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Central Bank Independence and the Dynamics of Public Debt?

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Abstract: Inspired from a simple theoretical macroeconomic model, proposed by Ozkan *et al.* (2010), which shows a positive link between public debt issues and central bank independence, we empirically investigate if central bank independence affects the way that net stock of government securities and public debt are altered by important macroeconomic variables. Our research has been focused on various levels of independence of the central bank of 22 countries from 1992 to 2000, where significant changes in the index of independence for a large number of central banks have been occurred. By applying dynamic panel data analysis, we show that central bank independence has a significant impact on the effects of deficit, GDP growth and government bonds yield on government bond issues and public debt. The latter result implies that higher levels of central bank independence make countries more affected by market conditions.

Keywords: Central bank independence, public debt, panel data.

JEL classification numbers: E52, E58.

1. Introduction

The issue of public debt sustainability for a large number of eurozone member countries has been the focus of serious attention recently as well as the role of the European Central Bank (ECB) as a possible solution to this problem. It is mainly argued that the austerity being imposed on country after country will negatively affect GDP growth, leading to higher unemployment, less tax revenue coming in and more unemployment benefits and other transfers being paid out. The resulting higher deficits will worsen the solvency of the government, leading to an increase in the cost of borrowing. Therefore, governments facing high deficits and debts should be directly financed by the ECB. On the other hand, article 123 of the Lisbon treaty prevents the ECB from lending to governments, guaranteeing thus its independence. Under these circumstances, the raising question is whether the ECB will take the steps needed to guarantee the sovereign debt of the countries in the eurozone as the lender of last resort in a crisis period.

Regardless of the fact that considering unelected officials in the conduct of monetary policy creates a democratic deficit (Stiglitz, 1998), theoretical support in favor of less central bank independence can be derived from Ozkan *et al.* (2010). Using an analytical framework to compare an independent central banking arrangement and a centralized one where a government chooses both monetary and fiscal instruments, they have shown that central bank independence leads to a higher public debt in equilibrium, and therefore raises the cost of borrowing. However, this theoretical consideration has not been examined empirically.

On the contrary, the benefits of central bank independence from a theoretical point of view are implied on the seminal papers of Kydland and Prescott (1977), and Barro and Gordon (1983). Acknowledging that monetary policy is conducted under tremendous uncertainty concerning the economy as a whole, they have shown that only an unanticipated monetary policy could affect macroeconomic variables in an environment where economic agents form their anticipations rationally. In this context, Barro and Gordon (1983) demonstrated that there is always a tradeoff

between credibility and flexibility since the difference between output stabilization and price stability can be viewed as the main difference between discretion and rules. Therefore, the time consistent monetary policy is the one conducted in a discretionary manner, but evolves an inflationary bias. Rogoff (1985) proposed to delegate the monetary policy to conservative and independent central banks in order to gain in credibility and be able to reduce the bias created.

In the empirical literature, a large strand of research is focused on the effects of central bank independence on macroeconomic performance¹, mainly on inflation and output growth (level and variability). Early empirical studies including Bade and Parkin (1982), Alesina (1988; 1989), Grilli *et al.* (1991) found that central bank independence is associated with lower levels of inflation. For instance, Cukierman *et al.* (1992) find that legal independence is an important and statistically significant determinant of price stability in industrial countries but not in developing countries. Moreover, Diana and Sidiropoulos (2004) indicate the beneficial effect of central bank independence on the sacrifice ratio. In contrast to these studies, Cecchetti and Krause (2002) found no influence of central bank independence on the level and variability of inflation. Klomp and De Haan (2010) conclude that there exists no general significant negative relation between central bank independence and inflation, except from a minority of the countries in their sample. As for Ismihan and Ozkan (2004), they argue that although central bank independence delivers lower inflation in the short-term, it may be detrimental for future growth potential. As a consequence, central bank independence is less likely to achieve lower inflation in the long-run.² Carlstrom and Fuerst (2009) have shown that central bank independence is responsible for nearly two-thirds of the decline in inflation for industrialized countries as a whole and Arnone *et al.*

¹ Berger *et al.* (2001) and Cukierman (2008) provide an overview of accumulated empirical evidence on the relation between central bank independence and macroeconomic performance.

