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**The Global Financial Crisis and Integration in European
Retail Banking**

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The Global Financial Crisis and Integration in European Retail Banking

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Abstract

The aim of this paper is twofold. Firstly, to investigate the integration process within the European Union retail banking sector by analysing deposit and lending rates to the household sector during the period 2003-2011. Secondly, to assess the impact of the 2008 global financial crisis on the banking integration process, an area that is yet unexplored. An important contribution of the paper is the application of the recently developed Phillips and Sul (2007a) panel convergence methodology which has not hitherto been employed in this area. This method analyses the degree as well as the speed of convergence, identifies the presence of club formation, and measures the behaviour of each country's transition path relative to the panel average. The empirical results point to the presence of convergence in all deposit and lending rates to the household sector up to 2007. In sharp contrast, the null of convergence is rejected in all deposit and credit markets after the onset of the 2008 financial crisis. These results show that the global crisis has had a detrimental effect on the banking integration process. We find some convergence in a few sub-clusters of countries but the rate of convergence is typically slow and several countries are identified as diverging altogether. In addition, we find that the credit market, in general, is far more heterogeneous than the savings market.

JEL Classification: F36, G21, C33

Keywords: Integration; European retail banking; savings; lending rates; household sector; global financial crisis; Phillip and Sul convergence method.

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1. Introduction

As part of the wider aim for a Single Market for financial services which was launched in 1992, a single market for EU banking was viewed as pivotal by the European Commission. The aim was to facilitate the establishment of pan-European providers of financial products, generate greater consumer choice, and boost efficiency and competition, amongst others. At the time, major regulatory and institutional reforms were launched and these have been revised and reformulated over the years to keep up with an ever-changing and dynamic market. The wholesale banking sector has been widely investigated in the literature while the retail sector to a much lesser extent. The first aim of this paper is to investigate how successful the Single Market initiatives have been in creating an integrated European retail banking sector. Financial integration is understood to lead to long-run equilibrium and in this paper we assess the degree and speed of convergence towards retail banking integration. Given the importance of the household sector as a component of retail banking, it is believed that a thorough analysis of deposit, consumer credit and mortgage rates with varying maturities can paint a true picture of the integration process in European retail banking.

Moreover, given the severity of the 2007/8 global financial crisis and the ensuing Euro sovereign debt crisis, it is essential that we analyse the impact of the recent crises on European banking sector integration. Indeed as argued by Dabrowski (2010), the global financial crisis has sprung new challenges for the Single European Market initiative and its institutional structure. Quoting the heavy exposure of European banks to toxic assets and the subsequent chaotic policy responses at EU level, Dabrowski (2010) further argues that the crisis has uncovered several systemic weaknesses amongst European banks. This view has also been reported by Fonteyne et al (2010) who argue that the financial crisis has revealed gaps in the current EU cross border arrangements on crisis management, resolution and burden-sharing within the EU. The debate now is whether the new arrangements can fully address the shortcomings that have come to light. In addition, as the authors point out, the crisis has also shown the weaknesses of linking financial stability to fiscal responsibility. Not only has the strain on national budgets been severe since the crisis but it has also prevented better cross-border coordination. This has distorted the workings of an efficient single market. Furthermore, as stated by Arghyrou and Kontonikas (2012), since 2009, the global financial crisis turned into a sovereign debt crisis in the euro area whereby global banking risks have been transformed into

sovereign risk due to a lack of bank liquidity and an increase in fiscal liabilities as well as due to the impact on government debt after bank bailouts. This is reflected in the credit ratings of the EU countries where a clear demarcation is noted with Greece, Italy, Ireland, Portugal and Spain being rated lower compared to the rest of the EU15 countries. Furthermore, as argued by Black et al (2013), in 2011, with the escalation of the Greek crisis and the fear of contagion spreading to Spain and Italy in particular, concerns about systemic risk in European banks were mounting. In their empirical measurement of systemic risks amongst European banks, Black et al (2013) find that the banks' systemic risks were largely due to default risks and reached a peak in 2011. Furthermore, variability in the systemic importance of banks was present with Italian and Spanish banks showing higher concerns compared to the UK banks. Consequently, in light of the challenges faced by the Single Market due to heightened credit risks, refinancing risks and sovereign risks in the banking sector stemming from the global crisis, the second aim of this paper is to assess the impact of the global financial crisis on the integration of the European retail banking sector. We do so by firstly subdividing the sample period into 2 sub-periods; 2003-2007 and 2008-2011. Secondly, we further divide our sample for the second sub-period into two groups of countries; one comprising the countries with a lower credit rating¹ (Greece, Ireland, Italy, Portugal and Spain) and the second group consisting of the remaining ten EU countries. In addition, given that the UK and Sweden conduct independent monetary policy, we further test for convergence exclusively for the group of euro area countries plus Denmark².

An overview of the literature, starting from the 1990s to the present, shows a mixed picture with regards to investigations on the process of European retail banking integration. Some of the earlier studies (Kleimeier and Sander (2000, 2003), Schuler and Heinemann (2002)), typically conduct bivariate cointegration analysis on interest rate spreads for different household lending and deposit rates. Other studies (Murinde et al, 2000, Adam et al, 2002 and Vajanne, 2007) draw from the growth literature based on beta and sigma panel convergence tests to assess the degree and speed of convergence in the retail household sector. The remaining studies (Affinito and Farabullini, 2006, Sorensen and Lichtenberger, 2007, Sorensen and Guitierrez, 2006),

¹ GR, IE, IT, PT and ES have a rating lower than AA based on S&P, Fitch and Moody's ratings. The remaining 10 EU countries have a rating above AA.

² Denmark maintains a fixed exchange rate with the euro.

apply some different techniques such as the tests of coefficient equality and hierarchical cluster analysis to euro area retail banking sector.

Overall, for the 1990s period, the evidence in the literature so far paints a picture of a fragmented retail banking market. Regarding the more recent period, progress in the retail banking integration process is observed. This lends support to the argument that the launch of the euro, as well as the initiatives stemming from the Single Market and more recently, the Financial Services Action Plan, has been effective. Nonetheless, in most of the recent studies, the persistence of cross-country heterogeneity is also clearly evident. Limited institutional convergence in European banking and the importance of national characteristics, among other factors, are considered to be responsible for these results.

In the case of several of these studies, a number of short-comings have been identified. Firstly, some of the earlier studies (see Schuler and Heinemann, 2002; Sander and Kleimeier, 2003) apply time series cointegration analysis to small samples which, as widely argued in the literature, result in a loss of power of the test. The same observation is noted for the study by Affinito and Farabullini (2006) who apply unit root tests and tests of equality on country coefficients on a sample covering 2 years only. Second, the sample periods covered in most of the studies stop in the early 2000s except for the one by Vajanne (2007) who considers a sample up to 2006. The empirical model used by Sorensen and Lichtenberger (2007) also considers data up to 2006 but it must be noted that their analysis is predominantly an investigation of the determinants of mortgage rate dispersion rather than a direct assessment of the degree of integration within retail banking. Third, none of the studies on retail banking integration uses an actual test of convergence except for the application of beta and sigma convergence tests drawn from the growth literature³. However, even with the beta and sigma convergence methodology, limitations have been identified. For instance, as argued by Quah (1996), beta convergence is uninformative on the behaviour of the dispersion of the entire cross-section. He further argues that sigma convergence does not factor in the convergent or divergent behaviour of individual countries in the sample but is only concerned with how the whole cross-section behaves. Hence these convergence tests do not enable the analysis of the behaviour of each individual country series over time. Also, as argued by Islam (2003), β - and σ -

³ Developed by Barro (1991) and Barro and Sala-i-Martin (1992) in the growth literature. β convergence measures the speed of convergence while σ convergence measures the degree of convergence. These convergence tests have been used by Adam *et al* (2002) and Vajanne (2007).

convergence are more relevant within the context of growth literature and he has uncovered problems that arise when empirical analysis of convergence are conducted using these methodologies.

We make three major contributions to the literature. First, we present a detailed analysis of the convergence process in the European retail banking market for the period 2003 to December 2011, thus updating the current literature. Second, we investigate for the first time the impact of the global financial crisis on European banking integration. Third, we apply the recently developed powerful panel convergence methodology by Phillips and Sul (2007a)⁴, which has not been previously employed in this area⁵. This test of convergence, termed as the *logt test*, is ideally suited for this paper for the following reasons. Firstly, this methodology provides an empirical modelling of long run equilibria within a heterogeneous panel, outside of the co-integration setup. Secondly, this methodology can provide an estimate of the speed of convergence and can also cluster panels into club convergence groups. This test would thus not only be able to reveal whether any convergence is present within the European banking sector of the EU15 countries but the clustering algorithm will, in turn, detect whether any specific group of countries are converging or diverging. Thirdly, the test does not necessitate any specific assumptions regarding the stationarity of the variables and allows for cases where individual series may be transitionally divergent. This information is obtained through the computation of each country's relative transition parameter and the depiction of its transition path which portrays the country's behaviour relative to the panel cross-section average over time. This is very significant as it can potentially uncover situations where individual countries may be diverging even if as a whole group, convergence is detected.

The rest of the paper is organised as follows: section 2 outlines the Phillips and Sul(2007a) convergence methodology. Section 3 describes the datasets used. Section 4 presents the empirical results, while section 5 concludes.

2. Empirical methodology

⁴See an application in Phillips and Sul (2007b, 2009)

⁵Except by the same authors who have conducted a similar analysis on the non-financial corporations sector.

In this paper we take the view that integration in retail banking is a process whereby segmented markets become unified and open and where there is a tendency for prices of financial assets to converge over time. The Phillips and Sul (2007a) convergence panel methodology has not been previously used in the context of the EU household banking sector and its application brings a new dimension to the study of European banking integration⁶. The Phillips and Sul (P&S) model is based on a time varying factor representation. These are key aspects of the Phillips and Sul (2007a) model as it does away with the restrictions faced with standard unit root and cointegration tests whereby the presence of long-run equilibrium can be rejected because of shorter data panels due to data limitations. For instance, cointegration will not be detected in cases whereby the variables of interest may be converging over time but the speed of convergence is not fast enough to reflect cointegrated behaviour. The Phillips and Sul model will, however, be able to detect the presence of co-movement and convergence. This methodology can thus be described as an asymptotic cointegration test that models long run equilibrium while allowing for individual heterogeneity which can evolve over time. In particular, this feature of the Phillips and Sul methodology makes it superior to the beta and sigma convergence test as the P&S test allows for both common and individual heterogeneity. Furthermore, the Phillips and Sul methodology is better suited for this analysis as the time varying component of this test not only reveals the speed at which retail integration is taking place, if present, (which is also indicated by the beta and sigma convergence tests) but also highlights the different extent and speed of the integration level in the group of countries through the process of club formation.

2.1 *Relative transition paths*

Panel data for a variable X_{it} can normally be decomposed into two components comprising systematic components, g_{it} , and transitory components, a_{it} , as follows:

$$X_{it} = g_{it} + a_{it} \quad (1)$$

⁶A few recent studies have used the Phillips and Sul (2007a) model within the context of the European financial market namely, Caporale et al (2009) who investigate convergence in stock returns for 5 EU countries; Antzoulatos *et al* (2011) who analyse the convergence of non-interest income in the EU countries; Higson *et al* (2009) who explore the convergence in the European equity markets; and Fischer (2009) who measures price convergence in the European Monetary Union.

The main procedure in the Phillips and Sul convergence test is to calculate the time-varying loadings, g_{it} and to do so, Phillips and Sul(2007a) reformulates equation (1) such that common and idiosyncratic components are separated as follows:

$$X_{it} = \left(\frac{g_{it} + a_{it}}{\mu_t} \right) \mu_t = \delta_{it} \mu_t \text{ for all } i \text{ and } t, \quad (2)$$

Where μ_t is a single common component and δ_{it} is a time varying idiosyncratic element. Hence, δ_{it} measures the economic distance between the common trend component μ_t and X_{it} . To test whether the components of δ_{it} are converging, Phillips and Sul (2007a) define the transition coefficient as h_{it} and information about the time varying factor loadings δ_{it} can be extracted as follows:

$$h_{it} = \frac{X_{it}}{\frac{1}{N} \sum_{i=1}^N X_{it}} = \frac{\delta_{it} \mu_{it}}{\frac{1}{N} \sum_{i=1}^N \delta_{it} \mu_{it}} = \frac{\delta_{it}}{\frac{1}{N} \sum_{i=1}^N \delta_{it}} \quad (3)$$

The so-called *relative transition parameter* h_{it} measures δ_{it} in relation to the panel average at time t and therefore describes the transition path for country i relative to the panel average. Moreover, the convergence process can be graphically illustrated by plotting the transition parameter for each country over time.

