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Business cycle determinants and fiscal policy: A Panel ARDL approach for EMU ☆

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ABSTRACT

In a monetary union, fiscal policy is probably the most important tool in dealing with country-specific fluctuations. This paper addresses some fundamental economic questions regarding the determinants of business cycles in the EMU in the time period 1995- 2012. More precisely, it acknowledges the significant role of fiscal policy and estimates relevant models for EMU countries where trade openness and other crucial variables are investigated. Various relevant econometric techniques have been employed, such as Panel ARDL. Social benefits are found to be the most important variable, whereas capital expenditures and indirect taxes are the major pro-cyclical variables. Furthermore, the formation of the EMU, along with the increasing trade openness, suggests a clear cut countercyclical effect. In other words, the common monetary policy and the deeper financial integration constitute reasons for the decrease in the magnitude of the fluctuations.

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1. Introduction

According to the IMF (2005), the determinants of output volatility may be broadly grouped in the following categories: the stability of macroeconomic policies (Fatás & Mihov, 2003), trade and financial integration, financial sector development (Easterly, Islam & Stiglitz, 2001; Kose, Prasad & Terrones, 2003; Raddatz, 2003), and the quality of institutions (Acemoglu, Robinson & Thaicharoen, 2003).

Also, business cycles fluctuations are often related to trade openness, despite the fact that the pro(counter)cyclical character of trade openness remains open (see Rodrik (1998) Easterly et al. (2001), Kose et al. (2003), Bejan (2006), Bekaert, Harvey and Lundblad (2006) and Cavallo, Powell and Rigobon (2008)). Furthermore, business cycle volatility is often related to financial integration, and to trade shocks (Kose, 2001) through foreign demand shocks (Senhadji, 1998). Furceri and Karras (2007) attribute business cycle volatility to the size of the population of a country and thus

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to economies of scale, whereas Kose et al. (2003) argue that business cycles volatility differs from emerging markets to developed ones.

Of course, business cycle fluctuations are often attributed to the impact of fiscal policy variables (see, for example, Lane (2003), Galli and Perotti (2003) and Alesina, Campante and Tabellini (2008)). In this framework, a question of great importance is whether fiscal variables are related to business cycle volatility and to business cycle synchronization in the context of the European Monetary Union (EMU), given that business cycle synchronization draws heavily upon comparable business cycle volatility, especially in monetary unions.

This paper contributes to the literature in the following ways: Firstly, it studies business cycle determinants for the EMU, in the time period 1995–2012 which captures the recent crisis, answering at least partly, the question of the origins of the crisis and the reasons for the divergence among EMU countries' business cycles, with respect to fiscal policy variables. Secondly, it examines the impact of EMU formation on the volatility of business cycles and, thirdly, it relates elections with business cycle volatility and synchronization. Of course, answering these questions is not devoid of policy implications.

The remainder of this paper is structured as follows: Section 2 provides a review of the literature; Section 3 sets out the methodological framework; Section 4 discusses the data and variables; Section 5 presents and analyses the empirical results; finally, Section 6 concludes.

2. Previous work

According to Blanchard and Simon (2001), the most recent expansions of the US economy have lasted more because of the underlying decline of output volatility. The first, from 1982 to 1990, lasted 31 quarters. The second started in 1991 and, although showing signs of faltering, is already the longest U.S. expansion on record. Furthermore, they contend that this decline is not a recent development. Rather it has been a steady decline over several decades, which started in the 1950s (or earlier, but lack of consistent data makes this difficult to establish), was interrupted in the 1970s and early 1980s, and returned to trend in the late 1980s and the 1990s. The magnitude of the decline is substantial: the standard deviation of quarterly output growth has declined by a factor of three over the period.

Acemoglu et al. (2003) instead of the relationship between output volatility and distortionary macroeconomic policies (including high inflation, large budget deficits and misaligned exchange rates), focus on the relationship between output volatility and institutions. They find that weak institutions cause volatility through a number of microeconomic, as well as macroeconomic, channels. Kose et al. (2003) mention that financial openness measured as the ratio of gross capital flows to GDP is associated non-linearly with an increase in the ratio of consumption volatility to income volatility. Also, they report that business cycle volatility differs from emerging markets to developed ones. Easterly et al. (2001) report that openness reduces volatility through the enhancement of growth. Also, excessive private credit can increase volatility, in the sense that financial institutions have a central role in economic volatility.

Meanwhile, Galli and Perotti (2003) do not find supporting evidence for the view that the Stability Growth Pact impaired the ability of EU governments to conduct effective discretionary countercyclical fiscal policy. Also, discretionary fiscal policy in the EMU countries has become more countercyclical over time, following what appears to be a trend that affects other industrialized countries, as well. Furthermore, the decline in public investment cannot be attributed to the constraints implied by the Maastricht treaty and the Stability and Growth Pact. Fatás and Mihov (2003) aimed at studying the effects of discretionary fiscal policy on output volatility and economic growth. They found that governments who use fiscal policy as an instrument induce macroeconomic instability. Also, prudent use of fiscal policy is explained, to a large extent, by the presence of political constraints and other political and institutional variables. As a result, they support institutional restrictions as a way to reduce output volatility. Castro (2011) showed that the institutional changes that occurred in the European Union after 1992 were not harmful to growth.

Bejan (2006) finds a negative relationship between trade openness and business cycle volatility should government size and some measures of external risk, such as terms of trade volatility and export concentration index, are controlled. Malik and Temple (2006) examine the structural determinants of output volatility in developing countries and especially the roles of geography and institutions. They find that countries with weak institutions are more volatile but also find evidence of geographical characteristics on output volatility. Countries remote from the sea are more volatile and remoteness is associated with lack of export diversification. Furceri and Karras (2007) suggest a strong, statistically significant and negative, relationship between country size and business cycle volatility implying that smaller countries are subject to more volatile business cycles than larger ones.

