RAE REVIEW OF APPLIED ECONOMICS
Vol. 10, Nos. 1-2, (January-December 2014)

'PUTTING THE HORSE BEFORE THE CART': A PRE-CRISIS PANEL DATA INVESTIGATION OF GREEK BANK'S CREDIT GROWTH

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ABSTRACT: *The economic crisis that was ignited in 2009 has ushered in an era of economic stagnation and social misery across much of the EU region that could last for a generation or more. As a result, governments in the recession-stricken Eurozone are struggling to find a viable way out of what is perceived to be the worst economic turmoil since the establishment of the EU. In Greece, the rippling effects of the crisis manifested themselves in a sovereign debt crisis accompanied by practically a collapse of its banking sector.*

This paper by using panel data analysis purports to explore and effectively shed some light on the key factors that determined the lending behavior of the banking sector in the pre-crisis period. To the best of our knowledge, there are hardly any empirical studies conducted on the role of banks over the period 2004-2010. The evidence yielded, relates credit growth to deposit growth and rising housing prices as well as banks' capital strength. In so far as the business cycle affects lending growth, our results confirm that an ever increasing public debt results in curtailed lending while rising real private consumption kept Greek lenders' volumes at high levels. Given the current banking sector restructuring that is taking place in Greece the evidence that is generated can be invaluable as it suggests alternative channels through which the battered banking sector could resume its main intermediation role.

JEL Classification*: G21, C23, L2*

Keywords*: Greek Banking Sector, Credit Growth, Business Cycles, Panel Data Analysis*

1. INTRODUCTION

In a broad consensus, bankers, regulators and academics assert that Greek banks entered the recent economic crisis in relatively good shape, reporting healthy fundamentals without major irregularities in their business models. Understanding the mechanics of crises on banks remains a major challenge due to the paucity of empirical studies. (Gorton, 2012). In the Greek context, the research area remains uncharted, with the scarcity of studies, owing to the inherent opaqueness of bank data, the problems of providing operational definitions of crises events (Candelon and

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Palm, 2010) and the fact that the sovereign debt crisis has not yet been fully addressed. Most empirical studies in the Greek context use models of banks' profitability or asset quality that include mostly financial ratios as explanatory variables and do not explicitly account for systematic problems arising from an adverse evolution of the macroeconomic environment. Internationally, the empirical research on credit growth is substantial and continues gathering momentum. Several studies point to a close correlation between credit and property prices (Borio et al. 1994; Goodhart and Hofmann, 2008). For instance Goodhart and Hofmann (2008) provide cross-country evidence of a significant relationship linking private credit, house prices and the macroeconomy measured by real GDP. The authors consider 17 industrialised countries in the period 1970-2006. Similarly, Igan et al. (2009) find that house price cycles lead the credit and business cycle in the long term while in the short to medium term the relationship varies across developed countries. Typically bank credit and house prices rise during economic upswings as firms and households demand credit for investments or consumption. Another strand of literature underscores the role of bank soundness on credit growth (Igan and Pinheiro, 2011; Dell' Ariccia *et al.*, 2008, Zicchino and Erlend, 2008). Using a sample of 90 countries during 1995-2005, Igan and Pinheiro (2011) assert that the relationship between credit growth and bank soundness is a dynamic one. Sounder bank have more capacity to extent credit and manage risks. Potential weaknesses in banks' balance sheets can reduce the supply of loans and accentuate any liquidity problems in the real economy.

Banks have always occupied a central role in Greece's economy. Given that, a healthy and functioning banking system is critical to the well-being of the economy. And the banks' *raison d'être* is to maintain the capacity to deliver the needed services to the public and facilitate sustained economic growth. In the light of this, the importance of the paper relates to the banks' fundamental role of being growth-friendly.

Building on a panel of 17 Greek banks spanning 2004-2010 the paper applies static and dynamic panel models to investigate the determinants of credit growth. Table A1 lists the panel members and Tables A2 and A3 provide the bank-specific and the macroeconomic datasets respectively used in this paper. Tables A4 and A5 in appendix display the descriptive statistics. The research methodology ensures a transparent design that addresses reasonably the phenomena under study, yet it allows the examination and replication of the findings. The estimated models provide sufficient evidence on the relationship between the business cycle and the loan growth of Greek banks as well as a better understanding of the impact of the macroeconomy on the viability of the banking sector.

The rest of the paper is organized as follows: Section 2 provides a concise historical account of the Greek banking sector whilst section 3 touches on the methodological approach used in exploring the relationship between credit growth and the business cycle in Greece. Finally, section 4 concludes the paper.

2. A BRIEF HISTORICAL ACCOUNT OF THE GREEK BANKING SYSTEM

The Greek banking system emerged in the 1920s, when the Bank of Greece assumed central banking functions and two major state-owned credit institutions were established (Eichengreen and Gibson, 2001). Broadly, the Greek banking sector can be defined as a traditional one.