However, macroeconomic variables often contain business cycle components which render the representation in (3) inappropriate. Hence, following Phillips and Sul (2007a) recommendation, the Hodrick-Prescott (1997) filter is used to filter out the cycle component in the interest rate data series and then work out the filtered transition coefficients \hat{h}_{it} . Hodrick and Prescott (1997) demonstrate that higher frequency data require a higher value for the smoothing parameter. In this paper the value of lamda is set to 14400, as suggested in the literature⁷ for monthly data.

2.2. The Log t regression

The log t regression test of convergence tests for the null hypothesis of convergence:

⁷ For instance, in Eviews, the default value for lamda is 14400 for monthly data.

$$H_0 : \delta_i = \delta \text{ and } \alpha \geq 0$$

Against the alternative

$$H_1 : \delta_i \neq \delta \text{ for all } i \text{ or } \alpha < 0$$

Phillips and Sul's (2007) procedure involves three steps, as listed below.

Step 1: The cross sectional variance ratio $\frac{H_1}{H_t}$ is calculated as follows:

$$H_t = \frac{1}{N} \sum_{i=1}^N (\hat{h}_{it} - 1)^2 \quad (4)$$

Step 2: The following OLS regression is performed:

$$\text{Log} \left(\frac{H_1}{H_t} \right) - 2 \log L(t) = \hat{a} + \hat{b} \log t + \hat{u}_t \quad (5)$$

Where $L(t) = \log(t+1)$ and the fitted coefficient of $\log t$ is $\hat{b} = 2\hat{a}$, where \hat{a} is the estimate of α in H_0 . The data for this regression starts at $t = [rT]$ with some $r > 0$. Based on the results of their Monte-Carlo simulations, Phillips and Sul (2007a) recommend $r = 0.3$.

Step 3: A one-sided t test of null $\alpha \geq 0$ using \hat{b} and a standard error estimated using a heteroskedasticity and autocorrelation consistent (HAC) estimator. The test statistic $t_{\hat{b}}$ is normally distributed and hence at the 5% level, the null hypothesis of convergence is rejected if $t_{\hat{b}} < -1.65$.

2.3. Club convergence algorithm

Following Phillips and Sul's (2007a) argument that a strict rejection of the null of convergence may not necessarily rule out the existence of sub-group convergence within the panel, the authors have developed a club convergence algorithm to detect such units of clusters. In the scope of this paper, this methodology will bring new insight into the convergence process within the EU15 retail banking sector by revealing whether clusters of convergence are present. If present, then the relationship within the clusters based on economic or structural characteristics can be further explored.

Phillips and Sul (2007a) clustering algorithm is based on repeated log t regressions and contains four main steps which are described below.

Step 1: The X_{it} series in the panel are ordered according to the last observation, X_{iT} .

Step 2: A core group is formed by selecting the first k highest panel members to form the subgroup G_k for some $N > k \geq 2$ and the convergence test statistic $t_{\hat{\beta}}(k)$ is calculated for each k . The core group size k^* is chosen by maximising $t_{\hat{\beta}}(k)$ under the condition that $\min\{t_{\hat{\beta}}(k)\} > -1.65$.

Step 3: Once the core group is formed, each remaining country is then added separately to the core group and the log t test is run. If the corresponding test statistic, $t_{\hat{\beta}}$ is greater than a chosen critical value, c^8 , then the country is included in the current subgroup to form a new group. The log t test is run for this subgroup and if $t_{\hat{\beta}}$ is > -1.65 , the formation of this subgroup is completed. Otherwise, the critical value c is raised and the procedure is repeated.

Step 4: The log t test is run on the group of countries not selected in step 3 and if convergence is detected within this new cluster, a second club is formed. Otherwise, in the case of rejection, steps 1, 2 and 3 are repeated on the remaining countries. If no other subgroups can be detected, it can be concluded that the remaining countries diverge.

3. Data sets and variable definitions

Nine monthly deposit and lending interest rate data sets for the households have been compiled for 15 EU countries⁹ over the period 2003-2011. Due to limited availability of data for the new EU countries, the empirical analysis conducted in this paper

⁸ Phillips and Sul (2009) suggest setting c to zero when T is small to ensure that it is highly conservative. However, for large T , c can be set at the asymptotic 5% critical value of -1.65 . Given that the number of observations in this paper ranges from 48 to 108, c is set at 0.

⁹ Austria (AT), Belgium (BE), Denmark (DK), Germany (DE), France (FR), Finland (FR), Italy (IT), Ireland (IE), Greece (GR), Luxembourg (LUX), Netherlands (NL), Portugal (PT), Spain (ES), Sweden (SE) and the United Kingdom (UK).

focuses on the group of 15 EU member states only. The data sets have been divided into two sub-periods to allow for the potential impact of the 2008 global financial crisis. The first period starts in January 2003¹⁰ and ends in December 2007. The second sub-period starts in January 2008 and ends in December 2011. The data series have been sourced from the ECB's harmonised database entitled "MFI Interest rates"¹¹ and some data have been supplemented by data obtained from national central banks.

The following datasets have been obtained from the ECB's Statistical Data Warehouse for the household sector:

- Deposit rates with up to 1 year; 1-2 years; and over 2 years maturities, respectively (2003-2011)
- Consumer credit with up to 1 year; and 1-5 years maturities, respectively (2003-2011)
- Mortgage rates with up to 1 year; 1-5 years; 5-10 years; and over 10 years maturities, respectively (2003-2011)

4. Empirical results

4.1. *Phillips and Sul (2007a) log t-test*¹²

Phillips and Sul (2007a) recommend conducting the convergence log *t*-test on filtered data series in order to remove the cycle component of each series. The Hodrick-Prescott (1997) filter is thus employed for this purpose. The *t*-statistics obtained for the convergence test for the 3 categories of deposit rates; the 2 categories of consumer credit rates; and the 3 types of mortgage rates for the period 2003-2007 and 2008-2011 are tabulated in Table 1. Of noteworthy importance is the fact that the magnitude of the convergence coefficient, \hat{b} , provides key information on the rate of convergence. Basically, the higher the value of \hat{b} , the faster the rate of convergence.

¹⁰ No harmonised data from the ECB is available prior to January 2003.

¹¹ The ECB Statistical Data Warehouse provides monthly harmonised data based on maturity duration for the household sector.

¹²The Gauss codes for the computation of the log *t* test and convergence clubs are available from Sul's website, <http://homes.eco.auckland.ac.nz/dsul013/>.

<Insert Table 1 here>

With regards to the household deposit rate series with up to 1 year; 1-2 years; and over 2 years maturities for the period 2003-2007, the null of convergence cannot be rejected for all 3 maturities. These results point to strong convergence in the European Union retail deposit market up to the year 2007. Furthermore, based on the value of the convergence coefficient, the rate of convergence is highest ($\hat{b} = 1.829$) for the deposit rates with the short-term maturities while the slowest rate of convergence ($\hat{b} = 0.836$) is noted for the deposit rates with the longest maturity duration.

As for the convergence results for the 2008-2011 period, the null of convergence is actually rejected for all 3 types of deposits rates and \hat{b} turns out to be negative. No convergence is also observed for the subcategories, i.e. i) the euro area countries plus Denmark, ii) for the group of GIIPS¹³ countries and iii) the group of non-GIIPS countries. These results are in sharp contrast to those from the earlier sample. The impact of the global financial crisis on the deposit market runs across board irrespective of whether countries belong to the euro area or not or whether they have varying levels of sovereign risks. The 2008-2011 log t results clearly indicate a retrenchment in the deposit market due to the crisis. As argued by the ECB (2011), banking activities were affected more by the 2008 global financial crisis than other markets due to the nature of the crisis which dealt a serious blow to the confidence in banks. Indeed, the ECB (2011) reports that based on structural indicators of integration such as the degree of bank penetration, the dispersion of the total assets of foreign branches and subsidiaries has increased, signalling an increase in cross-country differences in the degree of integration due to the crisis. The number of cross-border mergers and acquisitions has also been declining since 2008. Furthermore, the uncoordinated responses by national governments to the financial crisis created a major challenge to the Single Market. For example, in 2008, some Member States increased their maximum coverage under the deposit guarantee scheme while other Member States such as Ireland provided a blanket guarantee to their depositors. Eventually, in an attempt to harmonise the situation, the European Union amended the Deposit Guarantee Scheme Directive to increase the minimum coverage to €50,000 and to €100,000 one year later. Work on creating a more level playing field by

¹³ Greece, Ireland, Italy, Portugal and Spain.

harmonising the Deposit Guarantee Scheme and developing a funding model is still on-going at the European Commission level¹⁴. The Commission is expected to assess how a more integrated cross-border resolution and a crisis management framework are expected to be in place by 2014 (ECB, 2011).

Regarding the 2 panel data sets for the consumer credit rates for the period 2003-2007, the log t-test cannot reject the null of convergence for both the short-term and medium-term categories of consumer loans. However, the speed of convergence is slow ($\hat{b} = 0.425$) for the 1-year consumer credit rates and even slower ($\hat{b} = 0.080$) for the 1-5 years consumer credit rates. These results suggest that group convergence was present but at a slow pace in the household consumer credit market throughout the years 2003-2007. These results are not surprising given the highly segmented consumer credit market in the EU due to differences in national legislations, credit reporting systems, lack of cross-border credit transfers, and varied importance of consumer credit across the Member States. For instance, with regards to legislations, the Consumer Credit Directive which was adopted in 1987 was based on the principle of minimum harmonisation. This resulted in Member States establishing different national legislation which in turn, became obstacles to the provision of pan-European products (European Commission, 2005). Following years of negotiation, the Consumer Credit Directive has been revised and transposed in 2010. The new directive is based on the principle of maximum harmonisation and aims to facilitate cross-border transactions.

Another stark example of the differences in national legislations is the treatment of bankruptcy cases. For example, in France and Germany, personal bankruptcy is treated within the national bankruptcy regulations while in other Member States such as Spain, a customer cannot declare as bankrupt (Lanoo and Munoz, 2004). In addition, cross-border data information sharing through credit registers is limited within the EU and this obviously limits the opportunities for both providers of credit and potential customers (European Commission, 2009).

Moreover, the system for cross border payments was largely fragmented and posed a major impediment to the integration of the consumer credit market. In 1999, the common large-value payment system, TARGET, was launched but for retail low-

¹⁴http://ec.europa.eu/internal_market/bank/guarantee/index_en.htm#ccr

value payments, a large number of diverse payment systems¹⁵ have been in existence for most of 2000s.

Another factor that can explain the slow convergence in the consumer credit market is the heterogeneous nature of the European consumer credit markets, where the importance of consumer credit varies substantially among the Member States. For instance in the UK, consumer credit, as a share of GDP, represented around 16% in 2003 and around 11% for Sweden and Germany. In sharp contrast, for some other EU countries such as Belgium, Finland, Italy, Luxembourg and Netherlands, consumer credit was well below 6% (Wyman, 2005). This can be largely attributed to cultural differences and attitudes to credit within the EU. Overall, these factors may be responsible for the slow growth in group convergence, as evidenced by the log t -test. With regards to the log t -tests for the consumer credit panels for the period 2008-2011, in contrast, the null of convergence is rejected for all the panels, including the subcategories of i) euro-area countries plus Denmark; ii) GIIPS countries and iii) non-GIIPS countries. Once more, the impact of the 2008 global financial crisis in putting a halt to the integration process is clearly evident in these findings. Moreover, given the role that credit market risks played in the build-up of the crisis, it is not surprising that the credit market has taken such a hit. In the aftermath of a banking crisis, it is common occurrence for banks to scale back on their credit activities and in the case of Europe, credit tightening has been rife during 2008-2010 (Coeuré, 2012). Given the heavy reliance on bank credit in Europe, this has undoubtedly worsened the situation both domestic-wise and especially across-border. Coeuré (2012) further adds that the reduction in the growth of loans to households is a result of both a decline in the supply of loans to funding shortages but also due to a reduction in demand for credit and that the situation varies among the European countries, highlighting an increase in cross-country heterogeneity. Given the escalation of the Euro sovereign debt crisis in 2012, it is very likely that this heterogeneity will widen and further impair the integration process.