Magud (2008) argues that the smoothing effects of fiscal policy on business cycles fluctuations depend on the initial conditions at the time of a positive/negative shock, whereas fiscal policy may be expansionary or contractionary in terms of output according to the fiscal fragility of the government. In other words, an expansionary fiscal policy will not always be expansionary in terms of output and could end up being contractionary.

Checking for the implications of fiscal policy, in terms of business cycles volatility, sheds light on the particular character of the crisis. In the meantime, it provides scientific reasoning for or against the nature of public spending that brings up crisis phenomena, along with the role of the state in dealing with the crisis.

3. Methodology

A popular approach regards business cycles as fluctuations around a trend, the so-called "deviation cycles" (Lucas, 1977). Meanwhile, the business cycle component is regarded as the movement in the time series that exhibits periodicity within a certain range of time duration based on the seminal work by Burns and Mitchell (1946), and in line with the National Bureau of Economic Research (NBER). A number of fairly standard procedures need to be implemented before we proceed to our models.

3.1. Extracting the business cycle

In this paper, we use the Hodrick–Prescott (HP) filter because of its widespread acceptance in the literature (see, for instance, Montoya and De Haan (2008), Danthine and Donaldson (1993), Blackburn and Ravn (1992), Backus and Kehoe (1992), Dimelis, Kollintzas, Prodromidis, Chalikias, and Christodoulakis (1992), Fiorito and Kollintzas (1994), Dickerson, Gibson & Tsakalotos, 1998).[2] The robustness of the HP filtering method is confirmed, among others, by Artis and Zhang (1997) and Dickerson et al. (1998).

Another popular method for extracting the business cycle component of macroeconomic time series is the Baxter-King Filter (Baxter and King, 1999). The Baxter King filter is based on a band-pass linear-filter that extracts a frequency range dictated by economic reasoning. There is widespread agreement that a business cycle lasts between 8 and 32 quarters and the length of the (moving) average is 12 quarters (Baxter and King ,1999). This is due to the seminal works of Burns and Mitchell (1946). Consequently, these are the values (2 to 8 years) that we use in our de-trending methods. A plethora of studies have used the Baxter-King filtering method (see e.g. Stock and Watson 1999, Wynne and Koo 2000, Agresti and Mojon 2001, Massmann and Mitchell, 2004).

3.2. Cyclicality

In order to test whether the cycles extracted are not mere random walk processes we test for white noise is a data generating process where autocorrelation is zero between lagged versions of the signal, except when the lag is zero. The sample autocorrelation function measures how a time series is correlated with its own past history. In order to test for autocorrelation we use the Ljung and Box (1978) test (Q-stat) which, practically, tests the null hypothesis of white noise for a maximum lag length k.

3.3. Checking for stationarity

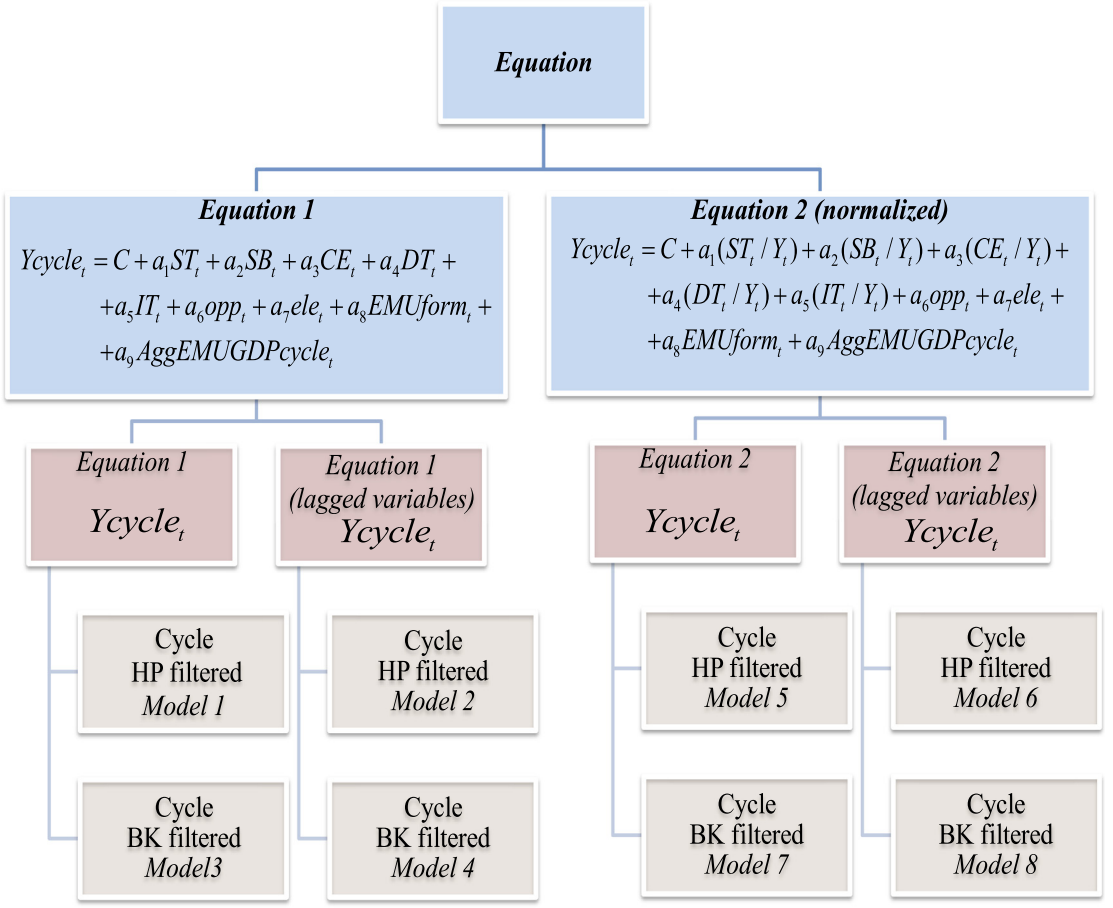
Now, before turning to our models we have to investigate the stationarity characteristics of the panel data series. We used panel data unit root tests that are relevant for this type of investigation, such as the popular panel unit root test of LLC (Levin, Lin and Chu, 2002), the IPS (Im, Pesaran and Shin, 2003), the ADF - Fisher Chi-square (Maddala and Wu., 1999), and the PP – Fisher Chi-square (Choi 2001).

