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# What effects exert Economic Globalization and Central Bank Transparency on inflation of OECD countries? An Application of LSDVC Estimator on a dynamic Panel Model

Emna Trabelsi\*

**Abstract:** This paper outlines the implications of **central bank transparency coupled with economic globalization** on the effectiveness of monetary policy at achieving low and stable inflation, through an empirical analysis on a sample of 34 OECD central banks. Our results are **threefold:** (i) There is a dampening and highly significant negative impact of economic globalization (measured by the composite index of Dreher et al., 2008) on inflation (ii) An appropriate and efficient U shape test proposed by Lind and Mehlum (2010), indicates a robust optimal intermediate degree of transparency, but suggests new evidence as to its level differently from van der Crujsen et al. (2010). Indeed, the optimal level is higher and seems to vary according to the set of controls included in the regression. The estimations were run using a bias corrected Least Square Dummy variable (hereafter, LSDVC), developed by Bruno (2005) for short dynamic panels with fixed effects, and extended to accommodate unbalanced data. Alternative results using Generalized Method of Moments (hereafter GMM) estimators: (Arellano and Bond, 1991, hereafter AB; Blundell and Bond, 1998, hereafter BB) are also provided. (iii) We find, overall, that LSDVC and BB estimators exhibit satisfactory fit, while AB estimator doesn't confirm the hypothesis of a quadratic relationship between transparency and inflation.

**JEL Classifications:** C23, E58

**Keywords:** central bank transparency, economic globalization, inflation, LSDVC, GMM

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\* **Corresponding author:** Emna Trabelsi. University of Tunis. Institut Supérieur de Gestion de Tunis. 41 Avenue de la Liberté, cité Bouchoucha, le Bardo, 2000, Tunisia. E-mail: [emna.trabelsi2007@yahoo.fr](mailto:emna.trabelsi2007@yahoo.fr). Mobile: 00216 21 310 931. This paper supersedes an earlier version entitled: "The relationship between central bank transparency and the quality of inflation forecasts: it is U Shaped?". We are grateful to Nergiz Dincer and Barry Eichengreen for making the transparency index available in their paper as well as downloadable via the website: <http://www.central-bank-communication.net/links/>

## 1. Introduction

There's a general line of thought that central bank transparency helps improve the efficiency of monetary policy. "The reasoning is that if the monetary policy is transparent, economic agents can easily realize that the policy decisions are really aimed at achieving low and stable inflation" (Cihák, 2007, p.491). This paper revisits the question of whether further increases of transparency may generate adverse consequences.

Some theoretical opposing views regarding potential benefits of transparency argue that excess transparency exposes the central bank to external interference (Amato et al. 2002; Morris and Shin, 2002; Kool et al. 2011). The influential paper by Morris and Shin (2002) found proponents like James and Lawler (2011) who brought a robust argument on the undesirable effect of increasing transparency (i.e. public information) on welfare, taking into account the central bank's policy action. Some other views emerge in relation of the minutes<sup>1</sup> and votes publishing or whether decisions should be accompanied by press conferences. In a recent statement made on 27<sup>th</sup> January 2015, Ignazio Angeloni, the member of the Supervisory Board of the European Central Bank (ECB) made the example of the disadvantages of disclosing the votes of the individual decision-making board members. Yet the success of the monetary policy depends on the understanding of central bank decisions and actions by the markets, which in return helps steer interest rates. Nevertheless, some central banks would refrain from "forward guidance" policy adoption<sup>2</sup>. In this context, Andersson and Hoffman (2010) argue that announcing the future interest rate path tracks may neither improve the predictability of monetary policy, nor does anchor long term inflation expectations if the central bank has already a clear defined price stability objective and a high degree of transparency. Much more persuasive arguments against increasing transparency have been made in the case of 'financial stability-related communication' or the use of models of bank runs (Diamond and Dybvig, 1983; Cukierman, 2009)<sup>3</sup>.

Whatever the case, the debate around the benefits and costs related to particular forms of communication practices didn't prevent a remarkable increase in the degree of transparency of the central banks around the world. Trends toward greater transparency seem not even knocked off course by the global financial crisis of 2007-2008.

The question of further information disclosure is especially appealing for central banks with a high degree of credibility like OECD countries. In order to examine the effect of central bank transparency on inflation, we use the most recent index updated by Dincer and Eichengreen (2014) which is available on an annual basis under the period 1998-2010.

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<sup>1</sup> The ECB resisted for years to the release of minutes. An act that makes it accused for failure to be transparent. Recently, the ECB decided to revise its decision in favor of a move to publish the minutes of its meetings.

<sup>2</sup> For more discussions about the issue, see, for example Kool and Thornton (2012) and Geraats (2014).

<sup>2</sup> For more discussions about the issue, see, for example Kool and Thornton (2012) and Geraats (2014).

<sup>3</sup> See Born et al. (2011) for more discussion.

We focus also on another issue that is as topical as central bank transparency. That is, we contribute to the empirical literature on the relationship between economic globalization and inflation. Nowadays, “it has been argued that globalization has had- or is likely to have- significant implications for the conduct and effectiveness of monetary policy in controlling inflation” (Papademos, 2008). Its link to inflation forms, then, an important objective of this paper. Both topics have been subject to empirical analysis separately in the literature. To our knowledge, there has not been a study that combines both issues. One exception is the contribution of Binici et al. (2008) who included central bank independence in addition to economic globalization into the same regression. However, their results didn’t lead to a significant effect of central bank independence on inflation. They conclude that it should be dropped from the regression (Binici, 2012). We fill this gap by including the aforementioned multidimensional index of transparency<sup>4</sup> constructed according to the methodology of Geraats (2002)<sup>5</sup>.