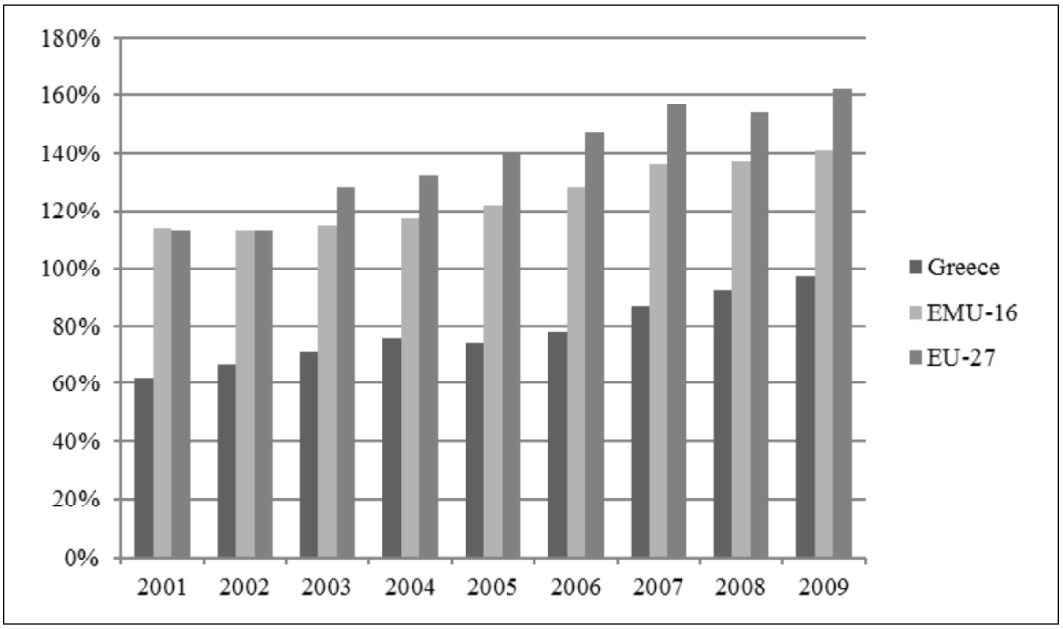
Although banks in Greece offer a diverse range of products, historically loans[1] and deposits[2] dominated the sector's aggregated balance sheet. As at the end of 2012, in total 63 credit institutions operate in Greece, comprised of 19 domestic commercial banks, 27 foreign banks that operate branches, 16 cooperative banks and one specialized credit institution.. Evidently, the five largest banks account for more than 70% of the sector's assets as of end of 2010 (Table A1). Although there was evidence of 'too much competition' in the Greek banking market in the pre-crisis period, as of end 2010 Greece was moderately banked, close to the EU median, as measured by population per bank-branch. (EC, 2012)Since size is not a measure of quality, efficiency or stability in a banking system (World Bank, 2012), this study considers a broader sample than the five largest banks of the Greek sector.

Research into the finance and growth nexus gauges financial development or depth in a country using the ratio of its banking system's loans as a share of GDP. Related evidence suggests that financial development is critical to a country's economy as it plays a vital role in aiding economic growth (Levine, 1997; Levine *et al.*, 2000). Still, empirical evidence over the period 1986-1999 suggests a bi-directional, albeit weak, causality between real economic activity and bank credit in Greece (Hondroyiannis *et al.*, 2004).

Figure 1 displays the evolution of the Greek financial development versus the EMU and EU countries over the period 2001-2009. Evidently, Greek banks had seen increasing penetration levels over the past decade, although still lower than EU and EMU averages.

Historically, the Greek State plays a key role in the domestic banking sector. Lazaretou (2011) documents that over the period 1900-1928, the Greek banking system was comprised of

Figure 1: Greek Banking System Loans to GDP



Source: Hellenic Banking Association and European Central Bank

multiple-issue banks, numerous small and a few large ones. Banks were enjoying monopoly rents, being highly leveraged and poorly managed with loose lending practices.

After World War II most banks came under the State's ownership and control. Eichengreen and Gibson (2001) maintain that authorities used the system to direct resources and activities, based on their priorities. For instance, as the authors assert, the state-owned and export-oriented enterprises were the major recipients of banks' funds, and also enjoyed subsidised rates. Most important, commercial banks had to finance the public deficit through a number of regulations. The country's entry to the EU by 1981, then forces Greece to abide by Europe's supervision and regulation practices (Eichengreen and Gibson, 2001). That explains how an undeveloped, by any standards, banking system underwent radical changes and witnessed relaxing controls during the second half of the 1980s.

In less than 20 years before that, Zolotas (1963) claimed that banks in less-developed countries, have to play an important role in the process of economic development. In author's words "banks should be organised and oriented towards the objectives they have to fulfil. In developed markets, banks may use their funds freely guided by the criterion of profit".

Instead, Greek banks were left unchecked without appropriate credit controls, to act exclusively based on profit criteria. At the same time, around 1989, Greece is reclassified from a developing to an industrial country. Then, over the 1990s, a massive liberalisation and deregulation of the Greek banking sector takes place. The Bank of Greece issues new licenses, the State reduces its holdings in several banks and privatisations transform the sector into a private preserve Still, Greek banks continue to park a large share of their funds in government securities. The sector's profitability soars supported by a booming stock exchange market and gains on government bonds in the run-up to EMU accession.

The dawn of the new millennium signals a period of robust growth supported by the adoption of the euro, lower interest rates as a side effect and more deregulation. Eichengreen and Gibson (2001) evidence that market discipline weakens resulting from a shift in regulatory constraints and a growing perception that public and large banks enjoy implicit guarantees from the State. Subsequently, the Greek banking sector goes through a consolidation phase prompted by privatisation. Fitch (2005) counts around 20 domestic mergers and acquisitions over the period 1997-2004 as market participants seek to strengthen their competitive positions.