² In contrast to Ismihan and Ozkan (2004), Brumm (2006) believes that their econometric method is problematic and finds that even if the sample is limited to developing countries, there is always a strong negative relation between central bank independence and inflation.

(2009), using an updated measure of central bank independence, have found that central bank independence is beneficial in terms of less inflation.

Concerning the effects on output, Alesina and Summers (1993) have found no relation between the variability of output growth and central bank independence. Cecchetti and Krause (2002) have shown that the variability of output is not significantly affected by central bank independence. However, reversing the causality between output and independence, Crosby (1998) arrived to the conclusion that countries with lower output variability are more likely to choose to have an independent central banker.

Regarding the effects of central bank independence on financial markets, Alesina and Summers (1993), using cross section evidence, argue that interest rate variability is decreasing with higher central bank independence, suggesting that more credible central banks benefit from less volatile interest rates. Contrary to this study, several authors (Clare and Courtenay, 2001, Chadha and Nolan, 2001, and Biefang-Frisancho and Howells, 2006), examining the relation between central bank independence and the response of financial markets to news related to monetary policy, do not come to the same conclusions. Another study proposed by Klomp and De Haan (2009) have found a significant and robust negative relation between central bank independence and financial instability, which is mostly due to political independence. However, more recently Papadamou *et al.* (2015) have shown both theoretically and empirically that central bank independence may increase stock market volatility highlighting the important role of central bank transparency in stabilizing financial markets.³

Recent literature has also been exploring the relationships between CBI and the conduct of monetary policy. Down (2008) demonstrated that politically autonomous central banks are more likely to be engaged in disinflation in any given year than are politically dependent central banks, highlighting that central bank independence may well deliver price stability, but not without cost

³ See also Papadamou *et al.* (2014) for monetary policy transparency effects on stock market volatility.

in terms of higher sacrifice ratios, leading to a sharper economic contraction. Alpanda and Honig (2009; 2010), examining the extent to which monetary policy is manipulated for political purposes during elections, have found evidence of the latter in developing countries that lack central bank independence. Furthermore, they also suggest that political monetary cycles are not the result of monetization of fiscal expansions but political pressures on the central bank to exploit the Phillips curve. Moreover, Alesina and Stella (2010) have shown that in a period of crisis, there is no place for central bank independence, meaning that the government should override the central bank when the realization of output shocks is above a certain threshold. Cukierman (2011) argues that, in normal times, the central bank must conduct monetary policy in an independent manner, mentioning also the need of fiscal cooperation in ensuring a sustainable fiscal budget. In crises periods, if we assume that monetary authorities have the ability to respond more quickly, it can be more efficient for the central bank to undertake such fiscal operations. But, this flexibility means the central bank risks political exposure, threatening thus the central bank's independence.

However, the above studies do not consider the effects of central bank independence on public debt issues. In this context, we contribute to the existing empirical literature on the effects of central bank independence by providing evidence on the theoretical considerations of Ozkan *et al.* (2010) and shed light to the ongoing debate regarding the role of central bank in a sovereign debt crisis.⁴

In order to take into account the country specific effects and the meaningful temporal variation in dependent and explanatory variables we use dynamic panel data approach to evaluate the effects of the central bank independence on public debt. Specifically, we analyze the indirect effect of central bank independence through the deficit as percentage of GDP, the 10 year government

⁴ Dai (2009) provides an analytical solution on the relationship between central bank transparency and public debt in an open economy framework.

bond yield, and the GDP growth respectively on the net changes in stock of domestic government debt securities as percentage of GDP, and the general government debt over GDP for the 1992-2000 time period.