We believe our analysis is important because it suggests new evidence as of the optimal level of transparency in the case of our sample which appears higher than the threshold found previously by van der Crujnsen et al. (2010). Moreover, we show that economic globalization matter for monetary policy. Particularly, the multidimensional composite index constructed by Dreher et al. (2008) seems to be a perfect proxy.

The rest of the paper is structured as follows: Section 2 presents the methodology, explains the data used, and describes how well transparency is related to inflation persistence, thereby providing new insights with respect to the robustness of previous related research. Section 3 presents the results and section 4 concludes.

## **2. Empirical analysis**

### ***2.1. Data***

We collect data for 34 OECD countries under the period 1998-2010. The choice of the sample is restricted by the availability of data on certain variables. The dependent variable is given by the actual inflation rate as projected by the World Economic Outlook (WEO). We use a set of control variables among those which potentially affect inflation, as well as inflation persistence (cf. Table B.1 for details and source of data). Whatever the case, we expect economic globalization (for instance, measured by the composite index of Dreher et al, 2008) to contribute to a lower inflation. The transparency index<sup>6</sup> of Dincer and Eichengreen (2014)<sup>7</sup>

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<sup>4</sup> The index was originally compiled by Eijffinger and Geraats (2006) for 9 major central banks in 1998 and 2002. Dincer and Eichengreen (2010) build their index on that of Eijffinger and Geraats (2006) for 100 central banks under the period 1998-2006. Siklos (2011) updated the index until 2009. Finally, Dincer and Eichengreen (2014) extended the score until 2010.

<sup>5</sup> Geraats (2002) distinguishes five dimensions: economic (data, models, forecasts), political (objectives, numeric targets, institution), procedural (strategy, minutes, and votes), policy (decision explanation, inclination) and operational (control errors, transmission shocks).

<sup>6</sup> We also tested the effect of central bank independence index augmented by Dincer and Eichengreen (2014) based on data of Cukierman et al. (1992), but we didn’t find any significant impact on inflation.

affects inflation through a quadratic form in the lines of van der Crujsen et al. (2010)<sup>8</sup>, suggesting the presence of a threshold effect of central bank transparency. We also include another set of additional controls, such as the output gap which is linked to inflation positively through a Philips curve (cf. Table B.2 for the expected signs according to related literature). Following Binici (2012), the one-lagged M2 growth serves as a proxy for the stance of monetary policy. We also introduce the logarithm of GDP per capita in our regression which is used as a general proxy to measure the economic development (Romer, 1993).

## 2.2. Model's specification

The empirical literature on measuring inflation persistence adopts usually univariate time series approaches (See, for example, Pivetta and Reis, 2007; Cecchetti and Debelle, 2006). Inflation is known to be a persistent process. Typically, the measure is given by the sum of the autoregressive coefficients extracted from the following equation

$$\pi_{it} = \alpha_i + \sum_{j=1}^K \beta_j \pi_{it-j} + \varepsilon_{it}$$

Where  $\sum_{j=1}^K \beta_j$  is interpreted as the measure<sup>9</sup> of the persistence. In this paper, we rely on an original and modified definition of inflation persistence proposed by van der Crujsen et al. (2010). Therefore, our general estimated econometric model consists of this equation

$$\pi_{it} = \alpha_i + \lambda_0 X'_{it} + \lambda_1 ecoglob_{it} + \lambda_2 \pi_{it-1} + \lambda_3 \pi_{it-1} \times T_{it} + \lambda_4 \pi_{it-1} \times T_{it}^2 + \sum_{p=1}^Q \lambda_{4+p} \pi_{it-1} \times Y_{it} + \varepsilon_{it}$$

$$i = 1, 2, \dots, N \quad t = 1, 2, \dots, T_i \quad \text{Eq 1}$$

Where  $\pi_{it}$  stands for the yearly inflation rate, expressed as the percentage increase of Consumer Price Index (CPI),  $X_{it}$  is the set of control variables that determine inflation rate,  $ecoglob_{it}$  is the component of KOF globalization index,  $T_{it}$  is the transparency score and  $Y_{it}$  is the set of potential variables that affect the inflation persistence. From **Eq 1**, we can deduct the measure of persistence denoted ( $P$ ) as follows

$$\pi_{it} = \alpha_i + \lambda_0 X'_{it} + \lambda_1 ecoglob_{it} + \pi_{it-1} \times \underbrace{\left( \lambda_2 + \lambda_3 T_{it} + \lambda_4 T_{it}^2 + \sum_{p=1}^Q \lambda_{4+p} Y_{it} \right)}_P + \varepsilon_{it}$$

<sup>7</sup> The index comprises 15 components; each component is assigned 0, ½ or 1 points. The overall score value ranges between 0 and 15.

<sup>8</sup> We considered a set of control variables that are different from that used in van der Crujsen et al. (2010).

<sup>9</sup> Fuhrer (2010) enumerated a battery of measures that attempt to capture the persistence of inflation. We recommend the paper for an overview.

$$i = 1, 2, \dots, N \quad t = 1, 2, \dots, T_i \quad \text{Eq 2}$$

First, we test the assumption under which inflation depends negatively on economic globalization. The corresponding hypothesis is given by:  $H_{01}: \lambda_1 < 0$ .

The coefficient of the squared term **Eq 2** is designed to capture non linearity effect. We can derive the influence (or effect) of transparency on inflation persistence through the following expression

$$B = \lambda_3 T_{it} + \lambda_4 T_{it}^2 \quad \text{Eq 3}$$

A U shape form consists of including a quadratic term in a linear model (**Eq 3**). It requires that- in the words of Lind and Mehlum (2010, p.111): “the slope of the curve is negative at the start and positive at the end of a reasonably chosen interval” [ $T_{\min}, T_{\max}$ ]. Therefore, there will be an estimated threshold up to which, increased transparency reduces inflation persistence and above which, the impact turns to be the opposite (cf. Figure A.1).

