries, 16 lower-middle-income countries, and 7 low-income countries. The box plots in Figure 1 show MPCTI and TI values conditional on income level. For both indices, the figure suggests that richer countries have more transparent central banks. Developing countries are somewhat more homogenous than high-income countries in their transparency practice, as the mean and median lie closer together. Statistical tests of the equality of means of the two indices conditioned on income level show that only in the case of MPCT are there significantly different means (F(1,73) = 7.44**), whereas there is no significant difference between TI in high- and low-income countries (F(1,62) = 2.07).[2]

Figure 1: Comparison of Transparency across Countries by Level of Economic Development



Notes: Box plots of MPCT and TI, differentiated by level of income.

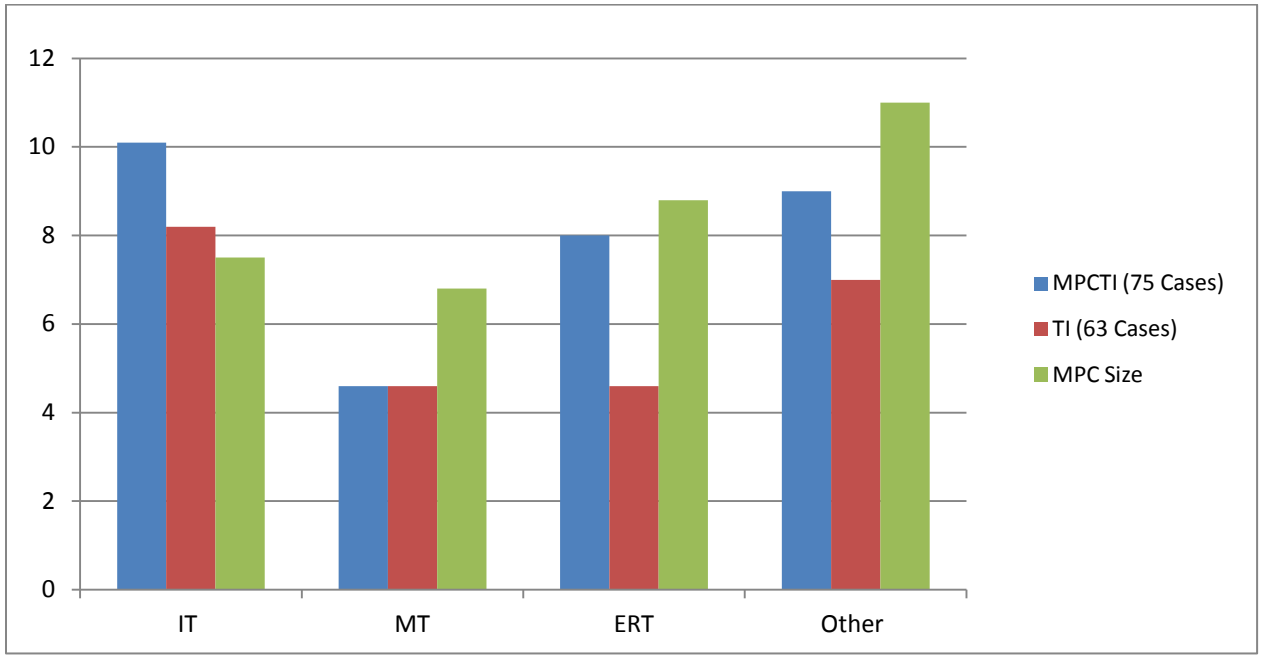
Next, we sort the sample according to the countries' official monetary policy strategies based on the IMF classification. Our sample contains 27 inflation targeters, 31 exchange rate targeters, 9 monetary aggregate targeters, and 8 countries that pursue a different monetary regime. Figure 2 plots the two

[2] * and ** indicate significance at a 5% and 1% level, respectively.

transparency indices and, if available, the size of the MPC depending on the respective monetary policy strategy implemented in a country.

According to both indices, inflation targeting countries have the greatest degree of transparency and monetary targeting countries the lowest. There is a difference between the indices with regard to exchange rate targeting countries, which are characterised as rather low on the transparency scale by TI and as quite transparent by MPCT. The differences across monetary policy regimes are statistically significant (MPCT: $F(2,64) = 4.5^*$ and TI: $F(2,54) = 9.7^{**}$). Figure 2 also shows that the size of the MPC is reasonably similar across the groups of countries classified by specific monetary policy strategies, whereas countries without a clearly defined strategy tend to have larger committees.

Figure 2: Comparison Across Monetary Policy Strategies



4. Theoretical Determinants of MPCT

We analyse determinants of central bank transparency using cross-sectional regressions. The descriptive analysis in the previous section suggests that there is a considerable cross-country variation in the degree of transparency. This section is concerned with explaining the degree of MPCT using a variety of factors. Discovering the relevant factors will help us find appropriate instruments to circumvent

endogeneity problems in our subsequent analysis of economic effects of transparency. Following Dincer and Eichengreen (2007, 2009), we assess the explanatory power of various macroeconomic and political institutional variables for the transparency indicators. We use averages of these variables due to the cross-sectional nature of our data. Thus, our regressions employ four groups of explanatory variables.