As for the 4 panels of mortgage rates with varying maturities for the period 2003-2007, the log t -test cannot reject the null of convergence for all the categories of

¹⁵ The Single Euro Payments Area (SEPA) initiative which aims at creating an integrated payments system has been implemented gradually in 2006-2008. It is only in 2011, that SEPA started processing card payments.

mortgage rates, hence providing strong evidence for an integrated mortgage market in Europe up to 2007. It can also be observed that the speed of convergence is faster for the short-term mortgage rates ($\hat{b} = 0.797, 0.387$) and medium-term rates ($\hat{b} = 0.550$) compared to the mortgage rates with over 10 years maturity ($\hat{b} = 0.221$). The group convergence results obtained for the mortgage rates with longer maturities can be explained through economic theories on term structure of interest rates, such as the expectations theory and the liquidity preference theory. According to the expectations theory, long-term interest rates are determined by market expectations about the trajectory of future short-term interest rates and inflation rates. Hence, an upward sloping yield curve, for example, would imply that the market expects short-term interest rates to rise (Pilbeam, 2010). Within the context of European mortgage interest rates, Bondt et al (2005) show that long term retail bank interest rates adjust not only to short-term interest rates but also to long term market interest rates. Their analysis is based on an error correction model that looks at long term mortgage rates in ten¹⁶ EU countries. The authors argue that in the presence of uncertainty with regards to future monetary policy changes, banks adjust their long-term retail interest rates in line with a target long-term money market rate which would better incorporate any expected future changes. Their argument also proposes that interest rate exposure due to a mismatch in maturities for assets and liabilities will thus be limited.

The second theoretical explanation for the limited convergence in long-term mortgage rates is the liquidity preference theory whereby longer term interest rates not only reflect market expectations but also include a risk or liquidity premium to factor in the higher level of risk for the lender. Martin-Oliver et al (2007) investigate the retail banking rate differences among Spanish banks for the period 1989 to 2003 using the relative and absolute law of one price and find that credit risk premium which is part of the marginal costs of loans is an important explanatory factor for dispersion among loan rates for various banks. Furthermore, based on an analysis of variance (ANOVA) test, the study finds that loan maturity is an important determinant of interest rate variability. Overall, based on their findings, the authors extrapolate that differences in credit risk policies would have a significant bearing on European retail banking integration. A similar conclusion was also reported in the ECB (2006) report which compares the differences between the yield curve for different instruments of varying maturities and the euro area yield curve in order to measure the impact of the maturity

¹⁶ AT, BE, DE, ES, FI, FR, GR, IE, IT, LUX, NL, PT

duration. The findings show that the period of maturity does indeed have an impact on the mortgage rates to households. Hence the underlying implication is that the duration of interest rate maturity may very well influence the lending rate by reflecting credit risk. This would, in turn, explain cross-country differentials.

Along the same lines as the results obtained for the deposit and consumer credit rates for the 2008-2011 period, the null of convergence is also rejected for all the 4 types of mortgage rates for the recent period ($\hat{b} = -0.988, -1.918, -1.738, -1.999$). Similar results are obtained for the panels consisting of only euro area countries plus Denmark as well as GIIPS and non-GIIPS countries. The dismal results for the mortgage market are not surprising given the repercussions across the world since 2007 when the subprime housing crisis in the U.S. erupted. The ensuing credit tightening and deleveraging among banks, the knock-on effects on the global economy, the ongoing Euro sovereign debt crisis have since been battering the European mortgage markets and widening disparities. Given the predicament and continuing uncertainty surrounding some of the EU member states such as Greece, Spain and Italy, this may lead to further national fragmentation.

4.2. Club clustering test and transition paths

Having established the presence of convergence in all of the deposit, consumer credit and mortgage up to 2007 and not beyond, the next step in the analysis is the application of the Phillips and Sul (2007) clustering algorithm test which would identify countries that are converging within different clusters and highlight diverging behaviour. The strength of this test is that even if the whole panel of 15 countries do not converge as a block, sub-group convergence, if present, may still be detected. Hence, retail banking integration should not be ruled out just on the basis of the log t -test but must be analysed together with the club clustering test results. The test statistics are reported in Table 2, and discussed below together with the third component of the test which is the calculation of each country's filtered relation transition coefficient, \hat{F}_{it} . This transition coefficient illustrates the path taken by each country's filtered series vis-à-vis the panel average over the time period investigated. Consequently, this procedure provides additional information on the convergence process in European retail banking.

<Insert Table 2 here>

4.2.1. *Short term deposit rates: 2003-2007*

The sub-club convergence tests reveal the presence of only one cluster, grouping all 15 countries, for the short term deposit rates for the period 2003-2007. A fast speed of convergence is also observed ($\hat{b} = 2.114$). These strong convergence results are depicted in Figure 1, where it can be observed that the deposit series for the panel of 15 countries are closely clustered and moving asymptotically towards one, especially around 2005. The other noticeable fact is that the transition paths for UK, Sweden and Italy start by moving away from the cross-section average but end up converging along the same lines as the other countries in the panel.

With regards to the UK, the unique characteristics of the UK banking market such as a generally higher concentration and profitability ratios; a significantly lower savings ratio (linked to developments in the housing market) compared to the EU average, combined with the fact that it is outside the Euro-zone could explain the divergent path undertaken by UK's deposit rates at the start of the period investigated. However, towards the middle of 2004 and 2005, the transition path takes a dramatic turn and starts converging towards the EU cross-section average. This turn of event coincides with the numerous regulatory reforms that were undertaken by the UK during this period such as the EU Directives on Consumer Credit and Capital Adequacy. It can thus be argued that these major regulatory reforms have catapulted the UK's integration within the EU banking sphere around 2005.

The divergent path undertaken by Sweden's rates at the start of the period coincide with the major banking reforms being undertaken following the Swedish banking crisis in the early 1990s. These included the break-down of the separation between savings and cooperatives banks. Further reforms were pursued from 1998 to 2003, and the Swedish banking sector was transformed from a fragmented banking market to a more competitive one. Hence, it can be advanced that the lack of convergence witnessed in Sweden's rates at the beginning of the period until 2004-2005, can be attributed to the major structural and consolidation programme going on at the time.

In the case of Italy, along the same vein as above, the initial move away from the cross-section average could be attributed to the major deregulation and privatisation reforms that were kick-started in the late 1990s. This resulted in the creation of universal banks and a much more competitive Italian banking market. Hence, the subsequent convergence in the transition path for Italy can be attributed to the positive results of the consolidation and privatisation programme in the domestic market post 2004.

<Insert Figure 1 here>

4.2.2. *Short term deposit rates: 2008-2011*

As seen in Section 4.1, the log t -test for group convergence is rejected for the short term deposit rates for this period. The club convergence results identify a slightly different pattern of convergence. Two clusters of slow convergent countries are revealed. The first club groups Greece, Italy, Portugal and Sweden ($\hat{b} = 0.916$) while the second club comprising Ireland, Spain, Netherlands and France shows a very slow speed of convergence ($\hat{b} = 0.084$). The remaining 7 countries show divergent behaviour, with the null of convergence being rejected. Interestingly, there is no change at all in the club formation and divergent behaviour if Sweden and UK are excluded from the panel. As for the GIIPS countries, 2 sub-clubs are identified, each club converging weakly. The first club consists of Greece, Italy and Portugal ($\hat{b} = 0.18$) while the second club groups Spain and Ireland ($\hat{b} = 0.02$). The results for the non-GIIPS countries mirror the results obtained for the panel of EU15 and EU13 countries. There is, once more, consistency with regards to the groupings of the countries into the sub-clubs. Overall these results are consistent with the log t -test which portrays a fragmented deposit market following the financial crisis. The results also imply that the club formation is not affected by the variability in credit risks. Looking at the transition paths displayed in Figure 2 for all the countries, it can be observed that the paths for the countries belonging to the first cluster in each sub-category have a similar trajectory, well away from the cross-section average, in particular Greece. The same can be observed for the countries in the second cluster and the divergent countries.

<Insert Figure 2 here>

4.2.3. *Deposit rates (1-2 years' maturity): 2003-2007*

The clustering test results for the deposit rates with medium-term maturities for the 15 EU countries shows a similar convergence process as for the deposit rates with shorter-term maturities. Once again, all 15 EU countries belong to just one sub-club pointing out to retail banking integration in this market during this period. However, the speed of convergence is slower for this panel set ($\hat{b} = 1.305$). This fairly pronounced degree of convergence is also illustrated in the behaviour of the panel of countries' transition paths (Figure 3). It can be observed that, at the start of the period, the transition paths for UK and Sweden diverge from the cross-section average of one

but slowly move towards the average around 2005. This was evident too for the deposit rates with shorter maturities and the same reasons, as discussed in Section 4.2.1, can be cited as explanations for such behaviour.

<Insert Figure 3 here>

4.2.4. *Deposit rates (1-2 years' maturity): 2008-2011*

On the other hand, the clustering results for the medium deposit rates after the crisis show opposite results with 13 of the countries rejecting the null of convergence and only two countries (Denmark and Luxembourg) showing club convergence. Interestingly, if we exclude the GIIPS countries from the panel, we find club convergence, albeit at a slow pace ($\hat{b} = 0.14$) in the first group of countries while Denmark and Luxembourg once more cluster together. So overall, the results overwhelmingly point to an abrupt halt in the integration process in the deposit market especially if the GIIPS countries are included, as observed in Section 4.1. The transition paths, on their part (see Figure 4) show very heterogeneous behaviour from the majority of the countries and underpin the discussion in Section 4.1.

<Insert Figure 4 here>

4.2.5. *Deposit rates (>2 years' maturity): 2003-2007*

With regards to the household deposit rates with over 2 years' maturity, once more, akin to the other 2 deposit sets for the 2003-2007 period, just 1 sub-cluster is identified, grouping all 14 countries in the sample. However, a much slower speed of convergence is noted, compared to the deposit rates with shorter maturities for the same period ($\hat{b} = 0.82$). These results point to a mixed picture on the convergence process for this dataset. This observation is also highlighted in the illustration of each country's transition path for this panel (see Figure 5). It is clearly visible that the transition paths for the 14 EU countries do not show a common front.

<Insert Figure 5 here>

Therefore, the major observation here is that the convergence process for that period seems definitely slower or more diverse when deposit rates with longer maturities are tested as opposed to deposit rates with shorter maturities. The explanation for the variation in the convergence process can be drawn from a theoretical perspective. As

widely discussed, long-term interest rates reflect financial market expectations of future inflation, economic developments and interest rates set by the central banks. Hence, by inference, long-term interest rates are determined by economic conditions at country-level and as such wide disparities are bound to exist within the panel of 15 EU countries. This would, in turn, translate into weaker integration with the retail banking sector. Moreover, as discussed in various interest pass-through literature, given the nature of the retail banking sector where regulatory and institutional barriers are rife, retail banking rates tend to adjust more slowly to competitive market rates. Of particular interest is the study by Sorensen and Werner (2006) who apply the Pedroni cointegration test to model a relationship between euro-area saving deposit rates and market rates. They find that the adjustments for the deposit rates are so sluggish that no long-run relationship with the market rates can be detected. The authors also attribute these results to differences in national regulations such as ceilings on rates and tax exemptions.

Another relevant study is the one by Gropp et al (2007) who investigate the adjustment process of retail euro area deposit spreads relative to the national inter-bank deposit rates and find that bank spreads for deposit rates with varying maturities (including long-term) adjust sluggishly to market rates. Importantly, the authors also reveal that control variables such as bank soundness, credit risk and interest rate risk have a significant influence on the speed of pass-through. Moreover, they also find that competition among banks triggers a faster pass-through. Therefore, based on these findings and the Phillips and Sul (2007) test results as discussed above, another notable inference that can be drawn here is that the lesser the degree of competition, the lesser the resulting degree of retail banking integration.

4.2.6. *Deposit rates (>2years' maturity): 2008-2011*

The clustering results for the longer term deposit rates after the crisis reveal that the slower rate of convergence noted for the earlier period has now turned to no convergence with 11 of the 14 countries rejecting the null of convergence. Austria, Finland and Ireland are the only 3 countries belonging to one convergent club ($\hat{b}=0.57$). The results do not change if Sweden and the UK are removed from the panel. However, for the group of GIIPS countries except for Ireland, a very slow rate of convergence is noted ($\hat{b}=0.01$). As for the panel of non-GIIPS countries, we find slightly more convergent behaviour with 2 clubs consisting of Netherlands, Sweden and the UK and secondly, Austria, Belgium and Finland. So it would seem that the inclusion of the GIIPS countries produce more divergence. The transition paths for

these deposit rates (see Figure 6) further highlight the lack of convergent behaviour among this panel.

Overall, the integration process in the European deposit market showed significant progress in the 2003-2007 period. However, the onset of the financial crisis has dramatically altered this process.

