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Financial Sector and Business Cycles Determinants in the EMU: An Empirical Approach (1996-2011)

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Abstract:
This paper investigates potential business cycles determinants for the EMU countries among financial sector indicators examining at the same time the link between financial sector variables and business cycles volatility. We find that the total value of stocks traded, the private sector debt and the net inflows of FDI constitute significant determinants of business cycles fluctuations. Financial openness has an increasing effect on business cycles volatility while there is an unsettled relationship between financial depth and volatility. Another important finding of the paper is that the analysis provides evidence in favor of the occurrence of opportunistic political business cycles among EMU counterparts. The robustness of the above findings is verified via the use of relevant econometric methods such as EGLS, GLM and fixed-effect models.

Key Words:
Business cycles determinants, financial openness, financial development, business cycles volatility, and opportunistic political cycles.

***JEL Classification**: E32, E44, D72*

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1. Introduction

The frequency and extent of business cycles fluctuations entail significant implications for the real economic activity and the well-being of society. Business cycles volatility reflecting country exposure and vulnerability to shocks, is considered a crucial determining factor for a wide range of economic outcomes including long-run growth (Ramey and Ramey, 1995; Hnatskovsa and Loayza, 2004), welfare (Pallage and Robe, 2003; Barlevy, 2004) and income distribution and poverty (Laursen and Mahajan, 2005; Calderon and Levy-Yeyati, 2009). Notwithstanding there is a subsequent difference between developed and developing economies concerning the level of macroeconomic volatility (Bejan, 2006; Hakura, 2009), there is clear evidence that most advanced economies have experienced a striking decrease in the output volatility over the past 30 years. This period of diminishing volatility starting in the mid 1980s is known as "The Great Moderation" [4]. The analysis of the phenomenon has mainly focused on the US economy while there is little evidence for the EMU countries (Gonzalez-Cabanillas and Ruscher, 2008). The ongoing recession started in 2007 has caused volatility to move considerably higher posing concerns on whether the Great Moderation is over or not.

According to World Economic Outlook (2005), the determinants of output volatility may be broadly categorized into four groups: namely, the stability of macroeconomic policies in regards of fiscal policy indicators, trade and financial integration, financial sector development, and finally the quality of institutions. Also, other structural characteristics are to be cited autonomously including the volatility of terms of trade and the flexibility of exchange rates.

Trade openness is often associated with business cycles fluctuations despite the relationship between openness to trade and business cycle volatility remains ambiguous (Bejan, 2006; Di Giovanni and Levchenko, 2008; Cavallo, 2008; Cavallo Kose and Yi (2003) suggest that the effects of trade openness on output volatility are

[4] Even though a great deal of attention has been dedicated on the determinants of business cycles fluctuations, the determining factors of the phenomenon have been of particular importance within business cycle literature. Actually, there is no consensus on the driving factors of the large decline in aggregate volatility. The potential causes of the Great Moderation can be summarized as follows: a) "good policy" hypothesis which covers structural changes in the economy (Kahn, McConnell and Perez-Quiros, 2002; Morley and Singh, 2009; Gali and Gambetti, 2008) and improvements in the performance of monetary and fiscal policy (Clarida, Gali and Getter, 2000; Bernanke, 2004; Benati and Surico, 2008) inducing a change in the propagation mechanism of shocks; b) "good luck" hypothesis which suggests that Great Moderation is attributed to the decline of the exogenous shocks volatility or/and the less frequent exogenous shocks that hit the economy (Stock and Watson, 2005; Ahmed, Levin and Wilson, 2004); and c) financial market innovations and financial integration (Perri and Quadrini, 2008; Gonzalez and Ruscher, 2008 and Frankel, 2008).

strictly related with the emerging patterns specialization and the nature of shocks. Also, the role of fiscal policy in driving business cycles fluctuations and the relationship between fiscal policy variables with output fluctuations are of particular importance (Lane, 2003; Gali and Perotti, 2003; Alesina *et al.,* 2008). Fatas and Mihov (2003) who investigate the impact of discretionary fiscal policy on output volatility and growth, suggest that discretionary fiscal policy increases output volatility which in turn lowers economic growth. Debrun and Kapoor (2010) find that, after accounting for 3 key dimensions of fiscal policy discretionary fiscal policy linked to cyclical conditions does not have a significant effect on output volatility. Structural determinants of business cycles fluctuations are widely investigated. Acemoglu *et al.* (2003) investigate the effect of institutions on volatility and crises via a number of macroeconomic and microeconomic routes. The empirical results suggest that low quality institutions cause volatility through a variety of micro and macro mediating channels. Gallegati *et al.* (2004) who examine business cycles characteristics of Mediterranean countries, find that output volatility varies across countries as a result of different stages of development.