Throughout the forthcoming estimations, we test for the U-shape<sup>10</sup> hypothesis (to be validated) using the corresponding test of Lind and Mehlum (2010) and applying “utest” Stata module.

$$H_{02}: \lambda_3 + 2\lambda_4 T_{\min} < 0 < \lambda_3 + 2\lambda_4 T_{\max}$$

Lastly, we solve for the first-order condition of  $P$  with respect to  $T$ , the estimated extreme point is given by:  $\hat{T} = -\frac{\lambda_3}{2\lambda_4}$

### 2.3. Estimation method

We estimate a dynamic panel model with fixed effects. The inclusion of fixed effects in our model is suitable when a specific set of  $N$  individuals is not randomly selected from some larger population. Since the sample data come specifically from OECD countries, the fixed effects model is more appropriate for the analysis. Furthermore, dynamic panels share the common feature of endogeneity of the lagged dependent variable. Arellano and Bond (1991) GMM-DIFF and Blundell and Bond (1998) GMM-SYS solve this problem. But, Blundell and Bond’s estimator (1998) is more appropriate than the one proposed by Arellano and Bond (1991) when it comes to deal with high persistent response variable.

By looking to the dynamic model described in **Eq 2**, three issues emerge:

- Our cross-sectional dimension of our panel is small; so that  $N$  consistent GMM estimators may be affected by potentially severe sample bias and could lead to a poor fit.

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<sup>10</sup> Other (non-parametric) techniques to test U-shape are also suggested in literature. See, for example, Imbs and Wacziarg (2003) and Kostyshark (2014).

- The unbalanced nature of our panel doesn't permit to correct the within estimator by applying the bias approximation formulae derived in Kiviet (1995), Bun and Carree (2005) and Bun and Kiviet (2003), which are only valid for balanced panels. Our estimation strategy will employ a bias corrected LSDV estimator as proposed by Bruno (2005).
- In the case of missing values<sup>11</sup> (which is also the feature of our sample), Flannery and Hankins (2013) show that LSDVC<sup>12</sup> is the most accurate estimator applied on corporate finance data.

A comparison between GMM estimators and LSDVC will be made available at the end of the paper. Briefly, we describe the characteristics<sup>13</sup> of all three types of estimators as follows (cf. Table 1 for more details):

- **AB** Arellano and Bond's (1991) difference GMM derive a consistent GMM estimator for datasets with many panels and few periods. The Stata command 'xtabond' implements this estimator, which applies one lag of the exogenous variables as the instrument set.
- **BB** Blundell and Bond's (1998) system GMM uses additional moment conditions. The estimator is designed for datasets with large panels and few periods. The Stata command 'xtdpdpsys' implements this estimator.
- **LSDVC** Bruno's (2005) Least Square Dummy Variable corrected of the biased Fixed Effect (FE) model. It extends the bias approximation formula in Bun and Kiviet (2003) to accommodate short unbalanced panels with a strictly exogenous selection rule. The estimator is implemented through the Stata command 'xtlsdvc'. Its performance is evaluated via Monte Carlo experiments.

In our case, the LSDVC estimator is initialized by a dynamic panel estimate (GMM-DIFF) and then relies on a recursive correction of the bias of the fixed effects estimator.

**Table 1** The efficiency of the estimators according to different situations

Estimator	Unobserved heterogeneity	Dynamic panel data	Second order serial correlation	Unbalanced data	Endogenous variables
<b>AB</b>	yes	yes	no	yes	yes
<b>BB</b>	yes	yes	no	yes	yes
<b>LSDVC</b>	yes	yes	yes	yes	no

Source: Flannery and Hankins (2013)

<sup>11</sup> A part of the effect results from the introduction of the output gap and the other part are due to the inclusion of M2 growth.

<sup>12</sup> The LSDVC estimator becomes a widely applied methodology for short dynamic panels, devoted to many applications (See for example Flannery and Hankins, 2013; Bogliacino et al., 2013).

<sup>13</sup> Those definitions are extracted from Stata manual. Check <http://www.stata.com/manuals13/xtxtabond.pdf> ; <http://www.stata.com/manuals13/xttdpdpsys.pdf> and Bruno (2005).

### 3. Results

#### *3.1. Impact of economic globalization on inflation: Sub-index of Dreher et al. (2008)*

Economic globalization may refer to “the process of integration into global markets facilitated by reductions in transaction costs. Accordingly, economic globalization constitutes a threat of international economic competition and dependence on foreign markets.” (Marshall and Fisher, 2015). An interest in the research of the relationship between economic globalization and inflation has increasingly grown. Earlier theoretical and empirical models, however, didn’t reach a consensus on the globalization-inflation linkage. At least, Allardo (2007) showed that globalization decreases in Poland. Other authors arrive at ambiguous effect of globalization driven by other factors such as higher energy prices that could cause the relationship to alter (Eijffinger, 2007). Binici et al. (2012) showed that economic globalization is negatively and significantly related to inflation. Economic globalization is a complex concept and it is difficult to find adequate measures. The KOF<sup>14</sup> globalization index is still worth look and usage. Its economic dimension measures the actual flows of trade, foreign direct investment and portfolio investment, as well as the restrictions applying to these flows<sup>15</sup>. Hence, we think it useful as a composite indicator.