This paper is structured as follows: Section 2 discusses briefly data and the empirical methodology. Section 3 discusses the effects of central bank independence on government bonds issuing and general government debt and section 4 concludes.

2. Data and Methodology

2.1 The Data

In the literature several methods to construct central bank independence index are proposed (Bade and Parkin, 1982 ; Grilli et al., 1991; Cukierman *et al.*, 1992; Fry *et al.*, 2000 and Arnone *et al.*, 2006).⁵ The most widely employed index is due to Cukierman *et al.* (1992). This index is based on four legal characteristics as described in a central bank's charter.

First, if the appointment of the chief executive is proposed by the central bank board rather than by the prime minister or minister of finance, is not subject to dismissal, and has a long term of office, then the central bank is more independent and avoids political pressures. Second, the level of central bank independence is higher if policy decisions are made independently of government involvement. Third, the central bank gains in independence if the central bank's charter states that price stability is the primary goal of monetary policy. Fourth, if the government's ability to borrow from the central bank is limited, then central bank independence is increased.

Cukierman *et al.* (1992) combine thus these four aspects into a single measure of legal independence which ranges from zero to one. In our empirical analysis, we use the index proposed by Polillo and Guillén (2005) who used Cukierman *et al.*'s (1992) methodology to

⁵ See Eijffinger and De Hann (1996) and Arnone *et al.* (2006) for a literature review on the independence index.

construct an independence index for a large sample of countries (92 countries) and for a longer period of time (1989-2000) to assess the effects of central bank independence on government bond issues and public debt.

For the purposes of the analysis that follows, annual data on the general government debt and deficit as percentages of the GDP are gathered from the OECD database. Moreover, the Bank for International Settlement (BIS) provides the data for the change in the stock of the domestic government debt securities. The GDP growth rate and real GDP levels in \$ are provided by the International Financial Statistics of the IMF. The government bond yields for ten-year maturity bonds are collected from the database Ecowin Reuters. The sample covers the period 1992 to 2000 on an annual frequency.

2.2 Empirical methodology

By using panel data analysis, the theoretical model developed by Ozkan *et al.* (2010) concerning the effect of central bank independence on net issues of government bonds will be investigated empirically. Panel data methodology presents a number of significant advantages compared to times series analysis. Among others Baltagi (2001) and Hsiao (1986) indicate that panel data methodology controls for individual heterogeneity, reduces problems associated with multicollinearity and estimation bias, and specifies the time varying relation between dependent and independent variables. In order to take into account the country specific effects and the meaningful temporal variation in dependent and explanatory variables we use panel data approach to evaluate the effects of the central bank independence on government bond issuing and public debt, for the 1992-2000 time period.

In our study, we estimate how the general government deficit, the cost of borrowing on long term bonds and the GDP growth affect the changes in stock of government bonds as percentage of GDP. However, our main effort is to investigate how the level of central bank independence

might affect these relationships. Similarly, we expect the changes in the Debt over GDP ratio to be affected by the level of central bank independence. In order to shed light on this direction, cross terms of these variables with the CBI index are augmented in our baseline model. The level of central bank independence is measured by the broad index proposed by Polillo and Guillén (2005) for our sample countries. Our data set consists by 22 countries that the majority of them experienced significant changes in the level of their central bank independence over the period 1992 to 2000.⁶ We estimate a dynamic panel model of the following form based on theoretical arguments of Ozkan *et al.* (2010).

$$y_{i,t} = a_0 + a_1 y_{i,t-1} + \sum_{j=0}^1 b_{1j} Def_{t-j} + \sum_{j=0}^1 c_{1j} GB10_{i,t-j} + \sum_{j=0}^1 d_{1j} GDPgrowth_{i,t-j} + \mu_i + e_{i,t}, \quad (1)$$

where $y_{i,t}$, the net changes in stock of domestic government debt securities as percentage of GDP, is the dependent variable in our first model (the general government debt over GDP in our second model); the deficit as percentage of GDP (Def), the 10 year government bond yield ($GB10$), and the GDP growth ($GDPgrowth$) are the regressors, while $e_{i,t}$ are the error terms for $i=1,2,\dots,M$ cross-sectional units, observed for $t=1,2,\dots,T$ dated periods. The parameter a_0 represents the overall constant in the model, while the μ_i represent cross-section specific effects.