3.4. Models

In this section, we propose and use dynamic models to investigate the determinants of business cycles volatility. In particular, using panel data regressions we check the roles of trade openness, elections and the consequences from the formation of the EMU on business cycles volatility. We use fixed effects models throughout our analysis in order to avoid restricting the empirical analysis to within-country variations. We exclude from our analysis monetary variables since all the countries examined participate in the EMU Union and share in common monetary circulation dictated by the ECB.

The models employed are variations of multivariate dynamic specifications and can be used to address the impact of different fiscal policy variables on business cycles. We have used panel techniques following Arellano and Bond (1991). The models are formulated in terms of ARDL regressions, a la Pesaran and Shin (1999).

[2] Of course, HP filtering has some shortcomings, as well. See Harvey and Jaeger (1993), King and Rebelo (1993), Cogley and Nason (1995), and Billmeier (2004).



ARDL is a powerful and general technique to deal with relationships between I(1) variables following Pesaran, Shin, and Smith (2001) and Pesaran and Shin (1999) who use the augmented ARDL model where long-run and short-run coefficients are estimated. Meanwhile, Pesaran and Smith (1995) suggest the use of the Mean Group (MG) model in order to resolve the bias due to heterogeneous slopes in dynamic panels, which provides the long-run parameters for the panel through making an average of the long-run parameters from ARDL models for individual countries. In brief, a general form of the equation to be estimated can be written as follows:

$$\Delta y_{t,c} = a_{0,c} + a_{d,c} t_c + \sum_{j=1}^{k} \alpha_{1,c} \Delta y_{t-j,c} + \sum_{j=1}^{l} \alpha_{2,c} \Delta ST_{t-j,c} + \sum_{j=1}^{m} \alpha_{3,c} \Delta SB_{t-j,c} + \sum_{j=1}^{n} \alpha_{4,c} \Delta CE_{t-j,c} + \sum_{j=1}^{o} \alpha_{5,c} \Delta DT_{t-j,c} + \sum_{j=1}^{p} \alpha_{6,c} \Delta IT_{t-j,c} + \sum_{j=1}^{q} \alpha_{7,c} \Delta opp_{t-j,c} + \sum_{j=1}^{r} \alpha_{8,c} \Delta ele_{t-j,c} + \sum_{j=1}^{s} \alpha_{9,c} \Delta EMUform_{t-j,c} + \sum_{j=1}^{t} \alpha_{10,c} \Delta AGGEMUGDP_{t-j,c} + a_{11,c} + u_{t,c} \quad (1)$$

where c stands for the cross section (countries under analysis), $a_{11,c}$stands for the fixed effect and $ST_{t-j,c}$ stands for the "Social Transfers" for cross section c_i,

$$\theta_c = \frac{\alpha_{2,c}}{1 - \alpha_{1,c}} \quad (2)$$

is the long run parameter for the independent variable Social Transfers (ST) and the MG estimators are:

$$\hat{\theta} = \frac{1}{N} \sum_{i=1}^{N} \theta_c \quad (3)$$

and

$$\hat{a_1}=\frac{1}{N}\sum_{i=1}^{N} a_1 \tag{4}$$

It should be noted that Eq. (1), above, holds only if a single lag is included in the right-hand side of Eq. (1), i.e., only if $k=l=m=\ldots=1$. If more than one lag is included then, of course, the more general long-run formula should be used. In the ARDL models employed in this work, the lag length is selected based on the optimality of the Schwarz information criterion (Schwarz, 1978) and the Hannan-Quinn information criterion (Hannan and Quinn 1979), which are relevant for this type of investigation.

Finally, there is a necessary condition for the consistency and validity of this approach, which is for the data to have a sufficiently large time-series dimension. This condition is clearly fulfilled in this work.

3.5. Generalized impulse response functions

Now, the long-run effect, are not the most informative piece of information from a business-cycle point of view. Even variables that have zero long-run effects on cyclical output could have powerful temporary effects. Hence, in order to study the dynamic characteristics of the model, we make use of the so-called Generalized Impulse Response Functions (GIRFs). The GIRFs are expressed as follows (Koop, Pesaran & Potter, 1996; Pesaran and Shin 1998):

$$I_{l(n)}=\sigma_{ll}^{-1/2}+B_n \Sigma e_l \;\forall\; n=1, 2, \ldots \tag{5}$$

where $I_{l(n)}$is the Impulse Response Functio*n* n periods after a positive standard error unit shock; σ_{ll} is the l-th row and l-th column element of the variance–covariance matrix of the lower Cholesky decomposition matrix of the error term which is assumed to be normally distributed; B is the coefficients' matrix when inversely expressing the model as an equivalent MA process and e_l is the column vector of a unity matrix.

3.6. Fiscal policy in the system

Fiscal policy variables are supposed to be manipulated before and after the elections in the context of political business cycles. If political business cycles are opportunistic, manipulation of fiscal policy variables can be used irrespectively of the political affiliation of the party governing. The following models were estimated as a system. Lagged values of the business cycle and the left hand side variables are used as well in the framework introduced by Arellano (1987).

