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NON-PERFORMING LOANS AND EURO AREA BANK LENDING BEHAVIOUR AFTER THE CRISIS

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NON-PERFORMING LOANS AND EURO AREA BANK LENDING BEHAVIOUR AFTER THE CRISIS

Abstract

Non-performing loans (NPLs) remain high on the policy agenda in Europe. Their persistence at elevated levels after the financial crisis gave rise to financial stability concerns – including possible adverse impacts on financial intermediation. A commonly-held view is that NPLs impair the credit allocation mechanism. However, the literature has not so far offered a theoretical framework to support this view. This paper argues that loan demand and supply dynamics may vary over the economic cycle and that banks that are burdened with high NPLs may discriminate between households and firms in their credit allocation decisions in the recovery phase. Using a novel bank-level dataset for large euro area banks covering the period of the recent economic upswing, we find robust evidence that the stock of NPLs relative to banks' shock-absorbing capacity, measured by bank capital, has been a significant factor in explaining bank-specific loan origination. The effect is found to be more significant for corporate than for household lending. Since high NPL stocks do indeed appear to impair credit allocation, dedicated policies aimed at bringing NPL stocks down are required to avoid adverse impacts on the real economy. Our findings support the aims of the guidance that the single supervisory mechanism has given to banks on their NPL strategies. Additionally, the linkages between high NPL stocks and credit flows motivate the need for complementary measures to address impediments to NPL resolution, such as weaknesses in judicial and insolvency frameworks.

1 Introduction

One of the consequences of the global financial crisis, which erupted in 2007, and the subsequent euro area sovereign debt crisis was the accumulation of a large stock of non-performing loans (NPLs) across a large swathe of euro area banks. By 2013, some 8% of the total amount of loans extended by the euro area banking sector were non-performing. The distribution of these NPLs was not uniform across countries: peak NPL ratios varied from less than 2% in the Nordic region to as much as 50% in Greece and Cyprus. By 2015, elevated NPLs were firmly recognised as one of the key macroprudential and supervisory policy challenges for the euro area banking sector [see Aiyar et al. (2015) and Grodzicki et al. (2015)].

The subsequent policy response, formulated by the European Council in July 2017, was founded on several pillars: improved supervision; the reform of insolvency and debt recovery frameworks; the development of secondary markets for NPLs ("distressed assets"); and restructuring of the banking industry [see FSC (2017)]. Similar policies were advocated by the European Systemic Risk Board [see ESRB (2017)]. Since the 2013 peak, the aggregate NPL ratio has slowly decreased, reaching about 4.4% in the second quarter of 2018. Supported by economic tailwinds – including robust economic expansion and accommodative monetary policy – the enhanced focus of supervisors on the need to bring NPL stocks down undoubtedly played a role in this.

The case for a public policy response to persistently-elevated NPL stocks was motivated by concern over the impact that high NPLs might be having on credit supply, and, by extension, on macroeconomic performance. As discussed in the reports of the ESRB and the FSC, high NPLs are often associated with inefficient allocation of capital and funding, while also distracting scarce bank management resources from the running of lending businesses. At the same time, high NPL stocks can be seen as a symptom of balance sheet weakness among borrower sectors, especially of non-financial corporates. As the empirical evidence available at the time that these reports were finalised was limited, this

paper attempts to shed some light on the relationship between the lending behaviour of individual banks and their asset quality, which could provide further insights regarding the policy response to asset quality problems.

2 Literature Review

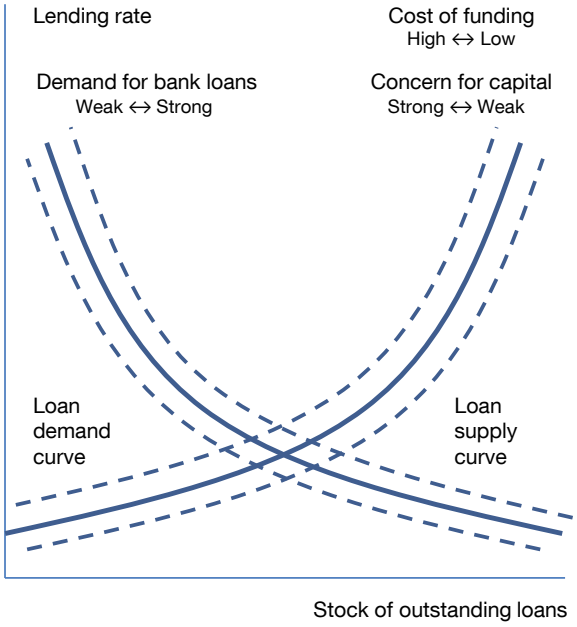
For a topic of such current policy importance, the available NPL literature is relatively sparse and almost exclusively empirical in nature. In a nutshell, the literature suggests that there may be two-way causality between bank asset quality and economic performance.

There is a large body of evidence which shows that episodes of increases in NPLs are triggered by macroeconomic shocks. Based on data from a large sample of advanced and emerging economies, it has been argued that the economic cycle is a key driver of aggregate NPL ratios, whilst lending rates, exchange rates and stock prices may also help to explain changes in NPLs [see Beck, Jakubik and Piloiu (2013)]. Similar conclusions were reached for smaller samples of countries [see Nkusu (2011), and Glen and Mondragón-Velez (2011)]. Using regional economic data, a threshold relationship between NPLs and economic growth in Italy was uncovered [see Mohaddes, Raissi and Weber (2017)]. In that paper, a GDP growth rate of more than 1.2% was found to be consistent with decreases in the NPL ratio. This leads to the conclusion that Italian economic growth would need to be significantly boosted, and structural reforms undertaken, to achieve a durable reduction in NPL levels. Evidence has also been uncovered that structural rigidities and inefficiencies in insolvency frameworks have contributed to slow down the reduction of NPLs, explaining high cross-country heterogeneity in NPL levels observed across Europe [see Cerulli et al. (2017)].

Other studies take a more micro approach, analysing the impact of bank-specific factors on NPL build-ups, in particular, bank-specific credit growth [see Espinoza and Prasad (2010), and Garrido, Kopp and Weber (2016)]. For Greek banks, it appears that low management quality – proxied by cost inefficiencies and weak profitability – contributes to poor asset quality of individual banks [see Louzis, Vouldis and Metaxas (2012)]. They interpret this relationship as evidence that poorly managed banks cannot discriminate between sound and unsound borrowers, and, more broadly, cannot manage credit risk well. On the other hand, financially weak banks may face incentives to "gamble for recovery", that is, knowing that their likelihood of survival is low, they might lend to financially unsound borrowers in the hope that an unexpected positive economic shock results in their loans being repaid. Some empirical evidence in favour of this hypothesis has been found [see Keeton and Morris (1987), and Jimenez and Saurina (2006)].

Only a few papers analyse the macroeconomic consequences of elevated NPL stocks and the associated debt overhang, or the interaction between policy responses to NPL increases and economic performance. The usual transmission channel is related to credit supply, which, arguably, may be negatively affected in the presence of high NPL stocks. In turn, lower credit supply leads to weaker credit and GDP growth. It has been argued that the literature has not so far offered a theoretical framework to support the view that high NPLs can limit banks' lending ability [see Angelini (2018)]. While the theoretical literature is indeed sparse, the existence of a relationship between credit supply and NPLs in a VAR framework has been variously supported [see Nkusu (2011), Espinoza and Prasad (2010), and Klein (2013)]. Using a large panel of countries, it has been shown that those countries which actively reduced their NPLs managed to achieve stronger macroeconomic performances than countries which did not reduce their NPLs [see Balgova, Nies and Plekhanov (2016)]. An extension of that study found that active resolution of NPLs, for example using asset management companies and publicly-funded bank recapitalisation,

LOAN DEMAND AND SUPPLY CURVE CHART 1



SOURCE: Own elaboration based on Aoki et al. (2009).

can boost GDP growth by up to 1.5 percentage points annually, in comparison to countries where high NPLs were not actively dealt with [see Balgova, Plekhanov and Skrzypinska (2018)]. On the other hand, it has been argued, on the basis of Italian borrower-level data, that only unexpected increases in NPLs have affected credit growth [see Accornero et al. (2017)]. To the extent that NPL build-ups are associated with weak fundamentals of the population of borrowers (i.e. negative credit demand shocks) and weak bank capitalisation, it is claimed to have no additional effect on credit growth.

Most of the literature which considers the consequences of high NPL stocks is focused on aggregate data. This paper harnesses bank-level data for a range of euro area countries which are part of the Single Supervisory Mechanism of the European Union. We investigate whether, within the same banking system, banks that differ in terms of their NPL ratios also differ in their volume of credit provision. We contend that this approach controls for credit demand effects, which are, by and large, common to all banks (that is, barring regional and business model variation). We contend that the presence of weak banks may adversely affect the total flow of credit and, thus, macroeconomic performance.

3 Theoretical Considerations

In the absence of a theoretical framework for the dynamic relationship between bank lending and NPLs, this paper aims to present a tentative theoretical foundation for the role that NPLs may play in the origination of credit, testing it with preliminary empirical evidence. A key element of that is distinguishing relevant phases in the NPL cycle, the periods when NPLs are building-up, when they stabilise and are being reduced.

3.1 DEMAND AND SUPPLY

A key step in answering questions concerning the role of NPLs in credit allocation is to understand the factors underlying credit demand and credit supply. Empirically, disentangling these factors is not straightforward [see, for example, Del Giovane et al. (2011), and Hempell and Kok Sørensen (2010)]. As illustrated in Chart 1, in a demand and supply context, loan supply, at a given lending rate, is impacted by banks' costs of

funding and their capital buffers; demand, at a given lending rate, is affected by macroeconomic variables impacting loan demand [see Aoki et al. (2009)].

In a static context, a rudimentary analysis highlights the role that NPLs may play in loan supply. For a given bank, an adverse shock (e.g. an unexpected macroeconomic downturn), which results in an increase of NPL stocks, depletes capital buffers and, *ceteris paribus,* results in a higher cost of funding, leading to a reduction of loan supply. The same shock will also adversely impact loan demand.

Distinguishing the effects on stocks and flows is also important in this context. In the absence of new lending, the stock of outstanding loans falls, as loans mature. The outstanding stock only remains unchanged, so long as new lending replenishes maturing loans. Empirically, therefore, the impact of NPL stocks on lending may be better observed through new lending flows than changes in the stock of loans.

In this rudimentary framework, it is clear that a potential link between NPLs and credit supply could emerge. But a further aspect of loan demand may be overlooked in such analysis. Assuming that banks only lend to solvent borrowers, the aggregate demand for new credit must decrease, all else being equal, and assuming that the system is closed: fewer solvent firms maintaining a given level of individual credit demand result in an overall lower aggregate demand. With falling demand, loan volume must decrease as well. From this perspective, it is difficult to argue that a stock of NPLs does not reduce lending.

It could be postulated that unimpaired borrowers could absorb the excess credit – and as such, loan volume does not shrink – and while such an effect may be present, one would not expect solvent borrowers to continue to increase demand to fully offset the disappearance of demand of insolvent borrowers, for all levels of impairment in an economy. This could be thought of as an "accounting identity", linking NPLs to credit origination.

On the other hand, banks are obliged to actively monitor and manage credit risk in their loan books. As part of risk management, they periodically re-estimate their internal credit risk models. Following a surge of NPLs, the probabilities of default provided by these models would increase; if bank risk appetite remains constant, fewer performing borrowers would be considered creditworthy. This would "move the goalposts" for borrowers, and result in a tightening of loan supply, even for those that are considered solvent.

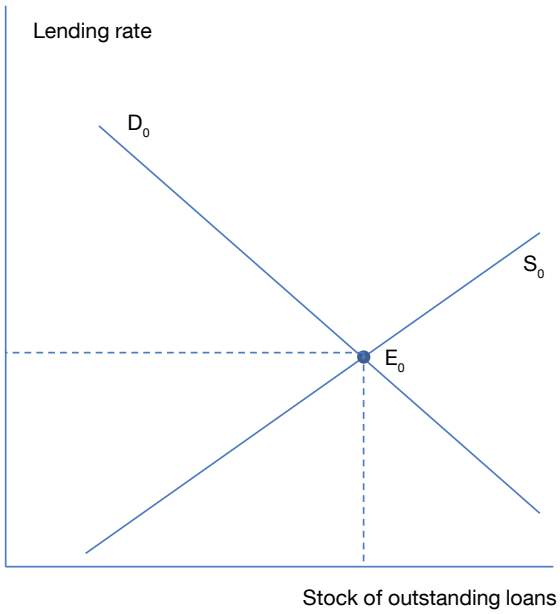
Perhaps what is missing from the static analysis presented previously, and which may impact empirical analysis, is a dynamic component that recognises the feedback loops that emerge as the economic and financial cycle turns down with NPLs rising, and then plateauing, before ultimately declining. Consider the following "cycle" analysis.

We commence with a closed banking system with equilibrium in the market for loans, and a known, small stock of NPLs across all banks (Chart 2). There is an equilibrium lending rate, in aggregate, for the economy, and an equilibrium stock of outstanding loans, where loans maturing are replaced by new credit flows.

Commencing from this equilibrium, consider the impact of an adverse macroeconomic shock which, for banks, raises the prospect of increasing losses on the outstanding stock of loans, as households and firms adjust to the shock. Concurrently, the loan supply curve will shift to the left, as banks reduce loan supply in the face of stresses to their capital

EQUILIBRIUM IN LOAN MARKET

CHART 2



SOURCE: Own elaboration.

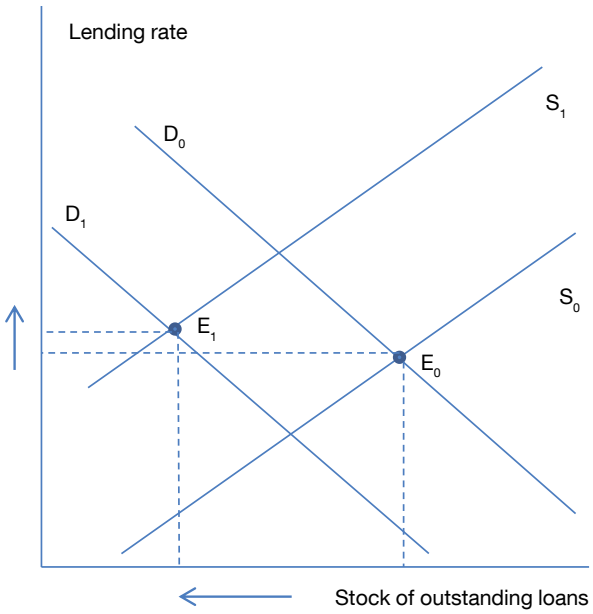
buffers and, perhaps, also their cost of funding; while the demand curve for loans will also shift to the left, as households and firms demand less credit, in light of reduced consumption and investment (Chart 3). This has the effect of decreasing the flow of new lending, and also the outstanding stock of loans, whilst the effect on lending rates would be ambiguous.

In the second phase, the impact of the macroeconomic shock has been absorbed, a cyclical recovery has set in, and NPL stocks have stabilised at an elevated level. In such circumstances, loan supply may recover, shifting to the right (Chart 4). This may result from some "strong" banks being relatively unconstrained by their capital buffers and costs of funding, given the perception that their balance sheets are strong and that expectations concerning credit risk and future losses remain contained. "Weak" banks on the other hand may continue to face lending constraints. The same too may be said of households and firms. On the demand side, unimpaired households and firms may no longer be adversely affected by negative economic sentiment, and may increase consumption and investment. On the other hand, impaired households and firms will remain unable to access credit and the market will have shrunk from its original size. Assuming the "accounting identity" approach holds, banks will supply less credit, as there is less demand from solvent borrowers. Of course, this may also lead to solvent households and firms being denied access to credit, if they are clients of "weak" banks. As such, from phase one to phase two, the market for new lending has shrunk as newly-impaired borrowers and "weak" banks are no longer active. Credit growth in this recovery phase may be impeded by "weak" banks, those with high NPLs. The combined effect of these forces on demand will depend, *inter alia,* on the relative proportion of impaired to unimpaired borrowers. So at the very minimum, credit will contract on a scale equivalent to the fall in demand, but possibly by more, if weak banks constrain credit to solvent borrowers.

