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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

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Abstract

We outline the implications of central bank transparency coupled with economic globalization on the effectiveness of monetary policy at achieving low and stable inflation, through a two-step empirical analysis on a sample of 34 OECD countries. Our results are fourfold: (i) There is a highly significant negative impact of economic globalization (measured by the composite sub-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 under the first estimation period (1998-2010), but suggests new evidence as to its level differently from van der Cruijsen et al. (2010). (iii) Although our findings are generally confirmed by a wide set of robustness tests, some caveats associated with the length of time period and the characteristics of inflation pattern observed under the second estimation period (2006-2015) should be taken into account. 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. (iv) Overall, we find that LSDVC estimator outperforms GMM estimators as it exhibits a satisfactory fit of our hypotheses.

We thank an anonymous referee for useful suggestions and comments. This paper supersedes an earlier version entitled: "The relationship between central bank transparency and the quality of inflation forecasts: it it 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/

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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 hurdles (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 (measured by the precision of public information) on welfare, taking into account the central bank's policy action. Some other views emerge in relation of the minutes[1] and votes publishing or whether decisions should be accompanied by press conferences. In a recent statement made on 27th January 2015, Ignazio Angeloni, the member of the Supervisory Board of the European Central Bank (ECB), identifies 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's decisions and actions by the markets, which in return helps steer interest rates. Nevertheless, some central banks would refrain from "forward guidance" policy adoption[2]. 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. Some authors (Diamond and Dybvig, 1983; Cukierman, 2009) have made much more persuasive arguments against increasing transparency in the case of 'financial stability-related communication' or the use of models of bank runs[3]. 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.

We also focus 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

[1] 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.

[2] For more discussions about the issue, see, for example, Kool and Thornton (2012) and Geraats (2014).

[3] See Born et al. (2011) for more details.

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 and conclude that it should be dropped from the regression (Binici et al., 2012). We fill this gap by including the aforementioned multidimensional index of transparency[4] constructed according to the methodology of Geraats (2002)[5]. 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 Cruijsen et al. (2010). Moreover, we show that economic globalization matters for monetary policy. Particularly, the composite sub-index constructed by Dreher et al. (2008) seems to be a perfect proxy. It is also interesting to see how sensitive our core results are, when we subject the specification to a wide series of robustness tests.

The rest of the paper is structured as follows: Sec. 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. Sec. 3 presents the results and Sec. 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 (see Table 1 for details and source of data). Whatever the case, we expect economic globalization (for instance, measured by the composite sub-index of Dreher et al, 2008) to contribute to a lower inflation. The transparency index[6] of Dincer and Eichengreen (2014)[7] affects inflation through a quadratic form in the lines of van der Cruijsen et al. (2010)[8], suggesting the presence of a threshold effect of central bank transparency.

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[4] 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.

[5] 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).

[6] 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.

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

[8] In a first step, we consider a set of control variables that are different from that used in van der Cruijsen et al. (2010). The comparison between our results and those of van der Cruijsen et al. (2010) is made in a second step.

Table 1 Description of variables and data source

Variables	Description	Source
Dependent variable		
Inflation (π)	Consumer price index (annual % increase)	IMF, World Economic Outlook Database http://www.imf.org/external/ns/cs.aspx?id=28
Variables of interest		
ecoglob	Economic globalization: a component of KOF index of globalization	Dreher et al. (2008) http://globalization.kof.ethz.ch/
T	Overall transparency index of Dincer and Eichengreen (2014)	Dincer and Eichengreen (2014) http://www.central-bank-communication.net/links/
Control variables		
outgap	Output gap as % of GDP	IMF, World Economic Outlook Database http://www.imf.org/external/ns/cs.aspx?id=28
Lngdp	Logarithm of GDP per capita growth	World Development Indicators, World Bank http://data.worldbank.org/indicator
IT	Inflation targeting, dummy set 1 starting from the adoption of inflation targeting regime and 0 otherwise	Roger (2010) http://www.imf.org/external/pubs/ft/fandd/basics/target.htm
Int_rate	Short-term interest rate	OECD.Stat http://stats.oecd.org/index.aspx?queryid=86
Openness	The sum of exports and imports as a % of GDP	World Development Indicators, World Bank http://data.worldbank.org/indicator
Banking_crisis	A dummy taking 1 during crisis episodes in country *i* and 0 otherwise	Laeven and Valencia (2012)
Additional control variables[(a)]		
Inst	The quality of public and private institutions	World Economic Forum http://reports.weforum.org/global-competitiveness-report-2014-2015/
DoC	The degree of competition as measured by the intensity of local competition	World Economic Forum http://reports.weforum.org/global-competitiveness-report-2014-2015/
exgdp	The exports of goods and services as a share of GDP	World Economic Forum http://reports.weforum.org/global-competitiveness-report-2014-2015/
WF	The flexibility of wage determination	World Economic Forum http://reports.weforum.org/global-competitiveness-report-2014-2015/
LS	Labor share measured by the production process sophistication	World Economic Forum http://reports.weforum.org/global-competitiveness-report-2014-2015/
TR	Technology readiness	World Economic Forum http://reports.weforum.org/global-competitiveness-report-2014-2015/
CR	Customer relation as measured by the degree of customer orientation.	World Economic Forum http://reports.weforum.org/global-competitiveness-report-2014-2015/

Table 1 Description of variables and data source (*continued*)

Countries considered in our sample
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, Turkey, United Kingdom, United States
Estimation period: 1998-2010 / 2006-2015

[(a)] See details about the definition of those variables in Appendix C.

We include a set of controls, such as the output gap which is linked to inflation positively through a Philips curve (see Table 2 for the expected signs according to existing literature). We use the nominal interest rate as the short-term monetary instrument of central banks, especially in inflation targeting framework[9]. We also introduce the logarithm of GDP per capita in our regression which serves as a general proxy of the level of development (Romer, 1993). Another set of controls is tested in a second econometric application (see Sec. 3.3).

Table 2 Determinants of inflation and inflation persistence and their expected signs

	Determinants of inflation	**Determinants of inflation persistence**
Institutional determinants	Transparency (-), Institutions (-)	Transparency (-), Transparency^2 (+),
Macroeconomic determinants	Inflation Targeting(-), Output gap (+), logarithm of GDP per capita growth (-), Short-term interest rate (+)	Inflation Targeting(-),
Financial determinants	Banking_crisis dummy (+)	
External determinants	openness (+/-), economic globalization (-), Degree of competition (-), exports as a share of GDP (-)	Degree of Competition (-), Technology Readiness (-), Customer Relations (+), Labor Share (+), Wage Flexibility (-)

Note: The expected signs are between ( )

2.2. Model's specification

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

[9] We are grateful to an anonymous referee for suggesting the inclusion of the interest rate in the regression.

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

Where $\sum_{j=1}^{K} \beta_j$ is interpreted as the measure[10] of the persistence. In this paper, we rely on an original and modified definition of inflation persistence proposed by van der Cruijsen et al. (2010). Therefore, our general estimated econometric model consists of this equation

$$\pi_{it} = \alpha_i + \lambda_0 X'_{it} + \lambda_1 ecoglob_{it} + \lambda_2 \pi_{it-1} + \lambda_3 \pi_{it-1} \times T_{it} + \lambda_4 \pi_{it-1} \times T_{it}^2 + \sum_{p=1}^{Q} \lambda_{4+p} \pi_{it-1} \times Y_{it} + \varepsilon_{it}$$
$$i = 1,2,....,n \qquad t = 1,2,...,t_i \tag{1}$$

Where π_{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 (1) we can deduct the measure of persistence denoted (P) as follows

$$\pi_{it} = \alpha_i + \lambda_0 X'_{it} + \lambda_1 ecoglob_{it} + \pi_{it-1} \times \underbrace{\left(\lambda_2 + \lambda_3 T_{it} + \lambda_4 T_{it}^2 + \sum_{p=1}^{Q} \lambda_{4+p} Y_{it} \right)}_{P} + \varepsilon_{it}$$
$$i = 1,2,....,n \qquad t = 1,2,...,t_i$$

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

$$B = \lambda_3 T_{it} + \lambda_4 T_{it}^2$$

(3)

A U shape form consists of including a quadratic term in a linear model as shown in (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 (see Fig. 1).