Controlling for such variables is very important and has not been used in the literature before. The effects of opportunism and elections can be confounded easily if we do not control for such variables, at least in principle.

$$\begin{aligned}
CE_t &= C + a_1 opp_t + a_2 ele_t + a_3 IQ_t + a_4 CI_t \\
ST_t &= C + a_5 opp_t + a_6 ele_t + a_7 IQ_t + a_8 CI_t \\
SB_t &= C + a_9 opp_t + a_{10} ele_t + a_{11} IQ_t + a_{12} CI_t \\
DT_t &= C + a_{13} opp_t + a_{14} ele_t + a_{15} IQ_t + a_{16} CI_t \\
IT_t &= C + a_{17} opp_t + a_{18} ele_t + a_{19} IQ_t + a_{20} CI_t
\end{aligned} \tag{6}$$

This system allows for a full examination of whether elections manipulate the fundamental policy variables after controlling for openness, institutional quality and corruption. We feel this is a fairly comprehensive model that can be used to examine carefully the politically induced business cycle, if present, and provide useful insights into the nature of opportunistic politico- economic behavior.

4. Data and variables

The following variables are used: social benefits (***SB***), i.e. social benefits other than transfers in kind, a variable which includes on the one hand social benefits paid in cash to households by social security funds which are provided under social security schemes e.g. pensions and unemployment benefits, and on the other social assistance benefits in cash payable to households by government units outside a social insurance scheme incorporating social contributions e.g. as living allowances paid by municipalities, child maintenance, child maintenance allowances, a variable that is used as an automatic stabilizer and thus is thought to be counter-cyclical. Real output (Y) i.e. output, Gross Domestic Product in constant prices, out of which the cyclical component is extracted. Social transfers in kind (***ST***) a variable which consists of individual goods and services provided as transfers in kind to individual households by government units and non-profit institutions serving households (NPISHs), whether purchased on the market or produced as non-market output by government units or NPISHs. direct taxes (***DT***), direct taxes revenues for the general government collected by individuals and enterprises, indirect taxes (***IT***), indirect taxes revenues for the general government, e.g. consumption tax (VAT). Taxation, especially direct is also

thought to be among the automatic stabilizers, a tool in the hands of the government to dampen fluctuations in the GDP. Capital expenditures (***CE***), refers to government capital expenditures, thus spending in assets. Openness (**opp**) is a measure of trade openness as given from the Penn World dataset, the use of this variable is trying to evaluate the question of increased trade towards business cycles fluctuations. Exports plus Imports divided by GDP is the total trade as a percentage of GDP. The export and import figures come from the World Bank and the United Nations data archives. Frankel and Rose (1998) employ a similar trade measure: total trade (i.e. exports X and imports M) between two countries (i, j) scaled by total GDP. ***Y cycle*** is the cyclical component of the GDP, de-trended by means of the HP and BK filters, and *AggEMUGDPcycle* is the cyclical component of the aggregate EMU GDP, de-trended by means of the HP and BK filters, respectively. The use of the aggregate EMU GDP is applied as a means of collective psychology, and as a sign of transmission channel between EMU countries. Also, various political variables were used. Elections ***(ele)*** is a dummy variable denoting the year of elections. The corruption index ***(CI)*** given by the organization "Transparency International" was also used as a measure of the political context of the countries. Another measure of the political context was the quality of institutions ***(IQ)*** given by CESifo, known as Institutional Climate. Lastly, all the other quantitative variables in levels are in 2005 prices. The data are quarterly, come from the OECD, and cover the time period 1995-2012.

5. Empirical analysis and discussion

We used the HP filter, as well as the BK filter to extract the cyclical time series. The results of the Ljung and Box test indicate a rejection of the null hypothesis of white noise for all the cyclical variables extracted. In other words, the existence of cyclical regularities is a valid hypothesis from a statistical viewpoint for output. Regarding the stationarity properties of the various macroeconomic variables, the relevant tests have been applied both on the original variables and on their first differences (where appropriate) and are available upon request by the authors.

Next, we used Panel ARDL to estimate the relationship between the variables examined and the cyclical component of the GDP of each country using both HP and BK filters (Tables 1, and 2). The cross section effects are depicted in Table 3; Table 4 shows the results of the political business cycle system of equations.

In the ARDL regressions, the lag length was selected based on the optimality of the Schwarz information criterion

Table 1
Models 1-4 panel (ARDL) results.