To first evaluate  $H_{01}$ , we examine the impact of economic globalization on inflation. Our empirical results are shown in Tables B.3-B.6 and support an overwhelmingly negative relationship, either with inclusion of transparency in the specification or without inclusion of that variable. The index is also robust to the introduction of trade openness<sup>16</sup> and the logarithm of GDP per capita. The latter is rarely significant and has an ambiguous sign, as expected, most of the time.

#### *3.2. Impact of central bank transparency on inflation: Overall index of Dincer and Eichengreen (2014)*

We turn, now, to evaluate the second hypothesis  $H_{02}$ . Table B.4 shows the results of the estimation of our regression. Clearly, the coefficients associated with the quadratic form are highly significant. In fact, transparency enters with a negative and significant coefficient and transparency squared enters positively and significantly. A large number of previous researches attempt to test non monotone relationship, but hardly any of these used adequate formal procedures to test the U shape. Lind and Mehlum (2010) developed a nice test to detect such a non monotone relationship. The results are given in the last lines of Table B.4 and show a significant intermediate degree of transparency. Based on the quadratic form’s coefficient signs and their significance, the findings confirm again a U-shaped relationship between transparency and the inflation persistence. Overall, LSDVC estimators exhibit a satisfactory fit of our hypothesis, and an optimal intermediate transparency is pronounced. All control variables have their expected signs, but hardly significant (i.e.  $Lngdp$  and  $M2lag$  exhibit a little bit significant coefficients). Inflation targeting dummy seems to affect more the inflation persistence than the inflation level itself (See column (2) of Table B.5 for  $k=1$ ) but is

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<sup>14</sup> The KOF index encompasses three aspects: economic, social, political.

<sup>15</sup> See Dreher et al. (2008) for details.

<sup>16</sup> The correlation between economic globalization and openness is 0.63.



still insignificant in major cases despite the correct sign. A possible reason might be that transparency is picking up the effect of that variable. In fact, inflation targeting regains its significance when we drop transparency from the regression (See column (1) of Table B.3). We subject our results to a number of robustness checks. First, we introduced lagged values of transparency<sup>17</sup> (cf. Table B.5). Again, the U test indicates a strong presence of an intermediate transparency level. The control variables follow the same pattern as in Table B.4. Hence, the corresponding coefficients have their correct signs, but remain insignificant most of the time, except the one-lagged dependent variable and the output gap which exert a positive and highly significant impact on inflation. Second, a comparison of results by using pure GMM estimators (AB and BB) is made available in Table B.6 and suggests that both LSDVC and BB estimators exhibit very satisfactory observations. Third, we initialize LSDVC estimator by BB (GMM-SYS) instead of AB (GMM-DIFF). The results confirm our baseline findings in previous tables and are available upon request.

An important feature of our results consists of the finding of a high optimal score level of transparency (in some cases, it attains almost 12.8) that varies according to the set of controls included in the specification. That observation is in sharp contrast to that of van der Cruisen et al. (2010) whose estimations showed an optimal level of 7.5. We think that our results are more in accordance with the actual data. Not only, is the level of 7.5 already exceeded by the advanced economies, but also the central banks around the world continue to increase their transparency practices (cf. Table 2). The Sveriges Riksbank (the bank of Sweden), for example, is on the brink of the maximum of transparency with a score of 14.5 (since 2003), making it at the top of the most transparent central banks. The lowest score of the group in 2010 is Mexico, which rated 6 points. Central Bank of Turkey figures initially among the least transparent central banks, but increased its score from 2002 with a value of 8.5<sup>18</sup>. Overall, there was a substantial upward trend of transparency. Horvath (2014) explained through social interaction regression the main forces that underpinned this trend. He identified ‘peer effects’ and other external factors that play as equally important role as domestic factors of central bank transparency. We remark that some emerging OECD countries (i.e. Chile, Estonia and Mexico) may still benefit from further transparency increasing as the actual degree still doesn’t attain the estimated optimum found in our results (cf. Table 3).

**Table 2 Descriptive statistics of central bank transparency: Our sample**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<b>Min</b>	3 (POL, TUR)	2 (TUR)	4 (TUR)	3.5 (SVK)	4.5 (MEX)	5.5 (SVK)	5.5 (SVK)	5.5 (EST)	6.5 (DNK, EST)	6 (MEX)	6 (MEX)	6 (MEX)	6 (MEX)
<b>Max</b>	11 (UK)	13 (NZL)	13 (NZL)	13.5 (NZL)	14 (NZL)	14.5 (SWE)	14.5 (SWE)	14.5 (SWE)	14.5 (SWE)	14.5 (SWE)	14.5 (SWE)	14.5 (SWE)	14.5 (SWE)
<b>Score range</b>	[0, 15]												

**Note:** DNK: Denmark, EST: Estonia, MEX: Mexico, NZL: New Zealand, POL: Poland, SVK: Slovak Republic, SWE: Sweden, TUR: Turkey, UK: United Kingdom.

<sup>17</sup> We considered lags  $k=1, 2, 3$ .

<sup>18</sup> The score is still superior to 7.5.

**Table 3 Emerging OECD countries: Transparency index in 2010**

Country	Chile	Czech Republic	Estonia	Hungary	Mexico	Poland	Slovak Republic	Turkey
<b>Transparency index</b>	<b>8.5</b>	12	<b>6.5</b>	13.5	<b>6</b>	9	n.a	10

Note: n.a=not available

#### 4. Conclusion

In this paper, we give new evidence on the presence of an intermediate transparency at the optimum on the one hand and examine the relationship between economic globalization and inflation on the other hand. Classical methods would be restricted on the findings of a significantly negative coefficient on transparency term and a significant positive estimate on the quadratic term and take them as evidence supporting the U shape curve. Lind and Mehlum (2010) argue that earlier conventional approaches -although intuitive- could yield misleading results. We revisit the hypothesis of an intermediate optimal central bank transparency by introducing both technical and economic differences in our specification. Particularly, we have used the most recent monetary transparency index developed by Dincer and Eichengreen (2014). We found that the hypothesis of U-shaped relationship was strongly depicted in the case of central banks considered in our sample. Indeed, the test results overwhelmingly reject the combined null hypothesis of an inverted-U or monotone relationship in favor of a U-shaped linkage between central bank transparency and inflation persistence by using an appropriate test of Lind and Mehlum (2010). The results are robust for using lagged values of transparency. We find, also that BB estimator follows almost the same pattern<sup>19</sup> as LSDVC estimator while AB rejects the hypothesis of a quadratic relationship between inflation and transparency.