[10] Fuhrer (2010) enumerated a battery of measures that attempt to capture the persistence of inflation. We recommend the paper for an overview.

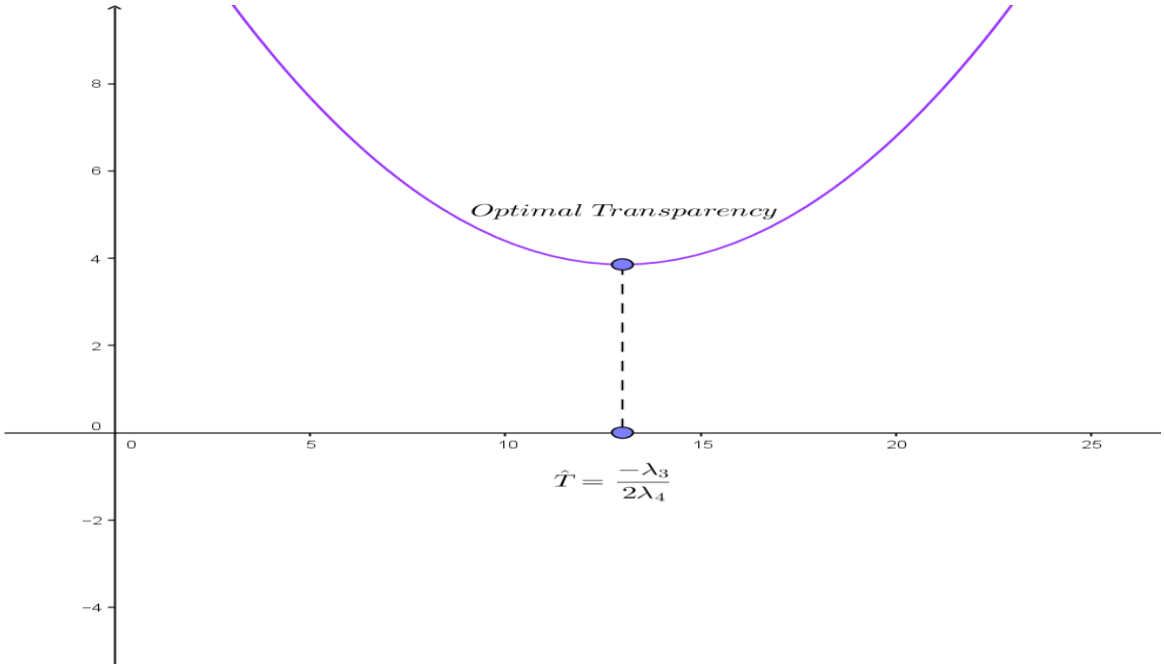

Fig 1 Example of the illustration of U shape

$\hat{T}$ is the extreme point= the estimated value of transparency score at which 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.

Throughout the forthcoming estimations, we test for the U-shape[11] hypothesis using the corresponding test of Lind and Mehlum (2010) and applying "`utest`" Stata module.

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

Lastly, we solve for the first-order condition of P with respect to T implies the extreme point:

$$\hat{T} = -\frac{\lambda_3}{2\lambda_4}$$

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.

[11] Other (non-parametric) techniques to test U-shape are also suggested in literature. See, for example, Imbs and Wascziarg (2003) and Kostyshak (2014).

By looking to the dynamic model described in (1), 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.

- 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. Thereby, our estimation strategy employs a bias corrected LSDV estimator as proposed by Bruno (2005).

- In the case of missing values (which is also the feature of our sample), Flannery and Hankins (2013) show that LSDVC[12] is the most accurate estimator applied on corporate finance data.

A comparison between GMM estimators and LSDVC is made available at the end of Sec. 3.2. Briefly, we describe the characteristics[13] of all three types of estimators as follows (see Table 3 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 '`xtdpdsys`' 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. Bruno (2005) implements bias-corrected estimator for a small number of individuals and short temporal dimension (n=29, t=9). Bruno et al. (2014) applied the estimator for n=27, t=29. Buddelmeyer et al. (2008) showed that LSDVC is the preferred estimator for n=20, t=5 in dynamic panels with a medium size on the one-lagged dependent variable.

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.

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[12] The LSDVC estimator becomes a widely applied methodology for short dynamic panels, devoted to many applications (e.g Flannery and Hankins, 2013; Bogliacino et al., 2013).

[13] Those definitions are extracted from Stata manual. Check http://www.stata.com/manuals13/xtxtabond.pdf ; http://www.stata.com/manuals13/xtxtdpdsys.pdf and Bruno (2005).

Table 3 The efficiency of the estimators according to different situations

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

Source: Flannery and Hankins (2013)

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[14] 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 flaws[15]. Hence, we think it useful as a composite indicator. Fig. 2 depicts the evolution of economic globalization between 1998 and 2010 in the case of our sample of countries. Ireland jumps to the top of OECD list in 2010 with a value of 94.96, followed by Luxembourg and Netherlands with respective scores 94.09 and 91.70. When it comes to the change rate, Poland ranks the first with a positive change of 42.2% between 1998 and 2010, followed by Slovak Republic (34.1%).

[14] The KOF index encompasses three aspects: economic, social, and political.

[15] The definition is taken from: http://www.mrglobalization.com/globalisation/292-measuring-globalization. See Dreher et al. (2008) for details.