<Insert Figure 6 here>

4.2.7. *Consumer credit rates (1 year maturity): 2003-2007*

With regards to the clustering results for the short-term consumer credit rates, two clusters are identified. The first club groups Austria, Denmark, Spain, Finland, France, Ireland, Italy, Luxembourg, Netherlands ($\hat{b} = 0.5$) while the second cluster groups Belgium, Germany, Greece, Portugal, Sweden and UK ($\hat{b} = 0.7$). So, along similar lines as results obtained under the log t tests (See Section 4.1), we find club-convergence in the short-term consumer credit rates but at a slow pace. Unsurprisingly, the countries' transition paths for the consumer credit rates for this period show a range of diverse and scattered transition paths (see Figure 7). No specific clustering around the cross-section average can be detected for this panel of countries. These results are similar to those obtained by Vajanne (2007) who actually rejects the hypothesis of convergence for consumer credit rates with shorter maturities. Her study finds that the spreads for this instrument category are very large and attributes these findings to the variety of credit products that exist in the European Union.

<Insert Figure 7 here>

4.2.8. *Consumer credit rates (1 year maturity): 2008-2011*

At the time of the crisis and leading up to 2011, for the EU15 group, the short-term consumer credit rates still show the prevalence of 2 sub-clusters, albeit with a slow pace of convergence. The first cluster groups Belgium, Denmark, Ireland, Italy, Portugal and Sweden ($\hat{b} = 0.6$) while the second cluster groups Austria, Spain, Finland and France ($\hat{b} = 0.35$). In addition, this time, five countries, namely Germany, Greece, Luxembourg, Netherlands and the UK are revealed as divergent. The exclusion of i) Sweden and UK and ii) GIIPS from the panel does not alter the results in any significant way. The same can be observed for the group of GIIPS countries which show weak convergence ($\hat{b} = 0.62$). Greece is once more revealed as diverging.

Overall, no obvious pattern in the formation of the clubs can be detected. This point is further reflected in the behaviour of the transition paths (See Figure 8). There is no evidence of clustering and in particular, it can be seen how the paths of certain countries such as Greece, Denmark, Italy and Portugal are moving further away from the cross-section average.

<Insert Figure 8 here>

4.2.9. *Consumer credit rates (1-5 years' maturity): 2003-2007*

With regards to the consumer credit rates with medium-term maturities for the period 2003-2007, 1 sub cluster with 9¹⁷ countries ($\hat{b} = 0.532$) is identified by the Phillips and Sul (2007) club clustering algorithm while the remaining 6¹⁸ countries are divergent. What is evident with this sample is that the duration of maturity seems to be inversely related to convergence. This is further illustrated by the transition paths (Figure 9) which are very heterogeneous, especially at the start of the period.

<Insert Figure 9 here>

4.2.10. *Consumer credit rates (1-5 years' maturity): 2008-2011*

The clustering results for the consumer credit rates with longer-term maturity for the EU15 group following the crisis reveal the presence of 2 clusters, converging at a slow speed. The first group consists of Spain, Greece, Portugal and the UK ($\hat{b} = 0.2$) while the second cluster groups the remaining countries and has a rate of convergence close to 0 ($\hat{b} = 0.005$). Weak convergence is again noted for the panel excluding i) Sweden and UK and ii) GIIPS countries. For the group of GIIPS countries, the pattern of club formation does not change with Spain, Greece and Portugal clustering together again ($\hat{b} = 0.52$) while Ireland and Italy diverge. The transition paths (Figure 10) underpin this observation and show very diverse behaviour.

<Insert Figure 10 here>

¹⁷ AT, ES, FI, GR, IE, IT, NL, SE, UK

¹⁸ BE, DK, DE, FR, LUX, PT

Overall, for the consumer credit panels, it can be observed that the countries move in and out of different clusters depending on which data set is tested, thus highlighting inconsistent behaviour. This haphazard clustering of the 15 EU countries and the diversity observed in the transition paths for the countries could be interpreted as follows. Firstly, these results could be reflecting the inherent national characteristics of retail banking such as varying market structures, different credit instruments, and legal and regulatory framework, amongst others. Secondly, the occurrence of the financial crisis has compounded the first factor and has further fragmented the consumer credit market along national boundaries.

4.2.11. *Mortgage rates (1 year maturity): 2003-2007*

For the short-term mortgage rates, all the EU countries in the panel form one single club for the period 2003-2007. Clearly convergence in the short-term mortgage market ($\hat{b}=0.88$) is clearly evident. The transition paths depicted in Figure 11 show some interesting patterns. Clearly, the convergence in the short mortgage market only gained momentum towards mid-2000s. Beforehand, the transitions paths are fairly scattered. Notably, we find that the transition path for the UK once more starts by moving away from the cross-section average to eventually move in tandem with the rest of the panel. This is discussed earlier in Section 4.2.1.

<Insert Figure 11 here>

4.2.12. *Mortgage rates (1 year maturity): 2008-2011*

The results for the EU15 club convergence tests for the second time period show a complete absence of convergence and underpin the group convergence results discussed in Section 4.1. When the test is run on a panel which i) excludes Sweden and UK and ii) GIIPS countries, some convergent behaviour is noted but the speed of convergence is very slow with \hat{b} ranging from 0.07 to 0.36. Amongst the group of GIIPS countries, Spain, Ireland and Italy show up as diverging while Greece and Portugal form a club with weak convergence ($\hat{b}=0.1$). The overall divergence noted for the short-term mortgage rates is clearly visible in the behaviour of the transition paths (see Figure 12) which show high variability beyond the year 2008.

<Insert Figure 12 here>

4.2.13. *Mortgage rates (1-5 years' maturity): 2003-2007*

Based on the club clustering test results, the convergence process in the short-term mortgage rates is once more evident in the 2003-2007 period. One cluster regrouping all of the 15 EU countries is identified ($\hat{b}=0.506$). This clearly points to convergence for this type of mortgage rate similar to the 1yr mortgage rates. The transition paths for the 1-5 year's mortgage rates, shown in Figure 13, highlight the convergence detected in this panel for most countries. For a few countries, namely Portugal, Greece and UK, initially the transition coefficients move away from the panel cross section average but eventually change course towards one in late 2000s. This pattern for the UK has been observed in the case of the deposit rates and 1-yr mortgage rates and the explanations for such behaviour have already been discussed in Section 4.2.1. In the case of Greece, one main aspect that sets the Greek mortgage market apart from the rest is the fact that the country has generally one of the lowest residential mortgage-debt to GDP ratio among the EU 15 countries (EMF, 2009). Additionally, compared to the other European countries, repayments periods tend to be shorter and a greater proportion of short-term fixed rate mortgages are available as opposed to variable rate mortgages (Miles, 2003). As for Portugal, according to Standard and Poor's (2012), in the early 2000s, the mortgage market went through a significant reduction in growth and attributed this to a rise in interest rates and much stricter regulation. This could explain the behaviour shown by the country's transition path at the start of the period.

<Insert Figure 13 here>

4.2.14. *Mortgage rates (1-5 years' maturity): 2008-2011*

Unsurprisingly, given the origins of the financial crisis, the impact on the European mortgage market has been severe. The clustering tests show that no club formation is present; with all the EU15 countries either displaying a negative rate of convergence ($\hat{b}=-0.229$) or being labelled as divergent (Austria, Denmark, Finland, Luxembourg). These results are reproduced fairly consistently even if i) Sweden and the UK and ii) GIIPS countries are excluded. This highlights the impact of the crisis on the mortgage market across all countries irrespective of the differences in monetary independence or the level credit risks. This fact is also dramatically depicted in Figure 14 where it can clearly be seen how the paths suddenly become increasingly divergent beyond 2008.

<Insert Figure 14 here>

4.2.15. *Mortgage rates (5-10 years' maturity): 2003-2007*

The clustering algorithm reveals only one sub-club grouping 14 of the 15 EU countries for the medium-term mortgage rates for the 2003-2007 period. Greece is the only divergent country. The speed of convergence for the cluster ($\hat{b}=0.550$) is also similar to those of the 1yr and 1-5 years mortgage panels for the same period. The transition paths, as illustrated in Figure 15, for the mortgage rates with medium term maturities show general similarities between the countries in the sample, with some concentration visible around the cross-section average. Interestingly, it is also apparent that the behaviour of the transition coefficients for Spain, Greece and Portugal take different paths from the rest of the group. The reasons cited above in Section 4.2.13 provide an interpretation for Portugal's and Greece's paths. As for Spain, a study by Sorensen and Werner (2006), which looks at the interest rate pass-through for various mortgage rates for the euro-area countries, makes the observation that the mortgage rates for Spain tend to adjust more slowly than other countries. Furthermore, the housing boom that took place in Spain during the period under investigation cannot be ignored. Spain consistently showed the highest proportion of residential investment as a share of GDP (EMF, 2009).

<Insert Figure 15 here>

4.2.16. *Mortgage rates (5-10 years' maturity): 2008-2011*

After the crisis, the formation of one major club drastically changes to 4 small clubs and some divergent countries when the whole group is tested. The first club consists of Portugal and Spain ($\hat{b}=3.168$) while the second group comprises Greece, Netherlands and the UK ($\hat{b}=0.290$). The third cluster groups Denmark, France and Ireland ($\hat{b}=0.693$) while the remaining five countries¹⁹ are all divergent. The number and composition of the sub-clubs do not change even if Sweden and the UK are excluded. Similar results are also obtained when the GIIPS countries are removed. As for the GIIPS panel, Spain and Portugal once more form a strong club, while Greece, Ireland and Italy diverge. Figure 16 show how the transition paths change from being initially clustered around the cross-section average to branching out in all directions

¹⁹ AT, FI, IT, LUX, SE

by 2009 and onwards. In particular it can be observed that the transition path for Spain is clearly separated from the rest of the group and moving further away. This can be attributed to the bursting of the massive housing bubble in Spain after the crisis.

<Insert Figure 16 here>

4.2.17. *Mortgage rates (> 10 years' maturity): 2003-2007*

The Phillips and Sul (2007) club clustering test cannot reject the null of convergence for the mortgage rates with longer term maturities for the 2003-2007 period and identifies one club. However a slow rate of convergence is noted ($\hat{b}=0.193$). These results are in tune with the log t -test which showed similar results for this panel set of 12 countries. The transition paths depicted in Figure 17, show very diverse behaviour of the transition paths of the countries in the panel. No consistent pattern can be observed in this case. Explanations for the weak results obtained for the longer-term mortgage rates for the 2003-2007 period have been discussed in Section 4.1.

<Insert Figure 17 here>

4.2.18. *Mortgage rates (> 10 years' maturity): 2008-2011*

The clustering results for this data set is similar to the previous mortgage set for the same period, where several small clusters are identified. Here, 3 clusters and 3 divergent countries are revealed. The first cluster consists of Denmark, Greece, Netherlands and the UK and has a negative rate of convergence ($\hat{b} = -0.263$). Similarly, the second cluster consisting of Italy and Spain also shows a negative rate of convergence ($\hat{b} = -0.001$). The final cluster comprising Belgium, Germany and France shows stronger club convergence ($\hat{b} = 2.715$) while Austria, Finland and Portugal are divergent. The formation of the clubs following the crisis is quite interesting, especially in the case of the bigger economies: Germany and France which show harmonised behaviour and isolation from the rest of the countries. The results show no marked differences when Sweden and the UK or when the GIIPS countries are excluded. Among the GIIPS countries, only Greece and Italy form a club but with slow convergence ($\hat{b} = -1.48$). The transition paths shown in Figure 18 further highlight the fragmentation and divergence sweeping the European mortgage market following the crisis.

<Insert Figure 18 here>

5. Conclusions

The aim of this paper is to conduct a thorough empirical investigation of the convergence process in European retail banking sector by analysing deposit, consumer credit and mortgage rates to the household sector for the period 2003 to 2011. An important contribution of this paper is the application of the Phillips and Sul (2007a) convergence methodology, which has not been previously employed in the literature on European banking integration. The use of this panel test is a major contribution of this paper as the Phillips and Sul (2007a) methodology not only detects the presence and degree of integration but also provides an estimate of the speed of convergence. Additionally, the club clustering algorithm indicates whether sub-groups of countries are converging or showing divergent behaviour. The second contribution of this paper is the analysis of the impact of the 2008 global financial crisis on the retail banking integration process, a new area of empirical work.