As can be easily seen equation (1) poses a dynamic error-components model. Substantial complications arise in the estimation of this model using OLS. In both the fixed and random effects settings, the lagged dependent variable is correlated with the error term, even if the disturbances are not autocorrelated. Arellano and Bond (1991) develop a generalized method of moments (GMM) estimator that solves the problems using the first difference of the equation (1).

$$\Delta y_{i,t} = a_0 + a_1 \Delta y_{i,t-1} + \sum_{j=0}^1 b_{1j} \Delta Def_{t-j} + \sum_{j=0}^1 c_{1j} \Delta GB10_{i,t-j} + \sum_{j=0}^1 d_{1j} \Delta GDPgrowth_{i,t-j} + (e_{i,t} - e_{i,t-1}) \quad (2)$$

⁶ This is our basic argument for including more eurozone countries.

Estimation of (2) requires an instrumental variable procedure to correct for the endogeneity as well as the correlation between the lagged difference of the dependent variable and $\varepsilon_{i,t-1}$. However, one of the major disadvantages of this method is that removes the long-run cross-country information present in the levels of the variables. Moreover, if the independent variables display persistence over time (which is the case for CBI⁷), their lagged levels will be poor instruments for their differences.

According to Arellano and Bover (1995), an alternative GMM estimator that overcomes these problems can be constructed. By assuming that the explanatory variables are uncorrelated with the individual effects more moment conditions are available. In this case, lagged differences of these variables and of the dependent variable may also be valid instruments for the levels equation. Then, the set of moment conditions available for the first-differenced equations with the additional moment conditions implied for the levels equation can be used combined in the estimation process. Blundell and Bond (1998) show that this system GMM estimator is preferable to that of Arellano and Bond (1991) when the dependent variable and/or the independent variables are persistent.

Moreover, if the model is over-identified, the Sargan tests of orthogonality between the instruments and the residuals, and the tests of second- or higher order residual autocorrelation, can provide useful information about the validity of the assumptions underlying the system estimators. Finally, due to possible heteroskedasticity problems our models are estimated with robust standard errors.

In order to identify if and how the level of central bank independence may affect the relationship between y and explanatory variables our baseline model is augmented with cross-terms based on

⁷ Klomp and de Haan (2009) argued also that Central Bank Independence variable displays significant persistence over time.

CBI index. Therefore equations (1) and (2) are formulated accordingly to (3) and (4) in order to test the effect of Central Bank Independence:

$$y_{i,t} = a_0 + a_1 y_{i,t-1} + \sum_{j=0}^1 b_{1j} Def_{t-j} + \sum_{j=0}^1 c_{1j} GB10_{i,t-j} + \sum_{j=0}^1 d_{1j} GDPgrowth_{i,t-j} + \sum_{j=0}^1 b_{2j} (CBI \times Def)_{t-j} + \sum_{j=0}^1 c_{2j} (CBI \times GB10)_{i,t-j} + \sum_{j=0}^1 d_{2j} (CBI \times GDPgrowth)_{i,t-j} + \mu_i + e_{i,t} \quad (3)$$

$$\Delta y_{i,t} = a_0 + a_1 \Delta y_{i,t-1} + \sum_{j=0}^1 b_{1j} \Delta Def_{t-j} + \sum_{j=0}^1 c_{1j} \Delta GB10_{i,t-j} + \sum_{j=0}^1 d_{1j} \Delta GDPgrowth_{i,t-j} + \sum_{j=0}^1 b_{2j} \Delta (CBI \times Def)_{t-j} + \sum_{j=0}^1 c_{2j} \Delta (CBI \times GB10)_{i,t-j} + \sum_{j=0}^1 d_{2j} \Delta (CBI \times GDPgrowth)_{i,t-j} + (e_{i,t} - e_{i,t-1}) \quad (4)$$