After 2002, banks see their profits rising driven by strong lending in the mortgage and consumer sectors (Brissimis *et al.*, 2012). Greek banks become engaged in a competitive race on their return on equity (ROE). But the boost in ROE is likely to have been an act of risk illusion by bankers, regulators and investors. As Haldane (2010) suggests, high ROEs in banking are not usually the result of a productivity miracle but of risk mismeasurement.

By 2005, five banking groups dominate the marketplace enjoying a combined share of 75% by assets. The State continues to exert some direct influence on the sector, although with a declining trend. Effective in 2005, Greece adopts the International Financial Reporting Standards (IFRS) which introduces transparency into the system. As a result of IFRS, banks' capital positions weaken andcost-efficiency improves. Still, efficiency remains lower than their European peers, signalling issues that are well concealed in a booming business environment (Fitch, 2005). While the Greek banking sector appears sound, well-capitalised and with ample

liquidity, as IMF (2006) maintains, it still faces challenges arising from a rapid credit growth that increased the banks' exposure to unfamiliar risks. In a similar tone, OECD (2007) concluded that the sector was well placed to absorb the consequences of the financial turmoil in 2007 and continue financing the economy. However, significant disparities may exist between different banks.

Evidently, the Greek banking sector went through a phase of intense structural change shaped by deregulation and liberalisation. As Eichengreen and Gibson (2001) put it, Greece moved rapidly from one of the most restrictive environments in the Western World to a largely deregulated market. The credit boom in the period 2001-2007 could have masked banks' inefficiencies and this does raise concerns over the quality of the loans granted. Also, a lack of historical data implies that banks' risks had not been tested under adverse economic circumstances. Historically, the Greek State relies on the banking system either as a finance source or as a vehicle for pursuing its objectives. Given that the condition of the public finances including the country's weak liability position are expected to exert a prominent role in explaining the bank's lending pattern.

3. CREDIT GROWTH AND THE BUSINESS CYCLE AN EMPIRICAL INVESTIGATION

Extending credit plays an important role in channeling savings to investors and households, thus supporting economic development. Equally, a smooth flow of credit is conducive to a healthy banking system. For the empirical investigation we zoom in on the period 2004-2010, around the Greek debt crisis, thus touching on the boom-bust of the Greek business cycle. Since its entry in the euro area, Greece has experienced an economic boom spurred on by private consumption and investment, but also a perpetuating state of poor public finances (OEDC, 2009; IMF, 2006). The economic activity started to slow down in 2007, worsened by the erosion of competitiveness stemming from a persistent inflation differential with the euro area average. Since 2007, domestic demand has weakened markedly, growth in business investment has declined as the economic climate deteriorated and new house purchases fell sharply after a strong increase in the previous years (OECD, 2009). A number of authors spot signs of deterioration in the Greek economy prior to the global financial crisis (Meghir *et al.*, 2010; Alexiou, 2011; Polychroniou, 2011). As such, the investigation of Greek banks over the specified period poses challenges for researchers. Traditionally, banking in Greece is the economy-moving engine that sets the pulse for the real sector. However, to our knowledge, there are hardly any empirical studies on the role of bank lending over 2004-2010 in Greece, which in effect marks the contribution and the practicality of this paper.

A number of theoretical papers regard the loss in competitiveness of the domestic economy as a source of the recent Greek crisis (Meghir *et al.*, 2010; Pelagidis, 2010). In this direction, when setting up the models for the estimation we consider a number of variables purporting to capture the bank specific variables that bound up with the economy's competitiveness.

The envisaged hypotheses that provide the backbone for this empirical investigation relate deposit growth to credit growth and housing prices as well as banks' capital strength to lending growth.

The Methodology

For the empirical investigation both static and dynamic panel data analysis are utilized and effectively applied on a dataset consisting of 17 Greek banks spanning the period 2004 to 2010.

A main advantage of panel data compared to other types of data is that it allows testing and relaxing of the assumptions that are implicit in cross-sectional analysis (Maddala, 2001). A number of econometricians assert that panel data analysis can be beneficial in a number of ways (Baltagi, 2003; Hsiao, 2005).

The Static Model

The use of pooled time series and cross sections allows us to take into account the unobserved and time invariant heterogeneity across banks.The main models used in static one-way panel data analysis are:

(a) The pooled model

(b) The fixed effects model

(c) The random effects model

For the estimation of the models, we use a dataset which consists of N cross-sectional units, denoted i = 1,…, N observed at T time periods, denoted t = 1,…,T. Therefore the total number of observations is TN. Then, y is a (TN×1) vector of endogenous variables, X is a (TN×k) matrix of exogenous variables, which does not include a column of units for the constant term. In the context of the research, N = 17 and T = 7. In econometric terms, the setup is described in the following equation:

$$y_{it} = \alpha_i + \beta_i' x_{it} + \varepsilon_{it}, \quad (1)$$

where y_{it} is the dependent variable, α_i is the intercept term, β_i is a $k \times 1$ vector of parameters to be estimated on the explanatory variables, and x_{it} is a $1 \times k$ vector of observations on the explanatory variables, $t = 1, \ldots, T$, $i = 1, \ldots, N$. The specification in equation (1) suggests a linear panel data model. The associated assumptions to the model are:

- Error terms are normally distributed and have zero mean and standard deviation, $\sigma_i^2 \varepsilon_{it}$ ~i.i.d. $(0, \sigma_i^2)$
- Similar variances among banks, $\sigma_i^2 = \sigma_\varepsilon^2 \forall i$
- Zero covariances among banks, $\text{Cov}(\varepsilon_{it}, \varepsilon_{js}) = 0$ for $i \neq j$