Independent variables	Model 1 HP detrended GDP	Model 2 HP detrended GDP		Model 3 BK detrended GDP		Model 4 BK detrended GDP	
Social transfers	−0.561037 (−6.245366)	−0.64383 (−1.22239)	–	−0.3016258 (−1.871818)	−0.306815 (−2.101210)	−0.3037178 (−1.876248)	−0.378472 (−2.332318)
Social benefits	−0.934069 (−4.715383)	−0.46749 (−3.66094)	−0.576289 (−5.63898)	−0.236295 (−2.680611)	−0.240018 (−2.752821)	−0.199175 (−2.380806)	−0.197130 (−2.698570)
Direct taxes	0.623109 (3.977626)	−0.09404 (−0.46661)	–	0.476475 (3.513460)	0.514804 (7.095156)	−0.024730 (−0.424463)	–
Indirect taxes	0.649065 (3.756092)	1.123423 (4.768558)	0.863697 (6.296178)	0.057740 (0.361090)	–	0.487872 (3.368862)	0.465952 (3.968522)
Capital expenditures	0.597642 (4.358361)	0.039606 (0.085089)	–	0.439276 (4.513837)	0.434364 (4.524736)	−0.092976 (−0.337709)	–
EMU formation	−2.220660 (−2.103449)	−0.10992 (−0.145987)	–	−0.809830 (−0.857600)	–	−0.164460 (−0.8321034)	–
GDP cycle (lagged)		0.38049 (3.641695)	0.405341 (6.058973)			0.064234 (2.124619)	–
Aggregate EMU GDP cycle	0.0232994 (8.160039)	−0.00066 (−0.202394)	–	0.044903 (8.229951)	0.046729 (8.165424)	−0.092976 (−0.254835)	–
Openness	−0.086055 (−2.392905)	−0.00164 (−0.12959)	–	−0.059625 (−2.035600)	−0.072049 (−2.716478)	−0.001201 (−0.126817)	–
Elections	2.468243 (2.590806)	−0.52995 (0.870901)	–	2.117393 (2.470527)	2.24097 (2.458673)	0.568147 (1.079791)	–
Constant	−7.046409 (−0.930138)	−16.3606 (−2.25958)	−10.87556 (−2.78987)	−3.162752 (−0.536884)	−0.577904 (−0.118686)	−5.299180 (−1.51842)	−5.496486 (−1.932783)
Model summary							
R^2	0.859553	0.951002	0.941484	0.668458	0.593916	0.762378	0.740009
Durbin–Watson stat	1.459976	1.755331	1.698345	1.682430	1.679816	1.925736	1.885936
Countries included	12	12	12	12	12	12	12

T-stat values in parenthesis. Models 1 and 3: right hand side variables are in the same time point with the independent variable, i.e. all the right hand side variables simultaneously affect the dependent variable. Models 2 and 4: right hand side variables are lagged by one year. The second column in models 2–4 estimates the model without the variables that are not found to be significant in the first step.

Table 2
Models 5–8 panel (ARDL) results.

Independent variables	Model 5		Model 6		Model 7		Model 8	
	HP detrended GDP		HP detrended GDP		BK detrended GDP		BK detrended GDP	
Social transfers/GDP	−474.2121	−484.8098	−85.38342	–	−132.6077	–	−35.38880	–
	(−3.087964)	(−3.32982)	(−0.683882)		(−1.234676)		(−1.493543)	
Social benefits/GDP	−106.5309	–	−82.26859	−86.39277	−34.49073	–	−40.08061	–
	(−1.246547)		(−2.251969)	(−2.748935)	(−0.913916)		(−0.479184)	
Direct taxes/GDP	106.0178	–	−44.81280	–	63.66989	–	23.19399	–
	(1.401236)		(−0.904203)		(0.984703)		(0.843348)	
Indirect taxes/GDP	268.6528	284.4668	278.9736	251.1525	29.98953	–	107.2016	65.02412
	(2.199681)	(2.414957)	(3.459903)	(3.753898)	(0.341355)		(2.289046)	(2.148405)
Capital expenditures/GDP	193.6432	179.4793	−150.2150	–	163.3050	130.4544	−50.29477	–
	(2.711544)	(2.532986)	(−1.373805)		(3.533212)	(3.483906)	(−0.910887)	
EMU formation	−3.251393	−3.13445	−2.303676	−1.651216	−2.692357	–	−0.789753	–
	(−2.335643)	(−2.311132)	(−1.875401)	(−2.189894)	(−2.398356)		(−1.142384)	
GDP cycle (lagged)			0.562024	0.522860			0.077125	–
			(5.345531)	(6.602615)			(0.845654)	
Aggregate EMU GDP cycle	0.047246	0.047776	-0.003961	–	0.056865	0.057391	0.000326	–
	(7.519521)	(7.882583)	(−0.757786)		(8.512077)	(8.897600)	(−0.72683)	
Openness	−0.122010	−0.137075	−0.052723	−0.046778	−0.080840	−0.101851	−0.014706	–
	(−2.636374)	(−2.841592)	(−1.912643)	(−1.991207)	(−2.125410)	(−2.619860)	(−0.988996)	
Elections	2.256209	–	0.801897	–	1.937981	–	1.271826	–
	(1.821280)		(0.834618)		(1.949435)		(1.856899)	
Constant	−6.698699	7.224515	−7.507581	−16.53644	2.153827	6.964984	−3.162752	−8.591508
	(−0.385162)	(0.499135)	(−0.634901)	(−2.189414)	(0.164437)	(1.936714)	(−0.536884)	(−2.204164)
Model summary								
R^2	0.678738	0.666143	0.741983	0.736126	0.555945	0.489509	0.632228	0.5639244
Durbin–Watson stat	1.430354	1.430580	1.739660	1.723407	1.633244	1.471875	1.936189	1.680717
Countries included	12	12	12	12	12	12	12	12

T-stat values in parenthesis. Models 5 and 7: right hand side variables and in the same time point with the independent variable, i.e. all the right hand side variables simultaneously affect the dependent variable. Models 6 and 8: right hand variables are lagged by one year. The second column in models 5–8 estimates the model without the variables that are not found to be significant in the first step.

Table 3
Cross section effects models.