Taken together, and given that it takes time to transit from one phase to the next, it may suggest that the relationship between new lending and NPL stocks varies over time. Time

DECLINING DEMAND AND SUPPLY OF LOANS

CHART 3



SOURCE: Own elaboration.

variance in the relationship between variables and heterogeneity across countries in terms of the timing of shocks may further complicate the matter. In fact, as the effects of a given shock may impact different sectors of the economy differently over time, it may even be the case that it is first seen in specific asset classes, before becoming more widespread, and therefore, first impacting those banks with higher exposures to those asset classes.

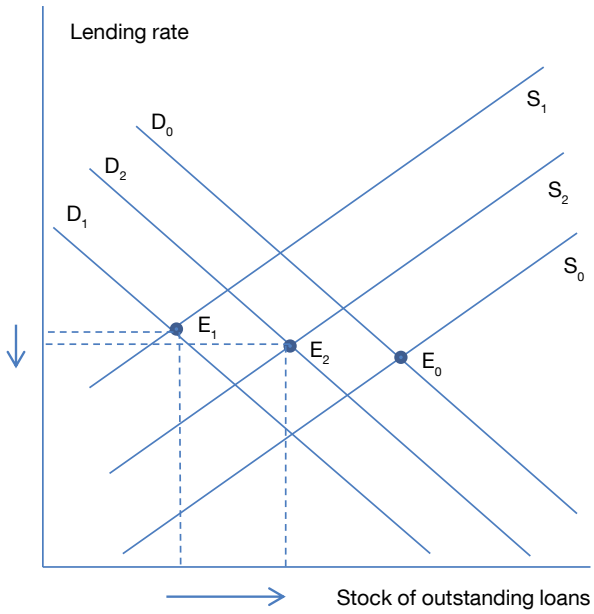
3.2 EMPIRICAL IMPLICATIONS

Empirically, the dynamics just described present some interesting challenges. In the first phase, following a macroeconomic shock which reduces both demand and supply and triggers a build-up of NPLs, NPL stocks should not explain reduced lending. On the one hand, reduced demand will play a role, while on the other, expectations for future bank losses and other uncertainties may impact supply. Including, therefore, this build-up phase of NPLs in empirical analysis may lead to inconsistent findings. NPL stock and flow dynamics may be a consequence, but not a cause, of changes in the demand and supply of loans.

In the second phase, when stocks of NPLs have built-up, but new flows have largely stabilised or decreased, a multiplicity of supply and demand factors will be at play, again making empirical investigation at the aggregate level challenging. Lending supply may increase overall, relative to the build-up phase, as strong banks resume lending while weak banks would be held back by their balance sheet and risk appetite constraints, but it is not clear what result the various forces impacting demand may have. It could be that demand also recovers somewhat, or that the effects of the shrinking market reduces credit demand further. The composition and condition of bank, firm and household balance sheets will condition the outcome.

Despite these challenges, it should nevertheless be possible to find a relationship between NPL stocks and flows of new lending through the supply channel in disaggregated, bank-level data, as “strong” banks by definition will have relatively smaller NPL stocks. While it

PARTIAL RECOVERY IN DEMAND AND SUPPLY CHART 4



SOURCE: Own elaboration.

may not be possible to disentangle the affects, high NPLs may also explain reduced demand – a high NPL bank has, by definition, a higher number of impaired clients, and is, therefore, more affected by the decreased demand of those clients. That concern should be mitigated by focusing the analysis on large banks which operate nation-wide or even in a cross-border environment, and across several industries. On the other hand, the focus on such banks may blur the relationship, for example where cross-border banks accumulated NPLs outside of the euro area and they may not consider them as a constraint in lending to euro area customers.

4 Empirical Evidence

4.1 DATA AND RELATED CONSIDERATIONS

Our empirical analysis harnesses a novel dataset, the core of which utilises the ECB's supervisory data for significant banks in the euro area.[1,2] The data are collected in the framework of statutory reporting requirements that all banks domiciled in the European Union must fulfil, and are subject to a harmonised quality assurance process. This quarterly dataset covers the period Q4 2014 to Q2 2018, which coincides with the broad-based recovery of the euro area economic activity and the decline in the aggregate NPL ratio. On average, it includes 65 significant banks over this period on a consolidated level which account for about 78% of the euro area bank assets.[3] Table 1 provides an overview of the data coverage across 14 euro area countries, including the frequency, or observations per country, the number of banks captured in the sample, the total assets of those banks as a

1 See https://www.bankingsupervision.europa.eu/banking/statistics/html/index.en.html.

2 A significant bank is a bank directly supervised by the European Central Bank in the framework of the Single Supervisory Mechanism. Significant banks are identified based on criteria laid down in the applicable legislation: (i) total assets above €30 billion, or (ii) total assets above 20% of GDP of the country of establishment, or (iii) total assets above €5 billion and the ratio of its cross-border assets/liabilities in more than one other participating Member State to its total assets/liabilities is above 20%, or (iv) the bank is one of the three largest banks in its country of establishment.

3 The cross-section is not fixed over the period as the banks subject to direct supervision by the ECB are subject to change each year. For further details, see, for example: https://www.bankingsupervision.europa.eu/banking/list/who/html/index.en.html.

DATA DESCRIPTION TABLE 1

Country	Frequency	No. Banks	Total assets (% of total euro area assets [1])	NPL ratio (% of total loans)
Austria	81	6	2.0	3.6
Belgium	28	2	1.8	2.5
Finland	20	2	0.9	1.4
France	108	8	27.8	2.5
Germany	156	13	13.3	1.6
Greece	56	4	1.0	43.5
Ireland	36	3	0.5	12.7
Italy	119	9	8.4	11.1
Lithuania	14	1	0.0	4.7
Malta	28	2	0.1	3.4
Netherlands	42	3	7.9	2.3
Portugal	42	3	0.9	16.2
Slovenia	24	2	0.1	4.8
Spain	154	11	13.2	4.0
Euro area	908	69	77.8	3.1

NOTES: Total euro area assets refer to total assets of all significant institutions supervised by the SSM, excluding custodian banks and public sector lenders for Q1 2018; country average for Q1 2018.

ratio of all euro area assets, and their NPL ratio, as a percentage of total loans. The table also shows the dispersion of NPL rates across the euro area, from a low of 1.36% of total loans in Finland, to more than 43% in Greece. With the focus on large banks, a question of representativeness arises, as the large banks may be better equipped to handle high stocks of NPLs and maintain loan supply than smaller banks. While it is difficult to fully overcome this limitation of the dataset, we control for bank size in the regression analysis.

For reasons of their business model a number of banks in the dataset may be better excluded. We focus on banks which engage in lending to the private non-financial sector on a substantial scale, which we define to mean that loans to that sector exceed 10% of a bank's total assets. Other banks are also removed from the sample. For instance, one which is undergoing a long-term wind-down process and several government-sponsored development banks are also excluded. This is because most of their lending business is tightly regulated, often subject to quantitative limits and limits on pricing, and the associated credit risk is often transferred to the government, for example through guarantee schemes. NPLs are usually very low or non-existent, owing to such structural considerations. After exclusion of the affected banks, the sample is reduced from about 120 to an average of 65 financial institutions per period.

We combine this sample with the individual monetary and financial institutions' (MFI) balance sheet statistics, collected by the ECB for monetary policy purposes. These individual MFI data are available for a selection of euro area banks, on a sub-consolidated level. Often, one consolidated banking group operates via several MFI subsidiaries which may be active in different countries. We aggregate the individual MFI observations to the level of consolidated banking groups in order to obtain the corresponding data

on new lending flows.[4] This aggregation procedure leads to a result which, by definition, cannot be fully consistent with consolidated data. While the data sources do not allow for the calculation of NPL ratios at a more granular, sub-consolidated level, which would be consistent with the data on lending flows, it was checked where the NPLs held by banks represented in the dataset were originated, and found that – depending on the time period – only about 10 to 15% of NPLs reflected exposures to non-euro area customers and in no case did non-domestic NPLs represent the majority of total NPLs. In practice, therefore, the loan flows and the NPL ratio are computed on the basis of a broadly aligned geographical perimeter.

While the time dimension for this dataset may appear short, there are some advantages of its limited time-span. First, given our focus on NPLs, the data reported throughout this period relies on the ECB's implementation of the European Banking Authority's harmonised definition of NPLs.[5] This provides much-needed consistency across banks and countries. Earlier data reporting by banks suffers from heterogeneity in the definition of NPLs.

Second, we know that the build-up phase of NPLs largely preceded 2014, our dataset arguably excludes the NPL build-up phase, which is desirable. However, in light of the balance sheet-bolstering activities, it is likely that data for 2014 and 2015 could prove unreliable, as banks' lending decisions – especially the weakest ones which failed the Comprehensive Assessment – may have been influenced less by their capital buffers and costs of funds, and more by their need to take the remedial action specified by the Comprehensive Assessment.[6] As the stocks of NPLs also stabilised in 2014 and declined only slowly in 2015, it may be argued that, from the cyclical perspective discussed earlier in Section 3, this period may still belong to the first phase that precedes a partial recovery in credit supply. The empirical analysis is therefore performed separately for the full sample (2014-2018) and a reduced sample, starting in Q1 2016.

A rudimentary review of the data provides some indication that NPLs impact credit origination. Charts 5 and 6 show a direct correlation between lending growth and NPL rates. Chart 5 displays the distribution of average new corporate and household lending across NPL ratio deciles for the full sample period on the left, while the distribution per NPL ratio decile of the changes in the stock of corporate and household lending is shown on the right-hand-side. The same exercise is conducted for a reduced sample period which omits the post-Comprehensive Assessment period (2016-2018) in Chart 6. While that relationship is not monotonous and may be affected by bank and country-specific factors, only the group of banks with an NPL ratio below the 60th percentile of the sample – which corresponds to about 5% – have a positive mean lending growth rate. New lending is also negatively correlated with the NPL ratio.

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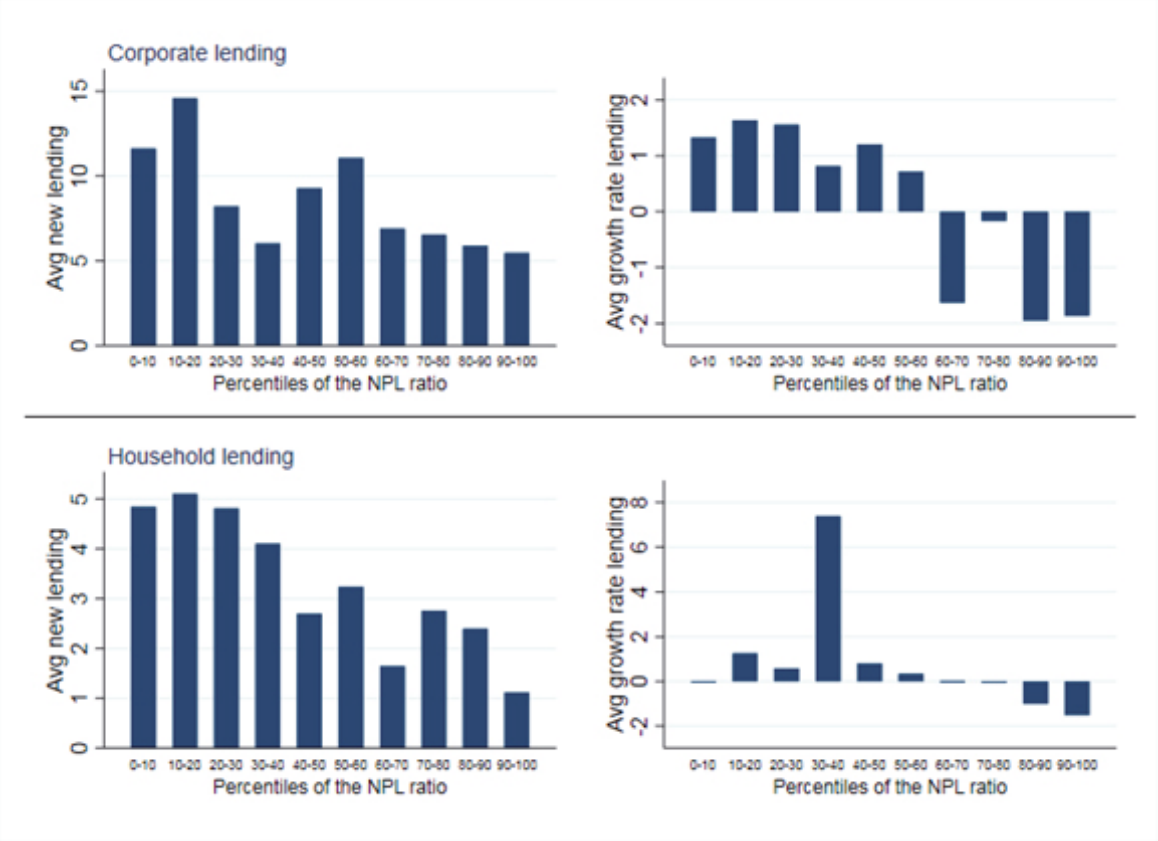
4 These data include genuine new lending as well as refinancings and renegotiations of existing loans. Although not ideal, no better proxy for new lending is currently available.

5 For further details, see: https://www.eba.europa.eu/documents/10180/449824/EBA-ITS-2013-03+Final+draft+ITS+on+Forbearance+and+Non-performing+exposures.pdf.

6 The sample period covers data reported after the ECB's 2014 Comprehensive Assessment – the asset quality review and stress test which was conducted on all banks in advance of their direct supervision by the ECB when it assumed its supervisory responsibilities. Two possible impacts could be seen in banking data around this time. In the months before and after the Comprehensive Assessment, there was likely to have been dispersion in the quality and consistency of banking data across the euro area, which the exercise significantly reduced. Perhaps more importantly, in the period before the Comprehensive Assessment, many euro area banks underwent a period of deleveraging and capital-building, in anticipation of the exercise and with a view to front-loading any possible requirements stemming from it: "… significant banking groups in the euro area have bolstered their balance sheets by over €95 billion through equity issuance" and by the second quarter of 2014 "euro area monetary financial institutions… have reduced total assets by €4.3 trillion since peaking in May 2012" [see ECB (2014)].

LENDING GROWTH BY NPL "BUCKET", 2014-2018 CHART 5
LHS: Quarterly flow of new lending (percentage of stocks), RHS: Quarterly growth rate of loans (percentages)



NOTE: Buckets are defined as deciles of the NPL ratio over the full sample of banks and time periods.