We then proceed with the choice of the best alternative static specification that links to the pros and cons of each specification. The argument in favour of the random effects model are that the fixed effects model or LSDV often results in a loss of a large number of degrees of freedom and also eliminates a large portion of the total variation in the panel. Another argument is that a_i combine a total of several factors specific to the cross-sectional units and as such they represent 'specific ignorance'(Maddala, 2001). Hence, α_i can be treated as random variables by much the same argument that ε_{it} representing 'general ignorance' can be treated as random variables. On the other hand, there are two arguments in favour of the use of the fixed effects model. The first, common in the analysis of variance literature, is that if the analysis wants to

make inferences about only this set of cross-sectional units then we should treat a_i as fixed. On the other hand, if we want to make inferences about the population from which these cross-sectional data come, then a_i should be treated as random. Mundlak (1978) argues that the dichotomy between the fixed effects and random effects model disappears if we make the assumption that a_i depend on the mean values of x_{it}, an assumption regarded as reasonable in many problems.

The Dynamic Model

The dynamic panel data specifications are used in this study in an attempt to capture the time path of the dependent variable in relation to its past values. Many studies provide evidence that the relationships between bank-specific or economic variables are dynamic in nature (Athanasoglou *et al.*, 2006; Rinaldi and Sanchis-Arellano, 2006; Wintoki *et al.* 2009; Louzis *et al.*, 2012). For instance, Athanasoglou *et al.* (2006) criticise other studies that falsely assume a static relationship among bank-specific variables when in fact it is a dynamic one. A body of literature indicates that in typical micro-panels with large N and small T, the fixed effect (FE) estimator is biased and inconsistent when the model is dynamic. Similarly, the random effects GLS estimator can also be biased in a dynamic panel data model (Baltagi, 2003). Yet, many economic relationships are dynamic in nature and should be modelled as such (Asteriou and Hall, 2007).

In view of these arguments, our approach involves the estimation of dynamic panel data models using the Generalised Method of Moments (GMM) framework originated by Holtz-Eakin *et al.* (1988) and developed by Arellano and Bond (1991) and Arellano and Bover (1995). Pesaran *et al.*, (1999) argue that even if the dynamic specification is unlikely to be the same in all cross sections, it is still possible to pool the estimates treating the model as a system since, as Baltagi and Griffin (1997) indicate, the efficiency gain from pooling the data outweighs the losses from the bias introduced by heterogeneity. Empirical literature suggests that Arellano and Bond's (1991) and Arellano and Bover (1995) framework suits reasonably well cases with small T and bigger N (but N>T), especially when samples are small, as with the undertaken research, and the relationships are of dynamic form as emphasized by a number of authors (Pain, 2003; Quagliariello, 2004; Wintoki *et al.* 2009; Louzis *et al.*, 2011). In the GMM estimations we use first differenced data (Arellano and Bond, 1991), and orthogonal deviations as in Arellano and Bover (1995) as an alternative transformation method of removing the individual effects. The use of GMM estimations through instrument specification allows capturing the dynamic nature of the data but also bracketing the results obtained from the static models – triangulation of methods. The use of the alternative transformation methods[3] - differences and orthogonal deviations – in the GMM framework serves as a robustness test of the dynamic results, In essence, we examine the sensitivity of the results to the choice of the 'GMM-style' transformation.

Testing and Results

Prior to setting up the respective static as well as dynamic models we subject our series to unit root testing. Having established that the series are integrated of order one, we then proceed to ascertaining the existence of cointegrating relationships based on the Pedroni (1999, 2004) framework.

Drawing upon existing empirical studies, the research first establishes the relationship between the growth in loans and deposits for the panel banks. As shown in Table A6 in Appendix, a positive correlation emerges between credit and deposits' growth, implying that, on average, a stable growth in deposits (GDEP) stabilizes the system by allowing a steady credit flow. A positive association also emerges between the growth of loans and housing prices used as a proxy for the construction and real estate activity in the period 2004-2010.

As a starting point, we investigate the existence of a cointegrating relation between the growth of loans and deposits for the panel members. Then, we estimate static and dynamic models to capture the lending behaviour of banks in the short-run. In line with empirical evidence (Rinaldi and Sanchis-Arellano, 2006; Monokrousos and Thomakos, 2011), the annual growth in loans (GLG) and the annual GDEP are integrated of order 1, i.e. I(1). We report the results of the unit root tests in Table A7 of Appendix and those of the Pedroni (1999) panel cointegration[4] in Table 1 as follows:

Table 1
Pedroni Panel Cointegration Test for Growth of Loans (GLG) and Deposits (GDEP)

	Statistic	*p-value*
Panel v-Statistic	2.409	0.008
Panel rho-Statistic	-1.861	0.031
Panel PP-Statistic	-2.972	0.002
Panel ADF-Statistic	-2.149	0.016
Group rho-Statistic	1.360	0.913
Group PP-Statistic	-5.832	0.000
Group ADF-Statistic	-4.167	0.000