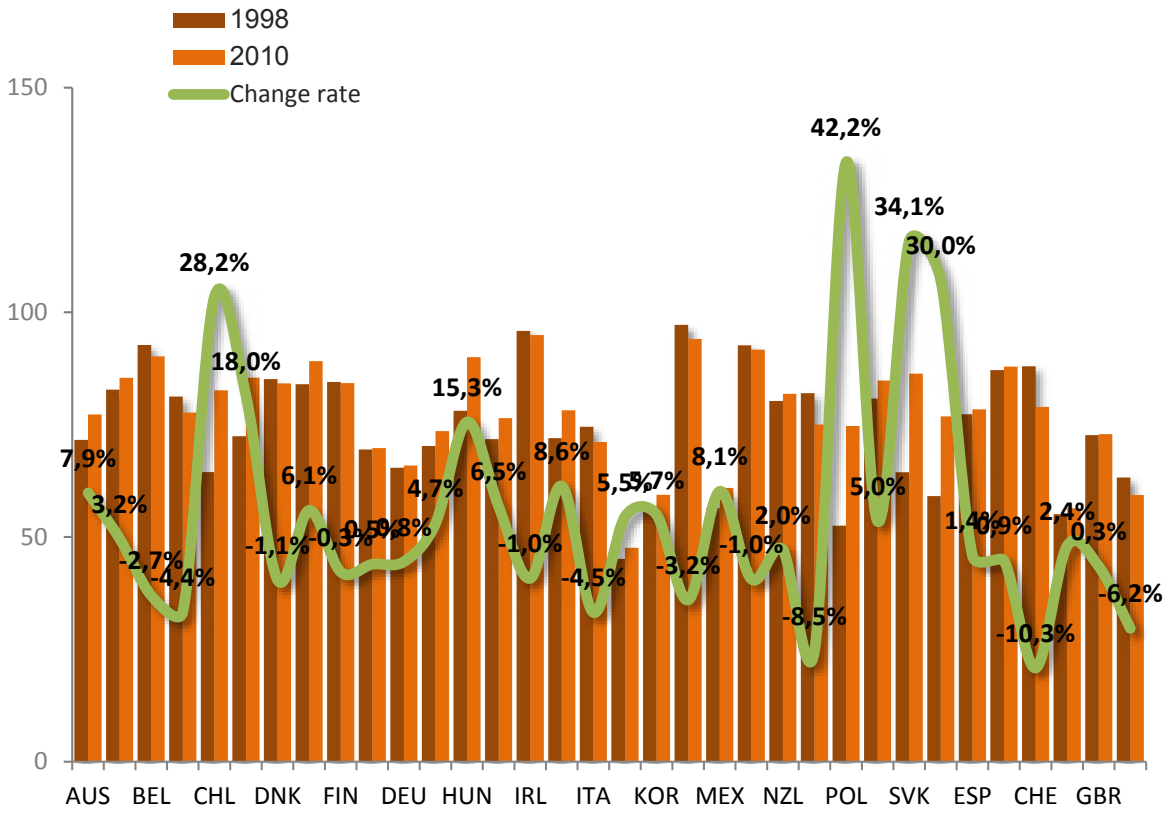

Fig 2 Evolution of economic globalization between 1998 and 2010 within OECD countries

AUS: Australia, BEL: Belgium, CHL: Chile, DNK: Denmark: FIN: Finland, DEU: Germany, HUN: Hungary, IRL: Ireland, ITA: Italy, KOR: Korea, MEX: Mexico, NZL: New Zealand, POL: Poland, SVK: Slovak Republic, ESP: Spain, CHE: Switzerland, GBR: United Kingdom. Data source: http://globalization.kof.ethz.ch/

To first evaluate H_{01}, we examine the impact of economic globalization on inflation. Our empirical results are shown in Table 4 and Table 5 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[16]. The remaining control variable are significant and the associated coefficients apprise the expected signs.

[16] The correlation between economic globalization and openness is 0.63 (see Table A.1).

Table 4 Impact of economic globalization on inflation: Initial results without including central bank transparency

Dependent variable: π_{it}	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
π_{it-1}	0.308***	0.268***	0.197***	0.342***	0.222***
	(0.052)	(0.051)	(0.068)	(0.050)	(0.046)
$outgap_{it}$	0.156***	0.146***	0.095***	0.150***	
	(0.030)	(0.030)	(0.034)	(0.030)	
$ecoglob_{it}$	-0.171***	-0.192***	-0.154***	-0.164***	
	(0.026)	(0.030)	(0.031)	(0.026)	
IT_{it}	-0.861*				
	(0.497)				
$Openness_{it}$		0.013			0.011*
		(0.010)			(0.006)
$Lngdp$		-0.997***	-0.471*		
		(0.236)	(0.246)		
int_$rate_{it}$			0.175***		0.285***
			(0.052)		(0.031)
$\pi_{it-1} \times IT_{it}$				-0.228**	-0.203***
				(0.096)	(0.055)

Note: Bias correction initialized by Arellano-Bond estimator. Bias approximation is accurate up to O(1/n t^2). Bootstrapped standard errors using 50 iterations are between () (Bruno, 2005). *, **, *** imply statistical significance at 10, 5, and 1%, respectively. π_{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, int_$rate_{it}$: interest rate.

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 5 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 5 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. The hypothesis H_{01} is again accepted since economic globalization mirrors the same magnitude and the statistical significance. All control variables have their expected signs. Particularly, the output gap and the nominal interest rate come out with significant coefficients. All other effects, when they do exist, are an order smaller of size and/or

significance. *IT* and *Lngdp* turn to be insignificant. A possible reason might be that transparency is picking up the effect of these variables (Table A.1 shows a correlation of 0.3 and 0.49, respectively). Indeed, inflation targeting significance is restored when we drop transparency from the regression and it affects both inflation rate and inflation persistence (see columns (1), (4) and (5) of Table 4). The same applies to the logarithm of GDP per capita (see columns (2) and (3) of Table 4).

Table 5 Impact of economic globalization and Central Bank transparency on inflation: Dincer and Eichengreen (2014) data

Dependent variable : π_{it}	**(1)** $k=0$	**(2)** $k=0$	**(3)** $k=0$	**(4)** $k=0$	**(5)** $k=0$	**(6)** $k=0$
π_{it-1}	0.869***	0.711***	0.685***	0.743***	0.722***	0.785***
	(0.077)	(0.085)	(0.091)	(0.083)	(0.064)	(0.064)
$\pi_{it-1} \times T_{it-k}$	-0.122***	-0.090***	-0.107***	-0.093***	-0.174***	-0.164***
	(0.024)	(0.026)	(0.036)	(0.024)	(0.028)	(0.008)
$\pi_{it-1} \times T^2_{it-k}$	0.004**	0.003	0.005*	0.004*	0.008***	0.008***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
$outgap_{it}$	0.151***	0.148***	0.138**	0.146***		
	(0.058)	(0.058)	(0.062)	(0.058)		
$ecoglob_{it}$	-0.156***	-0.154***	-0.159***	-0.149***		
	(0.043)	(0.045)	(0.048)	(0.048)		
$Openness_{it}$					0.031**	0.025*
					(0.013)	(0.014)
IT_{it}		-0.945	-0.762			-0.111
		(0.732)	(0.798)			(0.538)
$\pi_{it-1} \times IT_{it}$				-0.196		
				(0.180)		
$Lngdp$			-0.480			
			(0.437)			
int_rate_{it}					0.389***	0.323***
					(0.053)	(0.052)
Utest	**2.19*** **	**1.56 ***	**1.93****	**1.78****	**3.13*****	**2.98*****
[p-value]	**[0.01]**	**[0.06]**	**[0.03]**	**[0.04]**	**[0.00]**	**[0.00]**
Extreme point	**12.468**	**12.790**	**9.634**	**11.409**	**10.104**	**9.967**

Note: Bias correction initialized by Arellano-Bond estimator. Bias approximation is accurate up to O(1/n t^2). Bootstrapped standard errors using 50 iterations are between () (Bruno, 2005). *, **, *** imply statistical significance at 10, 5, and 1%, respectively. π_{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, int_rate_{it} : interest rate.

We subject our results to a number of robustness checks. First, we introduce lagged values of transparency[17] and the corresponding results are reported in Table 6. Again, the U test indicates a strong presence of an intermediate transparency level. The control variables follow almost the same pattern as in Table 5. Second, a comparison of results by using pure GMM estimators (AB and BB) is made available in Table 7 and suggests that LSDVC estimator displays very satisfactory observations[18].

Table 6 Impact of economic globalization and Central Bank transparency on inflation: Dincer and Eichengreen (2014) data_ Lagged values