The main findings of the paper are as follows. First, convergence is detected in the European retail banking sector for the household market for the period 2003-2007. Based on results obtained, it can be asserted that this convergence process is more evident for the deposit market. As for the consumer credit and mortgage markets, they show signs of being the most heterogeneous markets. A slower speed of convergence is detected at group level and club formation is apparent especially for the consumer credit market. Countries typically move in and out of clusters and no consistent pattern is observable. The transition paths also illustrate some diversity in the convergence patterns especially for instruments with longer maturities. In addition, maturity duration seems inversely related to convergence results and arguments drawn from a theoretical perspective on the term structure of interest rates such as the expectations and liquidity preference theories are put forward in support of this finding.

In sharp contrast to the positive results on retail banking integration obtained for the 2003-2007 series, no group convergence can be detected in any of the 9 panel data sets of deposit, consumer credit and mortgage rates for the period 2008-2011. The club clustering tests reveal the presence of very few clusters; typically with a slow rate of convergence. Excluding countries with monetary independence (Sweden and the UK) or countries with lower credit ratings (Greece, Ireland, Italy, Portugal and Spain) from the panel do not significantly change any of the results, except for the

long term deposit rates and short-term mortgage rates where the exclusion of the GIIPS countries produces less divergence. The transition paths, on their part, further highlight widespread heterogeneity and asymmetries in the retail banking sector. Hence, an almost total lack of convergence across all deposit and credit rates for the more recent period is evident. These results can only be attributed to the severe impact of the 2008 global financial crisis and the ongoing Euro sovereign crisis on the European retail banking integration process. It would seem that the crisis has brought an abrupt halt to the integration process in both the deposit and credit markets. In the consumer credit and mortgage markets, the crisis has most likely further compounded the existing structural and legal barriers prevalent in this market. Fragmentation along national boundaries, in this case, seems inevitable. We attribute this reversal in the European retail integration process to the systemic weaknesses in European banks and regulatory shortcomings that the 2008 global crisis and the ensuing Euro sovereign debt crisis have uncovered. The strain on national budgets, the lack of cross-border co-ordination on crisis management and resolution and the challenges posed in supervising pan-European banks²⁰ have dramatically changed the course of European retail banking.

It can be argued that the retrenchment being witnessed in the European retail banking sector is seriously impairing the integration process which has come a long way since the 1990s. In addition, the changes being brought forward by the European Commission such as the new proposal adopted in June 2012 on bank recovery and resolution,²¹ the review conducted on the structure of EU banking²², the proposal adopted in September 2012 for a single supervisory mechanism²³ for banks in the euro area, and the pressure on European banks to comply with Basel III will further change the scene for European banking. In the meantime, the threat of further national fragmentation is very tangible.

²⁰ See Dabrowski (2010), Fonteyne et al (2010) and Arghyrou and Kontonikas (2012) for a detailed discussion.

²¹ <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/12/570&format=HTML&aged=0&language=en&guiLanguage=en>

²² http://ec.europa.eu/internal_market/bank/group_of_experts/index_en.htm#High-level_Expert_Group

²³ <http://europa.eu/newsroom/calendar/event/387068/commission-to-propose-a-single-banking-supervision-mechanism>

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Figure 1. Transition paths for each country's 1yr deposit rates (2003-2007)

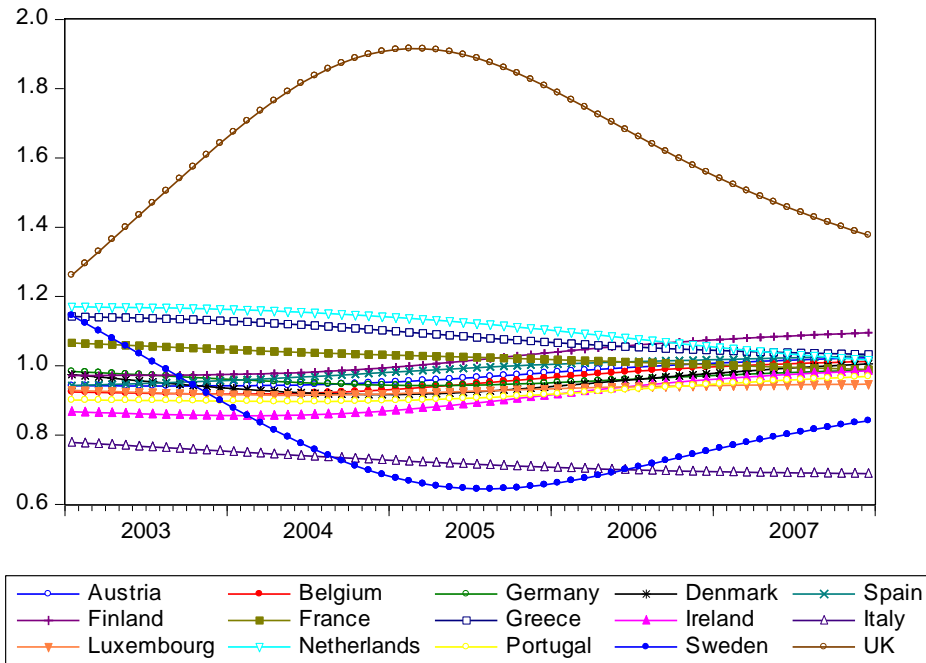


Figure 2. Transition paths for each country's 1yr deposit rates (2008-2011)

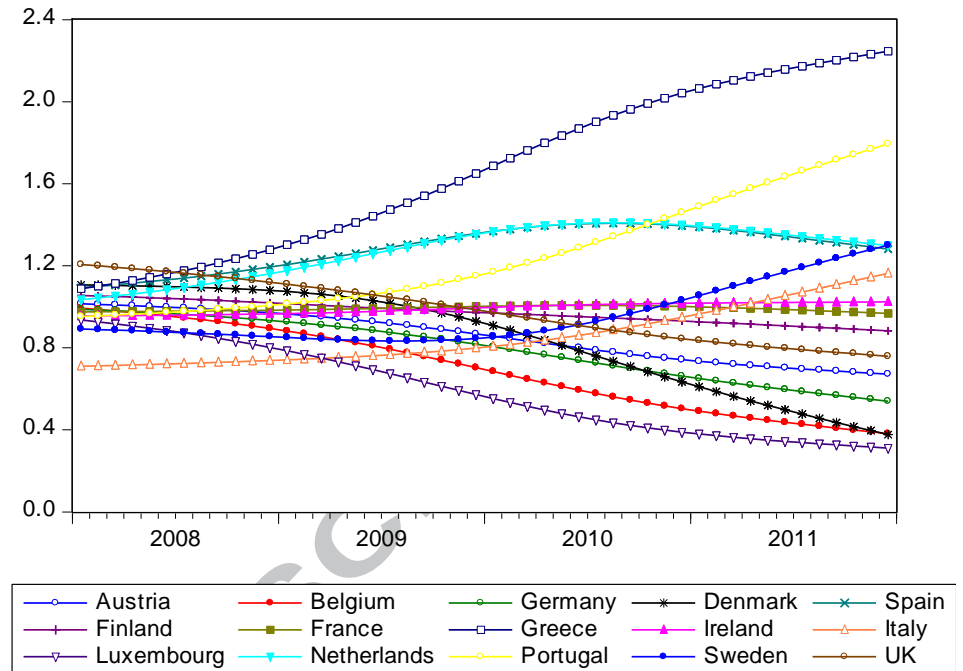


Figure 3. Transition paths for each country's 1-2yrs deposit rates (2003-2007)

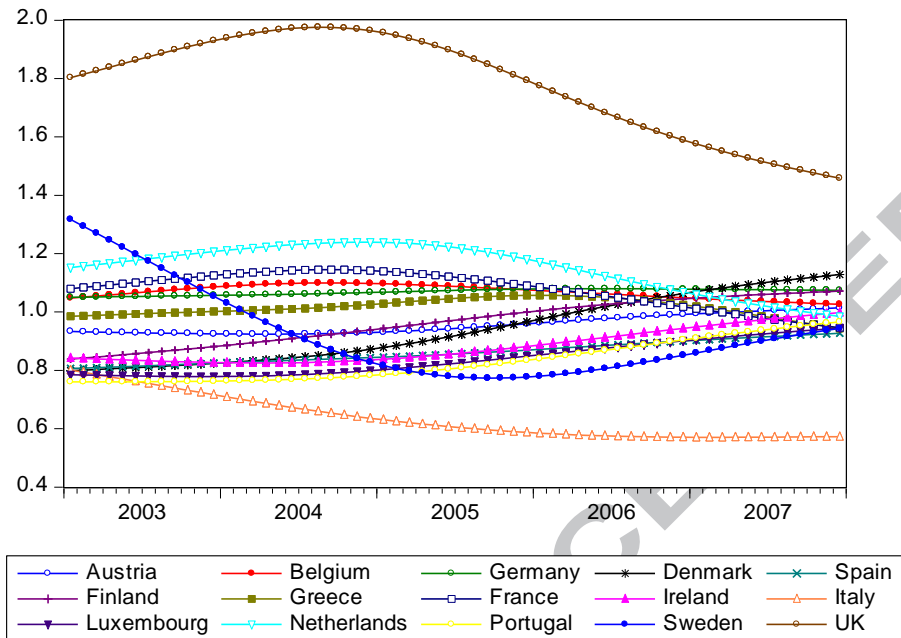


Figure 4. Transition paths for each country's 1-2yrs deposit rates (2008-2011)

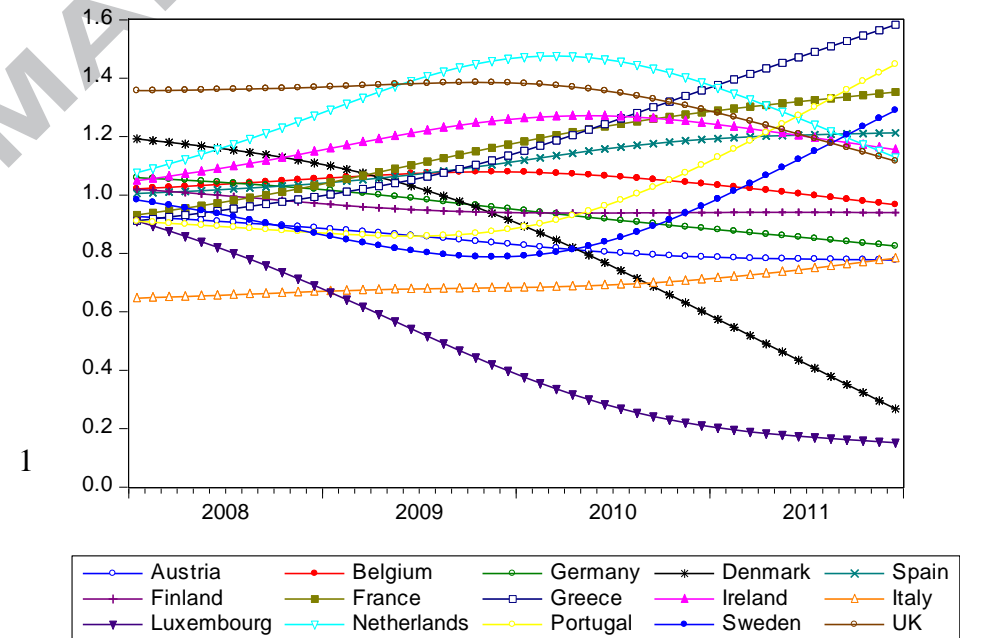


Figure 5. Transition paths for each country's >2yrs deposit rates (2003-2007)

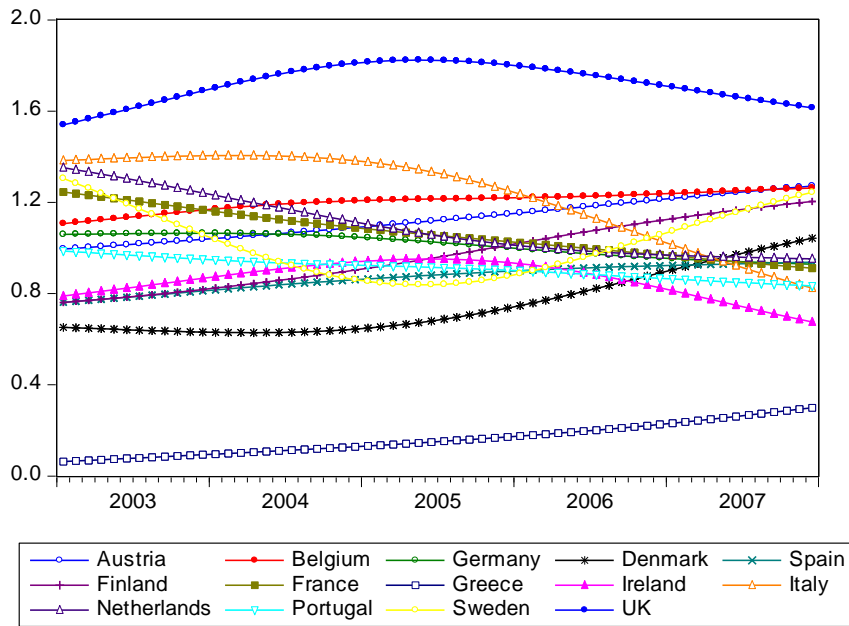


Figure 6. Transition paths for each country's >2yrs deposit rates (2008-2011)