3. Empirical Results

3.1 Preliminary Analysis

Before getting into regression results, as preliminary analysis, Table 1, provides information about the average level of debt, deficit, bond yields and GDP growth in the whole sample period for every country. The countries are sorted descending by their average values. It is easily seen that countries like Greece, Italy, Belgium and Portugal presented increased level of debt over GDP and increased level of deficit over GDP. The cost of borrowing for countries like Greece, Portugal and Spain is also high by looking Government bond yields in 10 years maturity bonds.

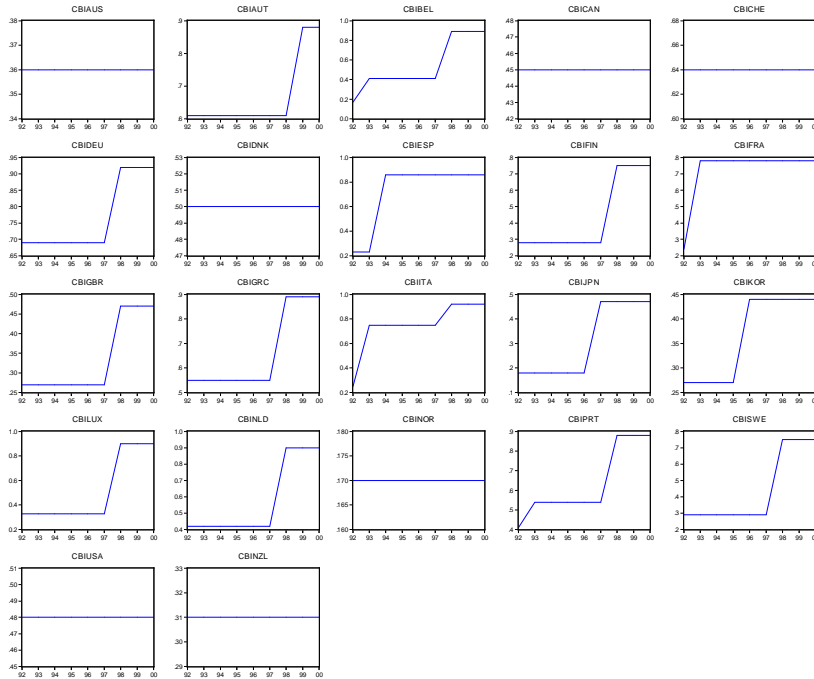
Table 1 Sort descending by mean values of variables over the period 1992-2000

Country	Gov. Debt % of GDP	Country	Deficit % of GDP	Country	Gov. Bond Yield %	Country	GDP Growth %	Country	Δ in Stock of Gov Bonds % of GDP
BEL	131.36	GRC	7.72	GRC	14.35	LUX	6.26	BEL	2.33
ITA	120.43	ITA	6.98	KOR	11.61	KOR	5.83	GRC	2.20