The first group includes several variables measuring degree of economic development, as previous studies on conventional TI provide evidence of their importance for monetary policy (Cukierman et al. 1992; Dincer and Eichengreen 2007, 2009; Geraats 2009). We include per capita income (log of the average per capita income from 1997–2007), income quartiles to capture the relative position of countries in the world income distribution, and the average GDP per capita growth rate over the period 1997–2007 in percent.

The second group of explanatory variables consists of indicators describing the general political-institutional environment within which central banks operate, in particular rule of law, political stability, voice and accountability, and regulatory quality (all from Kaufmann et al. 2008) as well as the country's rank in the corruption perception index (from Transparency International). Credible institutions can help reduce transaction costs and since the dissemination of information about the MPC has a very similar function, it is important to control for the overall degree of institutional quality in a country.

The third group of regressors includes variables related to the setup of monetary policy. Geraats (2009) finds differences in the degree of conventional transparency between central banks characterised by different monetary policy regimes. Therefore, we control for the official monetary policy strategy (monetary targeting, inflation targeting, or exchange rate targeting) and the *de facto* exchange rate regime (based on Reinhart and Rogoff 2004 and the update by Eichengreen and Razo-Garcia 2006). As an indicator of the central bank's previous success, the influence of past inflation rates is considered (CPI growth rate over previous year from 1997–2007 in percent), as well as for whether central banks comply with the IMF's special data dissemination standards (SDDS) (dummy variable). We believe that it is important to control for compliance with the IMF's SDDS, as the standards set a minimum benchmark for data dissemination. It is possible that middle- and low-income countries attempt to achieve higher central bank transparency if they are unable to satisfy the SDDS. In the robustness analysis, we also consider a *de facto* measure of central bank independence based on the central bank governor turnover rate (Dreher et al. 2009) and the conventional transparency index TI. These two variables are not included the general model, as doing so would result in a noticeable loss in the degrees of freedom.

Finally, we include a control group of variables that take into account regional differences. Dincer and Eichengreen (2007, 2009) and Geraats (2009) find regional linkages in terms of transparency. To evaluate the potential influence of regional effects on MPCT, we divide our sample countries into six geographical regions. We control for the share of Internet users in a country's population because our information has been gathered from central bank websites. Only under the condition that a large share of the population can actually access this information does it make sense to provide a lot of information via this medium. Therefore, we expect a positive relation between information disclosure and Internet usage. In the robustness analysis, we also consider the age of central bank websites, as those banks that have provided information via the Internet for a longer time may also be more open with regard to information about the MPC.

The choice of the sample period (1997–2007) is motivated by the fact that this period is associated with an increase in central bank transparency and independence, as, for instance, shown by Crowe and Meade (2008). To avoid problems of endogeneity, we employ explanatory variables as averages over past periods of time where applicable.

5. Empirical Analyses of Determinants of MPCT

We employ general-to-specific modelling (Hendry 2001) in our empirical analysis seeing as there are no theoretically grounded restrictions to help specify the empirical relationships between our variables of interest. We start with the maximum set of theory-based explanatory variables, the general model, taking into account constraints imposed by the limited sample size. After verifying the applicability of the OLS assumptions for the general model, we apply a consistent testing-down process to select the specific model, while controlling for any violation of the underlying statistical assumptions. Interpretation of the explanatory variables is then based on the reduced model.

Table 2 presents the estimates of the general model (1) with 22 explanatory variables. Variable definitions and sources can be found in Appendix B. The fit of the model is reasonably high and the group of explanatory variables is significant. Diagnostic tests for non-normality, heteroskedasticity, and specification error, given at the bottom of the table, show that none of the OLS assumptions are violated. We thus conclude that our model is a congruent representation of the underlying data generating process.

Table 2: Determinants of MPCTI

Model	(1) General Model: OLS		(2) Reduced Model: OLS	
Variables	Coefficients	Standard Errors	Coefficients	Standard Errors
A) Development Indicators				
GDP per Capita (in logs)	-0.230	1.534		
Income Quartiles:				
Low	Reference			
Lower middle	-3.168	2.731	-2.841*	1.133
Upper middle	-1.139	3.876		
High	0.663	5.093		
GDP per Capita Growth Rate in %	0.526(*)	0.308	0.430*	0.194
B) Institutional Indicators				
Degree of Corruption	0.056	0.040		
Voice and Accountability	2.031	1.433	1.933*	0.834
Rule of Law	5.336*	2.565		
Regulatory Quality	-5.458*	2.216	-3.807**	1.114
Political Stability	-0.154	1.038		
C) Monetary Policy Indicators				
Monetary Policy Strategy:				
Other strategy	Reference			
Monetary targeting	-4.605(*)	2.412	-3.986**	1.421
Inflation targeting	-0.611	2.002		
Exchange rate targeting	0.269	1.979		
Exchange Rate Regime	0.335(*)	0.190	0.502**	0.098