In the light of our results and the related previous research, we conclude some worth noting points:

- The index of transparency employed is subjective to the issue of quality. Yet, the existing measures focus on the quantity of disclosure, while the concept also encompasses features like accuracy, truthfulness, and information relevance.
- The pros and cons of providing too much or too little information rely on the country specific media and communication culture of each central bank. Both aspects have to be taken into account when design the appropriate tools and channels for explaining the monetary policy.
- Trends in transparency practices of each central bank are determined in an important part by other central banks' experiences and lessons (Called 'peer effects' as identified by Horvath, 2014).
- There has been a skeptical view as of the effective negative economic globalization-inflation relationship. In the words of Amtenbrink (2011, p.31): "globalization is considered to have a positive effect on inflation in industrial countries by inducing

<sup>19</sup> Some differences are related to the coefficient size of the *Lngdp* variable.

downward pressure on prices *inter alia* through the opening of labour markets, better allocation of (financial) resources and increased competition..” “...globalization may also induce upward pressure on prices as demand namely for energy and raw materials in emerging economies has grown notably”. As our sample is dominated by advanced economies<sup>20</sup>, we found that economic globalization did not alter the central banks’ tasks in pursuing their price stability primary objective. Precisely, inflation is a decreasing function of the sub-index of Dreher et al. (2008).

As a further econometric exercise, we suggest testing for the existence of an intermediate optimal level of transparency by using a dynamic panel threshold model estimated in the lines of Seo and Shin (2014) and by instrumenting the transparency variable<sup>21</sup>. Lastly, panoramic debate regarding the effect on inflation persistence of some particular transparency practices pursued by the central bank (i.e. publishing the minutes, forward guidance..) must be the object of more discussion (theoretical and empirical) in forthcoming research. For instance, Gaus (2015) shows through a Cagan-type model that the announcement of forward guidance may help decrease inflation persistence.

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<sup>20</sup> There are 8 emerging OECD countries in our sample.

<sup>21</sup> For instance, van der Cruysen et al. (2010) claim that it is difficult to find reliable instruments for central bank transparency. However, one could follow Dincer and Eichengreen (2010) and use the fitted value of transparency on a constant and a rule of law.

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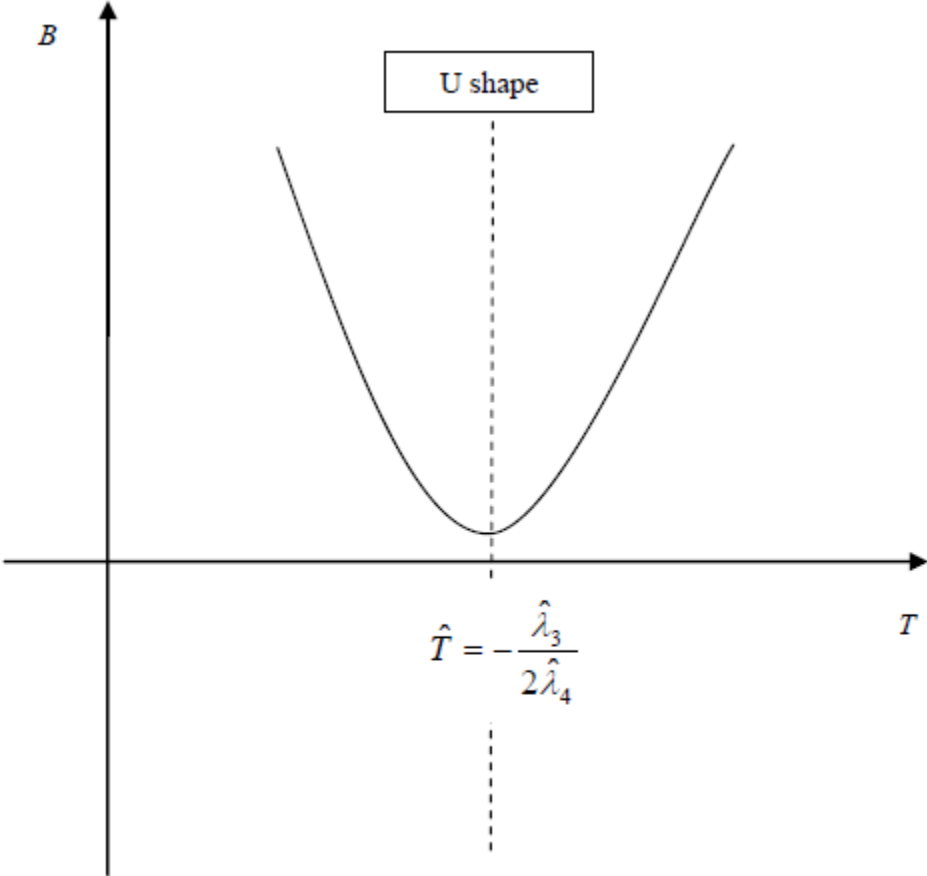
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Appendix

A. Figures

Figure A.1 Illustration of a U shape



**Note:**  $\hat{T}$  is the extreme point= the estimated value of transparency score at which the effect (denoted  $B$ ) on the persistence of inflation is minimized. It is the value up to which increasing transparency is always beneficial and beyond which further increasing turns to be undesirable.