GRC	100.60	PRT	5.01	ITA	8.74	AUS	3.93	FIN	1.92
CAN	94.78	ESP	4.69	PRT	8.57	USA	3.67	JPN	1.76
JPN	89.37	BEL	4.52	ESP	8.16	CAN	3.51	FRA	1.38
NLD	86.19	CAN	4.35	SWE	7.59	NZL	3.33	ESP	1.36
SWE	77.10	SWE	4.33	AUS	7.52	NOR	3.08	NLD	1.16
DNK	73.78	FRA	4.06	FIN	7.41	NLD	3.05	CAN	1.09
USA	68.11	JPN	4.05	NZL	7.26	FIN	3.05	DNK	0.99
PRT	66.38	GBR	4.02	GBR	7.08	ESP	3.04	AUT	0.99
ESP	66.27	AUT	3.45	CAN	6.88	PRT	2.87	DEU	0.96
AUT	65.37	DEU	3.32	DNK	6.83	GBR	2.86	GBR	0.95
FRA	58.83	FIN	3.24	NOR	6.79	SWE	2.68	CHE	0.91
FIN	55.43	NLD	2.88	BEL	6.43	AUT	2.44	KOR	0.89
DEU	52.19	USA	2.80	FRA	6.30	BEL	2.24	SWE	0.88
NZL	48.87	AUS	2.45	USA	6.25	DNK	2.17	USA	0.81
GBR	46.90	CHE	2.24	AUT	6.22	GRC	2.15	ITA	0.79
CHE	46.32	DNK	1.82	LUX	6.22	FRA	2.12	PRT	0.47
NOR	34.34	NZL	-0.40	NLD	6.07	DEU	1.75	NZL	0.47
AUS	33.79	LUX	-2.05	DEU	6.04	ITA	1.62	NOR	0.45
LUX	10.19	KOR	-2.56	CHE	4.20	CHE	1.33	LUX	0.15
KOR	7.62	NOR	-2.62	JPN	3.11	JPN	0.97	AUS	-0.41

Figure one shows the evolution of the central bank's level of independence for the twenty-two countries studied. There are six countries that during the period studied there have been no changes in the level of CBI index (USA, Canada, New Zealand, Norway, Denmark and Switzerland). In Italy, Belgium, Portugal and Spain there have been gradual changes in the level of independence. While in Germany, Nederland, Finland and Greece there is a substantial change during the year 1997. The latter observation has to do probably with the discount of the ECB creation. The maximum value that the index takes is the 0.92 while the minimum is 0.17.

Figure 1: The evolution of the CBI index in the 22 countries



3.2 Estimation Results from panel data analysis

Table 2 presents the results of estimating model (1) for the net changes in stock of domestic government debt securities over GDP as the dependent variable, by using Arellano-Bover/Blundell-Bond estimators. As far as the signs are considered, we observe that significant GDP growth is negatively related with changes in stock of domestic government debt securities. This implies that economic growth can help in reducing significantly the debt issues for that set of countries by disconnecting countries from market conditions.

Table 2 The impact of CBI on the effects of explanatory variables on Net Dom. Gov. Bond Issues / GDP

Explanatory Variables	System GMM					
	Model (1)			Model (2)		
	Coef.	z	P> z	Coef.	z	P> z
(Net Dom. Gov. Bond Issues /GDP) _{t-1}	0.147	1.310	(0.18)	0.116	1.040	(0.29)
(Gov. Bond Yield -10y) _{it}	-0.099	-1.290	(0.19)	0.067	0.480	(0.63)
(Gov. Bond Yield -10y) _{it-1}	0.264	2.210	(0.02)**	0.427	2.710	(0.00)***
(Deficit) _{it}	-0.068	-1.300	(0.19)	0.026	0.220	(0.82)
(Deficit) _{it-1}	-0.023	-0.650	(0.51)	-0.171	-2.210	(0.02)**
(GDP Growth) _{it}	-0.176	-2.660	(0.00)***	-0.198	-1.770	(0.07)*
(GDP Growth) _{it-1}	-0.031	-0.510	(0.60)	-0.185	-2.500	(0.01)**
(CBI x Gov. Bond Yield -10y) _{it}				-0.350	-1.470	(0.14)
(CBI x Gov. Bond Yield -10y) _{it-1}				-0.324	-2.110	(0.03)**
(CBI x Deficit) _{it}				-0.130	-0.600	(0.54)
(CBI x Deficit) _{it-1}				0.311	2.410	(0.01)**
(CBI x GDP Growth) _{it}				0.119	0.490	(0.62)
(CBI x GDP Growth) _{it-1}				0.439	2.690	(0.00)***
Constant	0.249	0.350	(0.72)	-0.065	-0.070	(0.94)
Number of Countries			22			22
Number of Years			8			8
Number of Observations			176			176
Arellano-Bond test AR(1) (p-value)			(0.07)*			(0.08)*
Arellano-Bond test AR(2) (p-value)			(0.80)			(0.72)
Sargan test (p-value)			(0.37)			(0.77)