SDDS Compliancy	-0.548	1.440		
Average Inflation Rate	0.151(*)	0.087		
D) Control Variables				
Constant	-1.357	10.100		
Degree of Internet Access	10.085*	4.772	12.716**	2.501
Regions:				
Europe	Reference			
Africa	0.786	2.343		
Asia	0.015	1.987		
North America	0.752	3.232		
Oceania	0.802	2.843		
South America	5.167(*)	2.975		

(1)	No. of observations	67	67
(2)	Standard error of regression	3.80	3.63
(3)	R^2	0.64	0.56
(4)	Adjusted R^2	0.46	0.52
(5)	Schwarz information criterion	3.70	2.91
(6)	Test of joint significance	F(22,44) = 3.58**	F(7,60) = 61.27**
(7)	Testing-down restriction	F(15,44) = 0.55	n.a.
(8)	Normality test	Chi2(2) = 2.03	Chi2(2) = 4.03
(9)	Heteroskedasticity test	F(32,34) = 1.74	F(12,54) = 0.57
(10)	RESET test	F(1,43) = 0.13	F(1,59) = 0.04

Notes: (*), *, ** indicate significance at a 10%, 5%, and 1% level, respectively. Reduced model R^2 and adjusted R^2 are based on the multivariate correlation coefficient. Dependent variable is MPCTI.

To increase estimation efficiency, we eliminate 16 variables from the general model. As shown in line (7) of Table 2, the testing-down restriction cannot be rejected at any reasonable level of significance. Implementing the restrictions yields the reduced model (2) of Table 2. None of the diagnostic tests indicates a violation of an estimation assumption. Inevitably, model fit has deteriorated after elimination of explanatory variables, but all three model selection criteria—standard error of regression, adjusted R2, and Schwartz information criterion—suggest a noticeable improvement. Testing the group of included variables yields a very high F-statistic, indicating that the remaining variables are significant even at very low levels of significance. Individually, all variables in the reduced model are significant at a 5 percent level of significance or lower.

The results in Table 2 suggest that all categories of variables matter in explaining monetary policy committee transparency. First, in terms of economic development, we find that countries experiencing more rapid GDP per capita growth implement a higher degree of MPCT. Roughly, a 1 percentage point increase in GDP per capita raises the MPCT index by 0.5.[3] Concentrating on the relative impact computed at the means of both series, the elasticity of MPCT with regard to GDP growth per capita is 0.16, i.e., a 1 percent increase in GDP per capita increases MPCT by approximately 0.16 percent. Lower-middle-income countries have a significantly lower degree of transparency. The difference of –2.6 MPCT index points is also economically relevant, as it is approximately equal to half a standard deviation of MPCTI.

Second, institutional factors play a role in determining the level of MPCT. Countries characterised by a high degree of voice and accountability show significantly greater transparency. This index measures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Thus, in an atmosphere of general political freedom, central banks are more likely to be transparent about their monetary policy committee members. However, the economic impact, as measured by the elasticity, is small: a 1 percent increase in the voice and accountability index raises the MPCT by only 0.1 percent. Another statistically significant effect is found for a country's regulatory quality. Regulatory quality is an index capturing perceptions of the government's ability to formulate and implement sound policies and regulations that permit and promote private-sector development. Countries characterised by a higher degree of regulatory quality have smaller values of the MPCT. Or, to put it the other way around, countries with a high degree of (inefficient) regulation tend to be more transparent about the members

[3] We cannot reject the restriction that the coefficient on GDP per capita growth rate is equal to 0.5 (F(1,60) = 0.13).

of their monetary policy committee. We suggest two explanations: (i) quite often, countries with low values in this index suffer from 'overregulation', and thus the MPCT may simply be a reflection of the government regulating the information flow, or (ii) central banks in countries characterised by a relatively low level of governance may attempt to improve efficiency through their own actions, such as being transparent as a public decision-making body. The economic effect is larger than that of voice and accountability, but still is not the relatively biggest determinant of transparency. A 1 percent decrease in the regulatory quality index raises the MPCTI by 0.13 percent.

Regarding the third category, monetary policy indicators, we find again two effects. Countries pursuing a strategy of monetary targeting demonstrate a significantly lower degree of transparency. The effect is sizable: monetary targeting countries have a lower level of transparency that is roughly equal to 75 percent of one MPCT standard deviation. Apparently, countries with this type of monetary policy strategy feel less of a need to be transparent. Regarding exchange rate flexibility, we find that countries with more flexible exchange rate systems have a greater degree of MPCT. A 1 percent increase in the degree of exchange rate flexibility raises the MPCT by about half a percent. Compared to the other explanatory variables, this is a substantial effect.

As to the group of control variables, we find that the share of Internet users in a society has a significantly positive impact on MPCT. This suggests that central banks react to the social environment in which they operate. A 1 percentage point increase in the share of Internet users raises the MPCT by half an index point. The elasticity estimate is very similar: a 1 percent increase in the share of Internet users generates a hike in the MPCT of half a percent.