The relationship between financial sector (openness, integration, development and liberalization) and business cycles volatility has recently received increasing attention among economists. Calderon and Hebbel (2008) find that the impact of financial openness on aggregate volatility is subject to the level of debt-equity ratios in countries under investigation. Higher financial openness is associated with a negligible effect on volatility in countries with high debt-equity ratios. More particularly, the authors argue that the relationship between financial depth measured by the ratio of debt liabilities to GDP and the volatility of output fluctuations appears positive as loan-related liabilities are driven by nominal shocks while the link remains negative in the presence of real shocks (equity-related liabilities). Easterly *et al.* (2000) find that financial development affects growth volatility in a non-linear way. More particularly, the evidence shows a negative relationship between the level of financial depth (measured by private credit to GDP) and the level of output volatility but this appears to be non-monotonic. That means that even though a deeper financial sector – through the consumption and production smoothing possibilities – diminish growth volatility, very large financial systems, with too much private credit, may have exactly the opposite effect, ending up in increased volatility and enhanced magnitude of shocks.

The financial crisis of 2007-2009 rapidly spread and transformed into a global crisis. Many causes and different hypotheses have been suggested about the financial crisis and its transmission mechanisms (Thalassinos, Liapis and Thalassinos, 2013). Problems of liquidity, the incapability of financial markets to finance real economy, highly leveraged financial institutions and indebted fiscal economies are considered significant determinants of the outbreak and spread of financial crisis (Adrian and Shin, 2010; Tirole, 2010). In the EMU context, the sovereign debt crisis has been

accredited on the one hand to the inadequacies of European economies with regards to the poor fiscal performance and on the other to the inherent weaknesses of the institutional framework of EU governance along with structural inefficiencies. The implication that the lack of fiscal discipline is the root of European sovereign debt crisis is in doubt. De Grauwe (2010) suggests that the current systemic crisis in the EMU is attributed to an unsustainable explosion of private debt which forced governments to protect financial sector by providing liquidity and guarantees from the bubbles created by the financial sector itself. Solomos and Koumparoulis (2012) argue that the deterioration of public finances seems to be more the impact of the crisis rather than a fundamental determinant of it. In other words, attributing the crisis in the EMU, partly at least, to the transmission of the US crisis seems to be credible (see also Michaelides and Papageorgiou 2012), highlighting, at the same time, existing adequacies of the Euro-area such as the core-periphery distinction (see also Papageorgiou *et al.* 2010).

Motivated by the ongoing crisis in Euro area and taking into account that more severe economic crises are strictly associated with financial crises, the objective of the paper is to investigate the role of financial sector in driving and propagating business cycle fluctuations in the EMU context. This paper contributes to existing knowledge in the following ways. First, it attempts to explore business cycles determinants among indicators of financial sector development and openness, examining inter alias the relationship between financial sector variables and business cycles volatility. The robustness of the results is checked through the incorporation into the analysis of control variables to account for other business cycles effects. Second, it studies aspects of discretionary fiscal policy suggesting policy implications. Finally, the paper investigates whether opportunistic political cycles occur in the EMU context relating elections with business cycles fluctuations.

The remainder of this paper is organized as follows: section 2 provides a brief review of the recent empirical and theoretical literature; section 3 sets out the methodological framework; section 4 describes the data used in the analysis presents the panel data regressions; section 5 sets out the estimation techniques; section 6 presents the emprical evidence and analyses them; finally, section 7 concludes.

2. Literature Review

2.1.1 Financial determinants of business cycles fluctuations

The theoretical literature provides an ambiguous image about the relationship between financial openness and business cycles volatility. Mendoza (1994) fails to find a significant impact of financial integration on output and consumption volatility. Baxter and Crucini (1995) argue that as financial openness increases, output volatility augments and consumption volatility decreases. The relationship is

not settled and appears to be affected by a number of factors (such as the nature of shocks, informational asymmetries, and structural features of economy and country size) which determine the level of output volatility via different routes. More particularly, Sutherland (1996) and Buck, Dopke and Pierdzioch (2002) who argue that the relationship between financial openness and output and consumption volatility depends on the nature of shocks, suggest that as financial openness augments monetary shocks have an increasing impact on output volatility and a diminishing effect on the volatility of consumption while during the fiscal shocks the effects are exact the opposite. As financial development can be a proxy for informational asymmetries (Kiyotaki and Moore, 1997), more developed and integrated financial markets are related with less volatile business cycles. Acemoglu and Zilibotti (1997) highlight the opportunities provided by an open well-developed financial system to countries to diversify their production where diversification is associated with less macroeconomic volatility[5]. Kose and Prasad (2002) stress the significance of the factor of country size, indicating that small nations with high degrees of financial openness are more susceptible to high volatility due to fluctuations in terms of trade and foreign aid flows (Thalassinos *et al.,* 2010).

The existing empirical studies have generally been unable to settle a clear empirical relationship between financial openness and business cycle volatility. To begin with, there are empirical studies which failed to establish a clear link between financial openness and volatility. Razin and Rose (1994) did not find evidence of a significant empirical relationship between trade and financial openness (capital-goods mobility) and the volatility of output, consumption, and Investment. Similar results from Buck, Dopke and Pierdzioch (2002) who study the empirical link between financial openness and output volatility but they disapprove of any significant relationship between them and from Thalassinos and Politis (2011) for the stock markets.