4.2 SPECIFICATION

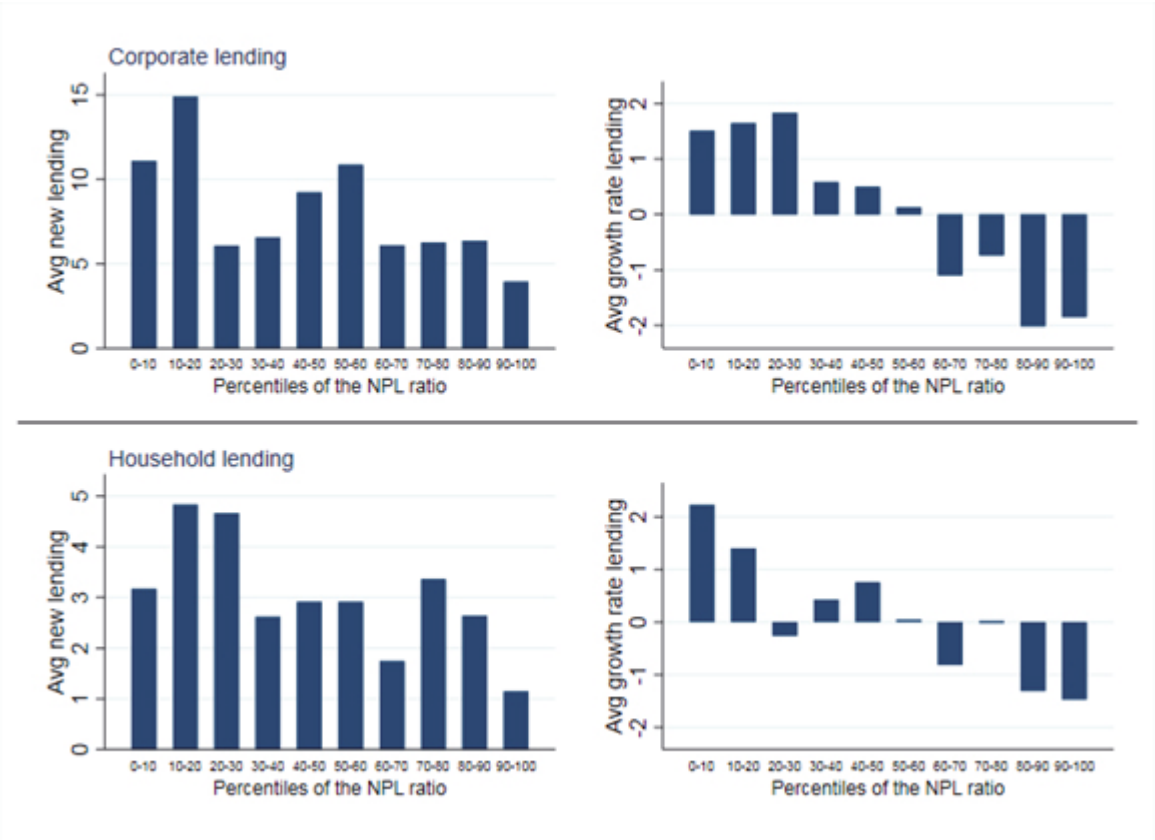
To explore the role of NPLs in credit dynamics, and to harness the novel dataset, a range of panel data techniques is employed. This approach builds on the specification proposed in the literature [see Bending et al. (2014)], although, providing additional insights into the robustness of the results due to the use of two different dependent variables and a broader range of bank-specific controls. In contrast with Bending et al. (2014), the NPL variable here is defined as the gross volume of NPLs over Tier 1 capital, with a view to normalising the NPL stock by the available loss absorption capacity.[7]

The first dependent variable used in the specification is a measure of the quarterly change in lending to non-financial corporates or to households. As that variable may be affected by changes that are not directly related to provision of new credit – such as loan sales, or mergers and acquisitions – an alternative dependent variable is defined as the quarterly sum of all new loans to, respectively, non-financial corporations and households, normalised by the total stock of such loans.[8] Table 2 provides details of the variables employed and their respective definitions.

7 The NPL stock is related mainly to lending to non-financial corporates and households. We do not distinguish between cases where high NPLs are related to corporate or to household lending, as both kinds of NPLs may serve as a constraint on new lending.

8 Quarterly corporate lending flows show pronounced seasonal fluctuations, being higher in the second and the fourth quarter of the year, and lower in the first and third quarter. Seasonal dummies are included in regressions with this dependent variable to correct for seasonal effects.

LENDING GROWTH BY NPL "BUCKET", 2016-2018 CHART 6
LHS: Quarterly flow of new lending (percentage of stocks), RHS: Quarterly growth rate of loans (percentages)



NOTE: Buckets are defined as deciles of the NPL ratio over the full sample of banks and time periods.

The rationale for using non-financial corporate and household lending as a separate dependent variable stems from the demand and supply considerations outlined in the previous section. It is postulated that banks may differentiate lending decisions, and in particular, their decisions to deny applications for credit, amongst different borrower classes. A bank's credit assessment may be more bespoke in the case of loans to non-financial corporations, which may require diligent financial analysis, than in the case of granular household loans, for which lending decisions are often supported by statistical tools. Restricting credit supply to households may then take place through price terms rather than the rejection of credit applications. Empirically, therefore, changes in loans to non-financial corporates may be more sensitive to any bank credit supply constraint. If households are willing and able to absorb the increased cost of lending imposed by banks, the pass-through of credit supply limitations will only be partially effective. This will not be true for lending to firms.

The fixed/random-effects specification is:

$$\Delta L_{i,t} = \beta_1 \left(\frac{NPL}{Tier1} \right)_{i,t} + \beta_2 \mathbf{b} + \beta_3 \mathbf{c} + \beta_4 \mathbf{s} + u_{i,t}$$

The specification for the dynamic panel model is:

$$\Delta L_{i,t} = \beta_1 \Delta L_{i,t-1} + \beta_2 \left(\frac{NPL}{Tier1} \right)_{i,t} + \beta_3 \mathbf{b} + \beta_4 \mathbf{c} + \beta_5 \mathbf{s} + u_{i,t}$$

VARIABLE DEFINITIONS TABLE 2

Variable name	Definition	Source
Dependent variables		
New corporate/household lending	Quarterly flow of new lending to non-financial corporates/households, percentages	ECB supervisory statistics
Growth in corporate / household loan stock	Quarterly growth rate of loans to non-financial corporates/households, percentages	ECB supervisory statistics
Independent variables		
NPL / Capital	Ratio of total NPLs to Tier1 capital at end-quarter, percentages	ECB supervisory statistics
Assets	Total assets at end-quarter, euro, logarithm	ECB supervisory statistics
Tier1 ratio	Tier 1 capital ratio at end-quarter, percentages	ECB supervisory statistics
L-t-D ratio	Ratio of total loans to total deposits at end-quarter, percentages	ECB supervisory statistics
LCR	Liquidity coverage ratio (liquidity buffer / net liquidity outflow) at end-quarter, percentages	ECB supervisory statistics
EONIA	Euro Overnight Index Average money market interest rate, average during the quarter, percentages	ECB statistical data warehouse
Yield slope	Spread between yield on 10-year sovereign bonds and EONIA, average during the quarter, percentages	ECB statistical data warehouse
GDP	Growth rate of real GDP of the bank's home country, percentages	ECB statistical data warehouse
Recovery rate	Recovery of debt in insolvency, calculated based on the time, cost and outcome of insolvency proceedings in each economy	World Bank doing business report
Resolving insolvency	Time, cost, outcome and recovery rate for a commercial insolvency and the strength of the legal framework for insolvency	World Bank doing business report
Q2 dummy / Q4 dummy	Seasonal dummy for second/fourth quarter	

where $\Delta L_{i,t}$ is the dependent variable which, depending on the specification, measures the quarterly growth rate of loans or the quarterly flow of new lending, by bank i in time t; $\left(NPL/Tier1\right)_{i,t}$ is the ratio of total NPLs to Tier 1 capital for bank i in tine t; **b, c** and **s** are vectors of bank, country-specific variables, and seasonal dummies, respectively; and $u_{i,t}$ are bank-specific fixed effects. The bank-specific vector of variables **b** comprises measures of bank size (total assets), capitalisation (Tier 1 capital or leverage ratio) and funding structure (loan-to-deposit ratio or liquidity coverage ratio).[9] The country-specific vector of variables **c** comprises measures of economic output (GDP growth) and short- and long-term interest rates (EONIA rate and the spread between yield on 10-year sovereign bonds and EONIA, respectively).[10] Seasonal dummy variables for the second and fourth quarter of each year are included in the vector **s.**

Where used, the bank-specific variables are intended to control for the impact of potential capital or liquidity constraints that a bank may face when lending. In particular, low risk-weighted capital ratios and higher leverage could be associated with weaker credit expansion. Highly leveraged banks may constrain lending more than those with lower

9 Note that not all of these variables are used in all estimations.

10 Loan supply may also be affected by structural factors, such as quality of institutions and the degree of protection of creditor rights.

leverage, owing to capital constraints. On a similar note, a weak liquidity position, measured through a high loan-to-deposit ratio or a low liquidity coverage ratio, could restrain a bank from expanding its lending business. It can be hypothesised, for example, that banks with a lower proportion of deposit funding may be more sensitive to market conditions and perceptions of risk impacting their cost of funding, and could, therefore, lend less than banks with a higher proportion of deposit funding. Country-specific controls are intended to reflect the differences in macroeconomic conditions that may influence both loan demand and supply.

4.3 METHODOLOGICAL APPROACH

Standard fixed effects and random effects panel data methods are used to estimate the proposed model. In addition, to ensure robustness of the results to any potential autoregressive effects in the data, a difference generalized method-of-moments estimator is used [see Arellano and Bond (1991)]. This approach is frequently used for dynamic panel data regression as it allows for unbiased estimations with short time periods and many individuals. Hence, it includes a dynamic independent variable, depending on its own lagged values, and independent variables that are not strictly exogenous but might be correlated with past and current realizations [see Roodman (2009)]. The Arellano-Bond estimator uses transformations of the endogenous variables via differencing and then applies a generalized method-of-moments (GMM), which in this case is preferred over system GMM [see Blundell and Bond (1998)], as the latter adds more instruments by introducing an additional level equation and, therefore, poses the threat of over-identification of the endogenous variables [see Roodman (2008)].

In order to maintain consistency of the estimators it is essential to test for serial correlation of the instrumental variables, using, for example, the Sargan and the Hansen test of over-identifying restrictions as well as a Difference-in-Hansen test for validity of instruments [see Sargan (1958) and Hansen (1982)].

Reducing the time dimension of the sample to 2016-2018 may be unproblematic from an econometric perspective, as the remaining number of observations is large in comparison with the total number of instruments used in the GMM estimation. Given the cross-sectional dimension, small values of T are considered sufficiently large [see Arellano and Bond (1991)].

4.4 RESULTS

As a first step, empirical results for the full sample period 2014-2018 were estimated, using the fixed effects, random effects, and difference-GMM approach. It should be noted that this data sample period coincides with the second phase introduced in Section 3.2, where stocks of NPLs have already built-up, but new flows have largely stabilised or decreased. The specification outlined previously was estimated, along with variants that included or excluded bank- and country-specific variables. In the dynamic specification, all of the right-hand-side variables were included as possible instrumental variables, with lag lengths constrained to a maximum of 2, to limit the number of instruments. Difference-in-Hansen tests of exogeneity of the instruments suggest that endogeneity is well-controlled for [see Hansen (1982)]. Sargan and Hausman specification test statistics indicate robustness of the estimators.

The results, outlined in Table 3, show that, effectively, the only bank-specific variable that is consistently related to the lending growth is the ratio of the NPL stock to capital. As expected, the sign of that relationship is negative; the estimated coefficients are higher for corporate lending than for lending to households (Table 4). All other things being equal, an

EMPIRICAL RESULT FOR THE FULL SAMPLE OF DATA, CORPORATE LENDING

TABLE 3

	New corporate lending			Growth in corporate loan stock		
	(1)	(2)	(3)	(4)	(5)	(6)
	RE	FE	AB	RE	FE	AB
NPL/capital	-0.0048**	-0.0038***	-0.0025**	-0.0103***	-0.0104**	-0.0133***
	(-2.96)	(-4.73)	(-2.73)	(-13.24)	(-2.89)	(-4.15)
Assets	-0.540	-2.611	0.135	0.340	15.710*	44.290*
	(-1.00)	(-1.24)	(0.05)	(1.64)	(2.18)	(2.44)
GDP	2.57E-06	2.17E-05	-6.01E-07	1.26E-07	9.23E-06	4.65E-05
	(0.75)	(1.90)	(-0.02)	(0.13)	(0.53)	(1.71)
EONIA	4.478	6.256*	5.086	1.940	1.005	-1.173
	(1.62)	(2.06)	(1.64)	(1.02)	(0.33)	(-0.27)
Yield slope	-0.210	-0.082	0.027	0.093	-0.766	0.445
	(-1.48)	(-0.51)	(0.09)	(0.66)	(-1.70)	(0.83)
Q2 dummy	1.323***	1.216***	1.654***			
	(5.24)	(5.19)	(3.32)			
Q4 dummy	1.579*	1.354	1.117*			
	(2.22)	(1.94)	(2.04)			
L. New corp. lending			-0.020			
			(-1.96)			
L. Growth in corp loans						-0.076
						(-1.35)
Constant	11.840***	15.100		0.076	-73.580*	
	(4.31)	(1.49)		(0.05)	(-2.06)	
Observations	897	897	759	889	889	751
R-squared	0.027	0.031		0.012	0.043	
Hansen test			0.014			0.461
Sargan test			0.000			0.029
Difference-in-Hansen			0.094			0.461

NOTES: Columns (1)-(6) refer to different specifications of the estimation: (1) regresses new corporate lending per period on NPL/capital, the log of total assets, GDP, EONIA, the yield slope and seasonal dummies in a random effects (RE) model with robust standard errors and a constant, (2) is the same specification for a fixed effects (FE) model with robust standard errors and a constant, (3) extends the independent variables by a lag of new corporate lending and applies the difference generalized method-of-moments estimator (AB) [see Arellano and Bond (1991)]. Columns (4)-(6) repeat the estimations using period-by-period growth of the stock in corporate lending as the independent variable. T-statistics are reported below the coefficients in parenthesis. R-squared and p-values obtained in Hansen/Sargan tests of overidentifying restrictions and Difference-in-Hansen tests of exogeneity of instruments are displayed below the estimation outcome. *** = significance at the 0.1% level, ** = significance at the 1% level, * = significance at the 5% level.

increase in the stock of NPLs by 1% of capital[11] would reduce the quarterly flow of new corporate lending by between 0.0025% and 0.0048%[12] of total loans (see columns 1 to 3 of Table 3). The quarterly growth rate of corporate loans (i.e. the change in the stock of loans) would deviate downwards by about 0.010 to 0.013 percentage points in the event of an increase in the NPL stock by 1% of capital (see columns 4 to 6 of Table 3). For loans

11 An increase in the NPL stock by 1% of capital would correspond to an absolute increase by slightly over EUR 10 billion, which is rather small in comparison with the total stock of NPLs held by significant institutions in the euro area, which amounted to EUR 722 billion (69% of Common Equity Tier 1 capital) at the end of June 2018, down from EUR 988 billion (96% of CET1 capital) at mid-2015. It should also be noted that the growth rates in loans are calculated over a horizon of one quarter. For annual growth rates, the effects would be about four times higher than those reported here.

12 To put this into perspective, the total stock of outstanding corporate loans in the euro area stood at about EUR 4.4 trilion at end-September 2018. The estimated impact would be equivalent to a reduction in the flow of new corporate loans by between 110 and 211 million euro per quarter.