Given these findings, it is instructive to compare the effect of the monetary policy indicators on the TI measure proposed by Eijffinger and Geraats (2006). In a regression of TI on the full set of monetary policy indicators listed in Table 3, only exchange rate flexibility (with a positive sign) and monetary targeting (with a negative sign) are significant. Thus, these variables appear to be of relevance for both the MPCT and the TI. This finding is in accord with a study by Romer (1993), who, in the context of a dynamic inconsistency framework, empirically shows that openness is negatively related to inflation. The argument is that a flexible exchange rate makes inflation more costly to policymakers as it would cause a depreciation of the domestic currency. Thus, the association of transparency with openness may indicate an attempt by central banks to dispel any notion of dynamic inconsistency among economic agents.

How robust are these results? Model (3) of Table 3 contains a robustness analysis with regard to the inclusion of institutional TI by Dincer and Eichengreen (2009), which causes a substantial reduction in the number of observations. Most of the previous results hold up quite well. Although we see a general increase in the marginal level of significance of the core variables, they remain significant as a group. On the one hand, GDP per capita growth is no longer significant at a 10 percent level. On the other hand, neither is TI. Thus, institutional transparency is not a significant predictor of MPCT.

Table 3: Determinants of MPCTI: Robustness Analysis

Model	(3)	(4)	(5)
Variables	Coefficients	Coefficients	Coefficients
Lower-Middle Income	-2.670(*)	-3.698**	-2.959*
GDP per Capita Growth Rate in %	0.392	0.552**	0.383
Voice and Accountability	1.628(*)	1.572(*)	2.602*
Regulatory Quality	-3.203*	-2.128(*)	-4.667**
Monetary Targeting	-3.441*	-3.647*	-4.482**
Exchange Rate Regime:	0.439**	0.505**	0.365*
Degree of Internet Access	11.274**	8.395**	12.950**
Conventional Transparency Index	0.139		
Central Bank Governor Turnover Rate		4.722	
Age of Central Bank Website			0.010
(1) No. of observations	58	58	55
(2) Standard error of regression	3.80	3.31	3.78
(3) Test of reduced model variables	F(7,50) = 7.0**	F(7,50) = 25.5**	F(7,50) = 7.6**

Notes: (*), *, ** indicate significance at a 10%, 5%, and 1% level, respectively. Reduced model R^2 and adjusted R^2 are based on the multivariate correlation coefficient. Dependent variable is MPCTI.

Model (4) in Table 3 studies the impact of a widely used indicator for *de facto* central bank independence, the central bank governor turnover rate. This time, all the reduced model variables remain significant individually, as well as a group, but the turnover rate is not significant. Finally, Model (5) considers the relevance of the age of the respective central bank websites as a control. Again, we

conclude that most of the core results hold up well; only GDP per capita growth becomes insignificant at a 10 percent level. Thus, we conclude that our reduced model is robust with regard to both changes in the sample size as well as potentially influential omitted variables.

6. The Effect of Monetary Policy Transparency on Inflation Variability

6.1 Theoretical Discussion and Setup of Empirical Model

Our research hypothesis is that there is a negative relation between transparency and inflation variability. There are at least three theoretical reasons that support this hypothesis. First, MPCT helps agents better understand policymaker preferences, thus reducing uncertainty and, consequently, more accurately anchoring expectations (Woodford 2003). Second, it signals openness, heterogeneity, and diversity of the MPC, which are important determinants of the debating potential of an MPC and therefore its ability to implement adequate monetary policies (Blinder and Morgan 2005). Third, disclosing information about their backgrounds could pressure MPC members with less strong credentials to become more efficient and thereby achieve a more stable monetary policy course (Sibert 2003). Arguably, transparency reduces asymmetric information and helps predict the future path of policy action, thereby reducing the frequency and magnitude of surprises (Hayo and Neuenkirch 2010). Thus, inflation variability may be caused by uncertainty about monetary policy stance (Demertzis and Hughes Hallett 2007). The relation between inflation variability and uncertainty is likely more pronounced in the absence of any publicised commitment to price stability on the part of policymakers (Ball and Cecchetti 1990). For instance, Dincer and Eichengreen (2007, 2009) find a negative relation between central bank transparency scores and the respective country's degree of inflation variability.

In light of previous empirical studies, we have to consider the possibility that transparency depends on the inflation performance of monetary authorities as well as the institutional environment within which central banks operate (Hayo and Hefeker 2002, 2010). Given the potential influence flowing from actual inflation performance to transparency, it is possible that MPCT is correlated with the error term. To investigate whether we can treat transparency as an exogenous variable, we conduct the *C*, or endogeneity, test based on the difference of two Sargan-Hansen statistics (Hayashi 2000). We can reject the null hypothesis that the regressor is exogenous at a 1 percent level of significance. Thus, to avoid inconsistent estimates, we need to employ instrumental variable (IV) estimation methods. An important

issue in this context is finding appropriate instruments for MPCT. Previous studies (see, e.g., Dincer and Eichengreen 2007, 2009) employ institutional and political variables to instrument transparency: rule of law, political stability, democratic accountability, government efficiency, and regulatory quality. In a related context, Crowe and Meade (2008) use rule of law as well as voice and accountability to instrument *de jure* central bank independence.