Kose *et al.* (2004) who investigate the relationship between growth and volatility suggests that both financial and trade openness have a diminishing effect in volatility while the tradeoff between growth and volatility is less intense. IMF (2002) suggests that financial integration is associated with lower output volatility in developing countries[6]. The transmission channels are the lower volatility of inflation and exchange rate while openness appears to smooth the magnitude of shocks. The above effect remains robust even if financial integration is linked with high external debt which has an indirect increasing effect in output volatility. Kaminsky and Schmkler (2008) argue that financial openness is followed by booms and bust in the short-run.

[5] Limited diversification or patterns of specialization make countries more prone to sudden fluctuations in terms of trade and industry-specific shocks.

[6] O' Donnell (2001); IMF (2002); Bekaert, Harvey and Lundblad (2002); Kose *et al.* (2003); and Mao (2009) find different emerging patterns between developing or emerging markets and developed countries.

Bekaert *et al.* (2006) explore the impact of financial liberalization on consumption growth volatility and GDP growth volatility. Using equity market liberalization and capital account openness as indicators of financial liberalization, the authors establish that both of them have a significant decline in output and consumption volatility but the impact of capital account openness is smaller than of equity market liberalization. The results remain robust under the incorporation into the analysis of controls for business cycle effects, economic and financial development, quality of institutions and other control variables.

Besides the empirical studies that investigate the relationship of financial openness and business cycles volatility, there is a branch of literature that establishes links between financial development and macroeconomic volatility. Denizer *et al.* (2000) using four different measures of financial development in order to shed light into the type of finance that matters more for the fluctuations and controlling for other roots of macroeconomic volatility, suggest that countries with more financial development experience less fluctuations in output, consumption and growth. The evidence shows that the reduction in consumption and investment variability is mainly attributed to the relative supply of credit from banks while the amount of credit provided to the private sector explains output volatility. Kose *et al.* (2003) use data of a large panel of both developed and developing economies over the time span 1960-1999 in order to examine the impact of financial integration on macroeconomic volatility. The results indicate that financial integration measured as gross capital flows as a share of GDP, is associated with an increasing ratio of consumption volatility to income volatility in developing countries but the effect is non linear. Beyond a particular threshold of financial development, the measure of financial openness appears to have a negative impact on the ratio. The above implies that the benefits in terms of smoothing possibilities and risk sharing can be reaped only above this limit.

Mao (2009) using banking sector openness as coefficient and six control variables as indicators of the level of financial development argues that banking sector openness has an enhancing impact on growth volatility in developing countries while in developed countries a more open banking sector tends to smooth the economic volatility. The phenomenon in developing countries is attributed to the fact that banking sector is less integrated into international financial markets leading to instability and countries cannot reap the benefits of improved risk.

Finally, Popov (2011) uses a large section of 53 economies over 45 years to examine the impact of financial openness on output growth, volatility and skewness. The evidence suggests that financial openness is closely related with higher output growth variability measured more in terms of large and abrupt macroeconomic contractions than in the sense of higher volatility. Similarly, Popov (2012) states that

financial openness has no impact on volatility but evidence shows that financial openness is linked with a negative skewed distribution of output growth.

2.1.2 Fiscal determinants of business cycles volatility

The contribution of fiscal policy on macroeconomic stability has a long tradition in both theoretical and empirical literature. Even more, the interest for fiscal policy implications has been recently renewed as a result of the ongoing economic recession in the EMU. The role of fiscal policy in driving business cycles fluctuations and the relationship between fiscal policy variables with output fluctuations are of particular importance.

Fatas and Mihov (2003) who investigate the impact of discretionary fiscal policy on output volatility and growth, suggest that discretionary fiscal policy increases output volatility which in turn lowers economic growth. The authors argue that institutional restrictions on fiscal authorities can tackle profligacy and reduce output volatility. Magud (2008) states that the smoothing effect of fiscal policy on business cycles fluctuations depends on the initial condition of economy at the time of the shock. The degree of fiscal fragility of the government determines whether fiscal policy is expansionary or contractionary in terms of output.

Debrun and Kapoor (2010) find that, after accounting for 3 key dimensions of fiscal policy (automatic stabilizers, fiscal stabilization unrelated to automatic stabilizers and fiscal policy variability unrelated to stabilization), discretionary fiscal policy linked to cyclical conditions does not have a significant effect on output volatility. Fiscal variability unrelated to business cycle appears to have increasing impact on output and consumption volatility.

Gali (1994), Fatas and Mihov (2001) and Debrun, Pissany-Ferry and Sapir (2008) establish a negative relationship between government spending – size and business cycles volatility. Leibrecht and Scharler (2012) provide evidence of a stabilizing effect of government size on output and consumption growth fluctuations under tight credit constaints. Van den Noord (2000), Girouard and Andre (2005), Dolls *et al.* (2009) and Debrun and Kapoor (2010) suggest that fiscal policy plays a key role for the smoothing of business cycle via the operation of automatic stabilizers.