Dependent variable:	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
π_{it}	$k=1$	$k=1$	$k=1$	$k=2$	$k=2$	$k=2$	$k=3$	$k=3$	$k=3$
π_{it-1}	0.900***	0.873***	0.937***	0.881***	0.984***	0.949***	0.394***	1.205***	1.146***
	(0.047)	(0.061)	(0.056)	(0.048)	(0.069)	(0.073)	(0.064)	(0.028)	(0.038)
$\pi_{it-1} \times T_{it-k}$	-0.201***	-0.122***	-0.129***	-0.188***	-0.139***	-0.126***	-0.099***	-0.233***	-0.227***
	(0.028)	(0.034)	(0.033)	(0.035)	(0.035)	(0.034)	(0.036)	(0.034)	(0.033)
$\pi_{it-1} \times T^2_{it-k}$	0.011***	0.005*	0.006**	0.0100**	0.005*	0.005*	0.006*	0.012***	0.012***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
$\pi_{it-1} \times IT_{it}$			-0.404**			-0.218			0.055
			(0.179)			(0.140)			(0.150)
$outgap_{it}$		0.087*	0.078*		0.131***	0.124***		0.164***	0.164***
		(0.046)	(0.045)		(0.038)	(0.038)		(0.039)	(0.041)
$ecoglob_{it}$					-0.135***	-0.132***		-0.141***	-0.122***
					(0.033)	(0.033)		(0.032)	(0.036)
int_rate_{it}	0.288***			0.241***			0.320***		
	(0.058)			(0.064)			(0.074)		
$Openness_{it}$	0.021*			0.030**	0.033**	0.037**	0.027**	0.021'	
	(0.013)			(0.013)	(0.014)	(0.014)	(0.013)	(0.013)	
IT_{it}		-1.688**			-0.491				
		(0.775)			(0.710)				
Utest	**3.81****	**1.67****	**2.04****	**2.49*****	**1.66****	**1.63***	**1.61****	**3.92*****	**4.06*****
[p-value]	**[0.00]**	**[0.05]**	**[0.02]**	**[0.01]**	**[0.05]**	**[0.05]**	**[0.05]**	**[0.00]**	**[0.00]**
Extreme point	**9.243**	**11.668**	**9.689**	**9.382**	**13.629**	**12.785**	**8.038**	**9.856**	**9.629**

Note: Bias correction initialized by Arellano-Bond estimator. Bias approximation is accurate up to O(1/n t^2). Bootstrapped standard errors using 50 iterations are between () (Bruno, 2005). *, **, *** imply statistical significance at 10, 5, and 1%, respectively. ' denotes a coefficient on the brink of significance. π_{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, int_rate_{it} : interest rate.

[17] We considered lags *k*=1, 2, 3.

[18] The control variables show almost the same pattern for all three estimators. Note that Sargan test for overidentification in GMM estimators is not applicable in case of robust standard errors.

Table 7 Alternative results using GMM estimators and comparison with LSDVC estimator

Dependent variable:	**LSDVC_Bruno**			**GMM_AB**			**GMM_BB**		
π_{it}	$k=0$	$k=0$	$k=0$	$k=0$	$k=0$	$k=0$	$k=0$	$k=0$	$k=0$
π_{it-1}	0.685***	0.687***	0.785***	0.603*	0.508	0.886	0.955***	0.791***	0.843
	(0.091)	(0.090)	(0.064)	(0.343)	(0.347)	(0.621)	(0.349)	(0.234)	(0.561)
$\pi_{it-1} \times T_{it-k}$	-0.107***	-0.107***	-0.164***	-0.157	-0.135	-0.273*	-0.248***	-0.208**	-0.261*
	(0.033)	(0.033)	(0.008)	(0.119)	(0.123)	(0.158)	(0.076)	(0.084)	(0.135)
$\pi_{it-1} \times T^2_{it-k}$	0.006*	0.006**	0.008***	0.006	0.006	0.015*	0.012***	0.011*	0.016**
	(0.003)	(0.003)	(0.002)	(0.007)	(0.007)	(0.009)	(0.004)	(0.005)	(0.008)
$\pi_{it-1} \times IT_{it}$		-0.172			-0.285**	-0.096		-0.327***	-0.028
		(0.194)			(0.121)	(0.105)		(0.112)	(0.135)
$outgap_{it}$	0.138***	0.139**		0.202*	0.195*		0.214**	0.202**	
	(0.061)	(0.062)		(0.109)	(0.101)		(0.103)	(0.097)	
$ecoglob_{it}$	-0.159***	-0.155**		-0.125**	-0.112**	-0.036	-0.078	-0.057	
	(0.048)	(0.051)		(0.056)	(0.051)	(0.063)	(0.053)	(0.059)	
$Openness_{it}$			0.025*			0.058*			
			(0.014)			(0.035)			
IT_{it}	-0.762		-0.111	-0.533			-0.767		
	(0.798)		(0.538)	(0.572)			(0.856)		
$Lngdp_{it}$	-0.480	-0.550		-2.076**	-2.143**		-2.366***	-2.528***	
	(0.437)	(0.436)		(1.015)	(0.965)		(0.897)	(0.919)	
int_rate_{it}			0.323***			0.483***			0.459***
			(0.052)			(0.152)			(0.158)
AR(1)				-1.19	-1.33	-1.90	-1.58	-1.97**	-2.37**
[p-value]				[0.23]	[0.18]	[0.06]	[0.11]	[0.05]	[0.02]
AR(2)				-0.00	0.29	-2.27**	0.26	0.84	-1.83
[p-value]				[0.99]	[0.76]	[0.02]	[0.79]	[0.39]	[0.07]
Utest	**1.93****	**2.07****	**2.98*****	0.91	0.85	**1.66****	**2.60*****	**1.89****	**1.87****
[p-value]	**[0.03]**	**[0.02]**	**[0.00]**	[0.18]	[0.19]	**[0.05]**	**[0.00]**	**[0.03]**	**[0.03]**
Extreme point	**9.634**	**8.907**	**9.967**	11.972	10.911	**8.910**	**10.120**	**9.544**	**7.924**

Note: Comparison between LSDVC estimator (Bruno, 2005) and GMM estimators (Arellano and Bond, 1991; Blundell and Bond, 1998 with robust standard errors, AR(k): serial correlation test at 5 % level for order k). *, **, *** imply statistical significance at 10, 5, and 1%, respectively. π_{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, int_rate_{it}: interest rate.

It is important to note that our variants of the baseline regression in (1) do not include the financial crisis 2007-2008 which could result in structural breaks biasing (potentially) our estimators. So, another (separate) robustness task is performed on a regression including a crisis variable and/or controlling for time dummies to capture OECD common changes in inflation and the explanatory variables. We focus on banking_crisis since the global recession that spreads around the world has affected banking systems. The corresponding dates are picked from Laeven and Valencia (2012). Surprisingly, we don't find evidence that the crisis dummy disturbs the inflation path under the period 1998-2010. Turning to time dummies, only year 2 (1999), year 3 (2000) and year 13 (2010) display significant slopes (see Table A.2). Finally, we replicate the results of Tables 4, 5 and 6 and initialize LSDVC estimator by BB (GMM-SYS) instead of AB (GMM-DIFF). The observations confirm our previous findings and are available in Table B.1, Table B.2 and Table B.3 of Appendix B.

An important feature of our first-step results consists of the finding of a high optimal score level of transparency (in some cases, it attains almost 13.6) that varies according to the set of controls included in the specification. That observation is in sharp contrast to that of van der Cruijsen 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 (Table 8). The Sveriges Riksbank (the bank of Sweden), for example, is on the brink of maximum 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[19]. Overall, there was a substantial upward trend of transparency. Horvàth (2014) explained the main forces that underpinned this trend through social interaction regression. 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 (Table 9).

Table 8 Descriptive statistics of central bank transparency: 1998-2010

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Min	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)
Max	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)
Score range	[0, 15]												

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

[19] The score is still superior to 7.5.