Despite employing IV, the aforementioned studies suffer from some weaknesses. For example, Dincer and Eichengreen (2007, 2009) do not rigorously test their instruments; they report only the J-statistic, which is a joint test of the orthogonality of the instruments and correct specification of the model but not of weak identification. But weak instruments can cause a bias in IV estimators even in the presence of large sample (Stock and Yogo 2005). A second weakness of their IV setup is the use of a relatively large number of instruments. If some of the instruments are highly collinear, the efficiency of the estimator will not improve by including them and the J-statistic cannot tell us whether some instruments are redundant. For example, Crowe and Meade's (2008) instruments are revealed as weak when scrutinised by the Stock and Yogo (2005) test. Our analysis in Table 2 shows that the extent of Internet access is a significant determinant of MPCT and as it is certainly exogenous with respect to inflation, it satisfies the necessary requirements of a valid instrument. In our empirical analysis below, therefore, we start off with the number of Internet users as our instrument but verify our results with different sets of instruments.

Regarding other regressors in our model, the empirical literature allows us to identify a set of commonly used macroeconomic variables associated with inflation. For example, Romer (1993) finds a robust negative association between openness and inflation and a study by Campillo and Miron (1996) concludes that GDP per capita, political stability, and government debt to GDP ratio are important determinants of inflation (de Haan and Kooi 2000 also find similar results). In addition, studies on institutional determinants of inflation typically control for real GDP growth, unemployment (Alesina and Summers 1993), past inflation (Cukierman et al. 1992), *de facto* exchange rate regime (Crowe and Meade 2008), and average level of past inflation (Siklos 2010).

6.2 Inflation Variability and MPCT: Empirical Analysis and Robustness

Our regression analysis explaining (the log of) inflation variance starts with a general model (Model (6) in Table 4) that takes into account the maximum number of theory-consistent variables outlined above. Table 4 shows the results of 2SLS regressions, with the relevant diagnostic statistics reported at the end

of the table. Following our general-to-specific approach, Model (7) in Table 4 is estimated efficiently, conditional on the testing-down restriction in line (4). Within our sample of 71 countries, we discover a highly significant negative effect of MPCT on inflation variability and our estimates indicate that transparency has noteworthy economic effects, too. A one standard deviation change in MPCT, for instance, reduces inflation variability by 0.84 standard deviations. Expressing this in the form of an elasticity computed at the means of the variables yields an elastic response of -1.34. Inflation variability increases due to output volatility, exchange rate flexibility, and past inflation, the elasticities of which are 1.58, 0.95, and 0.20, respectively.

Table 4: MPCTI and Inflation Variability

Model	(6) General Model: 2SLS		(7) Reduced Model: 2SLS	
Variables	Coefficients	Standard Errors	Coefficients	Standard Errors
MPCTI	-0.338(*)	0.194	-0.157**	0.056
A) Development Indicators				
Output Volatility (in logs)	3.888	2.409	1.575*	0.793
GDP Growth Rate (in percent)	-0.130	0.182		
Income Quartiles:				
Low		Reference		
Lower middle	-0.886	0.958		
Upper middle	0.632	1.030		
High	0.116	1.197		
B) Monetary Policy Indicators				
Monetary policy strategy:				
Other strategy		Reference		
Monetary targeting	-1.619	1.345		
Inflation targeting	-0.562	0.777		
Exchange rate targeting	-0.162	0.684		

Exchange Rate Flexibility	0.215	0.134	0.111*	0.047
Past Inflation	0.097	0.153	0.203*	0.095
C) Control Variables				
Openness	-0.005	0.004		
Constant	2.598	1.871	0.608	0.430
Regional Effects				
Europe		Reference		
Africa	-1.448	0.923		
Asia	-0.985	0.757		
North America	-1.386	1.240		
Oceania	-0.458	0.955		
South America	-0.717	0.809		
(1) No. of observations		71	71	
(2) First-stage F-Statistic		F(1, 53)=3.47(*)	F(1,66)= 20.58**	
(3) Test of joint significance		F(17, 53)=0.63	F(4,66) = 4.47**	
(4) Testing-down restriction		Chi2(13) = 6.44	n.a.	
(5) Underidentification test		Chi2(1) = 4.36*	Chi2(1) = 16.87**	
(6) Endogenous regressor test		Chi2(1) = 13.91*	Chi2(1) = 15.17**	
(7) Heteroskedasticity test		Chi2(1) = 0.54	Chi2(1) = 0.06	
(8) Stock-Yogo critical values		@10%=16.38	@10%=16.38	

Notes: MPCTI is instrumented by extent of Internet access. (*), *, ** indicate significance at a 10%, 5%, and 1% level, respectively. Dependent variable is inflation variability.