Also, there is subsequent literature that focuses on how fiscal variables co-move with the output cycle suggesting fiscal policy implications. Lane (2003) investigates the behavior of disaggregated components of fiscal policy over the business cycle in a sample of OECD countries. The empirical evidence shows that countries with more volatile cycles and dispersed political power affect fiscal cyclicality through the channel of wage government consumption leading to more procyclical fiscal policies. Alesina, Campante and Tabellini (2008) approach the cyclicality of fiscal policy from a political economy perspective. The authors attribute the political

distortion of procyclical fiscal policy and excessive accumulation of debt to the procyclical demand of voters who ask for expansionary policies during positive income shocks. Finally, Gali and Perotti (2003) who study the impact of Stability and Growth Pact on the ability of EU member states to conduct stabilizing discretionary fiscal policy, present evidence that suggests that discretionary fiscal policy in the EMU context has become more countercyclical over time. They argue that the observed decline in public investment among EMU counterparts is attributed to the constraints imposed by Maastricht Treaty and Stability and Growth Pact.

2.1.3 Structural determinants of business cycles fluctuations

The country size and the level of development exert subsequent influence on output volatility as how economies react to any shock depends on these features. Several empirical studies which investigate output volatility, use proxies of these factors as control variables providing significant relationships (Easterly, Islam and Stiglitz, 2000; Wolf, 2004; Bejan, 2006; Cavallo, 2007; Popov, 2012). Furceri and Karras (2007) provide evidence in favor of a negative relationship between country size and business cycles volatility. Larger countries exhibit lower fluctuations than the smaller ones which are subject to more volatile cycles..

Malik and Temple (2006) finds that weak institutions are associated with more volatile business cycles. Subsequent empirical evidence suggests that the impact of institutions on business cycles occurs via their effects on industry structure (Bastos and Nasir, 2004; Sivasadan, 2009; Barseghyan, 2008 and Bruhn, 2008. Barseghyan and DiCecio (2010) who study the features of the relationship documented by Acemoglu *et al.* (2003), find that entry regulation constitutes a significant determinant of output volatility and leads to higher degrees of volatility.

Geographical dummies constitute standard control variables since they affect both volatility and variables under investigation including trade openness and financial integration (Svaleryd and Vlachos, 2002; Mobarak, 2004; Bejan, 2006; Calderon and Hebbel, 2008). Malik and Temple (2006) suggest that countries remote from the sea tend to have more volatile economies. Rose and Spiegel (2007) find that countries closer (farther) to the financial centers, display lower (higher) business cycle volatility.

3. Methodological Framework

3.1.1 Defining business cycles

The standard definition of business cycles is provided by the seminal work of Burns and Mitchell (1946): “Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business

enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; in duration, business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar characteristics with amplitudes approximating their own."

Also another popular approach is those of Lucas (1977), which regards business cycles as repeated deviations or fluctuations in aggregate output around a trend, which are also associated with co-movements in prices and other variables time series. According to the National Bureau of Economic Research (NBER) business cycle component is regarded as the movement in the time series that exhibits periodicity within a certain range of time duration.

3.1.2 Stationarity

The first step is to examine the stationarity characteristics of each time series. It is well-known that regarding panel data series, the standard unit root tests based on individual time series are not the appropriate techniques to employ as they do not work effectively. This is why we tend to apply panel data unit root tests that are employed in the investigation of statistical properties in panel data analysis. For our analysis, we use the method of ADF – Fisher Chi-square as an alternative approach to the unit root tests. The ADF – Fisher Chi-square test combines the p-values from the individual unit root tests and allows for individual unit root processes so that p-values vary across cross-sections.

The ADF - Fisher Chi-square is based on the following regression (Baltagi, 2001; Fischer, 1932):

$$P = -2 \sum_{i=1}^{n} lnp_i$$

The hypothesis that we have to evaluate is $H_0 : \rho_i = 1$ against the alternative $H_1 : \rho_i < 1$ (the series are weakly stationary or trend stationary). Most of the original variables are non-stationary however their first differences are stationary.

3.1.3 De-trending

The trend is important for the propagation of shocks (Nelson and Plosser 1982). 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), Levasseur (2008), Darvas *et al.* (2005), De Haan *et al.* (2002), Artis and Zhang (1997), Dickerson *et al*. (1998) and Danthine and Donaldson (1993). The actual filtering methodology isolates the cycle by minimizing the fluctuations of the actual data around it, i.e. by minimizing the following function:

$$\sum [[\ln y(t) - \ln y^*](t)]^2 - \lambda \sum \{[\ln y^*(t+1) - \ln y^*(t)] - [\ln y^*(t) - \ln y^*(t-1)]\}^2$$

where y* is the long-term trend of the variable y and the coefficient λ>0 determines the smoothness of the long-term trend.

3.1.4 *Cyclicality*

A white noise process is a random data generating process of random variables that are uncorrelated, have mean zero, and a finite variance (which is denoted s2 below) and where autocorrelation is zero between lagged versions of the signal, except when the lag is zero. Formally, et is a white noise process if E(et) = 0, E(et2) = s2, and E(etej) = 0 for t not equal to j, where all those expectations are taken prior to times t and j. 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.

$$Q = n(n+2)\sum_{j=1}^{h} \frac{\hat{\rho}_j^2}{n-j}$$

where n is the sample size, $\hat{\rho}_j$ is the sample autocorrelation at lag j, and h is the number of lags being tested.