EMPIRICAL RESULTS FOR THE FULL SAMPLE OF DATA, HOUSEHOLD LENDING

TABLE 4

	New household lending			Growth in household loan stock		
	(1)	(2)	(3)	(4)	(5)	(6)
	RE	FE	AB	RE	FE	AB
NPL/capital	-0.0030	-0.0020	0.0003	-0.0078*	-0.0078	-0.0049**
	(-1.35)	(-1.20)	(0.70)	(-2.09)	(-1.30)	(-2.63)
Assets	-0.546*	1.600	-0.619	-0.324	24.040*	91.650***
	(-2.08)	(0.22)	(-0.28)	(-0.56)	(2.13)	(3.41)
GDP	3.00E-06*	-2.18E-05	6.76E-06	1.76E-06	-1.51E-04	-2.21E-05
	(2.24)	(-1.11)	(0.64)	(0.37)	(-1.12)	(-0.23)
EONIA	4.932	2.417	4.389	11.210	-5.230	-3.067
	(1.36)	(1.01)	(1.38)	(0.90)	(-1.06)	(-0.34)
Yield slope	-0.220	-0.106	-0.575	-0.126	-0.569	-1.137
	(-1.72)	(-0.43)	(-0.71)	(-0.64)	(-1.24)	(-1.10)
Q2 dummy	-0.050	0.069	-0.166			
	(-0.18)	(0.26)	(-0.38)			
Q4 dummy	-0.504	-0.201	-0.962			
	(-1.41)	(-0.56)	(-1.16)			
L. New hh lending			0.197			
			(0.88)			
L. Growth in hh loans						-0.021
						(-0.79)
Constant	7.061**	4.357		5.874	-59.910	
	(3.03)	(0.15)		(1.11)	(-1.72)	
Observations	897	897	759	889	889	751
R-squared	0.012	0.019		0.002	0.019	
Hansen test			0.001			0.316
Sargan test			0.000			0.204
Difference-in-Hansen			0.003			0.419

NOTES: Columns (1)-(6) refer to different specifications of the estimation: (1) regresses new household lending per period on NPL/capital, the log of total assets, GDP, EONIA, the yield slope and seasonal dummies in a random effects (RE) model with robust standard errors and a constant, (2) is the same specification for a fixed effects (FE) model with robust standard errors and a constant, (3) extends the independent variables by a lag of new corporate lending and applies the difference generalized method-of-moments estimator (AB) [see Arellano and Bond (1991)]. Columns (4)-(6) repeat the estimations using period-by-period growth of the stock in household lending as the independent variable. T-statistics are reported below the coefficients in parenthesis. R-squared and p-values obtained in Hansen/Sargan tests of overidentifying restrictions and Difference-in-Hansen tests of exogeneity of instruments are displayed below the estimation outcome. *** = significance at the 0.1% level, ** = significance at the 1% level, * = significance at the 5% level.

to households, these relationships are somewhat weaker, as indicated by lower coefficients for the NPL/capital variable in Table 4, compared to those for corporate lending in Table 3. The size of a bank is also statistically significant in some regressions.

These results are consistent with the hypothesis presented in Section 3 that, at least during economic recoveries when credit demand has recovered, high stocks of NPLs would weigh on bank credit supply. Once again, these results are consistent across the specifications used, regardless of the country and/or bank-specific variables considered.

Interestingly, these results differ substantially from those previously found using a similar specification [see Bending et al. (2014)]. In that case, almost all explanatory variables were found to have statistically significant coefficient estimates. That dataset was substantially smaller in cross-section, however, than that employed here, with just 42 banks, and covered a much longer period, from 2004 to 2013, which arguably includes a period of NPL build-up, and more generally, a period of crisis for the euro area.

EMPIRICAL RESULTS FOR THE RESTRICTED SAMPLE OF DATA, CORPORATE LENDING

TABLE 5

	New corporate lending			Growth in corporate loan stock		
	(1)	(2)	(3)	(4)	(5)	(6)
	RE	FE	AB	RE	FE	AB
NPL/capital	-0.0042***	-0.0037***	-0.0023***	-0.0111***	-0.0127***	-0.0153***
	(-5.16)	(-6.72)	(-4.74)	(-12.90)	(-6.84)	(-10.84)
Assets	-0.512	-1.805	0.997	0.415	28.360**	49.760*
	(-0.95)	(-0.83)	(0.31)	(1.52)	(3.41)	(2.24)
GDP	3.64E-06	2.26E-04	-1.04E-05	7.75E-08	2.00E-05	2.44E-05
	(1.01)	(1.42)	(-0.60)	(0.07)	(0.71)	(0.57)
EONIA	-3.529	0.581	-32.550	-0.003	-1.072	1.668
	(-0.74)	(0.09)	(-1.43)	(-0.00)	(-0.11)	(0.04)
Yield slope	-0.093	-0.054	-0.101	0.099	-1.346*	-0.960
	(-0.58)	(-0.26)	(-0.21)	(0.63)	(-2.42)	(-1.03)
Q2 dummy	1.181***	1.111***	1.480***			
	(4.10)	(4.37)	(3.77)			
Q4 dummy	0.727**	0.542	1.250**			
	(2.66)	(1.89)	(2.79)			
L. New corp lending			-0.197			
			(-1.10)			
L. Growth in corp loans						-0.025
						(-0.59)
Constant	8.488***	9.175		-0.799	-135.100**	
	(3.50)	(0.85)		(-0.34)	(-3.19)	
Observations	655	655	517	652	652	514
R-squared	0.050	0.055		0.019	0.090	
Hansen test			0.087			0.609
Sargan test			0.000			0.520
Difference-in-Hansen			0.260			0.317

NOTES: Columns present regression results in the same order as in Table 3. T-statistics are reported below the coefficients in parenthesis. *** = significance at the 0.1% level, ** = significance at the 1% level, * = significance at the 5% level.

In a second step, the sample period is reduced, excluding the years 2014 and 2015. In light of the arguments outlined in Section 3, it is expected that the reduced sample period should give more clear results. Again, the specifications outlined previously were estimated, along with variants that included or excluded bank- and country-specific variables. The results shown in Tables 5 and 6 resemble those in Tables 3 and 4, despite the reduced sample period.

These results are consistent regardless of the choice of dependent variable: growth in lending or new lending flows as a ratio of total loans. Sensitivity analysis is carried out using three bank-specific variables, representing capital and funding constraints that banks might face: the loan-to-deposit ratio, the leverage ratio, and the Tier 1 capital ratio, as well as two structural variables that capture the ease of resolving NPLs in a specific country. These five variables are added, one at a time, to the specification reported in Table 3.

EMPIRICAL RESULTS FOR THE RESTRICTED SAMPLE OF DATA, HOUSEHOLD LENDING TABLE 6

	New household lending			Growth in household loan stock		
	(1)	(2)	(3)	(4)	(5)	(6)
	RE	FE	AB	RE	FE	AB
NPL/capital	-0.0012	-0.0007*	0.0020	-0.0067**	-0.0053***	-0.0055***
	(-1.72)	(-2.53)	(0.40)	(-2.97)	(-4.13)	(-8.15)
Assets	-0.405*	-2.654*	-1.559	0.117	29.080**	81.050***
	(-2.05)	(-2.07)	(-0.84)	(0.43)	(2.86)	(4.16)
GDP	1.81E-06*	-3.93E-06	1.17E-05	-1.49E-06	-8.33E-05	1.87E-05
	(2.09)	(-0.36)	(0.73)	(-0.52)	(-1.12)	(0.78)
EONIA	-0.769	-1.522	16.800	-5.405	-31.690	-48.950
	(-0.43)	(-0.60)	(1.38)	(-0.72)	(-1.70)	(-0.95)
Yield slope	-0.162	0.074	-0.019	-0.124	-0.975	-1.081
	(-1.57)	(0.72)	(-0.14)	(-0.71)	(-1.85)	(-1.02)
Q2 dummy	0.010	0.048	0.161			
	(0.07)	(0.39)	(0.74)			
Q4 dummy	-0.185	-0.137	-0.292			
	(-0.89)	(-0.82)	(-0.66)			
L. New hh lending			0.088***			
			(5.82)			
L. Growth in hh loans						-0.046
						(-1.69)
Constant	4.482***	16.160*		-0.777	-114.000**	
	(3.40)	(2.18)		(0.29)	(2.89)	
Observations	655	655	517	652	652	514
R-squared	0.004	0.012		0.001	0.040	
Hansen test			0.628			0.647
Sargan test			0.001			0.017
Difference-in-Hansen			0.674			0.553

NOTES: Columns present regression results in the same order as in Table 4. T-statistics are reported below the coefficients in parenthesis. *** = significance at the 0.1% level, ** = significance at the 1% level, * = significance at the 5% level.

Table 7 reports the outcome of this sensitivity analysis for corporate lending for the fixed effects estimator.[13] It is notable that, in all of the considered regressions, bank capital and funding constraints, proxied by the Tier 1 capital ratio, the leverage ratio, and the loan-to-deposit ratio, are found to be statistically insignificant (see Table 7). This may be attributed to the macro-financial conditions prevailing in the period covered by the data. Capitalisation of significant institutions was found to be broadly sufficient in the 2014 ECB Comprehensive Assessment, and nevertheless, the aggregate Tier 1 capital ratio continued to increase throughout the sample period, reaching 15.6% by end-2017. That implies a very sizeable buffer with respect to 10%, the approximate level of the ratio that banks are expected to hold, on average, by the ECB in its supervisory capacity. This high level of the ratio, and insignificance of the capital ratio in our regressions, may be an indication that capital constraints were far from binding for most of the banks in the sample, even if a small group of banks might have been close to the minimum requirements. Similarly, and as discussed earlier, liquidity and funding constraints were relaxed by monetary policy measures; in

13 Table 7 provides a selection of these regression results. Owing to space constraints, detailed sensitivity analysis using all of the considered bank controls and removing bank-specific controls altogether is available from the authors upon request.

SENSITIVITY ANALYSIS FOR ADDITIONAL INDEPENDENT VARIABLES, FIXED EFFECTS MODEL

TABLE 7

	New corporate lending					Growth in household loan stock				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
NPL ratio	-0.0031***	-0.0039***	-0.0038***	-0.0037***	-0.0037*	-0.0141***	-0.0102**	-0.0104**	-0.0103**	-0.0128**
	(-4.70)	(-4.81)	(-4.75)	(-4.83)	(-2.38)	(-10.36)	(-2.80)	(-2.88)	(-2.86)	(-3.31)
Assets	-3.377	-2.794	-2.616	-2.597	-2.574	34.740**	15.900*	15.610*	15.620*	14.950*
	(-1.38)	(-1.29)	(-1.24)	(-1.23)	(-1.23)	(3.37)	(2.21)	(2.18)	(2.18)	(2.13)
GDP	1.67E-05	2.07E-05	2.14E-05	1.95E-05	2.17E-05	-9.95E-06	2.33E-06	3.90E-07	3.54E-07	1.21E-06
	(0.93)	(1.85)	(1.90)	(1.77)	(1.90)	(-0.31)	(0.15)	(0.03)	(0.02)	(0.08)
EONIA	-64.950**	6.252*	6.206*	5.600	6.326	-9.839	0.462	0.380	0.330	-0.809
	(-2.84)	(2.05)	(2.03)	(1.85)	(1.84)	(-0.20)	(0.16)	(0.13)	(0.11)	(0.28)
Yield slope	-1.181	-0.125	-0.077	-0.051	-0.080	-0.353	-0.638	-0.695	-0.697	-0.738
	(-1.55)	(-0.74)	(-0.47)	(-0.32)	(-0.49)	(-0.51)	(-1.58)	(-1.66)	(-1.66)	(-1.77)
Q2 dummy	1.243***	1.227***	1.219***	1.228***	1.217***	0.811	0.053	0.074	0.072	0.056
	(4.18)	(5.16)	(5.13)	(5.12)	(5.17)	(1.03)	(0.10)	(0.14)	(0.13)	(0.10)
Q4 dummy	0.835*	1.347	1.357	1.372	1.350*	1.587	0.771	0.764	0.764	0.834
	(2.59)	(1.95)	(1.95)	(1.96)	(2.00)	(1.75)	(1.04)	(1.03)	(1.03)	(1.10)
LCR	0.001					0.002				
	(0.65)					(0.68)				
L-t-D ratio		0.006					-0.010			
		(0.83)					(-1.28)			
Recovery rate			-0.006					-0.009		
			(-0.41)					(-0.47)		
Resolving insolvency				-0.041					-0.008	
				(-1.57)					(-0.29)	
Tier1 ratio					0.016					-0.288
					(0.12)					(-1.62)
Constant	-3.365	15.640	15.690	18.840	14.690	-160.300***	-71.560*	-69.870*	-70.040*	-63.490
	(-0.24)	(1.53)	(1.59)	(1.91)	(1.40)	(-3.53)	(-2.10)	(-2.03)	(-2.03)	(-1.93)
Observations	493	897	897	897	897	492	889	889	889	889
R-squared	0.099	0.031	0.031	0.032	0.031	0.099	0.045	0.045	0.045	0.047

NOTES: T-statistics are reported below the coefficients in parenthesis. *** = significance at the 0.1% level, ** = significance at the 1% level, * = significance at the 5% level.

particular through targeted, long-term refinancing operations and full allotment in regular policy operations. At the same time, it is reassuring that the coefficients estimated for the capital/NPL variable seem stable across these additional specifications.

At this juncture, it is appropriate to comment on the validity of the interest rates included as country-specific explanatory variables. The period included in the sample used here covers a period of extraordinary monetary policy accommodation by the European Central Bank, which heavily impacted the EONIA rate, through full-allotment credit operations and a zero interest rate since 2016, and sovereign yields, through various asset purchase programmes. It is, therefore, perhaps to be expected that these variables have little explanatory power during this period, as the cost and quantity of funding may not have been a binding constraint for the vast majority of euro area banks.

5 Conclusions

This paper analysed the relationship between bank asset quality and lending, providing evidence that, for large euro area banks, this relationship was in line with expectations during the economic recovery which developed between 2014 and 2018. This confirms that, in periods when loan demand is strong and improving, and banks are not facing

regulatory capital and liquidity constraints, the presence of high NPL stocks may hinder individual banks' lending. This is even more relevant when NPLs are not only high in absolute terms, but also high in comparison to the available loss-absorbing capital. This finding could be associated with risk perceptions and appetite. High realised credit risk may influence individual banks' assessment of future credit risk, as partly prompted by existing bank regulation. The nature of that mechanism would require further study, taking into account, in particular, risk profiles and pricing behaviour of individual banks.

This paper, being focused on bank-specific data, does not attempt to quantify the aggregate credit supply effect of elevated NPL stocks; to the extent that strong banks are present in the credit market, or new entrants are willing to step in, a reduction of credit supply by weaker banks may not necessarily lead to credit crunches. That being said, in the context of the euro area, where cross-border banking shrank significantly during the financial crisis, and many national banking markets are dominated by a small number of domestically-focused banks that all face similar asset quality issues, the presence of such non-trivial aggregate effects appears likely. Further analysis in that direction would be welcome.

From a macroeconomic and policy perspective, our findings support the view that high NPL stocks should be decisively resolved. When banks are burdened with high NPLs, adequate capitalisation and more resilient funding in the banking sector may not be sufficient to restore loan growth. Once NPLs stocks have been accumulated, it cannot be expected that monetary or macroprudential policy can address them. Policies that target NPL stocks directly are needed. In addition to supervisory action, such policies should include structural reforms that speed up enforcement of loan collateral and insolvency proceedings, or facilitate NPL disposals to non-bank investors. Well-designed asset management companies, which can be set up to carve out NPLs from going-concern banks, could also contribute to a swift reduction in NPL stocks [see Fell et al. (2017) and Balgova et al. (2018)].

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MACROPRUDENTIAL POLICY IN PORTUGAL: EXPERIENCE WITH BORROWER-BASED INSTRUMENTS (*)

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MACROPRUDENTIAL POLICY IN PORTUGAL: EXPERIENCE WITH BORROWER-BASED INSTRUMENTS

Abstract

A borrower-based macroprudential policy measure was recently adopted in Portugal targeting new loans for households, including both mortgage and consumer credit. The macroprudential measure recommends limits to LTV ratios, DSTI ratios and maturities of new loans, and the regular payments of interest and capital. The measure also encompasses interest rate and income shocks in its design. The purpose of this policy action is to ensure that credit institutions and financial companies do not take excessive risk when granting new household loans, promoting the resilience of the financial sector and the access of borrowers to sustainable lending. Taking into account the innovative and complex nature of the measure, this paper shares the Portuguese experience in operationalising borrower-based measures and discusses its appropriateness in light of the risks, the policy goals and the timing of the policy action.

1 Introduction

Banco de Portugal is responsible for promoting the stability of the financial system in Portugal. As the Portuguese macroprudential authority, Banco de Portugal identifies, assesses and monitors systemic risk and adopts measures aimed at preventing, mitigating or reducing this risk, so as to reinforce the resilience of the financial sector. Pursuant to its Organic Law and other applicable legislation, Banco de Portugal may issue orders, warnings and recommendations to public or private entities and authorities to meet its macroprudential policy goals.[1]

In accordance with its mandate, on 1 February of 2018 Banco de Portugal issued a recommendation on new loans to households, including credit secured by residential immovable property, credit secured by a mortgage or equivalent guarantee, and consumer credit. This macroprudential measure was adopted with a view to introducing limits to some of the criteria that institutions use in the assessment of borrowers' creditworthiness, such as loan-to-value (LTV) ratios, debt-service-to-income (DSTI) ratios and maturities. In addition, it also introduced regular interest and principal payment requirements. The measure, translated into a recommendation that follows the 'comply or explain' principle, is addressed to all entities authorised to grant credit in Portugal and was implemented as of 1 July 2018.