Table 9 Emerging OECD countries: Transparency index of Dincer and Eichengreen (2014) in 2010

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

Note: n.a=not available

3.3. Results from another set of controls

Our previous results suggest somehow a causal negative relationship between inflation and economic globalization (H_{01}), as well as an optimal level of transparency highlighted by a statistical support of a quadratic relationship hypothesis between transparency and inflation persistence (H_{02}). However, it is interesting to see if the co-movement between inflation and economic globalization plus the existence of an optimal threshold of transparency are not just a coincidental phenomenon - though a series of robustness checks is already made in Sec. 3.2 and confirms both hypotheses - or are related to the choice of the accompanied controls and to the inflation path observed under the estimation period (1998-2010)[20]. Our point is also motivated by the call of an effective comparison of our results with those of van der Cruijsen et al. (2010), hence we need to replicate our econometric exercise by using their set of controls, correcting for competition, institutions, labor share, technology readiness and customer relations (see Table 1 for the source of these data and their detailed definitions in Appendix C). A note of caution has to be in order here before proceeding to the analysis: According to the Global Competitiveness Report (World Economic Forum), an update of the indicators' weighting composing the overall index computation was introduced since the release of 2006-2007 edition of that Report (World Economic Forum). This caused a restriction on data availability, which are gathered from the web site: http://reports.weforum.org/global-competitiveness-report-2014-2015/. The period under investigation ranges now between 2006 and 2015. The scores of each indicator are calculated from Executive Opinion Survey conducted annually by World Economic Forum. Responses to the Survey questions are scaled from 1 (the lowest possible score) to 7 (the highest possible score). Individual responses are then aggregated at country level in order to produce country scores. Following van der Cruijsen et al. (2010), we exploit two indicators for labor share: the first control is for "production process sophistication" labeled as LS. We expect that upward trend of inflation persistence might be induced by higher labor costs of services (see Lawless and Whelan, 2011; Lünnemann and Matha, 2010). The second control is for "flexibility of wage determination" labeled as WF (Global Competitiveness Report, World Economic Forum). An increase in wage flexibility raises low inflation. Economic literature exploring the link between market competition and inflation suggest that higher competition leads to lower inflation (see for a related literature, Neiss, 2001; Cavelaars, 2003; Przybyla and Roma, 2005). Besides our variable of interest "economic globalization" denoted ecoglob, we test for the effect of globalization through the lens of increased competition. Hence, we use two further proxies: the first one controls for "the intensity of competition in the local market" and labeled as DoC, the second one is exgdp_ the total exports as a share of GDP. By doing so,

[20] We thank an anonymous referee for noting such an interesting point.

we select the one that performs the best in explaining inflation dynamics. We also assume that inefficient institutions contribute to higher inflation persistence. Hence, we introduce the quality of public and private institutions Inst_pub and Inst_priv, both are taken from the Global Competitiveness Report, World Economic Forum. Lastly, we control for technological readiness (TR) and for customer relations which is proxied by the "degree of customer orientations" (CR). While, TR (Global Competitiveness Report, World Economic Forum) should exhibit a negative effect on inflation persistence, inflation is positively related to customer relations indicator (CR). We note that many of those indicators affect inflation persistence but could impact inflation series, as well. Because inflation targeting (IT) is time-invariant in the second sub-sample (2006-2015), we dropped that dummy variable from the regression and keep transparency practices as the second mechanism of interest in controlling inflation stability by central banks. We run various combinations of variables and we finally retain the variants of the specification described in (1) that contain the most of significant explanatory variables (see Table C.2→Table C.4 of Appendix C). We include the above indicators such that concerns about multicollinearity are the least warranted (see Table C.1). Most of the controls have their expected signs. They have similar size and significance across all variants. Clearly, Technology readiness (TR) has a highly significant negative impact on inflation persistence. The indicator of "production process sophistication" (LS) does effect inflation persistence positively as to be expected but doesn't impact inflation in level. Moreover, LS outperforms WF in explaining inflation persistence. The latter has the negative expected sign but is never significant. Although a high correlation is depicted between LS and TR, these indicators remain significant even when included solely in the regression. Our second econometric exercise apprises us of a change in correlation dynamics between economic globalization and inflation: ecoglob has now an insignificant impact on inflation or has a significant effect but shows the opposite sign (Table C.2). Interestingly, exgdp appears to be the most efficient competition representative candidate, followed by "the intensity of competition in local markets" indicator (DoC) which exhibits a negative estimate and keeps the same magnitude in all specifications, but is rarely significant. When estimating specifications including both exgdp and ecoglob variables, exgdp retains the same coefficient's size, sign and significance. This result is not surprising if we refer to the low correlation of 0.0048 between these two proxies (see Table C.1). "Customer relations" impacts significantly both inflation rate and inflation persistence when enters the specification jointly with exgdp, with a positive coefficient of 1.319 and 0.023, respectively (regressions not reported). Lastly, we don't find evidence for the quality of institutions (Inst) in explaining inflation dynamics. Turning to central bank transparency, we observe a negative and significant impact on inflation persistence as well as on inflation series though weaker in the last case, therefore favoring maximum transparency. When the regression jointly comprises economic globalization and transparency, ecoglob loses its significance and H_{01} is rejected. The associated results are reported in Table C.3 and Table C.4. Note that adding this variable – T – to the regression compresses the sample size to 22 countries and the estimation period becomes 2006-2010. Transparency scores range between 6 (moderate) and 14.5 (high). Notwithstanding, some data limitations might play a role in explaining the findings. By re-

estimating the model using pooled OLS, we accept H_{02} if we include standard determinants such as he output gap and the logarithm of GDP per capita[21], the latter is to correct for the level of economic development and if we consider a quadratic relationship between transparency and inflation rate rather than inflation persistence. The second part of overall results' explanation is related to inflation pattern under the estimation period. In fact, three puzzles evolve from inflation dynamics: first, many countries (especially advanced ones) experienced high inflation during 2007-2011 crisis-period. Second, we characterize a sudden fall in inflation rate from 2012 to the middle of 2014. Third, we observe a deflation between 2014 and 2015. Friedrich (2014) nicely examined the first two puzzles, called "twin puzzles" in order to understand inflation behavior since the global financial crisis, in an unrelated work[22]. Indeed, time dummies and/or banking_crisis variable, when added to the regression, turn to be relatively significant (see Table C.3, Table C.4 and Table 10[23]), featuring inflation fluctuations (the switch from high to low) following the crisis period (2007-2008).

Table 10 Impact of central bank transparency on inflation: Pooled OLS with time dummies (2006-2010)

Dependent variable: π_{it}	(1)
T_{it}	-1.291* (0.733)
T_{it}^2	0.059* (0.034)
$outgap_{it}$	0.291*** (0.061)
$Lngdp_{it}$	-1.205** (0.460)
$year_2$	0.812 (0.555)
$year_3$	1.344*** (0.556)
$year_4$	1.048 (0.661)
$year_5$	1.727*** (0.629)
R^2_{adj}	0.449
Ramsey overidentification test [p-value]	2.00 [0.12]
Heteroscedasticity test [p-value]	1.92 [0.16]
Utest [p-value]	**1.58*** **[0.06]**
Extreme point	**10.997**

Note: *, **, *** imply statistical significance at 10, 5, and 1%, respectively. π_{it} : inflation rate, T_{it} : transparency score of Dincer and Eichengreen (2014). $outgap_{it}$: output gap, $Lngdp_{it}$: logarithm of GDP per capita. $year_k$: Dummy variable taking the value 1 at year t and 0 otherwise, $t \in \{2006, 2007, 2008, 2009, 2010\}$.

[21] Table 10 indicates that both indicators are significant. The overidentification test rejects the hypothesis of omitted variables. The adjusted coefficient of determination of 0.45 shows a moderate fit of OLS model.

[22] Some factors such as the variation of economic slacks measured by the output gap contribute to explain the inflation dynamics (Friedrich, 2014).

[23] We didn't find a significant effect of banking_crisis dummy in OLS model.

4. Conclusion

In this paper, we gave a 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 revisited 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 LSDVC is the most suitable estimator in fitting the hypothesis of a quadratic relationship between transparency and inflation persistence compared to GMM estimators[24]

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 Horvàth, 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 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[25], we found that economic globalization did not alter the central banks' tasks in

[24] Some differences are related to the coefficient's size of the *Lngdp* variable which becomes high in magnitude and statistically significant.

[25] There are 8 emerging OECD countries in our sample.

pursuing their price stability primary objective, given the first set of controls under the estimation period (1998-2010). Precisely, inflation is a decreasing function of the sub-index of Dreher et al. (2008).