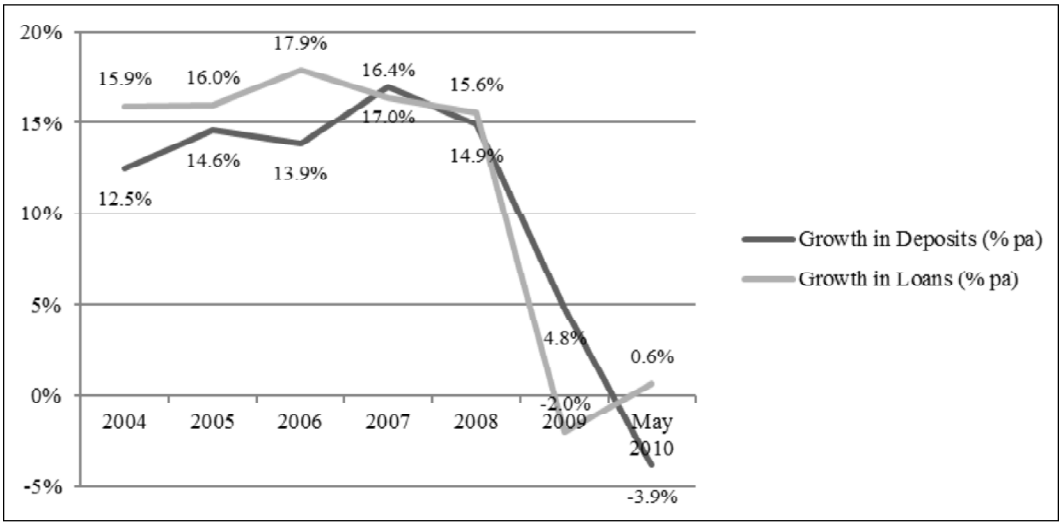
The results shown in Table 1 suggest that the null hypothesis of no cointegration can be rejected only in one case out of seven. Thus, the results generate evidence in favour of a positive link between extending credit and deposit-taking. The panel cointegration results are in concert with expectations arising from theoretical standpoints (Harvey and Spong, 2001) and empirical evidence (Monokrousos and Thomakos, 2011; Guo and Stepayan, 2011).

Traditionally, deposits oil the wheels of finance in Greece. Hence, a decline in core deposits accentuates Greek banks' funding problems forcing them to curtail lending. As such, the deposit outflow experienced in the period 2008-2010, shown in Figure 2, weakened banks' funding profiles and hampered their ability to lend to the real economy. Subsequently, a shortage in credit supply is a major factor contributing to the depression.

Overall, the results confirm to some extent the Greek bankers' view that their institutions presented a healthy business model by relying mostly on deposit-funding than wholesale borrowing. Yet, this explains why Greek banks sought government support to counter a liquidity squeeze resulting from a significant flight of deposits in 2009-2010.

A cointegrating relationship seems also to exist between the lending growth and housing prices (IRPC). The cointegration results reported in Table 2 that follows suggest that the null hypothesis of no cointegration can be rejected in three out of seven test statistics.

Figure 2: Growth in loans and deposits for the Greek banking system (2004-2010)



Source: Bank of Greece

Table 2
Pedroni Panel Cointegration Test for Loans' Growth (GLG) and Housing Prices Growth (IRPC)

	Statistic	*p-value*
Panel v-Statistic	0.742	0.229
Panel rho-Statistic	-0.349	0.363
Panel PP-Statistic	-5.660	0.000
Panel ADF-Statistic	-3.892	0.000
Group rho-Statistic	1.417	0.921
Group PP-Statistic	-13.447	0.000
Group ADF-Statistic	-9.542	0.000

Table 2 does not provide sufficient evidence to discard the existence of a relationship among the variables of interest. It is worth noting also that the Pedroni test generates evidence of a stable cointegrating relationship between the growth rates of lending and the real GDP.

The next step entails the specification of the Greek banks' lending growth panel models. On the basis of equation (1) the models that link credit growth with growth in deposits and housing prices can be expressed in the following settings. Equation 2 describes the static model and equation 3 the dynamic one, Operator Δ in the dynamic equation stands for the data transformation used in the GMM framework to remove the individual banks' effects. Hence, Δ denotes either first differences as in Arellano and Bond (1991) or orthogonal deviations (Arellano and Bover, 1995).

$$GLG_{it} = a_0 + a_1 GDEP_{it}^{+} + a_2 IRPC_t^{+} + \varepsilon_{it} \quad (2)$$

$$\Delta GLG_{it} = b_0 \Delta GLG_{it-1}^{+} + b_1 \Delta GDEP_{it}^{-} + b_2 \Delta IRPC_t^{-} + \varepsilon\mathring{a}_{it} \quad (3)$$

i= 1,…,17; t= 2004,..., 2010.

The results, summarized in Table 3, confirm the hypothesis that the banks' lending growth is positively related to deposits' growth and housing property prices, as suggested by theory and previous empirical work (Monokrousos and Thomakos, 2011). Interestingly, the fit of the relationship becomes unstable if short-term borrowings replace the deposits' growth as a proxy for funding in the equation. This result reinforces the contributing factor of deposits as a prerequisite for uninterrupted loan operations. The Hausman test suggests that the random effects model explains the loans' growth equally well to the fixed effects one, indicating that the banks' idiosyncratic effect is somehow minimised. Overall, the random effects model provides a reasonable fit of the data (adjusted $R^2 = 0.43$), where all coefficients are significant at the 1% significance level. Similarly, the estimated dynamic models present a reasonable convergence with the outcome of the static model. All variables remain significant, bearing coefficients that are close in magnitude to the static ones, taking into account the transformations involved in the dynamic equations. The evidence from both static and dynamic models suggests a positive relationship between growth in deposits, housing prices and loans, in line with empirical evidence (Fitzpatrick and McQuinn, 2004;). Past Greek studies also suggest that housing loans evolve hand-in-hand with the real housing prices. Brissimis and Vlassopoulos (2009) find a short-run contemporaneous bi-directional dependence among housing loans and housing prices in the period 1993-2005. The reported results confirm that the Greek lending boom continues after 2005 in tandem with increasing housing prices. Subsequently, a sharp credit contraction recorded in the aftermath of the Greek crisis moves in line with soaring bad debts and real estate prices in free fall.