To ensure the validity of our inferences, lines (5)–(8) of Table 4 report various tests of the IV estimator. A necessary requirement for an IV estimator is a non-zero correlation between endogenous regressor(s) and instrument(s). Under the condition that first-stage errors are identically and independently distributed (i.i.d.), the rank condition can be tested by Anderson's canonical correlation test. In line (5), the Anderson canonical correlations statistic rejects its null hypothesis of insufficient rank, suggesting

that our equation is not underidentified.[4] However, underidentification is not the same problem as weak identification. As Stock and Staiger (1997) show, the weak instrument problem can arise even when the correlations between endogenous regressors and instruments are significant at conventional levels of significance and the sample size is large. As is shown in line (8) of Table 4, we can reject the null hypothesis of the Stock and Yogo (2005) test, which indicates that our estimates are neither seriously biased nor size distorted.[5] To investigate whether there are irrelevant endogenous regressors in our model, we apply the Anderson and Rubin (1949) test.[6] As shown in line (6), there is no evidence of the irrelevance of MPCT in either the general or specific model.

The IV models in Table 4 are exactly identified. An overidentified model, in general, would ensure greater estimation efficiency and thus smaller standard errors. Moreover, it is important to guarantee that our results are not instrument specific and that they will continue to hold when employing different instruments. Thus, in Table 5 we assess the impact of alternative sets of instruments on our variable of interest.

In Models (8) and (9) of Table 5, we employ the set of instruments used by Dincer and Eichengreen (2007, 2009), namely, political stability, rule of law, voice and accountability, and regulatory quality. Model (9) uses a GMM estimator with robust standard errors because of evidence of non-spherical disturbances in Model (8) and greater efficiency of robust GMM estimator in the case of overidentified equations (Hayashi 2000). In both models, the coefficient estimates change only slightly and, in particular, MPCTI remains significant at a 1 percent level. However, the Stock and Yogo tests indicate evidence of weak instruments, potentially causing biased estimates and distortions in test sizes. Moreover, in the case of voice and accountability, we cannot reject the null hypothesis of instrument endogeneity at conventional levels of significance.

[4] Note that in the simple case of one endogenous regressor and one instrument, we can rely on simple rules and OLS statistics to perform these diagnostics. However, we prefer to report these tests for the sake of comparison among different sets of instruments in the next section.

[5] The Stock and Yogo test applies to the simple case of one endogenous regressor and one instrument and its more general version relies on the Cragg-Donald statistics.

[6] In principle, this is a joint test of the endogenous regressor's relevance and the validity of overidentifying restrictions, but here we have only one instrument and thus no overidentifying restrictions.

Table 5: MPCTI and Inflation Variability: Different Instruments

Model	(8) 2SLS	(9) GMM	(10) 2SLS	(11)2SLS
Variables	Coefficients	Coefficients	Coefficients	Coefficients
MPCTI	-0.141**	-0.155**	-0.155**	-0.135**
Output Volatility (in logs)	1.499*	1.406*	1.565*	1.471*
Exchange Rate Flexibility	0.103*	0.110**	0.110**	0.100*
Past Inflation	0.202*	0.193**	0.203**	0.201**
Constant	0.547	0.624*	0.600*	0.524(*)
(1) No. of observations	71	71	71	71
(2) First-stage F-Statistic	F(4,63)=5.99**	F(4,63)=6.47**	F(2,65)=11.42**	F(3,64)=11.78
(3) Test of joint significance	F(4,66)=4.73**	F(4,66)=6.23**	F(4,66)=6.68**	F(4,66)=6.83**
(4) Hetero. test first stage	3.33	3.33	9.74**	8.49*
(5) Underidentification test	Chi2(4)=19.57**	Chi2(3)=15.52**	Chi2(2)= 15.86**	Chi2(3)= 16.04**
(6) Endog. regressor test	Chi2(4)= 32.77	Chi2(4)=44.07	Chi2(2)= 25.26**	Chi2(3)=41.05 **
(7) Overid. restriction test	Chi2(3)= 7.37(*)	Chi2(3)= 6.51(*)	Chi2(1)=0.02	Chi2(2)= 6.50*
(8) Weak instrument test	5.99	6.47	17.62	11.78
(9) Stock-Yogo	@30%bias=5.34	@30%bias=5.34	n.a.	@10%bias=9.08
Critical values	@25%size=8.31	@25%size=8.31	@15%size=11.5	@20%size=9.54

Notes: (*), *, ** indicate significance at a 10%, 5%, and 1% level, respectively. Dependent variable is inflation variability. Robust standard errors are used in Models (9), (10), and (11). Instruments for Models (8) and (9) are political stability, voice and accountability, rule of law, and regulatory quality. Instruments for Model (10) are extent of Internet access and voice and accountability, whereas for Model (11) they are extent of Internet access, voice and accountability, and rule of law. Line (4) reports White's test statistic on the first-stage regression when only predicted values and their squares are used on the right-hand side. Line (5) reports the Anderson canonical correlation statistic for Model (8) and the Kleibergen-Paap rk LM statistic for the other models. Line (6) reports the Anderson-Rubin Wald test statistic. Line (7) reports the Sargan statistic for Model (8) and the Hansen J statistic for the other models. Line (8) reports the Cragg-Donald statistic for Model (8) and the Kleibergen-Paap rk F-statistic for the other models.