We examined the extent to which the essence of our multiple estimations in the first econometric task (under the period 1998-2010), prevails if we use a set of controls in the lines of van der Cruijsen et al. (2010). Summarizing:

- Shortened data plus the unusual inflation path under the second estimation period (2006-2015) engender an inconclusive impact of economic globalization (ecoglob) on inflation. At the same time, globalization affects inflation dynamics through enhanced competition channel. In contrast to economic globalization, we found that the exports as a share of GDP turns to be the leading candidate, hence outperforming the intensity of local competition (DoC). This means that some aspects of globalization might prevail others depending on the characteristics of inflation pattern.
- Favoring instead maximum transparency doesn't oppose our primary results because we already observe a high optimal level of transparency (in some cases, it attains 13.6, see Table 5).
- Future work should unravel potential sources explaining inflation path starting 2006 onwards.

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[26]. Lastly, a 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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[26] For instance, van der Cruijsen et al. (2010) claimed 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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Appendix A

Table A. 1 Correlation matrix

	T	ecoglob	outgap	IT	lngdp	openness	int_rate
T	1.0000						
ecoglob	0.2496	1.0000					
outgap	0.1027	0.2764	1.0000				
IT	0.2999	-0.1381	0.0012	1.0000			
lngdp	0.4884	0.3253	-0.0310	-0.1769	1.0000		
openness	-0.0891	0.6278	0.1229	-0.1560	0.1905	1.0000	
int_rate	-0.4351	-0.2732	0.3341	0.2236	-0.5198	-0.1140	1.0000

Table A. 2 Impact of economic globalization and central bank transparency on inflation including time dummies

	(1) inf
L.inf	0.640*** (0.088)
inflagxT	-0.0856*** (0.029)
inflagxT2	0.00473* (0.002)
ecoglob	-0.159*** (0.045)
outgap	0.163*** (0.060)
year2	0.781* (0.426)
year3	1.004*** (0.369)
year13	0.864** (0.424)
N	136

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Note: Bias correction initialized by Arellano-Bond estimator. Bias approximation is accurate up to O(1/n t^2). Bootstrapped standard errors using 50 iterations are between () (Bruno, 2005). `inf`: inflation rate, L.`inf`: lagged inflation rate, `ecoglob`: economic globalization, `inflagxT`: lagged inflation x transparency, `inflagxT2`: lagged inflation x squared transparency, `outgap`: output gap, `N`: the total number of observations.

	(1)
Utest	**1.91****
[p-value]	**[0.03]**
Extreme point	**9.054**

Appendix B

Robustness check using LSDVC estimator that is initialized by a dynamic panel estimate (Blundell-Bond, GMM- SYS) and then relies on a recursive correction of the bias of the fixed effects estimator

Table B. 1 Impact of economic globalization on inflation: Initial results without including central bank transparency

	(1) inf	(2) inf	(3) inf	(4) inf	(5) inf
L.inf	0.362***	0.335***	0.398***	0.222***	0.219***
	(0.052)	(0.051)	(0.049)	(0.067)	(0.046)
outgap	0.162***	0.150***	0.156***	0.102***	
	(0.034)	(0.035)	(0.034)	(0.037)	
ecoglob	-0.182***	-0.197***	-0.174***	-0.157***	
	(0.030)	(0.035)	(0.029)	(0.034)	
IT	-0.981*				
	(0.581)				
openness		0.0141			0.0122*
		(0.012)			(0.007)
lngdp		-1.184***		-0.508*	
		(0.291)		(0.269)	
inflagxIT			-0.245**		-0.207***
			(0.109)		(0.056)
int_rate				0.167***	0.284***
				(0.054)	(0.033)
N	285	285	285	278	417

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Note: Bias correction initialized by Blundell-Bond estimator. Bias approximation is accurate up to O(1/n t^2). Bootstrapped standard errors using 50 iterations are between () (Bruno, 2005). `inf`: inflation rate, L.`inf`: lagged inflation rate, `ecoglob`: economic globalization, `openness` : trade openness, `IT` : inflation targeting dummy, `inflagxIT`: lagged inflation x IT, `outgap`: output gap, `lngdp` : logarithm of GDP per capita, `int_rate` : interest rate. `N`: the total number of observations.

Table B. 2 Impact of economic globalization and Central Bank transparency on inflation: Dincer and Eichengreen (2014) data

	(1) inf	(2) inf	(3) inf	(4) inf	(5) inf	(6) inf
L.inf	0.734***	0.583***	0.563***	0.623***	0.746***	0.795***
	(0.081)	(0.091)	(0.095)	(0.089)	(0.062)	(0.060)
inflagxT	-0.112***	-0.0814***	-0.0993***	-0.0865***	-0.154***	-0.163***
	(0.026)	(0.029)	(0.035)	(0.027)	(0.028)	(0.028)
inflagxT2	0.00430*	0.00292	0.00496*	0.00352	0.00751***	0.00799***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
outgap	0.169***	0.167***	0.166***	0.164**		
	(0.063)	(0.063)	(0.064)	(0.064)		
ecoglob	-0.164***	-0.162***	-0.163***	-0.158***		
	(0.047)	(0.051)	(0.052)	(0.054)		
IT		-1.004	-0.784		-0.154	
		(0.810)	(0.839)		(0.537)	
lngdp			-0.681			
			(0.459)			
inflagxIT				-0.184		
				(0.194)		
openness					0.0295**	0.0292**
					(0.014)	(0.014)
int_rate					0.322***	0.319***
					(0.052)	(0.051)
N	136	136	136	136	244	244

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Note: Bias correction initialized by Blundell -Bond estimator. Bias approximation is accurate up to O(1/n t^2). Bootstrapped standard errors using 50 iterations are between () (Bruno, 2005). `inf`: inflation rate, L.`inf`: lagged inflation rate, `ecoglob`: economic globalization, `openness` : trade openness, `IT` : inflation targeting dummy, `inflagxT`: lagged inflation x Transparency, `inflagxT2`: lagged inflation x squared Transparency, `inflagxIT`: lagged inflation x IT, `outgap`: output gap, `lngdp` : logarithm of GDP per capita, `int_rate` : interest rate. `N`: the total number of observations.

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Utest	**1.82****	1.19	**1.64****	**1.39***	**2.81*****	**3.02*****
[p-value]	**[0.03]**	[0.12]	**[0.05]**	**[0.08]**	**[0.00]**	**[0.00]**
Extreme point	**13.078**	13.946	**10.006**	**12.299**	**10.249**	**10.207**

Table B. 3 Impact of economic globalization and Central Bank transparency on inflation: Dincer and Eichengreen (2014) data_ Lagged values

	(1) inf	(2) inf	(3) inf	(4) inf	(5) inf	(6) inf	(7) inf	(8) inf	(9) inf
L.inf	0.872***	0.104	0.661***	0.859***	0.872***	0.948***	0.361***	1.119***	1.055***
	(0.048)	(0.083)	(0.067)	(0.047)	(0.075)	(0.077)	(0.066)	(0.037)	(0.042)
inf~Tlag_1	-0.193***	0.0432	-0.101***						
	(0.027)	(0.036)	(0.037)						
inf~2lag_1	0.0104***	-0.00379	0.00514						
	(0.003)	(0.003)	(0.004)						
int_rate	0.294***			0.249***		0.0314	0.336***		
	(0.057)			(0.063)		(0.080)	(0.074)		
openness	0.0240*	0.0106	-0.0199	0.0329**	0.0357**	0.0237	0.0301**	0.0234	0.0270*
	(0.013)	(0.021)	(0.019)	(0.013)	(0.015)	(0.016)	(0.013)	(0.015)	(0.015)
outgap		0.153***	0.0925*		0.139***	0.129***		0.170***	0.166***
		(0.055)	(0.051)		(0.045)	(0.047)		(0.041)	(0.045)
ecoglob		-0.182***			-0.145***	-0.0813*		-0.157***	-0.152***
		(0.051)			(0.033)	(0.044)		(0.034)	(0.035)
IT		-1.694*			-0.847			0.322	
		(0.890)			(0.773)			(1.053)	
inflagxIT			-0.319*			-0.211			-0.0578
			(0.191)			(0.163)			(0.184)
inf~Tlag_2				-0.181***	-0.123***	-0.141***			
				(0.035)	(0.038)	(0.037)			
inf~2lag_2				0.00958**	0.00394	0.00566*			
				(0.004)	(0.003)	(0.003)			
inf~Tlag_3							-0.0959***	-0.222***	-0.203***
							(0.035)	(0.037)	(0.041)
inf~2lag_3							0.00597	0.0110***	0.0101***
							(0.004)	(0.003)	(0.003)
N	266	147	147	248	137	132	230	127	127