4. Data Analysis and Panel Data Regressions

4.1. *Data analysis*

Our sample consists of the 12 initial members–states of the Eurozone (Austria, Belgium, Finland, France, Germany, Greece, Luxemburg, Netherlands, Ireland, Italy, Portugal, and Spain). The data in the study is on annual basis and comes from the World Bank, OECD, AMECO and the International Monetary Fund. The analysis covers the time span 1996-2011 capturing inter alias the traces of the current crisis.

Financial Determinants of Business Cycles. We include measures and indicators of the size and liquid of stock markets and the development and openness of financial systems including the total value of stock market to GDP, the market capitalization, the private debt to GDP, and the Foreign Direct Investment (FDI). The total value of stock market trade to GDP is an indicator related to the activity of the stock market. The market capitalization is used as a proxy of the size of the stock market. The private sector debt to GDP constitutes an aggregate indicator of the amount of the credit given in an economy excluding the public sector. The indicator of the credit issued to private sector as a share of GDP is used as a proxy for financial system's ability to allocate credit. The FDI is the sum of equity capital, reinvestment of earnings, other long-term and short-term capita as shown in the balance of payment

(World Bank). FDI is strictly associated with the development, accessibility and efficiency of financial systems reflecting the level and quality of banking sector.

Control Variables. It is deemed necessary to incorporate into our empirical analysis a series of control variables in order to account for other effects which are related with business cycles fluctuations. GDP per capita is the most common proxy used to measure the level of development. Direct and indirect taxes are used as indicators of discretionary fiscal policy whereas their procyclicality or countercyclicality implies policy implications of fiscal policy. The dummy of elections relates business cycles fluctuations with potential opportunistic electoral effects while the dummy of EMU formation accounts for the impact of the process of European integration on business cycles volatility.

4.2. *Panel data regressions*

4.2.1. Output fluctuations

$$GDP_t = c + a_1 STV_t + a_2 PD_t + a_3 MC_t + a_4 FDI_t + a_6 ITAX_t + a_7 DTAX_t + a_8 GDPcap_t + a_9 GDP_{t-1}$$

$$GDP_t = c + a_1 STV_t + a_2 PD_t + a_3 MC_t + a_4 FDI_t + a_5 ITAX_t + a_6 DTAX_t + a_7 GDPcap_t + a_8 ELE_t + a_9 EMU_t + a_{10} GDP_{t-1}$$

4.2.2. Business cycles fluctuations

$$GDP_{cycle_t} = c + a_1 STV_t + a_2 PD_t + a_3 MC_t + a_4 FDI_t + a_5 ITAX_t + a_6 DTAX_t + a_7 GDPcap_t + a_8 GDP_{cycle_{t-1}}$$

$$GDP_{cycle_t} = c + a_1 STV_t + a_2 PD_t + a_3 MC_t + a_4 FDI_t + a_5 ITAX_t + a_6 DTAX_t + a_7 GDPcap_t + a_8 ELE_t + a_9 EMU_t + a_{10} GDP_{cycle_{t-1}}$$

$$GDP_{cycle_t} = c + a_1 STV_t + a_2 PD_t + a_3 MC_t + a_4 FDI_t + a_5 \left(\frac{ITAX_t}{GDP_t}\right) + a_6 \left(\frac{DTAX_t}{GDP_t}\right) + a_7 GDPcap_t + a_8 GDP_{cycle_{t-1}}$$

$$GDP_{cycle_t} = c + a_1 STV_t + a_2 PD_t + a_3 MC_t + a_4 FDI_t + a_5 \left(\frac{ITAX_t}{GDP_t}\right) + a_6 \left(\frac{DTAX_t}{GDP_t}\right) + a_7 GDPcap_t + a_8 ELE_t + a_9 EMU_t + a_{10} GDP_{cycle_{t-1}}$$

where GDP_t and is the gross domestic product, GDP_{cycle_t} is the cyclical component of the GDP de-trended by means of HP filter, STV_t is the stocks traded, total value (% of GDP), PD_t is the private sector debt (% of GDP), MC_t is the market capitalization of listed companies (% of GDP), FDI_t is the foreign direct investment, net inflows, $ITAX_t$ is the indirect taxes revenues for general government, $DTAX_t$ is the direct taxes revenues for general government, $GDPcap_t$ is the GDP per capita, ELE_t is the dummy for elections, EMU_t is the dummy for the formation of EMU,

GDP_{t-1} is the lagged gross domestic product and $GDP_{cycle_{t-1}}$ is the lagged cyclical component of the GDP. In Equations 9,10 all the variables under examination have been normalized by dividing each variable with the GDP of each year.