Country	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Austria	6.977634	6.765126	2.353427	2.64351	−1.68496	−1.15231	−1.82744	−0.30871
Belgium	8.471261	5.482232	1.250398	4.235114	18.82316	3.259396	1.885528	−3.45075
Finland	1.749258	8.599129	−1.5254	2.08611	−13.5123	−0.1425	−0.76123	1.477553
France	−24.7836	−34.8668	1.639993	−19.5217	−6.55167	−7.94783	−1.65584	2.007748
Germany	50.59211	12.20775	14.29167	22.28569	10.22037	−5.75865	−0.61121	−1.67347
Greece	5.32347	9.259616	2.40055	2.236365	−21.4081	2.129314	−2.90958	0.610095
Ireland	10.45805	5.256501	6.850372	1.69063	−3.95189	0.025524	3.398443	2.28601
Italy	−81.3145	−13.8761	−39.7588	−20.1571	−16.5925	1.726161	−3.79324	0.416482
Luxembourg	29.11809	10.12843	18.05228	5.033876	24.1492	8.872923	8.214627	0.321236
Netherlands	13.55221	−6.38664	4.504865	4.417831	26.54327	1.068856	1.662015	−1.32026
Portugal	7.098014	5.42583	3.390669	2.272483	−10.569	−3.79115	−1.46734	0.185711
Spain	−27.2421	−7.99506	−13.45	−7.22284	−5.46555	1.710261	−2.13474	−0.55165

(Schwarz, 1978) and the Hannan-Quinn information criterion (Hannan and Quinn, 1979), which are relevant for this type of investigation. Result showed that the appropriate lag length was one (1) quarter for all the estimated models. For instance, for the results referring to model 2, i.e. the first lagged (ARDL) model, see Table 5.[3]

Regarding the estimated models, we may derive several interesting conclusions. For instance, in model 1, all the variables are significant. The social benefits and social transfers are countercyclical as expected and highly significant. Both public policy tools are efficient against cyclical fluctuations, although social benefits seem to have a higher coefficient and thus are considered as being more effective. Also, openness is found to be countercyclical in the EMU in line with Bejan (2006) and Cavallo et al. (2008).

[3] The information criteria results referring to all the other models used in this work are available upon request by the authors.

Table 4
Political business cycle analysis.

	ST	SB	CE	DT	IT
Elections	−3.192608	−9.940071	−0.956464	−7.004233	−8.854145
	(−0.398668)	(−0.497608)	(−0.367866)	(−0.551433)	(−0.618055)
Openness	−0.423072	−1.670144	−0.131437	−0.960367	−1.209420
	(−3.973201)*	(−6.349363)*	(−3.478509)*	(−5.725979)*	(−6.399811)*
Institutions Quality	14.42346	346.6317	11.63753	239.4600	266.5690
	(0.307470)	(3.576616)*	(0.373952)	(3.656779)*	(3.685769)*
Corruption	7.105815	5.424324	0.155268	1.186072	3.110017
	(2.462470)*	(0.756606)	(0.159433)	(0.259884)	(0.604442)

* Significant at the 5% level.

Table 5
SIC and HQ results.

Lag	SIC	HQ
1	52.10907[a]	49.20188[a]
2	53.31836	49.46376
3	55.55615	49.65198
4	57.72028	49.96851

[a] Indicates lag order suggested by the criterion.

Furthermore, we checked the effects of elections on business cycles volatility. Elections are found to be highly pro-cyclical whenever significant. In model 1, the elections' coefficient is rather high and statistically significant. In the meantime, capital expenditures are found to be pro-cyclical and statistically significant. Therefore, government spending is found to generate positive private consumption multipliers in some policy regimes (Davig and Leeper, 2011). Also, we come up with the same evidence when turning to taxation. Taxation, both direct and indirect, is found to be highly pro-cyclical and significant. Katsimi and Sarantides (2011) found evidence of a political business cycle on the roots of a shift of public spending towards current expenditures at the cost of public investment, in the sense that current expenditures are more visible to the voters. Also, they denote that there is a fall in direct taxation and, thus, a negative effect on revenue related with the electoral process. In our model, elections are found to be pro-cyclical, just like taxation and capital expenditures.

Elections could be interpreted as a shift from a decline in taxation, capital expenditures and higher spending in the form of social benefits to an increase in taxation and a tightening in 'visible' spending irrespectively of the political affiliation of the incumbent, as would be the case in a rational political business cycle model. Elections express a shift in fiscal policy and as such they might make the business cycle more volatile. On the one hand, they may change the fiscal policy mix from countercyclical to pro-cyclical policies, and on the other hand, the change in itself may be pro-cyclical. In other words, it should be the increase in taxation immediately after the elections and the reverse in the shift in the mix of investment from capital investment to social benefits which are the reasons for the pro-cyclicality of elections. Also, it is in that sense that whenever the independent variables are lagged, elections are found to be insignificant; the elections'effects may have been transformed into a fall in social transfers - benefits and into an increase in taxation or a decline in social benefits in favor of increasing capital investment.

Furthermore, after the formation of the EMU and the common monetary policy, governments were incapable of manipulating monetary policy and thus inflation[4], and therefore fiscal variables became more 'vulnerable' in manipulation for re-election. This makes the hypothesis of opportunistic political business cycle models[5], at least in the EMU, more credible. Albeit, in Table 4 where the results of the system of equations are depicted, the elections are found to have no significant impact on the fiscal variables under analysis (social benefits, social transfers, capital expenditures, direct taxes and indirect taxes). Openness is found to be the main contractionary force on governmental spending either as social transfers or social benefits or capital expenditures and the same is in force regarding governmental revenues (direct taxes and indirect taxes). This finding may be the result of a decrease in trade openness of the EMU countries, accompanied by a general tendency towards diminished government spending and revenues, and shrinking social state policies. Social transfers are found to be positively related with corruption, whereas social benefits are not. Also, institutional quality is positively related to government revenues and to social benefits. In other words, better functioning institutions will bring higher revenues from taxation and increased social benefits.

[4] Inflation was the most pronounced manipulated variable in the classical political business cycles models. See, for example, Nordhaus (1975).
[5] See for example Goodman and Pauly (1993) and Andrews (1994).