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Note: Bias correction initialized by Blundell-Bond estimator. Bias approximation is accurate up to O(1/n t^2). Bootstrapped standard errors using 50 iterations are between () (Bruno, 2005). `inf`: inflation rate, L.`inf`: lagged inflation rate, `ecoglob`: economic globalization, `openness` : trade openness, `IT` : inflation targeting dummy, `inf-Tlag_k`: lagged inflation x lagged Transparency at t-k, `inf-2lag_k`: : lagged inflation x squared Transparency at time t-k, `inflagxIT`: lagged inflation x IT, `outgap`: output gap, `lngdp` : logarithm of GDP per capita, `int_rate` : interest rate. `N`: the total number of observations.

	$k=1$	$k=1$	$k=1$	$k=2$	$k=2$	$k=2$	$k=3$	$k=3$	$k=3$
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Utest	**3.72*** **	1.20	**1.44***	**2.39*** **	1.18	**1.73** **	**1.57***	**3.37*** **	**2.83*** **
[p-value]	**[0.00]**	[0.11]	**[0.07]**	**[0.01]**	[0.12]	**[0.04]**	**[0.06]**	**[0.00]**	**[0.00]**
Extreme point	**9.333**	5.696	**9.804**	**9.461**	15.649	**12.453**	**8.040**	**10.058**	**10.076**

Appendix C

Results using the set of controls of van der Cruijsen et al. (2010)

- **Definition of variables**

1 Institutions (`Inst`): A pillar based on various series of public and private institutions. Source: World Economic Forum.

6.01 Intensity of local competition (`DoC`) : It is the survey response statement to "In your country, how intense is competition in the local markets? [1 = not intense at all; 7 = extremely intense]". Source: World Economic Forum, Executive Opinion Survey.

10.04 Exports as a percentage of GDP (`exgdp`): Exports of goods and services as a percentage of gross domestic product. Total exports is the sum of total exports of merchandise and commercial services. Sources: World Trade Organization.

6.15 Degree of customer orientation (`CR`): It is the survey response statement to "In your country, how well do companies treat customers? [1 = poorly – mostly indifferent to customer satisfaction; 7 = extremely well – highly responsive to customers and seek customer retention]". Source: World Economic Forum, Executive Opinion Survey.

7.02 Flexibility of wage determination (`WF`): It is the survey response statement to "In your country, how are wages generally set? [1 = by a centralized bargaining process; 7 = by each individual company]". Source: World Economic Forum, Executive Opinion Survey.

11.07 Production process sophistication (`LS`): "In your country, how sophisticated are production processes? [1 = not at all—production uses labor-intensive processes; 7 = highly—production uses latest technologies]". Source: World Economic Forum, Executive Opinion Survey.

9 Technological readiness (`TR`): A pillar based on the average of various series such as Availability of latest technologies, Firm-level technology absorption, Internet users, etc… Source: World Economic Forum.

- **Econometric results**

Table C. 1 Correlation matrix

	Inst_pub	Inst_p~v	T	IT	WF	LS	ecoglob
Inst_pub	1.0000						
Inst_priv	0.9457	1.0000					
T	0.2347	0.2597	1.0000				
IT	-0.1282	-0.0576	0.0370	1.0000			
WF	-0.1797	-0.1207	-0.3863	0.5070	1.0000		
LS	0.7419	0.7235	0.3501	-0.2664	-0.2550	1.0000	
ecoglob	0.1241	0.1731	-0.0648	0.0954	-0.0901	-0.0195	1.0000
exgdp	0.0929	-0.0226	0.0526	-0.2122	-0.0836	0.0200	0.0048
DoC	0.3121	0.3809	0.3856	-0.0728	0.1045	0.4723	-0.1244
TR	0.7366	0.6387	0.3505	-0.1979	-0.1490	0.7635	-0.0327
CR	0.7142	0.7141	0.0617	-0.1821	-0.0880	0.7888	-0.0162
banking_cr~s	0.1112	0.0689	0.3176	-0.2545	-0.2316	0.1070	-0.0930

	exgdp	DoC	TR	CR	bankin~s
exgdp	1.0000				
DoC	-0.0595	1.0000			
TR	0.1868	0.3034	1.0000		
CR	-0.0423	0.4966	0.5923	1.0000	
banking_cr~s	0.0442	0.0235	0.0885	0.0369	1.0000

Table C. 2 Impact of economic globalization on inflation without including central bank transparnency

	(1) inf	(2) inf	(3) inf	(4) inf	(5) inf	(6) inf	(7) inf	(8) inf	(9) inf	(10) inf
L.inf	0.971***	0.135*	0.339***	0.226***	0.852***	0.125'	0.964***	0.142*	0.872***	0.303***
	(0.063)	(0.078)	(0.077)	(0.083)	(0.069)	(0.083)	(0.063)	(0.086)	(0.069)	(0.083)
ecoglob	0.186*	0.213***	0.143'	0.0496	0.178*	0.227***	0.208**	0.0208	0.198**	0.163'
	(0.101)	(0.077)	(0.101)	(0.125)	(0.094)	(0.076)	(0.102)	(0.130)	(0.094)	(0.103)
exgdp	-0.0598**	-0.0524***	-0.0567**	-0.0503**	-0.0588**					
	(0.028)	(0.019)	(0.024)	(0.026)	(0.026)					
inflagxTR	-0.165**		-0.345**	-0.0557***	-0.175***		-0.166**	-0.0363*	-0.180***	-0.358**
	(0.075)		(0.152)	(0.021)	(0.019)		(0.078)	(0.022)	(0.019)	(0.157)
inflagxWF	-0.0340						-0.0331			
	(0.073)						(0.075)			
inflagxLS			0.273*							0.293*
			(0.157)							(0.162)
banking_~s				-0.206				-0.138		
				(0.689)				(0.698)		
year2				0.0855				0.182		
				(0.626)				(0.643)		
year4				-1.559***				-1.640***		
				(0.581)				(0.598)		
year5				-1.078*				-0.872'		
				(0.564)				(0.592)		
year6				-0.388				-0.473		
				(0.543)				(0.557)		
year7				-0.951'				-1.185*		
				(0.623)				(0.614)		
year8				-1.696***				-1.984***		
				(0.652)				(0.670)		
LS					0.443				0.605	
					(0.999)				(1.015)	
N	238	238	238	238	238	238	238	238	238	238

Standard errors in parentheses
' p<0.2, * p<0.1, ** p<0.05, *** p<0.01

Note: Bias correction initialized by Arellano-Bond estimator. Bias approximation is accurate up to O(1/n t^2). Bootstrapped standard errors using 50 iterations are between () (Bruno, 2005). `inf`: inflation rate, L.`inf`: lagged inflation rate, `ecoglob`: economic globalization, `exgdp`: exports as a share of GDP, `DoC`: degree of competition, `Inst`: quality of private and public institutions, `CR`: customer relation, `LS`: labor share, `inflagxWF`: lagged inflation x wage flexibility, `inflagxTR`: lagged inflation x Technology readiness, `inflagxLS`: lagged inflation x Labor share, `banking_-s`: banking crisis dummy, `year_k`: dummy variable taking the value 1 at year t, $t \in \{2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015\}$. `N`: the total number of observations. `N`: the total number of observations.