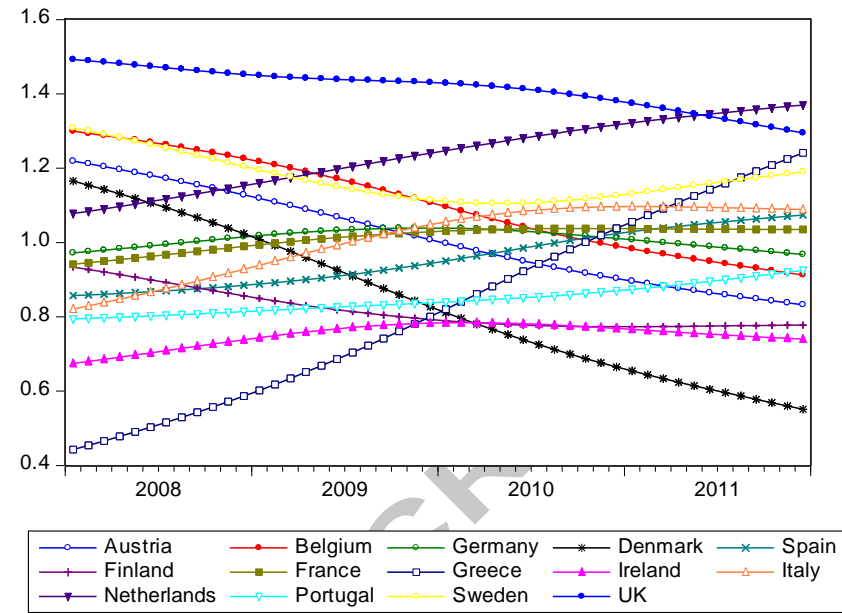


Figure 7. Transition paths for each country's 1yr consumer credit rates (2003-2007)

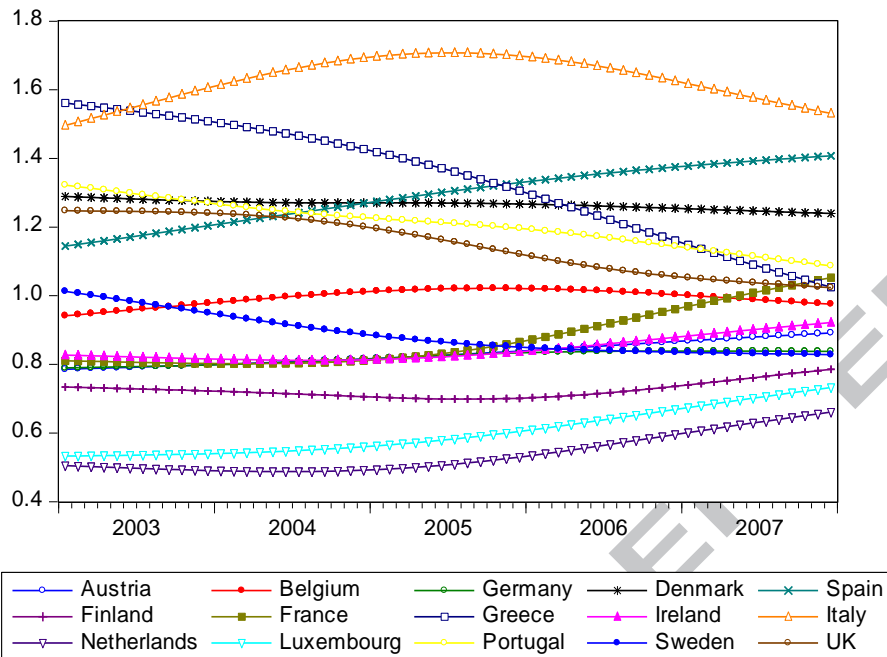


Figure 8. Transition paths for each country's 1yr consumer credit rates (2008-2011)

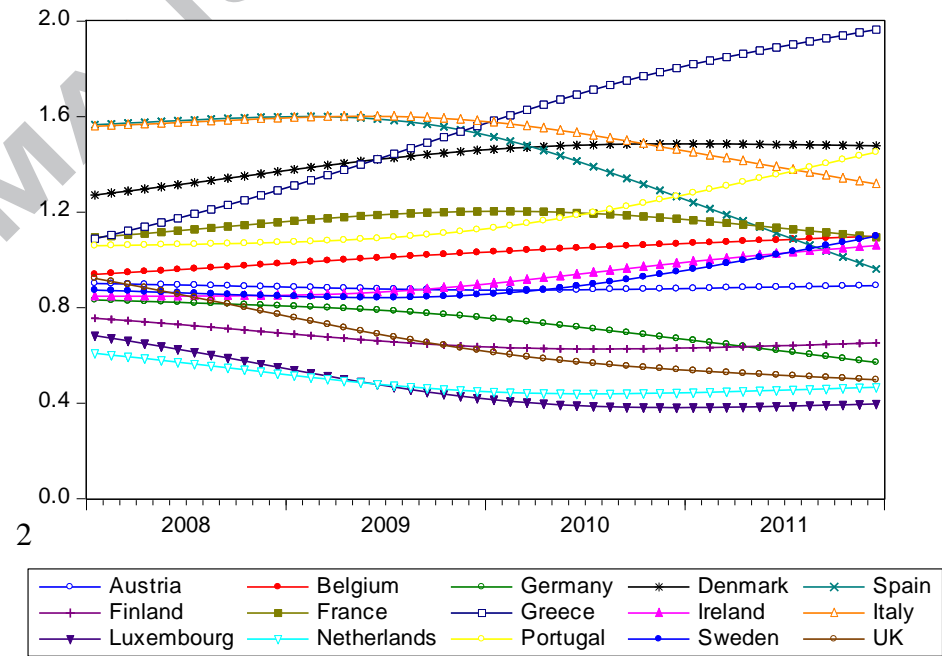


Figure 9. Transition paths for each country's 1-5yrs consumer credit rates (2003-2007)

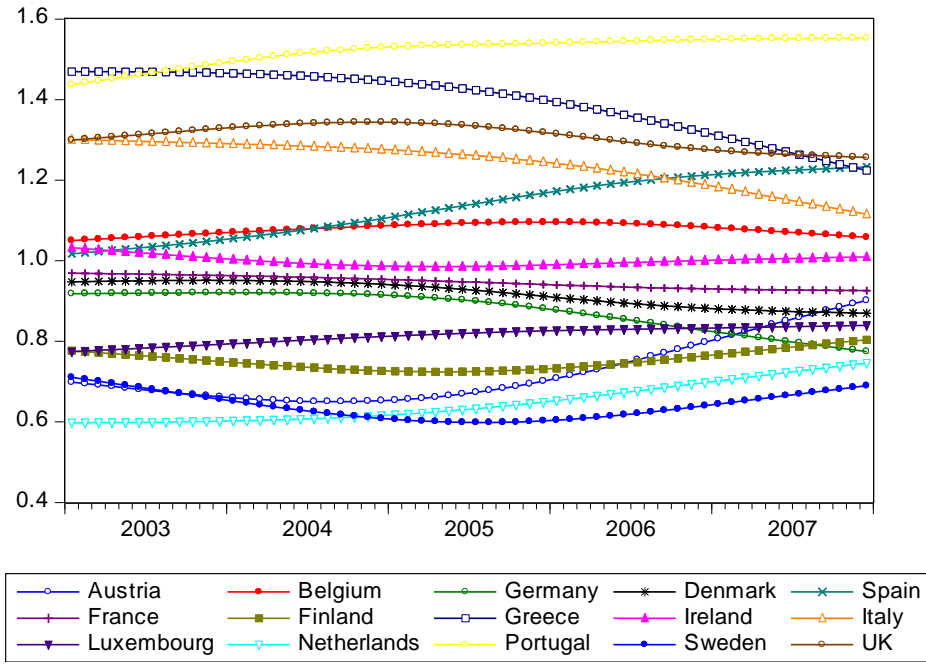


Figure 10 Transition paths for each country's 1-5yrs consumer credit rates (2008-2011)

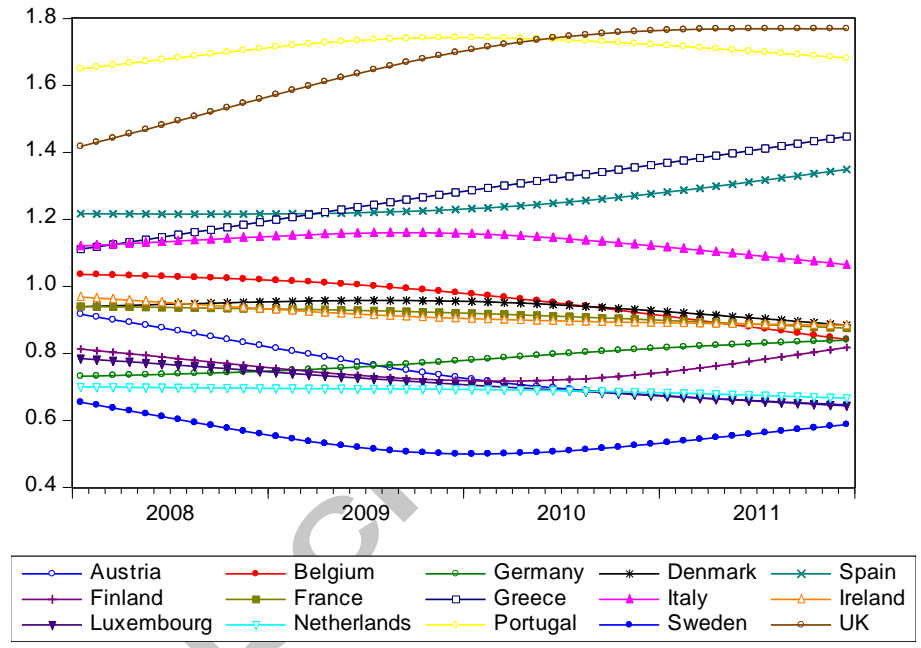


Figure 11. Transition paths for each country's 1yr mortgage rates 2003-2007

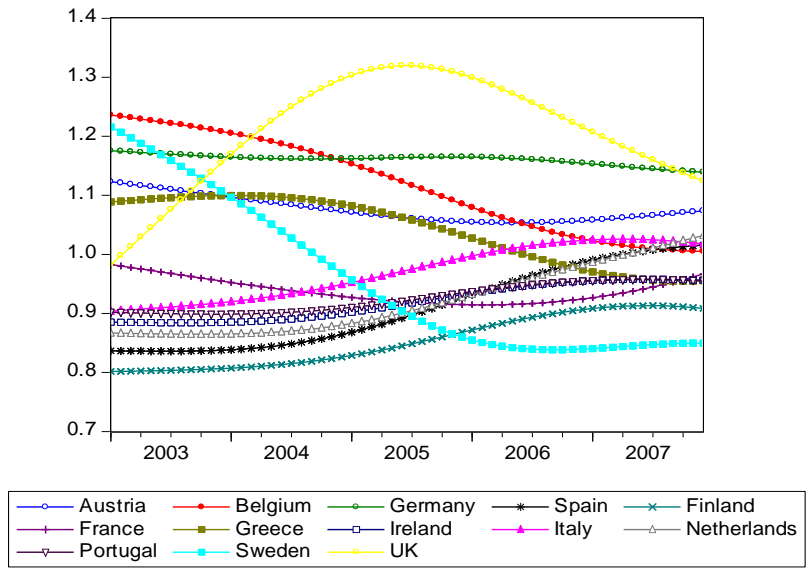


Figure 12. Transition paths for each country's 1yr mortgage rates 2008-2011

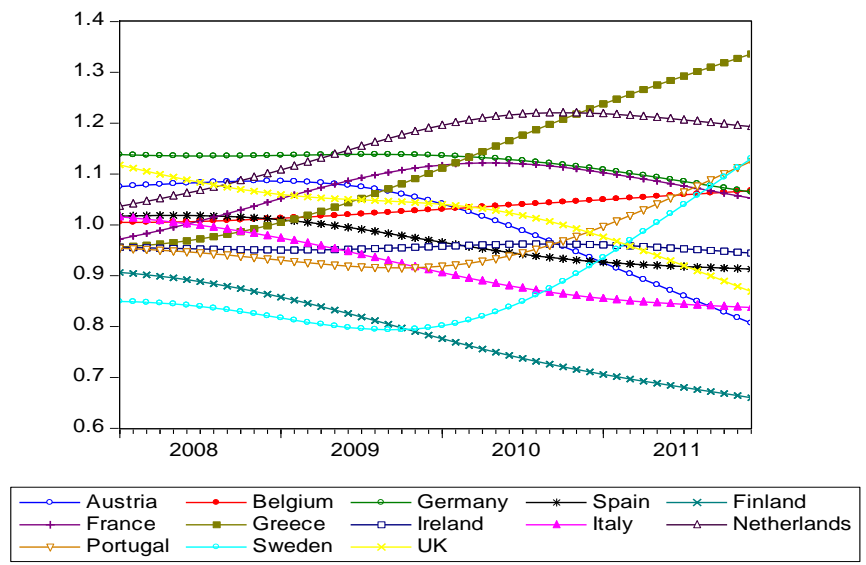


Figure 13. Transition paths for each country's 1-5yrs mortgage rates (2003-2007)