Note: *,** and *** indicate statistical significance at the 10%, 5%, and 1% level respectively. Cluster-robust standard errors (to account for both heteroskedasticity and autocorrelation) are used in order to calculate the p-values in parenthesis. All values in parenthesis are p-values of the tests.

As far as deficit is considered, our results indicate that domestic bond issues are not the major source of financing the deficit for these countries especially over the period studied.⁸ By looking the effect of government bond yields on net issues it seems that previous year bond yields positively affect the net stock change of bond securities. Given that our measure of stock changes in the domestic debt securities is not clearly decomposed between short and long-term bonds this effect may be explained possibly by the time structure of debt securities. The government recognizing that it is costly to issue long term bonds due to high bond yields in the market in the previous year may decide to increase the issue of short maturity bonds. An alternative possible

⁸ Low development of domestic bond markets for many of our countries studied in period between 1992-2000

explanation, in case that these issues are in their majority long-term bonds, is that government in order to attract investors accepts to issue bonds with high coupons⁹.

However, the really interesting findings, is that, these effects may be significantly affected by the level of the central bank independence. The effect of cost of borrowing induced by 10 year government bond yield on securities issues is negative and statistically significant, for countries that present high levels of central bank independence. This implies that these countries are more affected by pricing of debt in markets, in their decision to issue new debt. Moreover, the effect of deficit on bond issues is positive and statistically significant for the lag term. This means that countries with higher level of independence are more constrained in financing deficit by increasing bond issues. That is making also more dependent in market conditions. GDP growth in general reduces the possibility of issuing debt securities, but in countries with high central bank independence GDP growth is directly correlated with debt issues. Therefore the beneficial effect of economic growth by disconnecting countries by markets is significantly reduced in case of increased level of central bank independence. Overall, higher level of central bank independence makes countries more dependent on the security markets and its relevant conditions.

The last part of Table 2 presents the number of observations used and two important diagnostic tests since the consistency of the GMM estimator depends on the validity of the instruments. The Sargan test examines the overall validity of the instruments. While Arrelano-Bond tests investigate the hypothesis that the error term $e_{i,t}$ is not serially correlated. As can be easily seen, the Sargan test provides no evidence of misspecification, while the serial correlation tests point to first- but no second-order autocorrelation of the residuals, which is in accordance with the assumptions underlying the selection of the instruments.

⁹ An increase in bond yields in the secondary market can be achieved due to a possible significant selling activity of investors in the market driven mainly by increased risk about this country. The prices decrease and yields increase given the bond valuation procedure.

Given that a significant part of debt is not financed through securities issuing in many countries and especially over the period studied in our paper, the same methodology is applied on the level of debt/GDP in case of the net stock change of Debt Securities / GDP ratio. We thus focus on the effects of CBI on debt for the countries of our sample. Table 3 provides the empirical results of a balanced panel.