## B. Tables

Table B.1 Description of variables and data source

Variables	Description	Source
<b>Dependent variable</b>		
Inflation ( $\pi$ )	Consumer price index (annual % increase)	IMF, World Economic Outlook Database <a href="http://www.imf.org/external/ns/cs.aspx?id=28">http://www.imf.org/external/ns/cs.aspx?id=28</a>
<b>Control variables</b>		
Output gap ( <i>outgap</i> )	Output gap as % of GDP	IMF, World Economic Outlook Database <a href="http://www.imf.org/external/ns/cs.aspx?id=28">http://www.imf.org/external/ns/cs.aspx?id=28</a>
<i>Lngdp</i>	Logarithm of GDP per capita growth	World Development Indicators, World Bank <a href="http://data.worldbank.org/indicator">http://data.worldbank.org/indicator</a>
<i>IT</i>	Inflation targeting, dummy set 1 starting from the adoption of inflation targeting regime and 0 otherwise	Roger (2010) <a href="http://www.imf.org/external/pubs/ft/fandd/basics/target.htm">http://www.imf.org/external/pubs/ft/fandd/basics/target.htm</a>
<i>M2</i>	Money supply growth	World Development Indicators, World Bank <a href="http://data.worldbank.org/indicator">http://data.worldbank.org/indicator</a>
<i>Openness</i>	The sum of exports and imports as a % of GDP	World Development Indicators, World Bank <a href="http://data.worldbank.org/indicator">http://data.worldbank.org/indicator</a>
<i>ecoglob</i>	Economic globalization : a component of KOF index of globalization	Dreher et al. (2008) <a href="http://globalization.kof.ethz.ch/">http://globalization.kof.ethz.ch/</a>
<b>Monetary policy transparency</b>		
<i>T</i>	Overall transparency index of Dincer and Eichengreen (2014)	<a href="http://www.central-bank-communication.net/links/">http://www.central-bank-communication.net/links/</a>
<b>Countries considered in our sample</b>		
Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States		
<b>Period: 1998-2010</b>		



**Table B.2 Determinants of inflation and inflation persistence and their expected signs**

	Determinants of inflation	Determinants of inflation persistence
<b>Institutional determinants</b>		Transparency (-), Transparency <sup>2</sup> (+),
<b>Macroeconomic determinants</b>	IT(-), Output gap (+), GDP per capita growth (-), lagged M2 growth (+),	IT(-),
<b>External determinants</b>	openness (+/-), economic globalization (-)	

**Note:** The expected signs are between ( )

**Table B.3 Impact of economic globalization on inflation: Initial results without including central bank transparency**

Dependent variable:	(1)	(2)	(3)	(4)
$\pi_{it}$				
$\pi_{it-1}$	0.308*** (0.052)	0.268*** (0.051)	0.242*** (0.059)	0.321*** (0.058)
$outgap_{it}$	0.156*** (0.030)	0.146*** (0.030)	0.150*** (0.034)	0.151*** (0.035)
$ecoglob_{it}$	-0.171*** (0.026)	-0.192*** (0.030)	-0.187*** (0.030)	-0.178*** (0.030)
$\pi_{it-1} \times IT_{it}$				-0.202* (0.120)
$IT_{it}$	-0.861* (0.497)			
$Openness_{it}$		0.013 (0.010)		
$Lngdp$		-0.997*** (0.236)	-0.872*** (0.283)	
$M2lag$			0.007 (0.006)	0.008 (0.006)

**Note:** Bias correction initialized by Arellano-Bond estimator. Bias approximation is carried out by the first leading term of the LSDV bias. Bootstrapped standard errors using 50 iterations are between ( ) (cf. Bruno, 2005). \*, \*\*, \*\*\* imply statistical significance at 10, 5, and 1%, respectively.  $\pi_{it}$  : inflation rate,  $ecoglob_{it}$  : economic globalization,  $Openness_{it}$  : trade openness,  $IT_{it}$  : inflation targeting dummy,  $outgap_{it}$  : output gap,  $Lngdp_{it}$  : logarithm of GDP per capita,  $M2lag_{it}$  : lagged M2 growth.

**Table B.4 Impact of economic globalization and Central Bank transparency on inflation: Dincer and Eichengreen (2014) data**