5. Estimation Techniques

In this section, we present the regression methodology applied in our panel data regressions. First, in OLS panel data regressions, we eschew the utilization of cross-section analysis having single observation for each country for the entire period and country fixed effects estimators in order to avoid within country business cycles effects (pooled sample) and remove the time-invariant characteristics. In order to choose the appropriate weights and coefficient covariance method, we work in full accordance with the Arellano asymptotics (1987). According to Arellano, if T (number of periods) is greater than N (number of cross sections) and T<2N we use the method of White diagonal with Cross Section weights, while if T>2N we use the method of White Cross section with Cross Section SUR weights. In our panel data regressions, we use cross-section weights and White diagonal as coefficient covariance. The use of the lagged GDP and lagged cyclical component of GDP is deemed crucial in order to avoid autocorrelation error and to account for the likely of endogeneity. Also, it allows independent variables to have effects beyond the current period and it serves as a control for serial autocorrelation and a proxy for omitted variables.

Moreover, the econometric technique of Generalized Linear Model (GLM) is employed. Formulated by Nelder and Wedderburn (1972), the GLM constitutes an extension of familiar regression models such as the linear and the probit models. A generalized linear model can be defined as a model where the linear combination of X-variables is related to the outcome variable Y using a link function g and where the variance of the response variable is proportional to some function of the mean (Newson, 2001).

$$g(E[Y]) = X\beta$$

Each outcome of the response variable Y generated by a distribution in the exponential family with probability density function:

$$f(y_i) = \exp\left\{\frac{y_i\theta_i - b\theta_i}{a_i(\varphi)} + c(y_i, \varphi)\right\}$$

where θ_i and φ are parameters and a_i , b_i , c_i are considered known functions.

Finally, the traditional GLM is underlain by four major assumptions: i) linearity; ii) normality of the residuals; iii) equality of residual variances and iv) fixed independent variables.

6. Empirical Results Analysis and Discussion

A useful starting point for our empirical analysis would be to examine the casual relationship between output fluctuations and variations in financial sector variables. As it is generally accepted that economic growth is positively related with capital expenditures and investment, the above may reflect a potential relationship between macroeconomic aggregates such as the nominal GDP and the financial markets including inter alias stock market activity. Table 1 presents the determinants of fluctuations in output based on a set of financial indicators and control variables that are likely to correlate with GDP fluctuations. Explaining the observed trends in output fluctuations with regards to financial sector indicators, the market capitalization is procyclical indicating a positive correlation between stock market size and nominal output. At the same time, foreign direct investment is found to be procyclical and statistically significant as expected. Private sector debt is countercyclical and highly significant while the indicator of stock market activity i.e. total value of stocks traded is statistically insignificant. Concerning our control variables, both direct and indirect taxes revenues and GDP per capita are found to be highly procyclical as expected while the elections and the formation of EMU do not appear to have any significant effect on output fluctuations. The above analysis provides a useful descriptive relationship between financial variables and economic activity but it does not identify the role of financial sector in driving and propagating business cycle fluctuations.

Table 2 presents the results of our baseline business cycle model. The empirical evidence shows that the indicators of financial sector constitute significant determinants of business cycles among the EMU counterparts. More particularly, in model 3 the total value of stocks traded is found procyclical and highly significant. Private sector debt appears countercyclical suggesting a negative relationship between business cycles fluctuations and the amount of credit provided to the private sector. The net inflows of FDI are found to be procyclical and highly significant. The robustness of the significance of financial sector in driving business cycles fluctuations is verified even if we incorporate into the model other control variables such as the elections and the EMU formation that account for other business cycles effects (model 4). The R-squared of the models 3, 4 (0.53 and 0.59 respectively) as well as the F-stat (8.19 and 9.22 respectively) are deemed satisfactory. Moreover, the above results shed light into the nature of the relationship between financial sector and business cycles volatility. On the one hand, the procyclicality of the total value of stocks traded implies that the stock market activity have an increasing impact on business cycle volatility while the smoothing effect of the private sector debt on volatility provides an unclear empirical relationship between financial development and business cycles volatility for the EMU. On the other hand financial openness is found to be positively related with

business cycles volatility as the net inflows of FDI being procyclical determinant of the cyclical component of GDP, do not provide smoothing possibilities.

Furthermore, as mentioned above we incorporate into our model two fiscal indicators (direct tax revenues and indirect tax revenues) as proxies of discretionary fiscal policy focusing mainly in the side of revenues. We decompose the total revenues by extracting the amount of direct and indirect taxation in order to examine the two effects isolated. The main finding is that direct taxes revenues constitute significant determinants of business cycles fluctuations. Direct taxation is found to be procyclical and highly significant while indirect taxation does not appear significant in any model.

Elections are found to be highly pro-cyclical whenever significant making the business cycles more volatile. Our results are consistent with a subsequent literature which is in favor of the existence of the so-called "political business cycle" in the EMU context (Von Haagen, 2003; Mink de Haan, 2005; Efthyvoulou, 2010). Relating elections with financial indicators, we do not witness any radical change.

EMU formation is found to be counter-cyclical in all models indicating that the process of European integration was a step towards less volatility even if the magnitude of the effect would be much greater if the current crisis had not increased the business cycles volatility of EMU member-states.