In extending our approach, we then estimate panel regression models that link the loan growth with the business cycle. Using the information conveyed in Table A6 (correlation coefficients) it appears that good economic conditions reflected in GDP growth rate or share prices' growth are positively correlated with the loans. On the other hand, the unemployment rate (UNEM) and challenging fiscal conditions reflected RAT are negatively associated with the banks' lending attitude. Turning to bank-specific variables, solvent and cost-efficient banks exhibit a positive association with credit growth. Using the general to specific approach, the estimated static and dynamic models are expressed by the following equations:

$$GLG_{it} = a_0 + a_1 DCPR_t + a_2 GDEP_{it} + a_3 DGFD_t + a_4 EA_{it} + \varepsilon_{it} \quad (4)$$

$$\Delta GLG_{it} = b_0 \Delta GLG_{it-1} + b_1 \Delta DCPR_t + b_2 \Delta GDEP_{it} + b_3 \Delta DGFD_t + b_4 \Delta EA_{it} + \Delta\varepsilon_{it} \quad (5)$$

i= 1,…,17; t= 2004,..., 2010.

The estimated equations that essentially reflect short-run effects are summarized in Table 4.

As can be discerned from the preceding empirical results, the fixed effects model is the reference point among the static estimations. The test for redundant fixed effects, also the likelihood ratio, reject the null hypothesis of redundant cross-sectional effects. Furthermore, all estimated parameters pass the t-test at the 1% significance level. The model fits the panel data

Table 3
Static and Dynamic Specification for the Loan-deposit and Housing Prices Model Dependent Variable: GLG (Growth rate of loans)

	Fixed		*Random*		*Pooled*		*First Differences*		*Orthogonal Deviations*	
Explanatory Variable	*Coefficient*	*Std. error*	*Coefficient*	*Std. error*	*Coefficient*	*Std. error*	*Coefficient*	*Std. error*	*Coefficient*	*Std. error*
C	11.677	1.453	11.808	1.757	11.797	1.700				
GLG(-1)							0.144	0.018	0.174	0.009
GDEP	0.481	0.169	0.482	0.211	0.483	0.211	0.798	0.133	0.714	0.038
IRPC	1.294	0.175	1.263	0.186	1.257	0.187	0.984	0.100	0.877	0.062
AIC	8.57				8.55					
SIC	9.06				8.63					
Wald test [(1)]	60.83		50.92		50.61		470.15		740.57	
Hausman test			0.004							
F-statistic	6.455		39.468		38.639					
F-test (FE=0) [(2)]	1.800									
Sargan test (p-value)							0.431		0.347	
AR(1) (p-value)							0.162		0.174	
AR(2) (p-value)							0.649		0.726	
R^2	0.59		0.45		0.44					
Adjusted R^2	0.50		0.43		0.43					

[(1)] Wald test that all coefficients (except intercept and fixed effects) are jointly not significant.
[(2)] Tests the joint significance of the fixed effects estimates.
All coefficients are significant at 1% significance level.
Number of instruments used: three.

Table 4
Static and Dynamic Specification for the Lending Growth Model Dependent Variable: GLG (Loans' growth rate)

	Fixed		*Random*		*Pooled*		*First Differences*		*Orthogonal Deviations*	
Explanatory Variable	*Coefficient*	*Std. error*	*Coefficient*	*Std. error*	*Coefficient*	*Std. error*	*Coefficient*	*Std. error*	*Coefficient*	*Std. error*
C	9.515	5.514	12.577	5.729	13.176	5.305				
GLG(-1)							0.153	0.013	0.167	0.013
DCPR	1.856	0.548	2.056	0.517	2.097	0.492	1.863	0.274	1.632	0.098
GDEP	0.771	0.178	0.685	0.182	0.666	0.172	0.619	0.137	0.617	0.019
DGFD	-1.143	0.368	-1.134	0.325	-1.127	0.315	-1.238	0.225	-1.150	0.143
EA	1.573	0.422	1.232	0.340	1.158	0.286	-2.181	0.788	-1.920	0.365
Observations	101		101		101		79		79	
AIC	8.365				8.347					
SIC	8.909				8.476					
Wald test [(1)]	365.45		1000.33		832.18		243.72		620.97	
F-statistic	16.581		14.945		6.005					
F-test (FE=0) [(2)]	15.607									
Sargan test (p-value)							0.431		0.347	
AR(1) (p-value)							0.143		0.157	
AR(2) (p-value)							0.712		0.781	
R^2	0.68		0.57		0.56					
Adjusted R^2	0.59		0.56		0.54					

[(1)] Wald test that all coefficients (except intercept and fixed effects) are jointly not significant.
[(2)] Tests the joint significance of the fixed effects estimates.
All coefficients are significant at 1% significance level.
Number of instruments used: four.

reasonably, presenting fairly stable coefficients. The value of adjusted R^2 suggests that 59% of the variation in the annual growth in loans in the period 2004-2010 is explained by the model's variables.