Given these problem with this set of instruments, in Models (10) and (11) of Table 5, we add governance indicators as instruments in addition to extent of Internet access. As Models (10) and (11) do not have spherical errors, we use robust standard errors for testing. The tests for the exogeneity of instruments do not reject the null hypothesis of exogeneity. However, only Model (10), which uses extent of Internet access and voice and accountability as instruments, does not suffer from weak instruments. Yet again, the coefficient on MPCTI remains significantly negative, with a similar economic effect.

Next, we check our main result for robustness by including various other variables of interest that are available only for a smaller sample and thus cannot be included in the general Model (6) of Table 4. In Models (12)–(14) of Table 6, we control for the effects of *de facto* CBI, as measured by the turnover rate (TOR) of the central bank governor, and the Eijffinger and Geraats transparency index. We find no significant effects of these variables on inflation variability, whereas the significant effect of MPCT remains almost unchanged.

Table 6: MPCTI and Inflation Variability: Robustness Analysis

	(12)2SLS	(13)2SLS	(14)2SLS	(15)2SLS
Variables	Coefficients	Coefficients	Coefficients	Coefficients
MPCTI	-0.153**	-0.169*	-0.176*	-0.081*
Output Volatility (in logs)	2.587*	2.007	2.021	1.943(*)
Exchange Rate Flexibility	0.112*	0.089*	0.100*	0.068(*)
Past Inflation	0.142	0.205*	0.224(*)	0.230*
Central Bank Governor Turnover Rate	1.186		-0.595	
Conventional TI		0.017	0.019	
Constant	0.431	0.671	0.761	0.384
(1) No. of observations	62	59	53	58
(2) First-stage F-statistic	F(1,56)= 22.36**	F(1,56)=11.11**	F(1,46)=9.61**	F(1,53)=21.52**
(3) Test of joint significance	F(5,56)=3.82**	F(5,56)=3.48**	F(6,46)=2.80*	F(4,53)=4.58**

Notes: (*), *, ** indicate significance at a 10%, 5%, and 1% level, respectively. Dependent variable is inflation variability.

Finally, a possible weakness of our study could be the difference between the time of MPCTI construction (i.e., 2009) and the sample period of other regressors, chosen to ensure exogeneity (i.e., 1997 to 2007). Although the MPCTI is constructed based on data available in 2009, information about monetary policy committees was available before then. To investigate whether the possible asymmetry across central banks as to the length of the time for which information about MPCs is available affects our results, we modify our index by assigning weights equal to the age of the respective central bank website.[7] Again, as shown in Model (15) of Table 6, our model remains nearly unaffected.

7. Conclusion

Central bank transparency has become an important component of monetary policy institution design. We extend the transparency literature by developing a new indicator that measures the degree of transparency with regard to monetary policy committee (MPC) members and by building a novel data set about MPC members from a wide range of countries. A descriptive analysis of monetary policy committee transparency (MPCT) shows that it is positively but imperfectly correlated with other measures of central bank transparency, which suggests that the MPCTI contains a substantial degree of information that is not present in conventional transparency indices. Sorting our sample countries with regard to real per capita income, we find that richer countries have more transparent central banks. Moreover, inflation targeting countries have the greatest degree of transparency and monetary targeting countries the lowest.

Investigating the determinants of MPCT by means of a multivariate model containing macroeconomic, political, and institutional variables reveals that all categories of variables matter in explaining monetary policy committee transparency. First, countries experiencing more rapid GDP per capita growth implement a higher degree of MPCT, whereas lower-middle-income countries have a significantly lower degree of transparency. Second, institutional factors play a role in determining the level of MPCT. Countries characterised by a high degree of voice and accountability show significantly greater transparency. Thus, in an atmosphere of general political freedom, central banks are more likely to be transparent about their monetary policy committee members. We discover that countries showing a high degree of (inefficient) regulation tend to be more transparent about the members of their

[7] The age of a central bank's website is estimated through a web portal http://www.webconfs.com/domain-age.php that provides the approximate time period of its existence on the World Wide Web.

monetary policy committee. Third, monetary policy aspects matter: countries pursuing a monetary target have a significantly lower degree of transparency than do countries engaged in other types of monetary strategy. We also find that countries with more flexible exchange rate systems show a greater degree of MPCT. Finally, we find that the share of Internet users in a society has a significantly positive impact on MPCT.

Our analysis reveals a negative effect of MPCT on inflation variability when exchange rate flexibility, variation in national output, and past inflation levels are taken into account. These results are highly robust to changes in instruments, sample size, and other control variables. Thus, we recommend MPCT as a means of reducing inflation variability, yielding benefits in terms of smaller distortions of the price system in an economy and the avoidance of potential spillovers to output variability. A possible limitation of our study is the cross-sectional nature of our data set and the absence of a dynamic structure. Thus, one avenue for further research would be the construction of a panel data set on MPCT. In addition, the results of this analysis could be extended by constructing an overall index that combines aspects of our MPCT index with those of the conventional transparency index.