Table C. 3 Impact of Central bank transparency on inflation and inflation persistence

	(1) inf	(2) inf	(3) inf	(4) inf	(5) inf	(6) inf	(7) inf	(8) inf	(9) inf	(10) inf
L.inf	0.896***	0.484***	0.391***	0.129	0.232'	0.750***	0.875***	0.862***	1.127***	0.912***
	(0.141)	(0.178)	(0.179)	(0.175)	(0.181)	(0.148)	(0.153)	(0.148)	(0.116)	(0.146)
exgdp	-0.170'	-0.215***	-0.156'		-0.189*		-0.207***	-0.208***	-0.230***	
	(0.107)	(0.101)	(0.095)		(0.103)		(0.092)	(0.091)	(0.090)	
T	-1.272*	-1.133'	-1.252***	-1.611***	-1.126*	-1.810***				
	(0.691)	(0.691)	(0.611)	(0.559)	(0.663)	(0.637)				
inflagxTR	-0.533***	-0.526***	-0.548***	-0.481***	-0.532***	-0.487***	-0.698***	-0.692***	-0.697***	-0.670***
	(0.246)	(0.207)	(0.224)	(0.203)	(0.213)	(0.225)	(0.175)	(0.175)	(0.165)	(0.174)
inflagxLS	0.341'	0.394*	0.439***	0.409***	0.450***	0.312'	0.723***	0.709***	0.677***	0.739***
	(0.243)	(0.207)	(0.223)	(0.199)	(0.210)	(0.221)	(0.217)	(0.220)	(0.206)	(0.213)
banking_~s		2.435*							2.189*	
		(1.469)							(1.224)	
year2		1.106'		0.631	1.225		1.367'	1.202'	1.159'	0.811
		(0.848)		(0.796)	(1.004)		(0.893)	(0.855)	(0.770)	(0.714)
year3		1.603***	1.647***	1.968***	2.401***		2.620***	2.512***	1.783***	2.201***
		(0.692)	(0.625)	(0.715)	(0.838)		(0.745)	(0.691)	(0.655)	(0.684)
year5		-0.595		-0.181					-0.684	-0.244
		(0.876)		(0.779)					(0.756)	(0.738)
DoC				-2.562	-2.307	-1.583	-1.593			-1.420
				(2.166)	(2.239)	(2.457)	(1.977)			(1.975)
year4					0.615		0.697	0.670		
					(0.903)		(0.802)	(0.798)		
inflagxT							-0.129*	-0.124*	-0.131***	-0.164***
							(0.070)	(0.071)	(0.066)	(0.066)
N	80	80	80	80	80	80	80	80	80	80

Standard errors in parentheses
' p<0.2, * p<0.1, ** p<0.05, *** p<0.05

Note: Bias correction initialized by Arellano-Bond estimator. Bias approximation is accurate up to O(1/n t^2). Bootstrapped standard errors using 50 iterations are between () (Bruno, 2005). `inf`: inflation rate, L.`inf`: lagged inflation rate, `exgdp`: exports as a share of GDP, `CR`: customer relations, `DoC`: degree of competition, `T`: transparency score, `inflagxT`: lagged inflation x Transparency, `inflagxTR`: lagged inflation x Technology readiness, `inflagxLS`: lagged inflation x Labor share, `banking_~s`: banking crisis dummy, `year_k`: dummy variable taking the value 1 at year t, $t \in \{2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015\}$. `N`: the total number of observations.

Table C. 3 Impact of Central bank transparency on inflation (*continued*)

	(1) inf	(2) inf	(3) inf
L.inf	1.098***	1.480***	1.044***
	(0.185)	(0.149)	(0.156)
outgap	0.409***	0.400***	0.371***
	(0.066)	(0.063)	(0.053)
DoC	-2.516*		
	(1.313)		
T	-0.484	-0.382	-0.185
	(0.426)	(0.444)	(0.439)
inflagxTR	-0.301**	-0.472***	-0.350**
	(0.144)	(0.140)	(0.147)
inflagxLS	0.001	0.124	0.104
	(0.162)	(0.157)	(0.164)
year2	-1.681**	-2.250***	
	(0.773)	(0.722)	
year3	-0.335	-0.881'	
	(0.523)	(0.592)	
year5	-0.629	-1.160*	
	(0.572)	(0.644)	
exgdp		-0.195**	-0.184***
		(0.078)	(0.058)
banking_~s			2.024**
			(0.804)
year4			0.987*
			(0.528)
CR			
N	48	48	48

Standard errors in parentheses
' p<0.2, * p<0.1, ** p<0.05, *** p<0.01

Note: Bias correction initialized by Arellano-Bond estimator. Bias approximation is accurate up to O(1/n t^2). Bootstrapped standard errors using 50 iterations are between () (Bruno, 2005). `inf`: inflation rate, L**.**`inf`: lagged inflation rate, `exgdp`: exports as a share of GDP, `CR`: customer relations, `DoC`: degree of competition, `T`: transparency score, `inflagxTR`: lagged inflation x Technology readiness, `inflagxLS`: lagged inflation x Labor share, `outgap`: output gap, `banking_~s`: banking crisis `dummy`, `year_k`: dummy variable taking the value 1 at year t, $t \in \{2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015\}$. `N`: the total number of observations.

Table C. 4 Impact of Economic globalization and Central bank transparency on inflation and inflation persistence

	(1) inf	(2) inf	(3) inf	(4) inf
L.inf	0.310*	0.490***	1.129***	0.858***
	(0.182)	(0.177)	(0.119)	(0.149)
ecoglob	0.0806	0.0584	0.130	0.142
	(0.355)	(0.343)	(0.288)	(0.310)
exgdp	-0.201*	-0.219**	-0.237***	-0.214**
	(0.106)	(0.103)	(0.091)	(0.091)
T	-0.855	-1.121'		
	(0.669)	(0.702)		
inflagxTR	-0.530**	-0.522**	-0.690***	-0.682***
	(0.220)	(0.213)	(0.169)	(0.180)
inflagxLS	0.427**	0.388*	0.671***	0.702***
	(0.218)	(0.213)	(0.207)	(0.221)
year2	0.976	0.998	0.899	0.952
	(1.166)	(0.871)	(0.825)	(1.034)
year3	2.304***	1.582**	1.734***	2.500***
	(0.833)	(0.677)	(0.637)	(0.685)
year4	0.634			0.707
	(0.923)			(0.784)
banking_cr~s		2.449'	2.211*	
		(1.511)	(1.227)	
year5		-0.616	-0.725	
		(0.874)	(0.743)	
inflagxT			-0.133**	-0.127*
			(0.067)	(0.072)
N	80	80	80	80

Standard errors in parentheses
' p<0.2, * p<0.1, ** p<0.05, *** p<0.01

Note: Bias correction initialized by Arellano-Bond estimator. Bias approximation is accurate up to O(1/n t^2). Bootstrapped standard errors using 50 iterations are between () (Bruno, 2005). `inf`: inflation rate, L.`inf`: lagged inflation rate, `ecoglob`: economic globalization, `exgdp`: exports as a share of GDP, `CR`: customer relations, `DoC`: degree of competition, `T`: transparency score, `inflagxT`: lagged inflation x Transparency, `inflagxTR`: lagged inflation x Technology readiness, `inflagxLS`: lagged inflation x Labor share, `banking_cr~s`: banking crisis dummy, `year_k`: dummy variable taking the value 1 at year t, $t \in \{2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015\}$. `N`: the total number of observations.