The business cycle in the model is reflected in the dynamics of public debt (DGFD) and real private consumption (DCPR). As expected from theoretical propositions, an ever-increasing public debt results in curtailed bank lending while rising real private consumption maintains the Greek lenders' volumes at high levels. Deposit-taking continues to exhibit a clear-cut role in determining the growth of loans and sound solvency measured by EA, infuses stability in the system, exerting a positive influence on banks' lending behaviour.

The dynamic specifications exhibit an acceptable convergence with the fixed effects model while providing good reasons to accept the persistence of lending growth. All significant variables in the static model maintain their role in the dynamic specifications. Furthermore, the variables' coefficients turn out to be very close in magnitude in both modelling frameworks[5]. A striking difference is observed in dynamic equations' links to banks' capital which now yields a negative sign. The latter could imply that the presence of the lagged growth of loans interacts with banks' solvency causing an inverse relationship between GLG and EA. Hence, persistent and rising lending is associated with lower capital ratios in the research's timeframe consistent with empirical evidence pointing out that unhealthy banks may hide losses by ever-greening loans (Foos et al., 2009; Zemel, 2012). Still, it does provide reasoning that the loan growth of Greek banks is better explained within a dynamic framework. Certainly the banks' lending channel follows more complicated channels than the simple representation of the estimated models. Nevertheless, the results allow some interesting points to emerge as for the Greek banking system.

The stylised facts supported by the estimation results lend support to a Minskian moment in the Greek context. The euphoria of excessive credit growth and housing bubbles, evidenced in the period up to 2008, was prone to result in panic and recession. In a lending boom, firms and households led away from rational behaviour are tempted into 'speculative' finance. The risk appetite of lenders and borrowers reflect the psychological fix of the economy (Minsky and Vaughan, 1990). In other words, the Greek economy evolved in such a way that a banking crisis was likely to happen. The perfect storm that the Greek financial sector and real estate market underwent after the blow of the Greek debt crisis is nothing more than a Minskian meltdown. Property valuations kept on rising to an unsustainable level within an over-optimistic attitude of both banks and borrowers induced by a 'low rate - cheap money' euphoria. To a certain extent, the Greek story relates to the US housing bubble in the early 2000s where home prices started rising in a low interest rate environment. As the initial 'hook' low rates reset and economic conditions deteriorated, households realised that monthly payments were well beyond their means. This irrational exuberance of borrowers was mainly driven by a change in lending practices, a complete abandonment of traditional principles (Krugman, 2009). On the other hand, declining property prices caused a deterioration of banks' balance sheets highlighting the close connection between the banking and real estate sector (Davis and Zhu, 2004). The regressions of property prices on lending growth suggest two phenomena correlated in a remarkable way. And cross-country evidence suggests that the strong link of credit to property prices is more pronounced in crises-hit countries. On the other hand, the regression results

shown in Table 4 could simply mean that rising home prices tend to cause lending growth, rather than excessive lending boosts property prices. In the latter case we are dealing with the banks' disaster myopia that re-feeds into properties' overvaluation.

The estimation results in Table 4 reflect the relationship of banks' lending with the business cycle which appear to be in line with previous studies such as the ones by Pelagidis, (2010), Alexiou (2011) and Polychroniou (2011) suggesting that expansion of credit to households fuelled the growth of private overconsumption as well as borrowing.

Broadly the results demonstrate that the quality of credit expansion matters as much as its rate of expansion. The lending growth should reach the point that preserves healthy balance sheet measures as reflected in solid capital ratios. Moreover, the business model of Greek banks should rely on traditional and stable funding sources, such as customer deposits.

4. CONCLUDING REMARKS

As the recapitalization-reforming of the Greek banking system is close to completion , operational problems still hamper the lending that needed as 'manna from the sky' to restore growth to the flagging Greek economy. In the aftermath of the Greek sovereign debt crisis, bank deposits slumped significantly and banks were heavily reliant on financial support from external sources. Still, banks are under pressure from authorities to raise more capital.

Using an extensive dataset and panel modeling techniques, we provide evidence on the role of banks during the pre-crisis period by focusing on the factors that determine their lending growth. Our results reinforce the contributing role of deposit-taking and of robust capital profiles as prerequisites for uninterrupted loan operations. Equally, the credit growth in the booming period was reinforced by rising housing prices as the cointegrating results pinpoint. In so far as business cycle affects banking behaviour, the evidence generated points to a strong link between an escalating public debt and lending, thus implying that increasing liabilities of the public sector's balance sheet partly result in curtailed credit in the real economy. Equally, a rising consumption is also a driving force of the acceleration in banks' loan books. As the Greek banking sector is undergoing an unprecedented reshaping-restructuring, our results are of great significance in that they demonstrate that the quality of credit expansion matters as much as its rate of expansion. The lending growth of banks needs to strike a balance between preserving healthy fundamentals whilst at the same time lenders should aim at financing investment projects that promote economic development instead of private overconsumption or housing bubbles. It is in this sense, that traditional banking in conjunction with stable funding and a healthy balance sheet might provide the hoped-for stimulus that the Greek economy desperately needs.