Table 3 The impact of CBI on the effects of explanatory variables on Debt/GDP

Explanatory Variables	System GMM					
	Model (1)			Model (2)		
	Coef.	z	P> z	Coef.	z	P> z
(Debt/GDP) _{t-1}	0.828	17.670	(0.00)***	0.829	19.670	(0.00)***
(Gov. Bond Yield -10y) _{it}	-0.713	-2.370	(0.02)**	-0.073	-0.170	(0.87)
(Gov. Bond Yield -10y) _{it-1}	-0.228	-0.900	(0.37)	0.547	1.520	(0.13)
(Deficit) _{it}	1.082	6.520	(0.00)***	0.376	0.930	(0.35)
(Deficit) _{it-1}	0.161	0.800	(0.42)	-0.181	-0.450	(0.65)
(GDP Growth) _{it}	-0.052	-0.340	(0.73)	-0.601	-2.020	(0.04)**
(GDP Growth) _{it-1}	-0.643	-2.790	(0.01)**	-1.417	-4.160	(0.00)***
(CBI x Gov. Bond Yield -10y) _{it}				-1.005	-2.060	(0.04)**
(CBI x Gov. Bond Yield -10y) _{it-1}				-1.727	-3.690	(0.00)***
(CBI x Deficit) _{it}				1.632	2.180	(0.03)**
(CBI x Deficit) _{it-1}				1.181	1.730	(0.08)*
(CBI x GDP Growth) _{it}				1.543	2.430	(0.02)**
(CBI x GDP Growth) _{it-1}				1.935	3.100	(0.00)***
Constant	17.370	4.120	(0.00)***	14.011	3.410	(0.00)***
Number of Countries			22			22
Number of Years			8			8
Number of Observations			162			162
Arellano-Bond test AR(1) (p-value)			(0.00)***			(0.00)***
Arellano-Bond test AR(2) (p-value)			(0.32)			(0.30)
Sargan test (p-value)			(0.18)			(0.14)

Note: *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level respectively. Cluster-robust standard errors (to account for both heteroskedasticity and autocorrelation) are used in order to calculate the p-values in parenthesis. All values in parenthesis are p-values of the tests.

Firstly, the lagged dependent variable has a significant positive effect on the current level of debt. Secondly, as it is theoretically expected a positive increase in deficit coexists with higher level of debt by governments. However, the above effect depends on the level of central bank independence. The higher is the level of central bank independence, the less the monetisation of the debt. As a result, the government meets its debt obligations by issuing new debt, increasing

thus the deficit. That means that countries are more dependent on their fiscal decisions than others with lower levels of central bank independence.

Moreover, our results indicate the beneficial negative effect of GDP growth on debt. However, another important point is that countries that give the mandate of price stability to an independent central bank the GDP growth is positively correlated with debt. The inflation aversion of a conservative central banker (Rogoff type) leads to a more restrictive monetary policy with higher interest rates (cost of borrowing), decreasing therefore investment and the output growth. Both higher interest rates and low output growth are positively correlated to the debt, affecting thus the dynamics of debt.

4. Concluding Remarks

The issue of public debt sustainability raises an important policy issue that go beyond the recent austerity measures imposed on some of the eurozone countries. While central bank characteristics, such as independence, have been largely acknowledged by both academics and policymakers as important features for macroeconomic performance, there is a debate on whether the central bank should intervene more actively in the debt market. The fruition of this ambitious objective rests on whether the level of central bank independence may affect the dynamics of debt.

In this paper, the relationship between central bank independence and relevant government debt issues will be drawn. In this context, empirical evidence on main theoretical propositions by Ozkan *et al.* (2010) for the indirect effect of independence on government bond issues and government bond debt is provided. By using panel data analysis for 22 countries, during the period of significant changes in the degree of central bank independence, we indicate that a high level of independence may significantly affect the effects of a series of macroeconomic variables

on the issuance of government bonds and government debt. This implies that countries are more affected by market conditions the higher is the level of central bank independence.

More specifically, our results indicate that an independent central banker may worsen the effect of deficit on debt. Moreover, sensitivity of the debt to the cost of borrowing is affected by the degree of independence of the central banker. Finally, the beneficial effect of GDP growth on debt activity is reduced significantly in countries that decide to increase the level of independence of the central banker. These results may imply that the role of central bank intervention on the debt market may be crucial. By taking actions that significantly reduce the cost of borrowing some aspects of the institutional role of central banks should be reconsidered. In conclusion, less independent central banks may reduce the effect of markets on the debt of countries.

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