Moreover, the effects of the EMU cyclical component on the GDP cycle are statistically significant but not very high in magnitude; also a more volatile EMU business cycle would create more volatile country business cycles. Finally, regarding EMU, its formation is found to be countercyclical. In the sense that the formation of the EMU was a step towards less volatility, however the current crisis has caused increasing business cycle volatility in some of the countries that form the EMU. Model 1 and model 3 are similar in the sense that they test the same variables and do not have a time lag since, all the independent variables simultaneously affect the dependent variable. In model 3 the variables that are insignificant are: the dummy variable 'formation of the EMU' and the indirect taxation.

Models 2 and 4 examine the determinants of the cyclical component, by using lagged variables. The economic intuition is that the current state and the history of each independent variable (including the lags of the dependent), affect the cyclical component's current state.

The common finding is that social benefits and indirect taxes have a significant relationship with the cyclical component of GDP. In model 4, where we applied BK filtering, social transfers appear to be related, to a certain extent, with the cyclical component. The significance of indirect taxation and social benefits is confirmed. Again, in model 5, capital expenditures and indirect taxation are found to be pro-cyclical and significant; whereas social benefits are counter-cyclical. Also, openness is found to be countercyclical and significant.

In short, elections, direct taxes and social benefits are the variables that are not significant. In model 7, the picture is somehow different: capital expenditures, openness and the cyclical component of the aggregate EMU economic environment are the variables that are significantly related with the cyclical component of output. In model 8, only indirect taxes are found to have an impact on the cyclical component of GDP, whereas in model 6, social benefits, and indirect taxes shape in a statistically significant way the cyclical component. Also, openness and the formation of the EMU have a certain impact on the cyclical component. Openness again is found to be negatively related to business cycle movement and the formation of the EMU is negatively related to business cycle volatility. The issue of less volatile cycles owing to greater trade openness can be understood as part either of the lack of volatile international business cycles or of the mitigating effects of country specific business cycles through trade channels. Finally, the R-squared and Durbin-Watson statistics are quite satisfactory in all the aforementioned models.

Next, we proceed with the presentation of the GIRFs. Each GIRF shows the dynamic response of the cyclical component of the GDP to unit shocks in the variables examined, for a period of up to 30 months. We base our analysis of Generalized Impulse Response Function (GIRFs) on the robust 95% confidence bands (bootstrapped, 1.000 iterations) rather than the point estimates in order to avoid any possible structural instability. Since we are mainly interested in a sudden change in the fiscal policy mix applied and its impact on the cyclical component of economic activity, we focus on the impact of a unit shock in the fiscal policy mix on the GDP cycle of the various EMU countries (Fig. 1).

In general, regarding the GIRFs' figures, we can see that they do not experience persistent effects. All effects for the first lagged (ARDL) model, i.e. Model 2, presented in Fig. 1, appear to have a rather temporary, i.e. medium- to long- run, character, and tend to die out usually in less than 18 months (i.e. 1.5 year), approximately, when all variables reach an equilibrium position. In other words, all effects do not seem to be persistent and this finding is in favor of the overall stability of the model. Quite similar is the picture of all the GIRFs for the rest of the estimated models, implying non-persistent effects. The results for the rest of the models are, of course, available upon request by the authors.

Summing up, indirect taxes and capital expenditures are found to be highly pro-cyclical, whereas social benefits and openness are the most counter-cyclical variables in our dataset irrespectively of the method applied. We find that social benefits are the main countercyclical actor in an economy whereas indirect taxes and capital expenditures are the main pro-cyclical actors. Also, the cyclical component of the aggregate EMU GDP has a positive impact on the cyclical component of the GDP. The pro-cyclicality of capital expenditures is widely confirmed by the literature (see, Lane (2003) and Abbott and Jones (2011)). The results should be seen in the context that welfare gains from counter-cyclical fiscal policy are much stronger in the presence of wage rigidities compared with consumption habits (Malley, Phillipopoulos & Woitek, 2009).

As a general remark, regarding the fixed effects derived from the models, larger countries tend to experience larger deviations than smaller ones. In the majority of the models, Spain, Italy and France are found to deviate more while having a negative sign, whereas Luxembourg and Germany are the ones that deviate more, having a positive sign. Positive deviations may be understood as more 'effective' influences of the independent variables on the dependent variables, while negative deviations may be interpreted as less 'effective' influences. Benefits in kind should be 'more counter-cyclical' in a country that has positive deviations, than in a country with negative deviations. Also, in model 5, Greece, Finland and Portugal are found to deviate significantly and with a negative sign. Also, Italy, Spain and France deviate largely from the mean with a negative sign. See also Papageorgiou, Michaelides, and Milios (2010).

With the exception of Greece in model 5, a major finding is that there is a core-periphery distinction in the EMU, with Italy and Spain being part of the periphery. This result is in line with the majority of the studies in the literature, such as Bayoumi and Eichengreen (1993), Dickerson et al. (1998), Artis and Zhang (1998a, 1998b), Crowley and Christi (2003), Massmann and Mitchell (2004), Camacho, Perez-Quiros, and Saiz (2006) and Concaria and Soares (2009). See also Canzoneri, Valles, and Vinals (1996), Bayoumi and Eichengreen (1997), Taylor (1995). According to Artis and Zhang (1998b), Ireland and Finland are the countries which seem furthest from the core. In another study, Artis and Zhang (1998a) provide evidence for the existence of a cre group formed by Germany, France, Austria, Belgium and Netherlands, and two peripheral groups: the Northern (U.K., Ireland, and the Scandinavian countries) and the Southern (Italy, Greece, Spain, Portugal) based