MPCT adds another layer to the conventional transparency indicator and provides additional information that helps economic agents better predict monetary policy decisions. Moreover, for the general population, particularly in countries with less educated economic agents, transparency in regard to policymakers' background is more easily observable and, hence, provides easier access to relevant information than conventional transparency aspects. Thus, monetary policy committee transparency (MPCT) may be particularly suited for developing economies, whereas conventional transparency measures may be more appropriate for economies with developed institutional structure and hi-tech ability.

MPCT emphasises the link between policymakers' attributes and their preferences. The information environment faced by external observers is not an easy one: unpredictable economic and political shocks, incomplete information about the target variables (e.g., potential output and natural rate of unemployment), and lack of transparency about various technical aspects of policymaking (e.g., models, forecast errors, and voting records) make a proper understanding of monetary policy very difficult and leave the door open for policymaker discretion. Empirical evidence shows that policymaker behaviour is at least partially determined by past experience, which can be captured in a general form through career socialisation and the nature of education. Therefore, to the extent that market participants are aware of these characteristics of the MPC members, they are more likely to accurately predict policy decisions.

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Appendix

A) Constructing MPCTI

I. Transparency about the committee

1. Does Central Bank reveal how many members are in the group or committee of people that take monetary policy decisions?

(a) Yes = 1

(b) No = 0

II. Transparency about the members

1. Who are committee members?

(a) Both the names and designations are mentioned = 1.0

(b) If either names or designations are mentioned = 0.50

(c) Neither name nor designations are mentioned = 0

2. Are the CVs of the members given?

(a) Yes = 1

(b) Only of some members = 0.5

(c) Only of governor = 0.25

(d) No = 0

3. What information about the members is given?

(a) CV with educational background and age = 1

(b) CV with educational background only = 0.5

(c) Only brief information = 0.25

(d) No information = 0

III. Transparency about the head of the committee

1. Is the qualification of the head of the MPC mentioned?

(a) Yes = 1

(b) No = 0

Note: Maximum possible score of MPCTI is 5. We multiply the score of each country by 3 to make the scores comparable with the Eijffinger and Geraats (2006) index.

B) Variable Definitions and Sources

1. Voice and Accountability. Measuring perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Average 1996–2008.

2. Political Stability and Absence of Violence. Measuring perceptions of the likelihood that the government will be destabilised or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. Average 1996–2008.

3. Rule of Law. Measuring perceptions of the extent to which agents have confidence in and abide by the rules of society and, in particular, the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Average 1996–2008.

4. Regulatory Quality. Regulatory quality captures perceptions of the government's ability to formulate and implement sound policies and regulations that permit and promote private-sector development. Average 1996–2008.

Source of 1, 2, 3, and 4: World Bank aggregate governance indicators, Kaufmann et al. (2008).

5. Internet Users. Number of people in a country having access to the World Wide Web. Per capita Internet usage is derived by dividing by total population. Source: World Bank website, http://data.worldbank.org/indicator.

6. Per Capita Income. Logarithm of average of annual per capita GDP from 1997 to 2007 at constant 2000 US dollars. Source: IMF, IFS.

7. GDP per Capita Growth. Growth rate of annual per capita GDP from 1997 to 2007 in percent.

8. Average Inflation. Average of annual percentage change in CPI from 1997 to 2007. Source: IMF, IFS.

9. Variability in Inflation. Standard deviation of annual percentage change in CPI. Source: IMF, IFS.

10. Past Inflation. Average of annual percentage change in CPI from 1986 to 1996. Source: IMF, IFS.

11. Variability in GDP. Standard deviation of the log of GDP. Source: IMF, IFS.

12. Average Growth. Average percentage change in GDP volume from 1997 to 2007. Source: IMF, IFS.

13. Exchange Rate Flexibility. Eichengreen and Razo-Garcia's (2006) update of Reinhart and Rogoff (2004). A higher value indicates more exchange rate flexibility.

14. Special Data Dissemination Standards (SDDS) Dummy. Does the country in question adhere to the IMF's special data dissemination standards? Yes = 1; No = 0.

Source: http://www.dbbs.imf.org/Applications/web/sddshome.

15. Corruption Perception Index Dummy. Perception of corruption by the business population of a country as measured by Transparency International. Source: http://www.transparency.org/policy_research/surveys_indices/cpi.

16. Average Age of Central Bank's Website. Number of months the website has been active on the World Wide Web. Source: http://www.webconfs.com/domain-age.php.

17. Turnover Rate. Mean turnover rate of central bank governor taken from Table A1 of Dreher et al. (2008).

18. Monetary Policy Strategy: Coded based on the IMF categorisation. Source: http://www.imf.org/external/np/mfd/er/2008/eng/0408.htm.