Dependent variable : $\pi_{it}$		(1)	(2)	(3)	(4)	(5)	(6)	(7)
		$k = 0$	$k = 0$	$k = 0$	$k = 0$	$k = 0$	$k = 0$	$k = 0$
$\pi_{it-1}$		0.869*** (0.077)	0.711*** (0.085)	0.743*** (0.083)	0.813*** (0.088)	0.772*** (0.088)	0.685*** (0.091)	0.695** (0.090)
$\pi_{it-1} \times T_{it}$		-0.122*** (0.024)	-0.090*** (0.026)	-0.093*** (0.024)	-0.135*** (0.035)	-0.119** (0.045)	-0.107*** (0.036)	-0.100** (0.045)
$\pi_{it-1} \times T_{it}^2$		0.004** (0.002)	0.003 (0.022)	0.004* (0.002)	0.006** (0.002)	0.006 (0.004)	0.005* (0.003)	0.005 (0.003)
$outgap_{it}$		0.151*** (0.058)	0.148*** (0.058)	0.146*** (0.058)	0.141** (0.062)	0.132* (0.056)	0.138** (0.062)	0.132** (0.057)
$ecoglob_{it}$		-0.156*** (0.043)	-0.154*** (0.045)	-0.149*** (0.048)	-0.165*** (0.055)	-0.160** (0.050)	-0.159*** (0.048)	-0.159*** (0.050)
$Openness_{it}$					0.005 (0.017)	0.004 (0.023)		-0.028* (0.017)
$IT_{it}$			-0.945 (0.732)				-0.762 (0.798)	
$\pi_{it-1} \times IT_{it}$				-0.196 (0.180)				-0.144 (0.194)
$Lngdp$					-0.609 (0.429)	-0.511 (0.622)	-0.480 (0.437)	-0.495 (0.626)
$M2lag$						0.0141 (0.010)		0.013 (0.011)
<b>Utest [p-value]</b>		<b>2.19***</b> <b>[0.01]</b>	<b>1.56 *</b> <b>[0.06]</b>	<b>1.78**</b> <b>[0.04]</b>	<b>2.32***</b> <b>[0.01]</b>	<b>1.53*</b> <b>[0.06]</b>	<b>1.93**</b> <b>[0.03]</b>	<b>1.31*</b> <b>[0.09]</b>
<b>Interval</b>	lower	-29.681	-29.681	-29.681	-29.681	-29.681	-29.681	-29.681
	upper	582.156	582.156	582.156	582.156	582.156	582.156	582.156
<b>Slope</b>	lower	-0.414	-0.300	-0.337	-0.550	-0.464	-0.440	-0.411
	upper	5.594	4.022	4.687	8.009	6.661	6.408	5.988
<b>Extreme point</b>		<b>12.468</b>	<b>12.790</b>	<b>11.409</b>	<b>9.641</b>	<b>10.230</b>	<b>9.634</b>	<b>9.619</b>

**Note:** Bias correction initialized by Arellano-Bond estimator. Bias approximation is carried out by the first leading term of the LSDV bias. Bootstrapped standard errors using 50 iterations are between () (cf. Bruno, 2005). \*, \*\*, \*\*\* imply statistical significance at 10, 5, and 1%, respectively.  $\pi_{it}$ : inflation rate,  $T_{it-k}$ : transparency score of Dincer and Eichengreen (2014) at lag  $k$ .  $ecoglob_{it}$ : economic globalization,  $Openness_{it}$ : trade openness,  $IT_{it}$ : inflation targeting dummy,  $outgap_{it}$ : output gap,  $Lngdp_{it}$ : logarithm of GDP per capita,  $M2lag_{it}$ : lagged M2 growth.

**Table B.5 Impact of economic globalization and Central Bank transparency on inflation: Dincer and Eichengreen (2014) data\_ Lagged values**

Dependent variable: $\pi_{it}$	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	$k = 1$	$k = 1$	$k = 1$	$k = 2$	$k = 2$	$k = 2$	$k = 3$	$k = 3$	$k = 3$
$\pi_{it-1}$	0.888*** (0.082)	0.743*** (0.091)	0.683*** (0.071)	0.935*** (0.077)	0.821*** (0.084)	0.842*** (0.090)	1.371*** (0.010)	1.151*** (0.041)	1.382*** (0.011)
$\pi_{it-1} \times T_{it-k}$	-0.151*** (0.043)	-0.118*** (0.043)	-0.099** (0.039)	-0.132*** (0.040)	-0.121*** (0.031)	-0.124*** (0.031)	-0.297*** (0.046)	-0.224*** (0.043)	-0.298*** (0.046)
$\pi_{it-1} \times T_{it-k}^2$	0.007** (0.004)	0.007* (0.004)	0.005 (0.003)	0.006** (0.003)	0.005*** (0.003)	0.005*** (0.003)	0.015*** (0.004)	0.012*** (0.003)	0.015*** (0.004)
$outgap_{it}$	0.072 (0.058)	0.070 (0.059)	0.091 (0.050)	0.122*** (0.039)	0.107* (0.057)	0.111*** (0.056)	0.133** (0.058)	0.160*** (0.042)	0.140*** (0.043)
$ecoglob_{it}$				-0.134*** (0.033)	-0.091** (0.044)	-0.095** (0.042)		-0.141*** (0.034)	
$IT_{it}$			-1.316 (0.908)			-0.232 (0.822)			0.423 (1.126)
$\pi_{it-1} \times IT_{it}$		-0.311* (0.172)		-0.220 (0.142)	-0.112 (0.181)		-0.030 (0.172)	-0.011 (0.166)	
$Lngdp_{it}$	-0.485 (0.558)	-0.493 (0.565)	-0.277 (0.601)	-0.191 (0.433)	-0.162 (0.584)	-0.117 (0.571)	-0.627 (0.673)	-0.141 (0.471)	-0.571 (0.497)
$M2lag_{it}$	0.012 (0.009)	0.011 (0.009)			0.010 (0.007)	0.010 (0.006)	0.009 (0.006)		
$Openness_{it}$	-0.025 (0.017)	-0.018 (0.018)	-0.023 (0.018)	0.037** (0.015)			0.001 (0.016)	0.021 (0.015)	-0.007 (0.016)
Utest [p-value]	<b>1.90**</b> <b>[0.03]</b>	<b>1.66**</b> <b>[0.05]</b>	<b>1.36*</b> <b>[0.08]</b>	<b>1.53*</b> <b>[0.06]</b>	<b>1.71**</b> <b>[0.04]</b>	<b>1.68**</b> <b>[0.05]</b>	<b>3.30***</b> <b>[0.00]</b>	<b>2.93***</b> <b>[0.00]</b>	<b>3.83***</b> <b>[0.00]</b>
Interval	lower	-28.391	-28.391	-28.391	-28.391	-28.391	-28.391	-25.81	-25.81
	upper	376.689	376.689	376.689	273.956	273.956	273.956	145.064	145.064
Slope	lower	-0.604	-0.528	-0.381	-0.458	-0.418	-0.408	-1.111	-0.834
	upper	5.860	5.309	3.639	3.016	2.744	2.621	4.279	3.204
Extreme point	<b>9.492</b>	<b>8.254</b>	<b>10.048</b>	<b>11.517</b>	<b>11.576</b>	<b>12.418</b>	<b>9.426</b>	<b>9.506</b>	<b>9.553</b>