In models 5 and 6, the independent variables under investigation have been normalized i.e. divided by GDP. The coefficients and the mathematical operator of the variables do not change dramatically and as a result our main conclusions remain robust. In model 5, the total value of stocks traded and FDI are found to be pro-cyclical while the private sector debt is found to be counter-cyclical. Again, direct taxes revenues and GDP per capita are pro-cyclical while indirect taxation are found to be insignificant. In model 6, elections and the formation of EMU are found to be pro-cyclical and significant but FDI does not appear statistically significant. The statistical properties of the models are given by the R-squared values (0.58 and 0.69 respectively), the F-stat values (9.67 and 14.52 respectively) and the Durbin-Watson stat (1.53 and 1.54 respectively) and they are quite satisfactory.

Table 3 presents the GLM results. Under the subject econometric methodology, we find that the total value of stocks traded is pro-cyclical and highly significant and also direct taxes and GPD per capita are found to be pro-cyclical.

Finally, concerning the fixed cross-section effects we may derive several interesting conclusions. In models 3, 4 Germany, Italy and Luxemburg are found to have a negative operator with a large deviation from the mean. Greece and Portugal deviate significantly from the mean having a positive operator. France, Austria, Spain and

Ireland are found to have a positive operator standing near the mean while Belgium, Finland and Netherlands are in similar situation but with a negative operator. In models 5, 6, Greece, Portugal, Spain and Italy are found to deviate significantly from the mean having a positive operator while the rest of the countries have a negative operator. There is an implicit distinction between core and periphery in the EMU which is consistent with a subsequent literature (Concaria and Soares, 2009; Massman and Mitchell, 2003; Camacho *et al.* 2006). Concluding, the above findings raise questions about the degree of synchronization, the distinction between core and periphery and potential clusters.

7. Conclusions

At the time when the current economic crisis has reached its peak, the relationship between financial sector variables and business cycles fluctuations is considered of particular importance and has attracted increasing attention among economists. To this end, the paper has attempted to investigate the role of financial sector in driving and propagating business cycle fluctuations in the EMU context (1996-2011). More particularly, this study explores potential business cycles determinants among indicators of financial sector and other control variables and relates them with business cycle volatility using various econometric techniques such as EGLS, GLM and fixed-effect models.

The total value of stocks traded and the FDI are found to be highly procyclical variables while the private sector debt is the major countercyclical financial indicator. Concerning the relationship between financial sector and business cycles volatility, the empirical evidence provides an unclear empirical relationship between financial development and business cycles volatility for the EMU while financial openness is found to be positively related with business cycles volatility. Elections are found to be highly pro-cyclical making the business cycles more volatile. Finally, we find that the formation of EMU has smoothed business cycles volatility significantly.

Concluding, it must be stressed that readers should take into account the limitations associated with the empirical analysis and not to overestimate the findings provided. What is more, we would rather to consider our findings as useful caveats to the debate about the nature of the current crisis in the EMU. It is apparent that future and more extended research on the extent to which business cycles fluctuations are associated with financial sector development and openness would be of great interest.

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APPENDIX

Table 1: Models 1-2 EGLS Results

Independent variables	**Model 1**	**Model 2**
	GDP	**GDP**
Stocks traded, total value (% of GDP)	0.005764 (0.291458)	0.006081 (0.302813)
Private sector debt (% of GDP)	-0.033117 (-3.084024)	-0.026472 (-2.366878)
Market capitalization (% of GDP)	0.034153 (2.233571)	0.033188 (2.210770)
FDI (net inflows)	3.45E-11 (2.554930)	3.51E-11 (2.485615)
Direct taxes revenues	0.892790 (4.258953)	0.887959 (4.036424)
Indirect taxes revenues	0.863534 (3.381786)	0.932545 (3.510640)
GDP per capita	1.277330 (3.641523)	1.360274 (4.040465)
Elections		-0.730381 (-0.525236)
EMU formation		-1.213599 (-1.054899)
Lagged cyclical component	0.652144 (12.49663)	0.656534 (12.38422)
Constant	126.7670 (7.048985)	122.1062 (6.309336)
Model summary		
R-squared	0.999683	0.999694
Durbin-Watson stat	1.409085	1.437668
F-stat	22399.79	20757.20
Countries included	12	12
Total panel observations	163	163

T-stat values in parenthesis. Models 1, 2: dependent variable is the GDP.