The macroprudential measure aims at taking pre-emptive action in the field of household credit, in a context characterized by some easing of credit standards and the expectation of intensification of this trend, coupled with a high level of indebtedness and a low saving rate of Portuguese households. The measure is targeted at strengthening the adoption of prudent credit standards by the Portuguese financial system, improving its ability to withstand adverse shocks. By defining prudent credit standards in lending to the household sector, this measure also promotes the access of borrowers to sustainable financing and mitigates the risk of default. Given that the identified risks are still in an early build up stage, the macroprudential measure was designed to have an impact on loans to borrowers with a riskier profile, without significantly affecting lending activity to households in general. Overall, the measure mitigates the build-up of systemic risk related to excessive risk-

1 According to the legal framework established in Portugal and in line with the formal mandate of Banco de Portugal as macroprudential authority, the National Council of Financial Supervisors plays an advisory role to Banco de Portugal in macroprudential matters. Furthermore, cooperation with the other two national financial supervisors – the Portuguese Securities Market Commission, which supervises and regulates the securities market and the Insurance and Pension Funds Supervisory Authority, which is responsible for supervising and regulating the insurance and pension funds sector – takes place under the auspices of the National Council of Financial Supervisors, in which the three national supervisors are represented.

taking by both lenders and borrowers, thus preventing potential serious consequences for the financial system and the economy going forward.

As also addressed by European Union and national legal initiatives governing credit to households, the macroprudential measure reinforces the importance of promoting an adequate assessment of risk in this type of credit, by assuming that a household loan should only be granted when the result of the creditworthiness assessment confirms that the borrower is likely to comply with the obligations of the credit agreement.

The macroprudential measure adopted by Banco de Portugal is in several aspects quite innovative and rich, taking into account the international experience with borrower-based instruments. First, it is pioneering since it targets both housing and consumer lending, while the common approach followed by other countries is to define limits to credit standards that only apply to mortgage credit. To the extent of our knowledge, among European countries, only Romania, Czech Republic and Slovakia have adopted measures on consumer lending. Second, the richness of the measure lies in the simultaneous introduction of limits to three instruments – LTV, DSTI and maturity – with a view of reinforcing their effectiveness by overcoming some shortcomings of each instrument when implemented single-handedly. Furthermore, the measure considers interest rate and income shocks in the calculation of the DSTI.

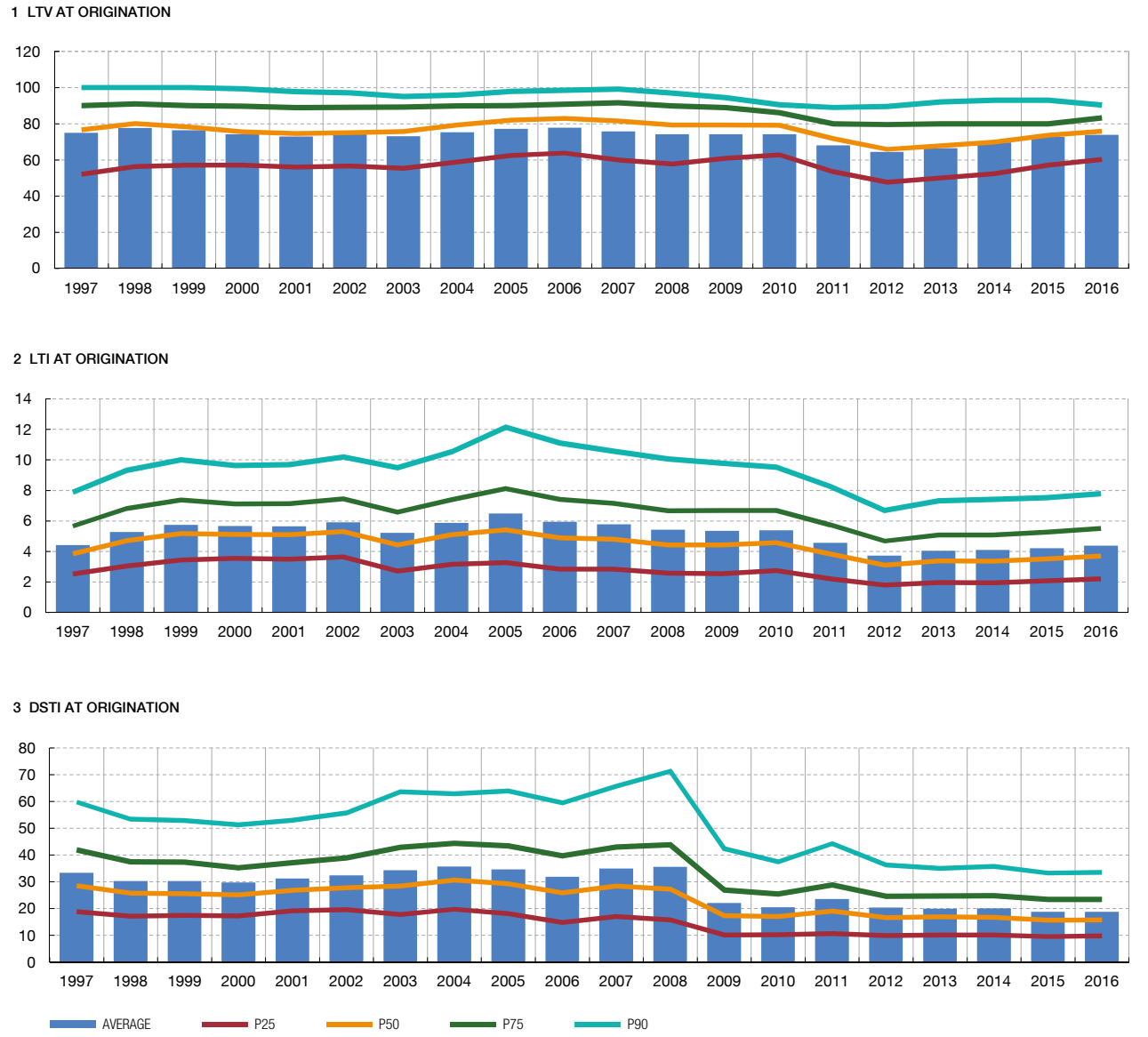
In this paper we recall the several stages of the decision and implementation process of the macroprudential measure, framed by the pillars of macroprudential policy strategy adopted by Banco de Portugal.[2] We start by providing an overview of the risk assessment that motivated this policy action and we introduce the policy objectives and the main components of the measure. As part of the design and calibration process, we discuss the selection of macroprudential instruments, their transmission mechanisms and the preference for a specific combination of macroprudential policy instruments, based on the assessment of the associated costs and benefits. Some features of the macroprudential measure reflect the need to establish a bridge between the legacy of the crisis, namely the level of non-performing assets, and the potential build-up of risks going forward. The interaction of the macroprudential measure with other policy fields, such as monetary policy and banking conduct supervision, was also a key concern of Banco de Portugal and is addressed in this paper. Another pillar of the macroprudential policy strategy relates to the communication of the adopted instruments. The tailor-made external communication strategy for borrower-based measures followed by Banco de Portugal is also worth sharing in this paper. Additionally, we discuss the Portuguese experience with borrower-based measures so as to point out knowledge gaps that, in our view, still persist. Finally, we conclude by dwelling on the way forward concerning policy monitoring and evaluation.

2 Risk assessment and policy objectives

From the assessment of vulnerabilities and risks related to credit granted to households – both mortgage and consumer credit – Banco de Portugal identified some easing of credit standards in household lending. In fact, amid the economic recovery, the prolonged low interest rates environment, and the strong increase of new lending to households, although the outstanding amount of housing loans is still declining, the easing of credit standards could hamper financial stability in the future. These credit dynamics occur in a context characterized by still high household indebtedness, low saving rate and high exposure of the financial system to credit secured by residential real estate. In this context, it is worthwhile to highlight that, in Portugal, the proportion of owner occupied housing is among the highest of EU countries.

2 Banco de Portugal, *Macroprudential policy strategy,* December 2015.

LTV, LTI AND DSTI RATIOS, BY YEAR. AVERAGES AND PERCENTILES CHART 1



SOURCE: Banco de Portugal.

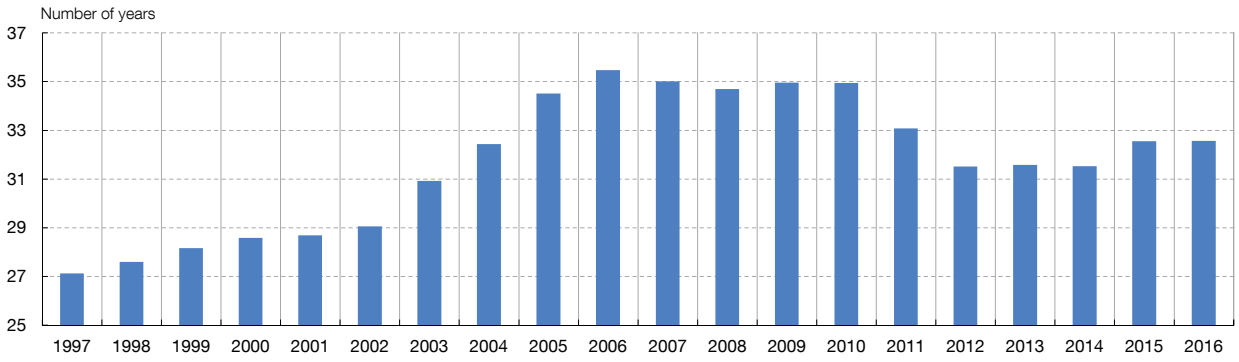
Note: Loan-level data collected for outstanding loans at year-end 2015 and 2016 through Instructions of Banco de Portugal.

A protracted low interest rate environment, coupled with the recovery of the economy and an improving real estate market, creates incentives for greater competition among banks and the consequent easing of credit standards. The current economic and financial conditions bolster demand for credit and may encourage the granting of credit to borrowers with a riskier profile, thus increasing the likelihood of default, in the case of short term interest rates increases and / or economic conditions deterioration.

There is evidence of some easing in credit standards in both mortgage and consumer credit in Portugal.[3] For example, in the case of mortgage credit, the recent evolution of LTV, LTI ratios and loans maturities at origination of credit shows some signs of credit standards starting to be loosened (Chart 1). Following a tightening after the financial crisis,

3 See the Background document published by Banco de Portugal on 1 February 2018.

MATURITY OF LOANS SECURED BY RESIDENTIAL IMMOVABLE PROPERTY IN PORTUGAL CHART 2



SOURCE: Banco de Portugal.

the LTV and LTI ratios reversed this trend since 2012, indicating less restrictive credit standards practiced by Portuguese banks in mortgage loans. The DSTI ratio at origination did not follow the same trend as LTV and LTI ratios: it was high until the onset of the financial crisis, following a downward path from that period onwards. The diverging path followed by DSTI ratios was driven by the effect of the decrease of short term interest rates that was observed throughout this period. As concluded in a study by Banco de Portugal, based on loan-level data collected for outstanding loans at year-end 2015 and 2016, high LTV, LTI and DSTI ratios tend to be associated with a higher default rate, in the absence of other factors that could mitigate credit risk.[4]

As mentioned, the easing of credit standards in new lending to households, especially in the case of credit secured by residential immovable property, also included the lengthening of the loan original maturity (Chart 2). From 2015 onwards the average maturity of new credit secured by residential immovable property increased further each year, reaching 33 years in 2016, which corresponds to a high level by European standards.[5] Moreover, a significant share of new credit secured by residential immovable property has a 40-years maturity, according to the information provided by a sample of institutions which account for a very high share of this category of loans to households.

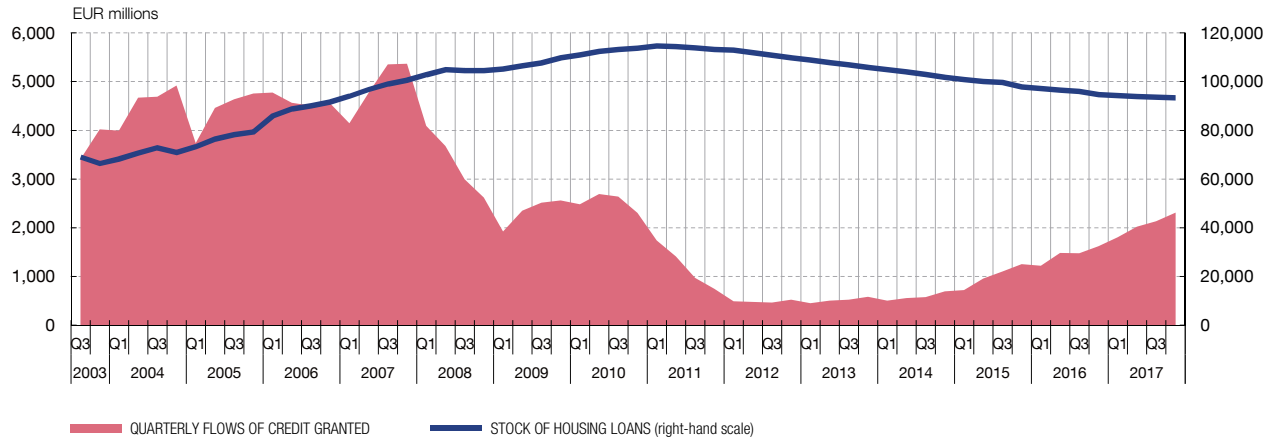
Longer maturities (up to 50 years) are reported by some institutions, which also grant credit to borrowers whose age significantly exceeds the expected retirement age at the expiry of the loan. The projections of replacement rates of the public old-age pensions system in Portugal point to the likely reduction in income that will tend to occur with the transition from working life into retirement [see European Commission (2018)]. These projections should be considered in the assessment of the borrower creditworthiness, so as to avoid the emergence of risks for financial stability in the long term related to situations of great financial vulnerability of borrowers and risk of default.

The trend of lengthening loan maturities has also occurred in consumer credit in recent years. The *Retail Banking Markets Monitoring Report* for 2015, 2016 and 2017 indicates that, in those years, average maturity increased in most consumer credit sub-segments. For example, car loans granted in 2017 presented an average maturity of 6.7 years and

4 See Banco de Portugal, *Financial Stability Report,* June 2017, Special Issue 3 "Banking sector's exposure to mortgage loans: analysis of LTV and LTI/DSTI and implications for financial stability".

5 Banco de Portugal (2018), *Retail Banking Markets Monitoring Report 2017.*

FLOWS AND STOCKS OF HOUSING LOANS CHART 3



SOURCE: Banco de Portugal.

there is an increase in the importance of this credit segment with longer maturities. Notwithstanding this trend, the original maximum maturity in consumer loans has not exceeded 10 years so far.

Another sign of credit standards becoming less restrictive is related to the narrowing of credit spreads in new lending to households in recent years. After peaking in 2011, average spreads on new lending to households for house purchase have been declining considerably, even though their level remains clearly above the average spreads observed immediately before the financial crisis.