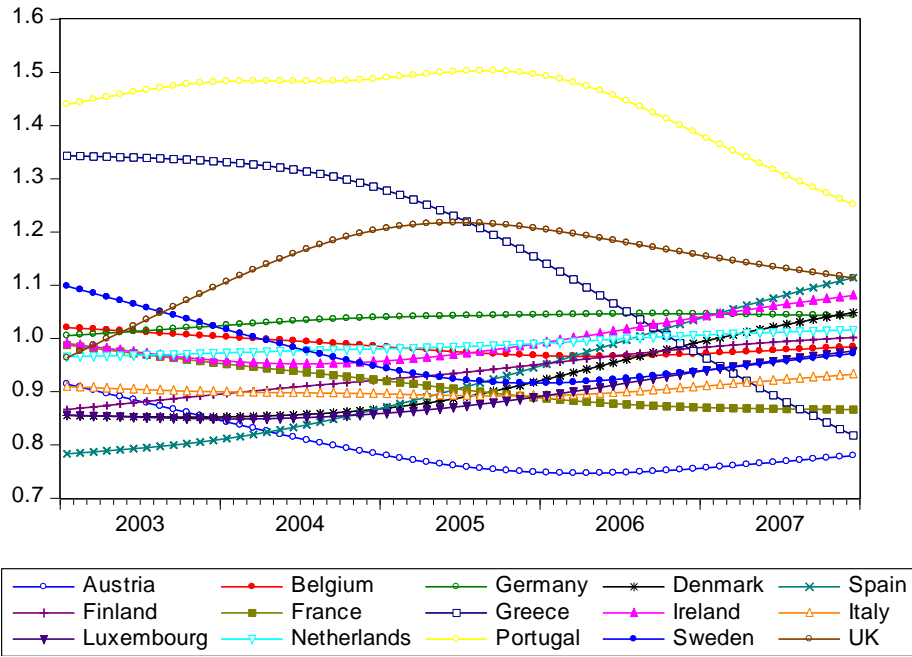


Figure 14. Transition paths for each country's 1-5yrs mortgage rates (2008-2011)

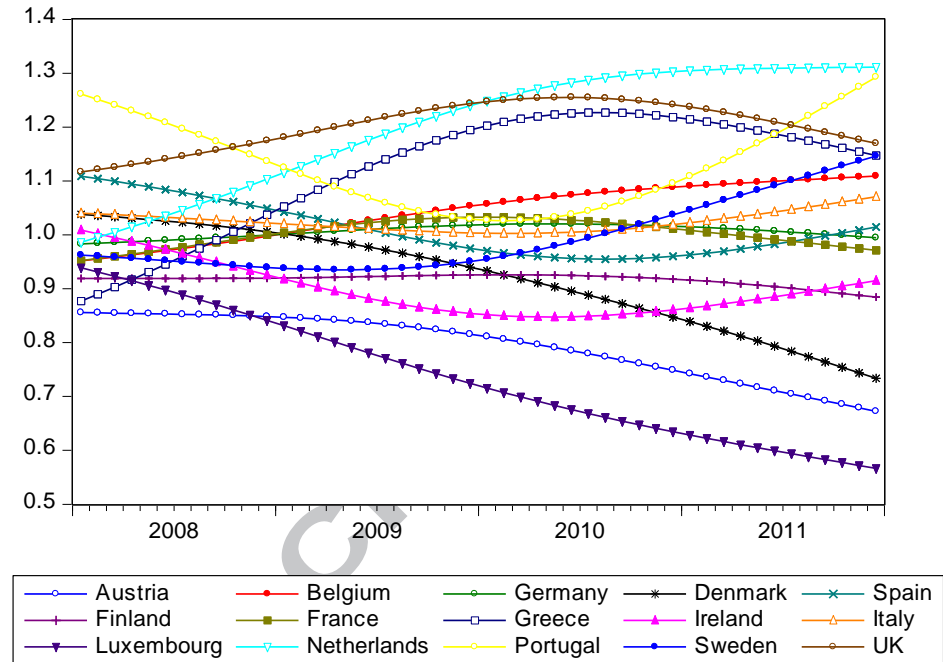


Figure 15. Transition paths for each country's 5-10yrs mortgage rates (2003-2007)

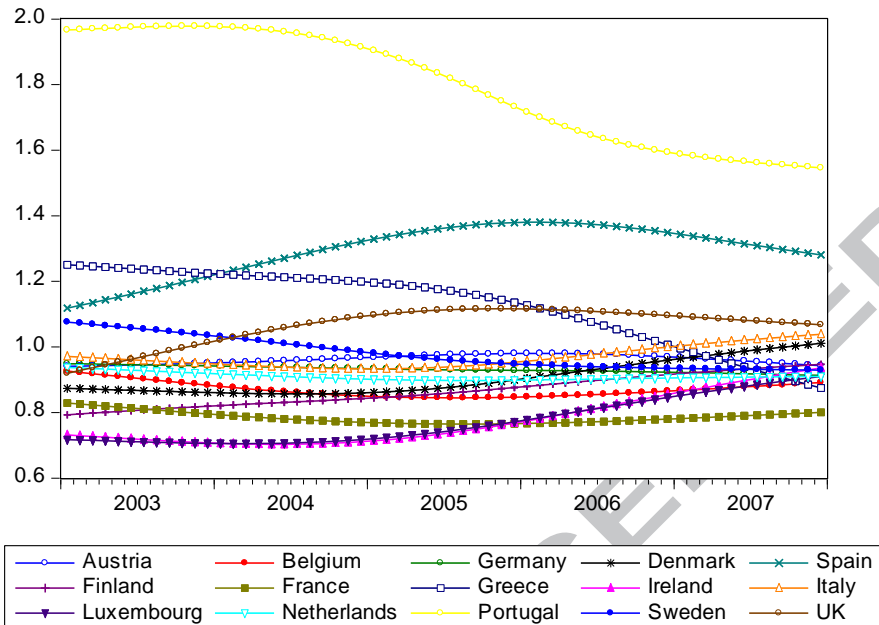


Figure 16. Transition paths for each country's 5-10yrs mortgage rates (2008-2011)

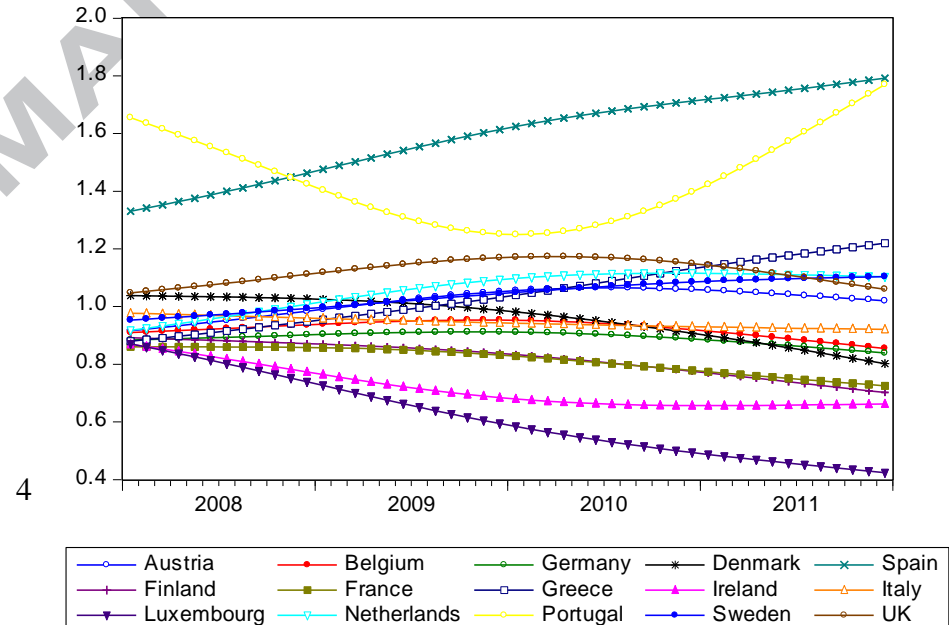


Figure 17. Transition paths for each country's >10yrs mortgage rates (2003-2007)

Figure 18. Transition paths for each country's >10yrs mortgage rates (2008-2011)

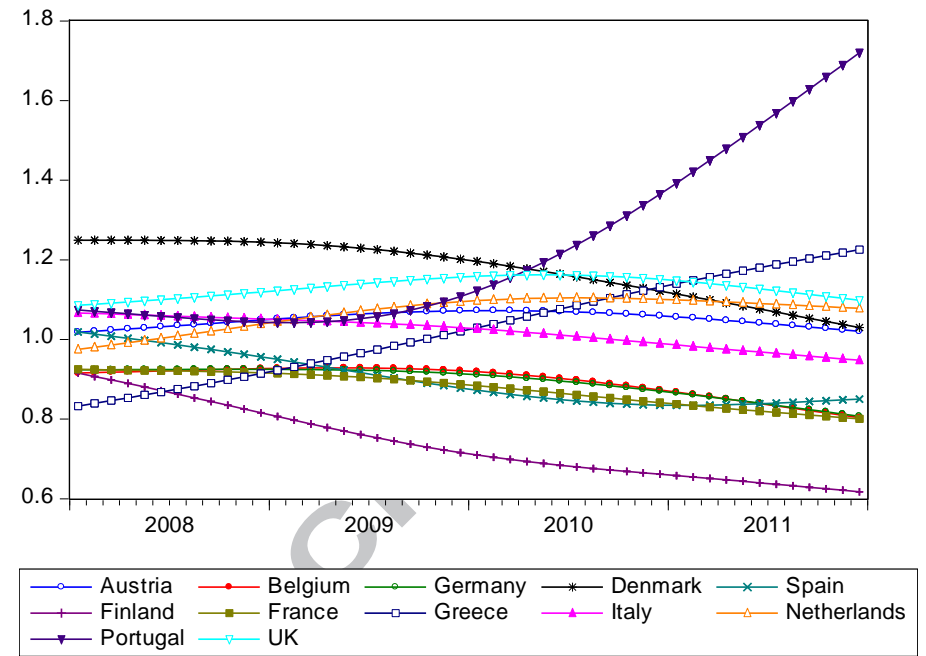
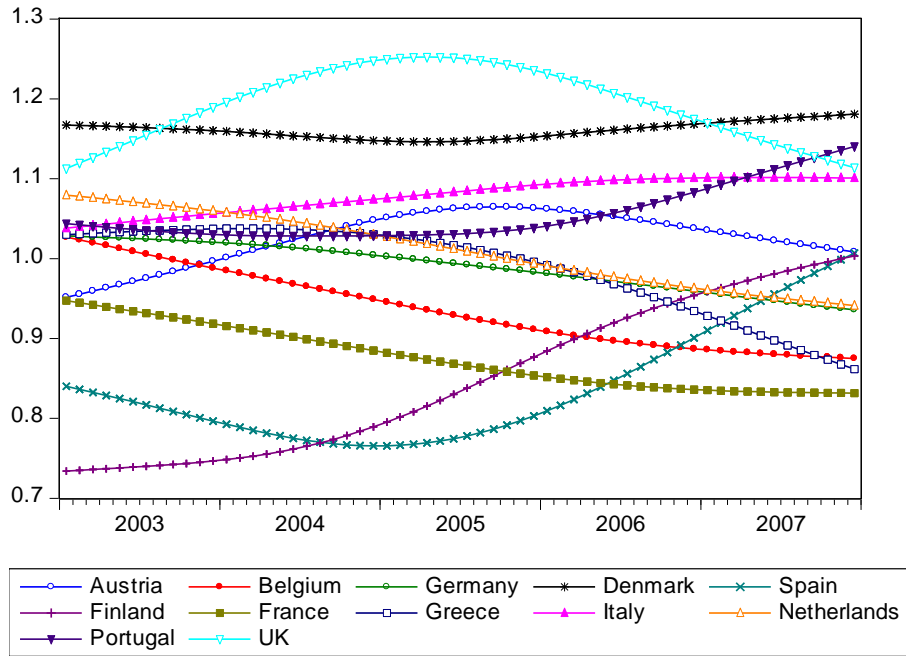