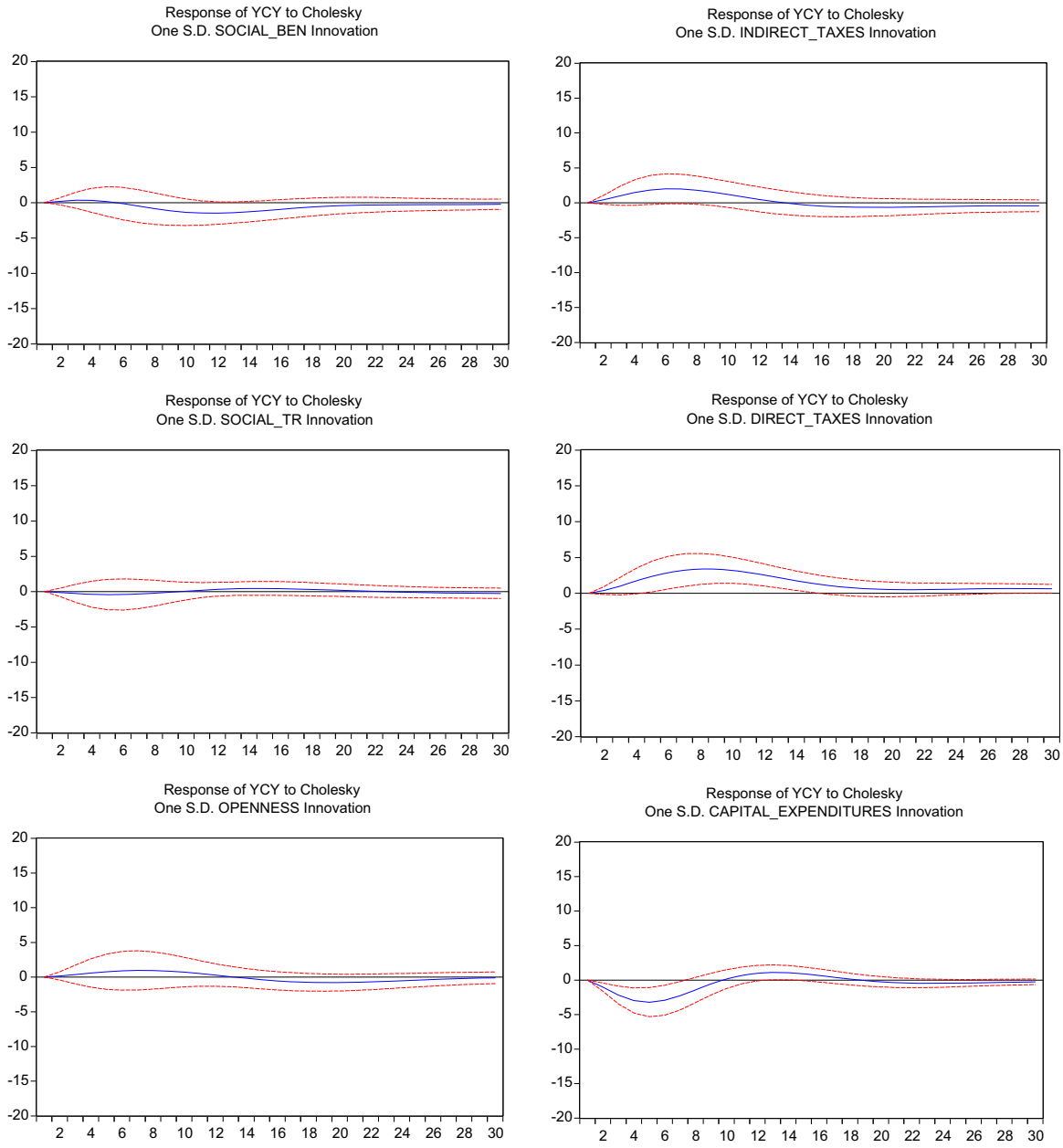


Fig. 1. Impulse Response Functions.

on a set of variables suggested by O.C.A. theory. These findings are, in general terms, consistent with the work by Esping-Andersen (1990).

6. Conclusions

This paper has attempted to answer some fundamental economic questions regarding the determinants of business cycles in the EMU (1995–2012). For instance, in a public policy context, the relationship between fiscal policy variables and economic fluctuations are of particular importance, especially at a time when the severe economic crisis has hit EMU countries. This paper acknowledges the importance of fiscal policy in the EMU and estimates ARDL panel data models for the twelve EMU countries in the time period 1995–2012.

In brief, a number of novelties are introduced in the article: firstly, political and trade variables are used in the models estimated. Second, government spending is further analyzed into capital expenditures, social transfers and social benefits.

Similarly, government revenues are divided into direct and indirect taxes. Third, the impact of fiscal deficits is being assessed with direct reference to the structural dimension of the EMU.

Regarding the GIRFs, which express the dynamic response of the cyclical component of the GDP of each economy, we found that there are no persistent effects, a fact which is in favor of the stability of our model. More specifically, all effects appear to have a temporary, i.e. medium- to long- run, character, and tend to die out usually in less than 18 months (i.e. 1.5 year), approximately, when the cyclical variable reaches an equilibrium position.

Furthermore, social benefits are found to be the most effective fiscal variable, while capital expenditures and indirect taxes are the major pro-cyclical variables. Openness is found to be counter-cyclical, in accordance with part of the literature. Also, the formation of the EMU, along with the increasing trade openness, suggests a clear cut countercyclical effect. In other words, the common monetary policy and the deeper financial integration constitute reasons for the decrease in the magnitude of the fluctuations. Meanwhile, opportunistic business cycles exist in the EMU that are pro-cyclical, the major channel probably being taxation and capital expenditures.

Finally, trade openness has contractional effects, either on the cyclical component of the GDP or on fiscal variables, a finding that can be seen as an expression of the shrinkage of state policies, internationally. Thus, fiscal policy variables' effectiveness is not universal for the countries investigated. Still, a question that remains open is the extent to which the current crisis could be attributed to fiscal policy instruments or to the strict monetary context of the EMU. Clearly, future and more extended research would be of interest.

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