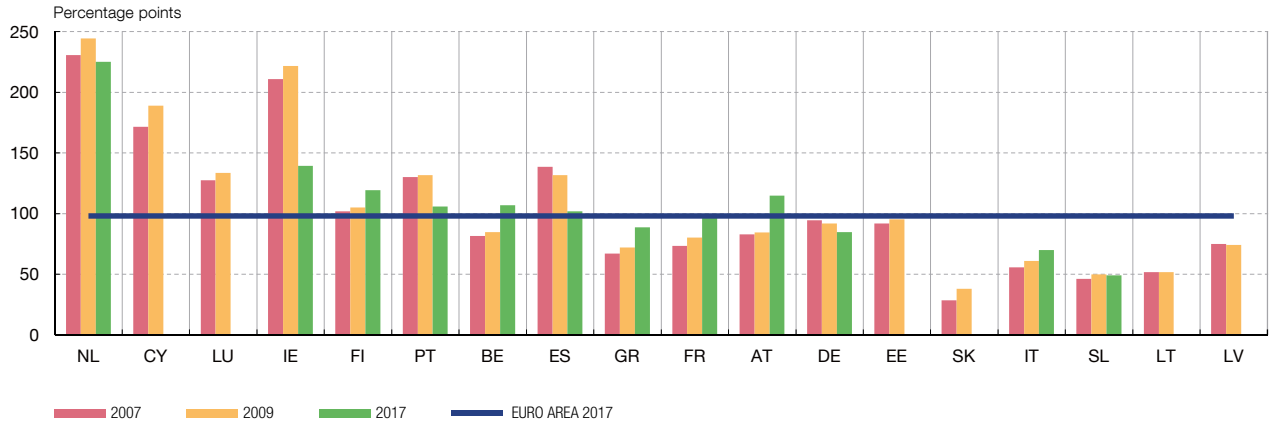
The Portuguese banking system is particularly exposed to residential real estate market developments, mainly through credit to households secured by residential immovable property, which accounted for 28% of total assets by the end of 2017. Despite of some easing in credit standards in new loans, the stock of housing credit continued to decline, although at a slower pace than observed in recent years (Chart 3). In turn, the amount of new business on housing credit has been increasing since 2013 and accelerated from 2015 onwards, albeit still remaining below the levels reported before the financial crisis. These developments have been determined, to a large extent, by new borrowers joining the credit market, i.e. households that in the previous year did not have any loans granted by resident financial institutions [see Banco de Portugal (2018b)]. At the same time, there was a significant amount of early repayments of housing loans granted in the past, without the borrowers being granted a new loan.

The stock of consumer credit has also reported high growth rates in recent years and these dynamics have also been dominated by new borrowers.

In Portugal, mortgage loans account for the most significant share of household indebtedness (around 72% in 2017), although consumer credit has been increasing its weight in the total. Despite of its steady decline in the past few years (more than 20 percentage points between 2012 and 2017), a key vulnerability of the Portuguese economy and financial system is the still high level of aggregate household indebtedness ratio (around 106% of disposable income in 2017) (Chart 4). The increase in the outstanding amount of consumer loans coupled with the strong

PRIVATE INDIVIDUALS' INDEBTEDNESS RATIO

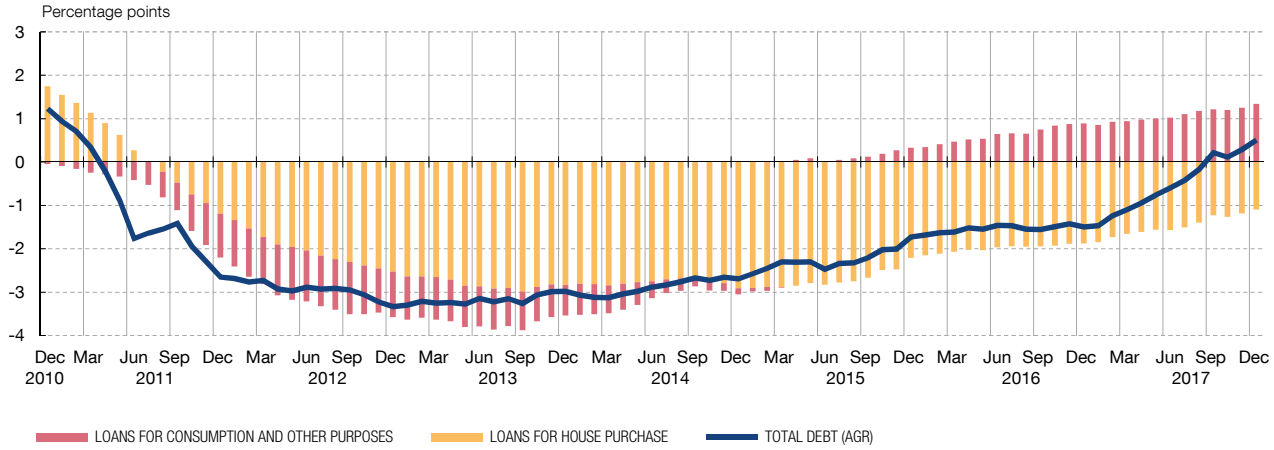
CHART 4



SOURCES: Banco de Portugal and Statistics Portugal.

CONTRIBUTIONS TO THE ANNUAL RATE OF CHANGE OF PRIVATE INDIVIDUALS' TOTAL DEBT

CHART 5



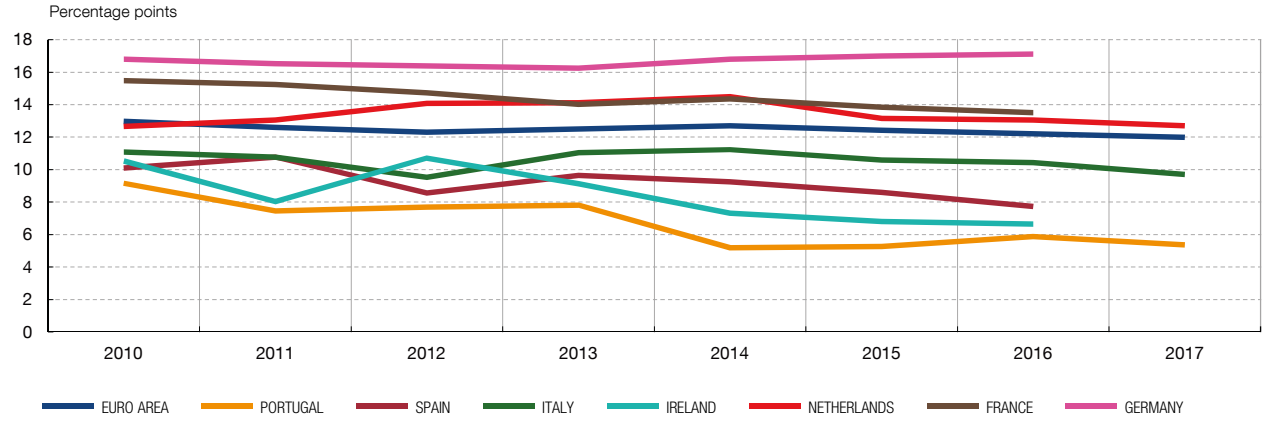
SOURCE: Banco de Portugal.
NOTE: Total debt includes loans and trade credits granted by the resident financial system, by other resident sectors (excluding private individuals) and by non-residents. Annual growth rates (AGR) are calculated on the basis of an index computed from adjusted transactions, i.e., end of period outstanding amounts' changes adjusted for reclassifications, write-offs, exchange rate and price changes and, whenever relevant, securitisation operations and outright sales. The total debt AGR stems from adjusted transactions of loans for house purchase and consumption (whose contribution is presented in the chart), and of loans for purposes other than house purchase and consumption, and trade credits.

growth of new housing loans have determined a slowdown in the decreasing path of the household indebtedness ratio. It is thus desirable, at this stage, to ensure that the current credit dynamics do not jeopardize the favourable decline of household indebtedness (Chart 5).

Evidence indicates that most debt is concentrated in middle-income households, who show significant shares of mortgage credit with debt service-to-income ratios close to critical values [Banco de Portugal (2018b)]. Furthermore, in spite of some measurement uncertainties, the saving rate of Portuguese households stands at rather low levels in international terms (Chart 6). The low saving rate and the still high households' indebtedness

GROSS HOUSEHOLD SAVING RATE

CHART 6



SOURCE: Eurostat.
NOTE: The gross saving rate of households (including Non-Profit Institutions Serving Households) is defined as gross saving divided by gross disposable income, with the latter being adjusted for the change in the net equity of households in pension funds reserves. Gross saving is the part of the gross disposable income which is not spent as final consumption expenditure.

renders households more vulnerable to reductions in income and increases in short-term interest rates.

In Portugal, there are specific structural factors of the lending markets that may amplify or mitigate the shocks to financial stability. One important structural factor is the predominance of the floating rate regime in the mortgage credit market. This feature suggests that the interest rate pass-through to households' mortgage rates is faster in the Portuguese economy. However, in the last few years, mixed interest rates regime gained importance in new mortgage loans.

This structural characteristic of the mortgage lending market was beneficial for Portuguese households when the monetary policy interest rates began to decrease and remained at very low levels, because the accommodative monetary policy stance eased their debt-service burden. However, after a protracted period of short term interest rates at record low levels, market expectations point to an increase in the near future, although at a gradual pace.

In light of the conclusions of the risk assessment, with evidence of some easing of credit standards and expectations of further strengthening of this trend in the near future, Banco de Portugal deemed appropriate to recommend the setting of maximum limits to some of the credit criteria used by financial institutions in the assessment of the borrower's creditworthiness, indicating to both borrowers and lenders the need to pursue prudent credit standards in household lending.

At this initial stage of risk build-up, in a context of still high household indebtedness, economic recovery, very low interest rates and expectations of a gradual increase in the near future and an improving residential real estate market, the anchoring of credit standards at prudent levels is key to reinforce the resilience of the financial sector, by ensuring that the dynamics of credit granted to households do not promote the build-up of excessive risk in banks' balance sheet and that borrowers have access to sustainable funding, minimizing their risk of default.

SUMMARY OF THE MACROPRUDENTIAL MEASURE

TABLE 1

LTV limits (Recommendation A)	– LTV ≤ 90% - New credits secured by residential immovable property for the purchase or construction of own and permanent residence – LTV ≤ 80% - New credits secured by residential immovable property or credit secured by a mortgage or equivalent guarantee for other purposes than own and permanent residence – LTV ≤ 100% - New credits secured by residential immovable property and credit secured by a mortgage or equivalent guarantee for purchasing immovable property held by the institutions themselves and for property financial leasing agreements – The value of the property pledged as collateral is given by the minimum between the purchasing price and the appraisal value
DSTI limits (Recommendation B)	DSTI ≤ 50%, with the following exceptions on the total amount of credit granted by each institution in each year: – up to 20%: DSTI ≤ 60%; and – up to 5%: no DSTI limit For the calculation of the DSTI, monthly instalments of new loans are assumed constant over the entire period of the loan. For variable and mix interest rate loans, the impact of an interest rate rise should be considered. The DSTI should also take into account the impact of a reduction in the borrower's income, if the borrower's age at the term of the loan contract is higher than 70 years old, except if the borrower is already retired at the time of the creditworthiness assessment
Maturity limits (Recommendation C)	For new loans secured by residential immovable property or credit secured by a mortgage or equivalent guarantee: – Maturity ≤ 40 years – Average maturity of new loans should gradually converge to 30 years until the end of 2022 For new consumer loans: – Maturity ≤ 10 years
Requirement of regular payments (Recommendation D)	New loans should be granted with regular payments ofinterest and capital. The use of mechanisms such as the introduction of grace periods or forbearance should be reserved for loans intended to prevent or address arrears situations. Institutions must fully justify the existence of other types of loans

SOURCE: Banco de Portugal.

3 Overview of the macroprudential borrower-based measure adopted by Banco de Portugal

Banco de Portugal announced the macroprudential measure on 1 February 2018 and allowed a five months period for institutions to adapt their IT systems to the new requirements, namely to collect the necessary information. The macroprudential measure covers all new loans to households[6] concluded from 1 July 2018 onwards falling within the scope of the recommendation.

The macroprudential measure takes the legal form of a recommendation that follows the "comply-or-explain" principle. This means that institutions are expected to comply with the recommendation. If they do not, they need to explain why and Banco de Portugal will assess the adequacy of the explanations provided by banks. Even when using the exceptions considered in the recommendation (and detailed below), institutions need to present the risk mitigants that in their view allows them to use the exceptions. The choice for a non-binding legal instrument was warranted taking into account the need to gather experience with the implementation and potential impact of such innovative and complex macroprudential measure. In the following we describe in detail the main components of the macroprudential measure.

Table 1 presents an overview of the main features of the measure – limits to LTV, DSTI, maturities and requirements of regular payments of capital and interest – while the other components are presented subsequently.

6 Household refers to a credit consumer that is a natural person who acts for purposes other than those of his or her commercial or professional activity in the credit agreements covered by the provisions of Decree-Law No. 133/2009 and Decree-Law No. 74-A/2017.

Scope of the recommendation

The recommendation applies to new loans secured by residential immovable property, credit secured by a mortgage or equivalent guarantee and consumer credit.[7] According to the definition in the recommendation, a new loan is defined as a credit agreement whereby an institution grants or promises to grant credit to a household under the form of a loan, payment deferment, revolving credit or any other equivalent financial agreement, including financial leasing. This definition also applies to any credit, including credits granted before 1 July 2018, that is subject to changes of their terms and conditions after that date. The limits apply to all entities authorised to grant credit in Portugal, namely credit institutions and financial companies that have their head office or a branch in Portuguese territory and should be adopted upon conclusion of a credit agreement. The encompassing scope of the measure contributes to the prevention of potential competition distortions in the credit market.

There are several exclusions to the scope of the recommendation, that in some cases reflect other provisions already in place in Portugal concerning the regulation of creditworthiness assessment of borrowers and other legal provisions. These exclusions also reduce the costs arising from the implementation of the measure (as addressed in more detail in Section 4.1). Banco de Portugal will monitor developments of excluded loans to guarantee the effectiveness of the measure.

The scope of the recommendation excludes:

- Overrunning[8] and loans intended to prevent or address arrears situations namely through refinancing or consolidation of other credits, as well as through the renegotiation of the terms and conditions of already existing loans.

- Loans for a total amount equal to or lower than the equivalent to tenfold the guaranteed monthly minimum wage, in accordance with the provisions of Notice of Banco de Portugal No. 4/2017. Specifically, in the event of a loan concluded for a total amount equal to or lower than the equivalent to tenfold the guaranteed monthly minimum wage, institutions may estimate the consumer's regular income based on sufficient information obtained from the potential borrower, and are not required to gather evidence of this income to assess the consumer's creditworthiness.

- Loans in the form of an overdraft facility and other credit with no defined repayment schedule (including credit cards and credit lines).

Although excluded from the scope of the macroprudential measure, all these loans should be considered in the calculation of the DSTI limit, provided that they present a defined repayment schedule.

Recommendation A – Limits to the LTV ratio

In accordance with Recommendation A, new loans secured by residential immovable property and credit secured by a mortgage or equivalent guarantee should observe the limits presented in Table 1. The LTV ratio is calculated as the ratio of the total amount of loans secured by immovable property to the value of the immovable property. The numerator

7 There are exceptions set forth in Decree-Law No. 74-A/2017 and Decree-Law No. 133/2009 that also apply to the scope of the recommendation.

8 Overrunning means the overdraft tacitly accepted by the creditor, allowing consumers to have at their disposal funds in excess of the balance of their deposit account or of the agreed overdraft facility.

INCREASE IN THE REFERENCE RATE

TABLE 2

Interest rate regime	Maturity of the contract and increase in the reference rate		
	Up to and including 5 years	More than 5 and up to and including 10 years	Over 10 years
Variable and mixed (a)	+1 pp	+2 pp	+3 pp

SOURCE: Banco de Portugal.
NOTE: pp refers to percentage points.

a In the case of loans at a mixed interest rate, the institution should consider the higher instalment for the customer between that resulting from applying the increase in the reference rate, taking into account the maturity of the agreement in the variable interest rate period, and that resulting from the fixed rate period.

should consider the amount of a loan or loans secured by the same immovable property, thus considering the whole credit (fully or partially) secured by mortgages on the same property (linked credit) with a view to preventing regulatory arbitrage. In the denominator, the immovable property value should correspond to the minimum between the purchase price and the appraisal value of the immovable property pledged as collateral.[9] The definition of the LTV ratio denominator is consistent with the Recommendation of the European Systemic Risk Board (ESRB) on closing real estate data gaps.