Table 1. Phillips and Sul (2007a) Log t test

Data series	\hat{b}	t -statistics
Deposit rates		
• 2003-2007 (1yr); (1-2yrs); (>2 yrs) EU15 panel sets	1.829; 1.216, 0.836	9.789; 8.450; 11.182
• 2008-2011 (1yr); (1-2yrs); (>2 yrs) EU15 panel sets	-2.178; -1.770; -1.119	-22.637*; -22.273*; -23.170*
• 2008-2011 (1yr); (1-2yrs); (>2 yrs) panel sets for all countries excl. UK and Sweden	-2.310; -1.987; -1.424	-26.356*; -29.147*; -15.760*
• 2008-2011(1yr); (1-2yrs); (>2 yrs) panel sets for GIIPS	-0.692; -0.706; -1.083	-6.146*; -7.136*; -10.832*
• 2008-2011(1yr); (1-2yrs); (>2 yrs) panel sets for countries excl. GIIPS	-2.770; -2.015; -1.778	-32.152*; -26.924*; -165.049*
Consumer credit rates		
• 2003-2007 (1yr); (1-5yrs) EU15 panel sets	0.425; 0.080	7.928; 1.692
• 2008-2011 (1yr); (1-5yrs) EU15 panel sets	-0.933; -0.719	-20.532*; -21.517*
• 2008-2011 (1yr); (1-5yrs) panel sets for all countries excl. UK and Sweden	-0.872; -0.893	-19.702*; -54.840*
• 2008-2011 (1yr); (1-5yrs) panel sets for GIIPS	-0.556; -0.813	-8.864*; -70.367*
• 2008-2011 (1yr); (1-5yrs) panel sets for countries excl. GIIPS	-1.010; -0.637	-18.489*; -14.336*

Data series	\hat{b}	t -statistics
Mortgage rates		
• 2003-2007 (1yr); (1-5yrs); (5-10yrs); (>10yrs) EU15 panel sets	0.797; 0.387; 0.550 ; 0.221	7.327; 3.805; 5.961; 5.125
• 2008-2011 (1yr); (1-5yrs); (5-10yrs); (>10yrs) EU15 panel sets	-0.988; -1.918; -1.738; -1.999	-9.347*; -40.140*; -253.438*; -119.934*
• 2008-2011 (1yr); (1-5yrs); (5-10yrs); (>10yrs) panel sets for all countries excl. UK and Sweden	-1.568; -2.105; -1.782; -2.113	-21.461*; -42.748*; -206.313*; - 100.191*
• 2008-2011 (1yr); (1-5yrs); (5-10yrs); (>10yrs) panel sets for GIIPS	-2.390; -0.922; -1.210; -3.778	-23.006*; -4.727*; -60.444*; - 85.408*
• 2008-2011 (1yr); (1-5yrs); (5-10yrs); (>10yrs) panel sets for countries excl. GIIPS	-0.698; -2.030; -1.843; -1.222	-5.778*; -70.934*; -54.284*; - 40.022*

Note: a) The Phillips and Sul (2007a) log t-test were run in OxEdit using the Gauss code programmed by Sul (2007); b)* Indicates rejection of the null hypothesis of convergence at the 5% significance level; c) The results are generated using Ox version 4.00 (see Doornik, 2006).

Table 2. Phillips and Sul (2007a) Club Convergence Test

Data	EU15 2003-2007			EU15 2008-2011			EU15 (exc. UK,SE) 2008-2011			GIIPS 2008-2011			EU15 exc. GIIPS 2008-2011		
	Clubs	\hat{b}	t -stat	Clubs	\hat{b}	t -stat	Clubs	\hat{b}	t -stat	Clubs	\hat{b}	t -stat	Clubs	\hat{b}	t -stat
Deposit rates (1yr)	1) All EU15	2.1	13.7	1) GR,IT,PT, SE 2) IE, FR, NL, ES Divergent: AT, BE, DK, FI, DE, LUX, UK	0.92 0.08 -2.6	5.6 0.8 -21.2*	1) GR,IT, PT 2) IE,FR,NL, ES Divergent: AT, BE, DK, FI, DE, LUX	0.18 -0.17 -3.91	1.37 -1.60 -29.1*	1)GR,IT, PT 2)ES, IE	0.18 0.02	1.37 0.18	1)FI,FR,NL,SE, UK Divergent countries: AT, BE, DE, DK, LUX	0.09 -8.27	0.44 -25.9*
Deposit rates (1-2yrs)	1) All EU15	1.3	12.1	1) AT,BE,DE,ES,FI, FR,GR,IE,IT,NL,PT, SE, UK 2)DK, LUX	-0.13 4.7	-2.3* 2.5	1)ES,FR,GR, IE,NL,PT 2) BE,FI,IT Divergent: AT,DE,DK,L UX	1.64 0.10 -3.44 4	11.06 1.28 -127.9*	1)ES, GR,IE,PT Divergent: IT	1.15	10.23	1)AT,BE,DE,FI ,FR, NL,SE,UK 2) DK, LUX	0.14 2.21	0.89 1.03
Deposit rates (>2yrs)	1) All EU14	0.82	13.4	1) BE,DE,ES,FR,GR, IT,NL,PT,SE,UK 2) AT,FI,IE Divergent: DK	-0.08 0.57	-2.4* 11.96	1) BE,DE, ES,FR,GR, IT,NL,PT 2) AT,FI,IE Divergent: DK	-0.25 0.60	-4.71* 12.20	1)ES,GR, IT,PT Divergent: IE	0.01	0.20	1) NL,SE,UK 2) AT,BE, FI Divergent: DK, DE, FR	0.72 0.52 -2.64	5.41 7.94 -29.7*

Data	EU15 2003-2007			EU15 2008-2011			EU15 (exc. UK,SE) 2008-2011			GIIPS 2008-2011			EU15 exc. GIIPS 2008-2011		
	Clubs	\hat{b}	<i>t</i> -stat	Clubs	\hat{b}	<i>t</i> -stat	Clubs	\hat{b}	<i>t</i> -stat	Clubs	\hat{b}	<i>t</i> -stat	Clubs	\hat{b}	<i>t</i> -stat
Consumer credit (1yr)	1) AT,DK,ES,FI,FR,IE,IT,LUX,NL 2)BE,DE,GR,PT,SE,UK	0.5 0.7	9.1 15.7	1)BE,DK,IE,IT,PT,SE 2)AT,ES,FI,FR Divergent: DE,GR,LUX,NL,UK	0.6 0.35 -1.02	8.60 5.71 -28.25*	1)BE,DK,ES,FR,IE,IT,PT 2) DE,FI,NL Divergent: AT,LUX,GR	0.21 0.37	2.48 3.38	1)ES,IE,IT,PT Divergent : GR	0.62	5.04	1) AT,BE,FR,SE 2) DE,FI,NL Divergent: DK,LUX, UK	0.64 0.37 -0.90	4.97 3.38 -17.7*
Consumer credit (1-5yrs)	1)AT,ES,FI,GR,IE,IT,NL,SE,UK Divergent : BE,DK,DE,FR,LUX,PT	0.5 -0.8	9.9 -297*	1)ES,GR,PT,UK 2)AT,BE,DE,DK,FI,FR,IE,IT,LUX,NL,SE	0.2 0.005	4.7 0.093	1)ES,GR,PT 2)BE,DE,DK,FI,FR,IE,IT 3)AT,LUX,NL	0.52 0.55 0.637	10.61 7.51 1.394	1)ES,GR,PT Divergent : IE, IT	0.52 -0.1	10.6 -1.9	1) BE,DE,DK,FI,FR,SE Divergent: AT,LUX, NL,UK	0.60 -1.0	7.16 -69.2*
Mortgage (1yr)	1)All EU13	0.8 8	8.10	1)AT,BE,DE,ES,FR,GR,IE,IT, NL, PT, SE,UK Divergent: FI	-0.38	-8.27*	1) BE,DE,FR,GR,NL,PT 2) AT,ES,IT Divergent: FI,IE	0.07 0.81 -1.61	0.54 8.33 -21.5*	1)GR,PT Divergent : ES,IE,IT	0.10 -1.71	0.77 -14.2*	1) AT,BE,DE,FR,NL,SE,UK Divergent: FI	0.36	6.16
Mortgage (1-5yrs)	1) All EU15	0.5	5.9	1) BE,DE,ES,FR,GR,IE,IT,PT,NL,SE,UK Divergent: AT,DK,FI,LUX	-0.23 -1.69	-2.45* -113*	1)BE,GR,PT,NL 2) DE,ES,FI,FR,IE,IT Divergent: AT,DK,LUX	0.31 -0.32 -1.09	1.45 -5.27* -31.8*	1)GR,IT,PT 2)ES,IE	0.32 0.05	1.69 1.85	1) BE,DE,FR,NLSE,UK Divergent: AT,DK,FI,LUX	-0.57 -1.85	-9.91* -106.7*

Data	EU15 2003-2007			EU15 2008-2011			EU15 (exc. UK,SE) 2008-2011			GIIPS 2008-2011			EU15 exc. GIIPS 2008-2011		
	Clubs	\hat{b}	<i>t</i> -stat	Clubs	\hat{b}	<i>t</i> -stat	Clubs	\hat{b}	<i>t</i> -stat	Clubs	\hat{b}	<i>t</i> -stat	Clubs	\hat{b}	<i>t</i> -stat
Mortgage (5-10yrs)	All EU15 except GR	0.6	9.24	1) PT, ES 2) GR,NL,UK 3) BE, DE 4) DK,FR, IE Divergent: AT,FI,IT,LUX,SE	3.17 0.29 0.9 0.70 -1.61	7.5 0.72 8.5 7.9 -79.3*	1) PT,ES 2)GR, NL 3)BE,DE,DK 4) FI,FR,IE Divergent: AT,IT,LUX	2.58 -0.108 0.29 1.12 -1.71	6.02 -0.040 1.14 8.82 50.03*	1) ES,PT Divergent: nt: GR, IE, IT	2.58 -1.37	6.02 -38.3*	1) AT,NL, SE, UK 2) BE,DE, DK Divergent: FR,FI, LUX	0.65 0.29 -1.72	5.48 1.14 -41.39*
Mortgage (>10yrs)	1) All EU12 ¹	0.19	7.09	1) DK,GR,NL,UK 2) IT,ES 3) BE,DE,FR Divergent: AT,FI,PT	-0.26 -0.001 2.72 -2.12	-0.83 -0.006 3.596 -118.6*	1)DK,GR, NL 2) BE,DE, ES, FR Divergent: AT, FI, PT, IT	0.56 1.37 -2.21	1.55 2.70 110.1*	1) GR,IT Divergent: nt: ES, PT	-1.48 -3.37	-1.59 -50.2*	1)AT,DK, NL, UK 2) BE,DE,FR Divergent: FI	0.47 2.02	8.20 2.58

Note: a) The Phillips and Sul (2007a) club clustering log t-test were run in OxEdit using the Gauss code programmed by Sul (2007).

b) * Indicates rejection of the null hypothesis of convergence at the 5% significance level.

c) The results are generated using Ox version 4.00 (see Doornik, 2006).

¹ AT, BE, DE, DK, ES, FI, FR, GR, IT, NL, PT, UK

Highlights

- We investigate the integration process in the European Union retail banking sector during 2003-2011
- We apply the Phillips and Sul (2007) convergence methodology to deposit and lending rates to the household sector
- We find the presence of convergence in the savings and credit markets up to 2007
- The null of convergence is rejected in all deposit and credit markets after the onset of the 2008 financial crisis
- The credit market displays greater heterogeneity than the savings market.