Table 2: Models 3-6 EGLS Results

Independent variables	**Model 3**	**Model 4**		**Model 5**	**Model 6**	
	HP detrended GDP	**HP detrended GDP**		**HP detrended GDP**	**HP detrended GDP**	
Stocks traded, total value (% of GDP)	0.086066 (3.622654)	0.085325 (3.094689)	0.087769 (3.286146)	0.088306 (4.754034)	0.092320 (3.135523)	0.116805 (4.980119)
Private sector debt (% of GDP)	-0.026364 (-2.273388)	-0.035125 (-2.722955)	-0.035611 (-2.766490)	-0.041061 (-3.134222)	-0.035972 (-2.857384)	-0.040746 (-4.835581)
Market	0.001094	-0.003401		-0.004440	-0.013896	

capitalization (% of GDP)	(0.085558)	(-0.228624)		(-0.281711)	(-0.845730)	
FDI (net inflows)	2.03E-11 (2.073586)	2.73E-11 (2.273731)	2.59E-11 (2.093164)	2.35E-11 (1.872614)	2.38E-11 (1.664643)	
Direct Taxes revenues / GDP				274.3693 (2.775364)	327.7222 (3.223753)	243.9956 (4.853102)
Indirect taxes revenues / GDP				108.5058 (0.970684)	134.5971 (1.105859)	
Direct taxes revenues	0.796550 (2.708114)	0.867685 (2.843056)	0.860158 (2.895926)			
Indirect taxes revenues	0.244452 (0.648682)	-0.003401 (-0.228624)				
GDP per capita	0.816998 (1.933423)	1.299817 (2.920158)	1.360642 (3.190549)	1.136472 (2.993241)	1.566986 (3.992113)	1.259877 (4.559907)
Elections		1.776619 (2.031249)	1.808725 (2.072703)		1.749300 (2.133964)	1.353256 (1.770221)
EMU formation		-3.894147 (-2.323548)	-3.764226 (-2.218091)		-6.378564 (-3.398464)	-4.618942 (-3.353275)
Lagged cyclical component	0.434790 (4.731631)	0.440171 (5.048354)	0.440144 (5.521779)	0.441984 (4.754034)	0.420688 (4.982973)	0.439486 (6.282829)
Constant	-33.92562 (-3.970718)	-44.08565 (-4.682601	-47.02073 (-5.131972)	-45.47796 (-4.874715)	-62.16525 (-6.675779)	-58.91746 (-7.631462)
Model Summary						
R-squared	0.535702	0.591750	0.613087	0.576808	0.695316	0.723674
Durbin-Watson stat	1.513734	1.477231	1.438810	1.536472	1.541477	1.608017
F-stat	8.191900	9.223955	11.25036	9.677270	14.52241	21.96978
Countries included	12	12	12	12	12	12
Total panel observations	163	163	163	163	163	163

T-stat values in parenthesis. Models 3, 4: dependent variable is the HP cyclical component. The second column in models 4,6 solves the equations without the variables that are found to be insignificant in the first step.

Table 3: Models 7-8 GLM Results

Independent variables	**Model 7**	**Model 8**
	HP detrended GDP	**HP detrended GDP**
Stocks traded, total value (% of GDP)	0.088520 (2.958153)	0.077828 (3.17655)
Private sector debt (% of GDP)	-0.005563 (-0.378012)	
Market capitalization (% of GDP)	-0.023688 (-0.991492)	
Direct taxes revenues	0.218168 (1.679486)	0.229319 (1.989547)
Indirect taxes	0.218168	

revenues	(1.261136)	
GDP per capita	0.158218 (1.540017)	0.124357 (2.739814)
Elections	1.180361 (0.354709)	
EMU formation	2.244917 (0.850930)	
Lagged cyclical component	0.361524 (2.664608)	0.404689 (3.134978)
Constant	-9.151396 (-2.924278)	-8.571086 (-3.686235)
Model summary		
Mean dependent var	0.530395	-0.276265
Akaike criterion	8.503954	8.395572
LR statistic	61.49169	72.64304
Pearson statistic	270.7973	251.0821
Iterations for convergence	1	1
Countries included	12	12
Total panel observations	163	163

T-stat values in parenthesis. Models 7,8: dependent variable is the HP cyclical component.

Tables 4-7: Cross Country Effects

Table 4: Model 3

Country	**Effect**
Austria	7.070703
Belgium	-1.736364
Finland	-1.325659
France	2.983338
Germany	-11.44756
Greece	21.53774
Ireland	3.454721
Italy	-33.14873
Luxembourg	-17.97318
Netherlands	-2.981137
Portugal	25.97591
Spain	-1.954870

Table 5: Model 4

Country	Effect
Austria	6.232288
Belgium	-2.093164
Finland	-0.988202
France	2.318191
Germany	-13.90139
Greece	27.24489
Ireland	0.661244
Italy	-36.55864
Luxembourg	-34.54912
Netherlands	-3.931711
Portugal	33.85107
Spain	1.256219

Table 6: Model 5

Country	Effect
Austria	-2.011110
Belgium	-9.148170
Finland	-16.91568
France	2.383393
Germany	-1.518680
Greece	20.60868
Ireland	-8.647241
Italy	1.376916
Luxembourg	-47.81087
Netherlands	-5.924112
Portugal	26.24158
Spain	6.867626

Table 7: Model 6

Country	Effect
Austria	-4.160083
Belgium	-11.55727
Finland	-20.52013
France	2.636171
Germany	-1.180301
Greece	27.87084
Ireland	-12.16197
Italy	1.277707
Luxembourg	-65.34003
Netherlands	-7.325208
Portugal	32.47009
Spain	11.14018