Recommendation B – Limits to the DSTI

Generally speaking, the DSTI is the ratio of the total amount of monthly instalments associated with the borrower's loans to his/her income (applied limits and exceptions are presented in Table 1). However, as set forth in the recommendation, there is a set of carefully considered specificities in the calculation of both the numerator and denominator of the DSTI ratio in light of the conclusions of the risk assessment and the policy goals.

As such, the calculation of the DSTI ratio numerator should consider:

– The instalments of loans already granted and the instalments of the new loan. The total amount of monthly instalments for all loans refers to the sum of instalments paid on a monthly basis regarding all of the borrower's loans, as reported in the Portuguese Central Credit Register, including the case of instalments of loans falling outside the scope of the recommendation, provided that they present a defined repayment schedule. The monthly instalment of the new loan should be calculated assuming that it is constant throughout its lifetime and consider the impact of an increase in the interest rate.

– The impact of an interest rate rise varies depending on the loan's original maturity and the interest rate regime (Table 2). The purpose of an interest rate test is to assess whether borrowers are able to withstand the increase in the debt service burden resulting from an expectable rise in the reference rates. It is important to underline, though, that the value of the effective DSTI ratio at the time the loan is granted for each borrower will be lower, because it will be calculated based on the current interest rate in order to create a buffer to withstand future increases in interest rates.

9 The property valuation should follow the guidelines set forth in the legal framework applicable to real estate appraisers, provided for in Law No. 153/2015 of 14 September 2015 governing the taking up and pursuit of the business of real estate appraisers providing services to entities within the Portuguese financial system.

The denominator of the DSTI should consider:

– The annual income of a borrower (divided by 12 months). Income is defined as the annual income of a borrower, less taxes and compulsory social security contributions, as per the latest tax statement and/or information on income received in the three months before the creditworthiness assessment.

– A reduction of, at least, 20% in the borrowers' income as of the age of 70, given that a material decrease is expected in the transition from working life into retirement. In the event the loan only has one borrower and assuming a reduction in income of at least 20%, the income to be considered for calculating the DSTI (Inc_{DSTI}) results from a weighted average, as described in the formula below:[10]

$$Inc_{DSTI} = x_1 \times Inc + x_2 \times Inc \times (1 - \alpha)$$

Where:

Inc: Current monthly net income of the borrower;

x_1: Number of years along the lifetime of the loan in which the borrower is aged 70 or less divided by the total number of years of the loan;

x_2: Number of years along the lifetime of the loan in which the borrower is aged over 70 divided by the total number of years of the loan;

$\alpha \geq 0.2$.

The consideration of increases in interest rates and decreases in income for the purposes of calculating the DSTI are in line with the European Banking Authority's Guidelines on the creditworthiness obligation. These Guidelines state, in particular, that if the maturity of the loan is extended beyond the borrower's expected retirement age, institutions should pay special attention to whether the borrower's probable income is adequate or if he/she is able to continue complying with the obligations resulting from the loan during retirement.

Finally, institutions may consider other important risk-mitigating elements other than the LTV and DSTI criteria, such as the existence of guarantors or additional guarantees. Hence, to prevent any disruptive impact on credit granting, the following exceptions have been introduced to the 50% limit to the DSTI: up to 20% of the amount of loans granted every year by each institution may exceed this limit, provided the DSTI, calculated according to recommendation B, is less than or equal to 60%. Institutions are also allowed to exceed these limits up to 5% of the credit amount granted every year. This exception may be particularly important, for example, in the case of loans for financing education services. Should credit institutions use these exceptions, they will have to submit to Banco de Portugal an explanation based on additional risk-mitigating elements considered in the loans covered by the exception, for an assessment of the compliance with the macroprudential measure.

10 As regards credits with more than one borrower and in which information on aggregate income is only available for the group of borrowers, the age of the borrower with the earliest date of birth will be considered for the purpose of calculating the reduction in income.

Assessment of the compliance with the macroprudential measure

The efficacy and effectiveness of a macroprudential measure depend on the degree of compliance by institutions. Acknowledging that the monitoring process is key for the success of the measure, Banco de Portugal needs to have access, in a timely way, to the relevant data and information for monitoring the respective compliance. Hence, institutions should ensure that they have the suitable means and processes to comply with it – in fact, the five-month period between the announcement of the recommendation and its application was provided with this purpose. Banco de Portugal will assess the adequacy of the justifications presented by institutions for not complying with the recommendation. Should Banco de Portugal consider the justifications presented by institutions to be inadequate, it may issue other measures within its competences as the national macroprudential authority. Banco de Portugal will monitor the implementation of the recommendation at least once a year and may require additional information to be reported.

Adequate risk management criteria

Institutions should apply adequate risk management criteria in all credit transactions, including those covered by the macroprudential measure. The limits introduced correspond to caps and do not replace the institutions' mandatory assessment of the adequacy of the values of the different indicators and other relevant criteria used in the assessment of each borrower's creditworthiness.[11] This means that a loan should only be granted when the outcome of the borrower's creditworthiness assessment indicates that the obligations resulting from the credit are likely to be met in the manner required under that credit's terms and conditions.

Complementarity of the macroprudential measure with other pieces of legislation

The macroprudential measure reinforces the importance of promoting an adequate assessment of risk in lending to households, which has also been addressed by a number of European Union and national legal initiatives governing loans for households. At the European level stands out the "Mortgage Credit Directive"[12], and the Directive on credit agreements for consumers[13]. At national level, the Notice of Banco de Portugal No. 4/2017 of 22 September 2017 lays down the principles and rules to be observed by institutions in the creditworthiness assessment. In accordance with this Notice, a household loan shall only be granted where the outcome of the borrower's creditworthiness assessment indicates that the obligations resulting from the credit are likely to be met in the manner required under its terms and conditions.

4 Appropriateness of the macroprudential measure

In this section, we explain why Banco de Portugal considers that this borrower-based macroprudential measure is appropriate to address the identified vulnerabilities and systemic risk and pursues the stated policy goals of reinforcing the resilience of the banking sector to withstand adverse shocks and promoting the access to sustainable financing by borrowers, minimizing their probability of default. Essentially, to design and implement an adequate macroprudential policy action a policymaker needs to answer three questions: 1. What are the risks? 2. What are the policy goals? 3. How is the macroprudential authority going to tackle the risks and achieve the policy goals?

In what follows, we explain the rational underlying the selection of the macroprudential instruments, focusing, in particular, on their transmission channels, and how these instruments may be effective in addressing the identified risks to attain the policy

11 As provided for in Notice of Banco de Portugal No. 4/2017 of 22 September 2017 and other applicable legislation.

12 Directive 2014/17/EU of 4 February 2014 on credit agreements for consumers relating to residential immovable property (the "Mortgage Credit Directive"), partially transposed by Decree-Law No. 74-A/2017 of 23 June 2017.

13 Directive 2008/48/EC of 23 April 2008 on credit agreements for consumers, transposed into Portuguese law through Decree-Law No. 133/2009 of 2 June 2009.

objectives. We also consider the business and credit cycles positions and the timing of the implementation of the measure in the design of the macroprudential measure.

4.1 SELECTION OF MACROPRUDENTIAL INSTRUMENTS

Banco de Portugal has at its disposal a set of macroprudential instruments that can be used to ensure financial stability and reinforce the resilience of the Portuguese financial system to adverse shocks. As set out in the macroprudential policy strategy framework of Banco de Portugal, the design of a macroprudential policy measure entails the selection of the most appropriate instrument or combination of instruments to address the identified systemic risk. In turn, the instruments selection process includes an assessment of their transmission channels, a cost/benefit analysis, an assessment of the leakages or potential regulatory arbitrage and the interaction with other policies.

The macroprudential toolkit adopted by Banco de Portugal includes instruments that, from a conceptual point of view, are deemed more appropriate in light of the systemic risks pointed out in the risk assessment and the stage of the business and credit cycles. The macroprudential toolkit comprises sectoral macroprudential tools that can be used in a targeted manner to build the resilience of the financial system, including capital-based tools, such as risk weights, and borrower-based instruments, such as limits on LTV ratios and caps to DSTI or loan-to-income (LTI) ratios.

There is evidence that both capital-based and borrower-based tools can be effective in increasing the resilience of borrowers and of the financial system to income, house price or interest rate shocks. On the one hand, risk weights requirements are adequate tools to increase the resilience of lenders, since they increase their ability to absorb losses. On the other hand, LTV and DSTI caps increase the resilience of borrowers to asset prices, income or interest rates shocks, but also of lenders by restricting the amount of lending relative to the borrower's income or collateral value and reducing the probability of default or the loss given default for the specific exposure. The borrower-based instruments directly impact on debt affordability and credit conditions faced by borrowers, while capital-based instruments directly impact on the resilience of banks by requiring higher capital levels.

Capital-based measures, such as risk weights add-ons, imply higher capital requirements for a specific credit exposure with the purpose of strengthening banks' resilience. Capital requirements apply to the stock of loans, so they are especially effective in the case of already accumulated risks, which usually characterize the expansion phase of the credit cycle.

As concluded in the risk assessment, the systemic risks related to household lending are still building up, as the stock of housing credit continues to decline and the amount of new business on housing credit has been gradually increasing but remains clearly below the pre-financial crisis levels. However, consumer credit is growing at a fast pace. Notwithstanding this, there is recent evidence of some easing of credit standards applied to loans granted to households and that this trend is expected to accelerate in a procyclical fashion, but this evidence also underlines that the overall credit standards applied to this segment are still significantly tighter than in the pre-crisis period.

In fact, the timing of the policy intervention is another key aspect to take into account when selecting the most appropriate macroprudential instruments and should be assessed together with the phase in the credit cycle. A preemptive and forward-looking macroprudential measure should act ahead of the accumulation of vulnerabilities and systemic risks, when vulnerabilities and systemic risks start to build up, but the likelihood

of risk materialization is low. Macroprudential instruments that have a direct impact on the flow of new lending are likely to be more effective in smoothing the cyclical fluctuations if they are activated in the build-up phase of the credit cycle. As such, borrower-based measures are seen as primary tools to be adopted in such a context.

The activation of borrower-based measures at this stage in the cycle has the purpose to anchor current credit criteria at standards that Banco de Portugal see as prudent, impeding them of deteriorating in future stages of the business and credit cycles. By acting pre-emptively, the policy measure prevents risks from building up, reducing the need for further policy measures in the future and for the adoption of stricter measures in later stages of the cycle. On the other hand, this policy measure also plays a non-negligent role in containing the risk of self-reinforcing credit and residential real estate prices spiral by promoting that credit standards remain appropriate.

Given the policy objectives, but also the initial stage of systemic risk build-up, Banco de Portugal considers the adoption of borrower-based measures more appropriate than capital-based instruments for two main reasons. First, borrower-based measures only impact on the flow of new credit and, depending on the way the limits are defined, they may only bind the access to credit by high risk profile borrowers. Second, borrower-based instruments may more directly enhance the sustainability of households' borrowing, which renders these tools more appropriate in a context of still high household indebtedness levels and low saving rate.

Against this background, we discuss the transmission mechanisms of borrower-based instruments, when single and jointly considered and we address their benefits and potential unintended effects. Borrower-based measures consist in the adoption of upper limits to variables, and, generally speaking, the limits are to be complied with at the moment the credit is granted, impacting on the flow of new lending.[14] By having a direct effect on lending terms and conditions, a tightening of borrower-based measures affect households' borrowing capacity and lending flows in the short term (and also the stock of lending in the long term). In addition, by restricting the amount of lending relative to households' income or the value of collateral, these instruments reduce the probability of default of borrowers and the loss given default for the specific exposure, improving the soundness of banks' portfolios and their resilience to withstand shocks related to house prices reductions or default of borrowers. Borrower-based instruments also increase resilience of the households by limiting the degree of households' leverage, which is beneficial in case of the materialisation of risks related to interest rates, house prices or income adverse shocks.

Moreover, borrower-based measures may also impact on other economic and financial variables, through the interaction of their effects with banks' and borrowers' balance sheets. Households for whom the limits are binding will borrow less, and, in aggregate, depending on the design and calibration of the instruments, they may slowdown the dynamics of new lending and dampen the credit cycle. Through the credit channel, the residential real estate cycle is also affected, since less mortgage lending will tend to reduce housing demand and residential real estate prices. The cyclical loops between credit and real estate markets, which are self-reinforcing and tend to pose serious risks to financial stability, are thereby

14 Although Banco de Portugal's macroprudential measure also recommends the application of the limits in case of a change of the terms and conditions of the loans originated before 1 July 2018.

curtailed with the adoption of borrower-based measures, if addressed in early stages of systemic risk build up.

Along the instruments selection process, Banco de Portugal has also considered alternative borrower-based instruments, such as the introduction of limits to LTI and debt-to-income (DTI) ratios. After balancing the advantages and shortcomings of these income-related instruments against DSTI limits, Banco de Portugal preferred to apply limits to the latter ratio because it allows to consider the total debt servicing obligations that a borrower must comply with (as opposed to LTI caps) and to test the ability of a borrower to meet debt obligations in the event of shocks, such as those that can affect interest rates and income levels (contrary to DTI limits). Last but not least, borrowers are more familiar with the DSTI indicator, having a better understanding regarding its economic meaning.

The appropriateness of a policy measure depends on how the nature of the identified risks and their position in the business and credit cycles are addressed by the available instruments in the macroprudential toolkit, taking into account the desired policy goals. The design and calibration of a policy measure should be undertaken carefully to take the most of its benefits while minimising the costs. Given the intended preventive nature of the macroprudential action, with systemic risks starting to build up, Banco de Portugal considers that the introduction of limits to the LTV and DSTI ratios, as well as the limits to the maturity of loans and the adoption of amortisation requirements (which, in the Portuguese case, means the requirement to have regular payments of principal and interest), are the most appropriate instruments to promote the Portuguese financial system's sustained adoption of prudent credit standards.

Evidence suggests that domestic credit is not the key driver for the current sustained increase in residential real estate prices as the housing credit stock continues to decline, and recent developments in the residential real estate market appear to be associated, to a significant extent, to direct investment by non-residents and to the expansion of tourism [see Banco de Portugal (2018b)]. However, there are some limited signs of overvaluation in the residential property market in aggregate terms, which may imply risks to financial stability in case these dynamics persist or are reinforced. Against this background, by ensuring that credit standards remain appropriate, the policy action will limit the flows of new credit and may also have an additional dampening effect on the risk of a self-reinforcing credit and residential real estate prices spiral. Moreover, by limiting flows of new credit, in particular new loans to borrowers with a riskier profile, the macroprudential measure will not only contribute to prevent a potential reversal of a decreasing trend of households indebtedness, but will also lead to a better credit risk profile of banks' credit portfolio.

In the following, for each single instrument, we describe the underlying transmission channels to the financial system and the economy. A particular emphasis is put on the strengths of each instrument that justified its activation and on the weaknesses that made its combination with other instruments warranted. Finally, we also present how the combination of the chosen instruments reinforce their effectiveness and efficiency.

LTV limits

The LTV ratio is defined as the ratio between the amount of the loan and the value of the collateral. The higher the value of the LTV ratio, the larger the credit availability of a borrower, *ceteris paribus.* Limits on LTV ratios may require a minimum down payment on borrowing households relative to the value of the property. The requirement of a down-payment may also contribute to incentivise household savings. As such, LTV caps make both households and banks less vulnerable to house prices reductions thereby minimizing

the losses for banks given the default of borrowers, but also help reducing the borrowers' probability of default as the use of equity is required. Ultimately, LTV limits increase the resilience of the banking sector and of the borrower.