**Note:** Bias correction initialized by Arellano-Bond estimator. Bias approximation is carried out by the first leading term of the LSDV bias. Bootstrapped standard errors using 50 iterations are between () (cf. Bruno, 2005). \*, \*\*, \*\*\* imply statistical significance at 10, 5, and 1%, respectively.  $\pi_{it}$ : inflation rate,  $T_{it-k}$ : transparency score of Dincer and Eichengreen (2014) at lag  $k$ .  $ecoglob_{it}$ : economic globalization,  $Openness_{it}$ : trade openness,  $IT_{it}$ : inflation targeting dummy,  $outgap_{it}$ : output gap,  $Lngdp_{it}$ : logarithm of GDP per capita,  $M2lag_{it}$ : lagged M2 growth.

**Table B.6 Alternative results using GMM estimators and comparison with LSDVC estimator**

Dependent variable:	LSDVC_Bruno			GMM_AB			GMM_BB		
	$k = 0$	$k = 0$	$k = 0$	$k = 0$	$k = 0$	$k = 0$	$k = 0$	$k = 0$	$k = 0$
$\pi_{it}$									
$\alpha$				34.388*** (4.976)	34.023*** (4.924)	30.926*** (5.261)	33.806*** (3.975)	33.711*** (3.965)	33.540*** (4.429)
$\pi_{it-1}$	0.685*** (0.091)	0.687*** (0.090)	0.921*** (0.081)	0.603* (0.349)	0.508 (0.337)	0.479 (0.366)	0.955*** (0.298)	0.791*** (0.294)	0.824*** (0.310)
$\pi_{it-1} \times T_{it-k}$	-0.107*** (0.033)	-0.107*** (0.033)	-0.163*** (0.048)	-0.157* (0.095)	-0.135 (0.094)	-0.145 (0.099)	-0.248*** (0.084)	-0.208** (0.084)	-0.219** (0.088)
$\pi_{it-1} \times T_{it-k}^2$	0.006* (0.003)	0.006** (0.003)	0.008** (0.003)	0.006 (0.006)	0.006 (0.006)	0.006 (0.006)	0.012** (0.005)	0.011** (0.005)	0.011** (0.005)
$\pi_{it-1} \times IT_{it}$		-0.172 (0.194)			-0.285** (0.141)			-0.327*** (0.127)	
$outgap_{it}$	0.138*** (0.061)	0.139** (0.062)	0.089* (0.055)	0.202*** (0.043)	0.195*** (0.043)	0.181*** (0.046)	0.214*** (0.040)	0.202*** (0.041)	0.194*** (0.043)
$ecoglob_{it}$	-0.159*** (0.048)	-0.155** (0.051)		-0.125*** (0.037)	-0.112*** (0.037)		-0.078*** (0.025)	-0.057** (0.026)	
$Openness_{it}$			-0.025 (0.018)			-0.043*** (0.016)			-0.015*** (0.006)
$IT_{it}$	-0.762 (0.798)		-0.947 (0.958)	-0.533 (0.842)		-0.648 (0.889)	-0.767 (0.594)		-1.080* (0.597)
$Lngdp_{it}$	-0.480 (0.437)	-0.550 (0.436)	-0.399 (0.673)	-2.076*** (0.483)	-2.143*** (0.481)	-2.353*** (0.501)	-2.366*** (0.382)	-2.528*** (0.389)	-2.800*** (0.412)
$M2lag_{it}$			0.017* (0.010)			0.005 (0.007)			0.005 (0.007)
<b>Utest [p-value]</b>	<b>1.93**</b> <b>[0.03]</b>	<b>2.07**</b> <b>[0.02]</b>	<b>2.06**</b> <b>[0.02]</b>	1.12 [0.13]	1.08 [0.14]	1.08 [0.14]	<b>2.34***</b> <b>[0.01]</b>	<b>2.12**</b> <b>[0.02]</b>	<b>1.92**</b> <b>[0.03]</b>
<b>Interval</b>	lower upper	lower upper	lower upper	lower upper	lower upper	lower upper	lower upper	lower upper	lower upper
<b>Slope</b>	lower upper	lower upper	lower upper	lower upper	lower upper	lower upper	lower upper	lower upper	lower upper
<b>Extreme point</b>	<b>9.634</b>	<b>8.907</b>	<b>9.825</b>	11.972	10.911	11.004	<b>10.120</b>	<b>9.544</b>	<b>10.291</b>

**Note:** Comparison between LSDVC estimator (Bruno, 2005) and GMM estimators (Arellano and Bond, 1991; Blundell and Bond, 1998). \*, \*\*, \*\*\* imply statistical significance at 10, 5, and 1%, respectively.  $\pi_{it}$  : inflation rate,  $T_{it-k}$  : transparency score of Dincer and Eichengreen (2014) at lag  $k$ .  $ecoglob_{it}$  : economic globalization,  $Openness_{it}$  : trade openness,  $IT_{it}$  : inflation targeting dummy,  $outgap_{it}$  : output gap,  $Lngdp_{it}$  : logarithm of GDP per capita,  $M2lag_{it}$  : lagged M2 growth.