NOTES

1. The Greek banking system loan book is broadly exposed to the household and the non-financial corporate sector. Each sector accounted for about 40% of total loans as of end 2010.
2. Nevertheless, it is noteworthy that Greece's savings rate which averaged 10.2% of GDP over the decade 2001-2012 is one of the lowest in the among the Eurozone countries.
3. First differencing eliminates any potential bias that may arise from unobserved heterogeneity. The disadvantage of the first difference transformation is that it magnifies gaps in unbalanced panels as is this case, i.e. one period of missing data is replaced with two missing differences (Roodman, 2008). The

alternative transformation used, i.e. orthogonal deviations, overcomes this problem as it maximizes the sample's size in panels with gaps.

4. The Pedroni test is an Engle-Granger type test where the null hypothesis suggests no cointegration and the decision is based on seven statistics–panel and group.
5. Using the orthogonal deviations' transformation, the autoregressive coefficient is a bit larger, and the coefficients of the other explanatory variables a bit smaller. Nonetheless, the significance of all coefficients is retained. Although the dynamic panel data estimators are linear estimators, they are highly sensitive to the specification-transformation of the model and its instruments.

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Appendix

Table A1
The Sample of Greek Banks

	Bank	*Total Assets*	*Gross Loans*	*Deposits*
1	National Bank of Greece (NBG)	120.745	75.105	68.039
2	Eurobank Ergasias (EFG)	87.188	58.597	44.435
3	Alpha Bank (ALP)	66.798	51.525	38.293
4	Piraeus Bank (PIR)	57.680	40.027	29.254
5	ATEBank (ATE)	31.221	22.912	19.683
6	Marfin Egnatia Bank (MEG)	22.131	13.794	9.861
7	Emporiki Bank (EMP)	26.777	24.105	12.246
8	TT Hellenic Postbank (TT)	16.566	8.216	12.125
9	Millennium Bank (MIL)	6.858	5.123	3.122
10	Proton Bank (PRN)	4.255	2.058	1.934
11	Attica Bank (ATT)	4.770	3.892	3.317
12	Probank (PRO)	3.938	2.876	3.031
13	Geniki Bank (GEN)	4.276	4.332	2.361
14	T Bank (TB)	2.733	1.939	1.701
15	FBB First Business Bank (FBB)	1.850	1.562	1.349
16	Panellinia Bank (PAN)	964	671	501
17	Aegean Baltic Bank (ABB)	385	217	221
	Total of sample	459.135	316.949	251.472
	Total Assets of Greek Banking System	514.130	377.175	281.197
	Percentage of system covered by sample	89.3%	84.0%	89.4%

Sources: BankScope, Banks' IFRS audited annual reports, ASE, Bank of Greece
Amounts in millions of euro. Data as of year end 2010.

Table A2
The Set of the Bank-specific Variables

Variable	*Definition*	*Measures or Proxies*
GLG	Gross loans (% change pa)	Growth in loans
GDEP	Customer deposits (% change pa)	Growth in deposits
EA	Equity to assets	Capital
ROAA	Return on average assets	Performance
CI	Cost to income	Operating efficiency

Source: Bankscope, Banks' IFRS audited annual reports and author's calculations

Table A3
The set of macroeconomic variables

Variable	*Definition*
DCPR	Private consumption, real (% change pa)
DGDP	Gross domestic product, real (% change pa)
DGFD	Public debt (% change pa)
IRPC	Housing prices index (% change pa)
LRD	Lending - Deposit interest rate differential (%)
RAT	Long-term Greek government bond yield (%)
SPD	Share prices' index (% pa)
UNEM	Unemployment rate (%)

Source: IMF Statistics, OECD, EIU, European Central Bank, Bank of Greece.

Table A4
Descriptive Statistics of the bank-specific variables

Variable	*Mean*	*Median*	*Maximum*	*Minimum*	*Std. Dev.*	*Observations*
GLG	20.88	16.63	159.10	-12.77	22.45	114
GDEP	8.23	7.21	96.29	-141.74	23.55	102
EA	8.66	7.14	73.30	-1.86	7.58	119
ROAA	0.21	0.38	8.13	-9.03	1.59	118
CI	69.03	65.11	159.48	31.66	21.91	119

Table A5
Descriptive Statistics of the Macroeconomic Variables

Variable	*Mean*	*Median*	*Maximum*	*Minimum*	*Std.Dev.*	*Observations*
DCPR	2.21	3.84	4.48	-3.63	3.26	7
DGDP	1.18	2.28	5.54	-3.52	3.59	7
DGFD	10.29	8.98	14.67	6.75	3.09	7
IRPC	3.60	2.31	12.98	-4.37	6.83	7
LRD	3.26	3.43	3.66	2.60	0.38	7
RAT4	5.07	4.50	9.09	3.59	1.85	7
SPD	2.25	22.31	29.45	-33.80	30.54	7
UNEM	9.60	9.43	12.48	7.70	1.58	7

Table A6
Growth in loans (GLG): Correlation Coefficients

	GLG
DGDP	0.589
DCPR	0.017
UNEM	-0.391
RAT	-0.406
LRD	0.011
IRPC	0.540
SPD	0.445
GDEP	0.721
EA	0.064
ROAA	0.416
CI	-0.225

Table A7
Panel Unit Root Tests for Growth in Loans (GLG) and Growth in Deposits (GDEP)

	Levin, Lin and Chu test	*ADF test*	*PP test*
GLG	-11.294 (0.00)	56.088(0.00)	83.678(0.00)
GDEP	-7.146 (0.00)	79.254(0.00)	90.126(0.00)

Note: The p-values are shown in brackets next to the corresponding statistic of each test.