Moreover, households for which the limits are binding will borrow less, which may result in lower housing demand with dampening effects in house prices growth. As O'Brien and Ryan (2017) note, restrictions to LTV ratios may prevent some of the pro-cyclicality associated to the exuberant developments that may affect housing markets, but are not strictly countercyclical. In fact, when house prices are continuingly increasing, two effects occur. On the one hand, the amount of credit that is available through the LTV ratio channel increases proportionally to the rise of house prices. On the other hand, the value of the housing collateral also increases, expanding the households' capacity to finance a higher down-payment on a subsequent property and the credit availability for property purchase.

These effects may increase housing demand, leading to further increases in residential real estate prices. Hence, the collateralization in mortgage contracts amplifies the credit and real estate cycles and adds to the propagation of the shocks. The pro-cyclicality of the LTV ratio may hamper the efficacy of a macroprudential measure that envisages the introduction of a permanent cap on this indicator.

The limits applied to the LTV ratio by Banco de Portugal, calculated using the minimum between the appraisal and the acquisitions values, are expected to minimize the loss given default of banks and help reducing the borrower's probability of default, given that it requires the use of equity. Both effects contribute to mitigate the building up of systemic risk and increase the resilience of the financial sector. There are also positive side-effects related to the adoption of this instrument. First, households for which the limits are binding will borrow less, which may reduce housing demand and dampen residential real estate prices growth. Second, in a context of still-high indebtedness and low saving rate of Portuguese households, the requirement of a down payment implied by a LTV limit may foster household savings, which would result in an additional positive side-effect of this instrument.

To assess the impact of the LTV limit, structural models, econometric analysis and general equilibrium frameworks were used (see Section 6 for a discussion on the modelling gaps). According to those models, LTV restrictions would lead to a decrease in the demand of mortgage loans as well as to some negative impact on GDP growth, while improving banks' overall solvency. As a side-effect the LTV limit would reduce the growth rate of housing prices, albeit in a limited manner.

With the aim of minimizing expected costs related to the introduction of LTV limits, Banco de Portugal has opted for defining three distinct limits to the LTV ratio depending on the purpose of the loan. In its design, the macroprudential measure takes into consideration the fact that it is more likely that, in the event of financial difficulties, borrowers favour compliance with the obligations of loans for the purchase of or secured by own and permanent residence because they value the safeguarding of their house. In this vein, the LTV limit for the purchase or construction of own and permanent residence (90%) is less strict than the limit for other purposes (80%). Also, the need for institutions to continue with the reduction of non-performing assets on their balance sheets, which are partly comprised of real estate owned assets, warranted the introduction of a limit of 100% to the LTV ratio to be applied to loans financing the purchase of property held by the institution. The necessity of selling these assets puts downward pressure on their prices, and, as such, a LTV of 100% in this type of loans cannot be

considered as risky as in typical mortgage credits. Finally, the distinct features of property financial leasing agreements compared to conventional housing loans – the legal ownership of the immovable property remains with the institution until the end of the agreement – justified the introduction in the former case of a limit of 100% to the LTV ratio.

DSTI limits

From a conceptual point of view, the DSTI ratio relates the amount of monthly debt payments with the level of the income of the borrower. Limits to the DSTI ratio operate by imposing credit restrictions relative to income, reducing the probability of default of the borrower. Depending on the macroprudential authority's choice, this instrument may consider the debt service associated with the total amount of debt of the borrower and the effects of potential increases of interest rates and/or potential reductions in income. This feature turns this instrument more adequate to tackle risks related to household vulnerability related to the prevalence of household loans with variable interest rates compared to LTI limits, for example. Since it reduces the probability of default, lower DSTI ratios strengthen both the resilience of banks and borrowers, as these measures provide for a greater income shock absorption capacity of the borrower. The DSTI ratio also tend to be a more commonly known credit criterion among borrowers.

Moreover, compared to LTV measures, DSTI limits (as well as LTI limits) have a more direct and effective impact on reducing pro-cyclicality, given that, in general, house prices tend to grow faster than borrowers' income. As such, DSTI limits become tighter than LTV in the expansionary phase of the credit cycle, acting as automatic stabilisers in a context in which sharp increases of house prices may render LTV limits less effective. However, DSTI limits can be easily circumvented by the lengthening of mortgage maturities.

Against this background, there are a number of benefits underlying the limit applied by Banco de Portugal to the DSTI ratio. By restricting the monthly instalment associated with loan amounts for a given income level, the measure increases borrowers' resilience and reduces their probability of default. Also, the DSTI limit considers the impact of an interest rate rise in the numerator, which varies according to the original maturity of the loans, in the case of variable or mixed interest rate loans. In a context of historically very low levels of interest rates, the aim is to test whether borrowers are able to withstand the effects of an expectable rise in interest rates on the debt service. As such, the measure fosters the resilience of borrowers and reduce the probability of default over the lifetime of the agreement. By the same token, in the event the loan agreement extends beyond 70 years of age of the borrower, the DSTI calculation establishes an income cut, which contributes to an increase in borrowers' resilience, leading to a reduction of the probability of default and banks' credit risk.

Moreover, the monthly instalment of the new credit agreement should be calculated assuming that it is constant throughout the loan lifetime. In non-constant instalments schemes, such as with increasing instalments, grace periods or forbearance, there are incentives to consider the lowest-value instalments in the calculation of the DSTI, implying a more favourable DSTI for households in the short term. In fact, non-constant instalments schemes tend to be associated with higher default ratios. This requirement aims at avoiding the illusion effect on borrowers' ability to pay the debt throughout the lifetime of the loan and at reducing the probability of default. Additionally, households for which the limits are binding will borrow less, which may result in lower housing demand and have a dampening effect on residential real estate price dynamics.

A maximum proportion of loans with a DSTI above the limit set has been allowed in the recommendation, given that the application of a DSTI limit may lead to distributional effects. To overcome this, Banco de Portugal has introduced the possibility that a predetermined proportion of loans granted may exceed the predetermined threshold of 50%. As such, up to 20% of the total amount of credit granted by each institution in each year may be granted with a DSTI of up to 60%, and up to 5% of the total amount of credit granted by each institution in each year may exceed the limits to the DSTI. In fact, the DSTI is an indicator of the borrower's degree of financial effort associated with debt service. Although this criterion is key for ascertaining, in general terms, the probability of credit default, there are other important criteria for assessing credit risk. For example, the borrower's level of wealth, the existence of a guarantor, or the amount of the borrower's other regular expenses also affect the loan repayment ability. However, Banco de Portugal requires institutions to justify the use of these exceptions, namely by mentioning mitigation elements of the credit risk considered in the analysis.

Maturity limits and amortisation requirements

By reducing the term of the loan, a limit on loan maturity also decreases the probability of occurrence of a negative event before the full repayment of the credit, adding to the reduction of the probability of default of the borrower. In turn, long repayment periods limit the introduction of any adjustments that may be necessary for borrowers to overcome difficulties in paying their loans. In fact, loans with lower maturities are easier to adjust in case of borrowers' arrears, facilitating loan restructuring and potentially reducing the loan probability of default over its lifetime. Banco de Portugal has also adopted limits to the original maturity of the loans to prevent the circumvention of the limit to the DSTI ratio by the lengthening of the loan maturity. Finally, by recommending a convergence towards an average maturity of 30 years of new loans by the end of 2022, Portuguese banks will be more in line with the European banking systems' standards.

The introduction of amortisation requirements has the purpose to prevent financial difficulties related to the concentration of large amounts of the loan in its final periods. The regular payments of capital and interest requirement expected benefit is the reduction of the probability of default over the lifetime of the credit agreement. The use of mechanisms such as the introduction of grace periods or forbearance should be reserved for loans intended to prevent or address arrears situations, which also contributes to reducing the probability of default. Moreover, the regular amortisation of the principal will translate in a lower loss given default, thus increasing bank resilience.

Combined use of LTV, DSTI and maturity limits, amortisation requirements and of other features envisaged in the macroprudential measure

As discussed above, the specificities of each borrower-based instrument individually considered may affect their efficiency and effectiveness once adopted. To maximize the strengths of each instrument and minimize their costs and unintended negative effects, Banco de Portugal has opted for the jointly adoption of multiple borrower-based instruments as a way of improving efficiency and effectiveness of the macroprudential measure. In particular, when LTV and DSTI limits are used as complements, they may have a positive reinforcing effect on the borrower's probability of default. The DSTI limit increases resilience of borrowers by creating a buffer against income an interest rate shocks, while LTV limits require a minimum down payment and thus reduce not only the loss given default, but also borrowers' incentive to default on their debt obligations in case of house prices decreases. The requirement of regular payments of principal and interest also adds to the reduction of the probability of default. Additionally, the combined use of LTV and DSTI limits reinforces the dampening effect in residential real estate price dynamics. The enforcement of maturity limits complement the effectiveness of DSTI limits, by precluding circumvention strategies, at the same time it allows adjustments in case of repayment hurdles of the borrowers.

There are other features of the macroprudential measure that, taken together, also contribute to reduce expected costs and unintended effects. For example, Banco de Portugal has considered that the macroprudential measure should be implemented as a recommendation, following the 'comply or explain' principle, to benefit from the greater flexibility associated with this type of measure and avoid market disturbances, which are difficult to forecast in the current circumstances, given the more recent nature of macroprudential policy, the greater uncertainty about its impact and the early stage in the build-up of systemic risk. Importantly, this flexibility is granted under the assumption that it is used carefully and according to strict risk analysis standards.

Furthermore, a set of loans was excluded from the scope of the measure, particularly low-amount credits, loans intended to prevent or address arrears situations and loans with no predefined repayment schedule, including credit cards. In the case of low-amount loans, their exclusion was due to the operational burden implied by the implementation of the procedures of the macroprudential measure, which might excessively hamper the consumer credit market. In the view of Banco de Portugal, these costs would outweigh the benefits from including these small amount loans under the scope of the recommendation. This was also the main reason underlying the exclusion of loans with no predefined repayment schedule, including credit cards, notably as regards the calculation of limits to the DSTI and the application of limits to the loans original maturity, given that this type of loans has no previously defined repayment schedule or determined duration.

According to the definition envisaged in the macroprudential measure, situations of renegotiation of the loans' terms and conditions are considered new loans. However, if loans renegotiations are due to financial difficulties of the borrowers and are intended to prevent or address arrears situations, their exclusion from the scope of the macroprudential measure is justified, because these are situations in which credit risk has already materialised or is about to materialize. As such, from the risk management perspective it was acceptable to allow for greater flexibility in the design of these loans, not to condition even further borrowers that are already financially constrained. Furthermore, this exclusion is aligned with adequate banks incentives, as these loans are (or will be) considered non-performing and therefore will be subject to higher provisioning and capital requirements.

Notwithstanding these aspects that contribute to reduce the costs of the implementation of the macroprudencial measure, the evolution of the credit categories excluded from its scope will be closely monitored by Banco de Portugal to prevent unintended effects and ensure its effectiveness.

4.2 CALIBRATION STRATEGY OF THE MACROPRUDENTIAL MEASURE

In the design of the macroprudential measure, the combination of limits was chosen taking into account an analysis of the costs and benefits associated both with each instrument and with their combination. The calibration of the various instruments' levels was based on the analysis of both international experience in the adoption of similar instruments and current lending standards in Portugal. Over the course of this process, Banco de Portugal collected cross-country experiences with borrower-based measures adopted by other macroprudential authorities (Cyprus, Ireland, Slovenia, Slovakia, Lithuania, Estonia, Czech Republic, Romania and the UK).[15] In addition, Banco de Portugal analysed information on the credit standards applied by Portuguese institutions, in the past and at the current

15 Although the evidence is not limited to European countries, these country experiences were taken into account by Banco de Portugal given the stronger commonalities of these countries with the Portuguese case, for

juncture, and also assessed expectations as to the future evolution of these standards in view of their procyclical nature.

Banco de Portugal applied both empirical and theoretical modelling approaches to evaluate the *ex-ante* impact of the measure and inform calibration levels of the instruments, which also benefitted from micro data analysis. Banco de Portugal collected loan-level information concerning the credit contracts secured by residential immovable property, reported to Banco de Portugal by the eight major banking groups. These credit contracts accounted for nearly 98% of the total number of outstanding loans in December 2015 and almost 92% of the total amount of mortgage loans.[16] A Special Issue based on this dataset was published in the June 2017 *Financial Stability Report* of Banco de Portugal.

In this study, the analysis of the distribution of mortgage loans per percentile indicated some easing in credit standards, namely in terms of LTV, LTI, DSTI and maturity of loans. However, the percentage of loans for which the two indicators (LTV/LTI) were in the intervals with higher risk was very low. While calibrating the macroprudential measure, information regarding percentile thresholds was duly taken into account.

Since the treatment given to data (aggregation of loans) and some caveats to reported information restricted the number of observations available for the calculation of the indicators, affecting to some extent the sample representativeness, and taking into account that this dataset is about mortgage lending only, Banco de Portugal has conducted market intelligence initiatives with institutions and respective associations to gather information on current and expected future practices in both mortgage and consumer lending. Banco de Portugal has also consulted the Associação Portuguesa para a Defesa do Consumidor (the Portuguese Consumer Protection Association) and the National Council of Financial Supervisors.

In addition, the calibration process of instruments also entailed quantitative assessments of the impact of the measures on the level of risk and on financial and macroeconomic variables, such as credit, house prices and GDP. Both empirical and theoretical modelling approaches were applied to evaluate *ex-ante* the expected impact of the measure and inform calibration levels of the instruments.

The limits were calibrated in order to have an impact on loans to borrowers with a riskier profile, without significantly affecting lending to households in general and to accommodate the expected rise in interest rates and the likely reduction in the borrower's income at the time of retirement. The final calibration of the measure corresponded to the standards that Banco de Portugal considered to be adequate for household credit, and in some cases does not differ substantially from current banking practices, anchoring credit standards so as to avoid further procyclical easing.

4.3 INTERACTION WITH OTHER POLICY FIELDS

According to the macroprudential policy strategy, the interaction of macroprudential policy with other policy fields is a component of the policy design and implementation. In the specific case of the adopted macroprudential measure, the financial stability risks posed by the current and expected monetary policy stance were carefully taken into account

example, all of them belong to the European Union and most of them are part of the euro area. For other international experiences see, for example, Kuttner and Shim (2016).

16 These data has been collected on a yearly basis since 2015.

during the risk assessment, as aforementioned. The design and calibration of some aspects of the measure intended to prevent and mitigate those risks, namely by including interest rate shocks in the calculation of the DSTI.

Monetary policy

The current low interest rate environment may be an incentive for risk-taking and leverage, leading to the emergence of speculative asset price bubbles. However, low interest rates also contribute to lower debt service and credit risk (particularly relevant to economies with high levels of debt). In this context, a less accommodative monetary policy stance may exacerbate these risks in the transition phase to a lower debt level. Furthermore, significant heterogeneity of financial cycles in euro area countries implies that the common monetary policy stance may be less appropriate at the national level.

A question that arises often in the literature is whether macroprudential policy can mitigate possible negative effects of a single monetary policy stance. While economic literature seems to suggest that macroprudential policy may counter negative monetary policy shocks and contribute to financial stability – [see Brzoza-Brzezina et al. (2015), Quint and Rabanal (2014) and Rubio and Carrasco-Gallego (2014)] – the efficacy of macroprudential policy relies primarily on its pre-emptive nature and, as such, it is important to take also into account effects of a future change in the stance of monetary policy.

The macroprudential measure adopted by Banco de Portugal promotes the adoption of prudent credit standards on new mortgage and consumer loans granted to households by the Portuguese financial system, in order to enhance the resilience of the financial sector and the sustainability of households' financing. In its design, special attention was devoted to the implications for financial stability of the current low interest rate environment (through the *risk-taking and leverage channel)* and future phasing-out of the accommodative euro area monetary policy stance (through the *credit channel).*

Given potential risks stemming from the current stance of monetary policy, limits were calibrated in order to prevent excessive risk taking by the financial sector, since less restrictive credit standards have been observed in the Portuguese banking sector and, against a background of a prolonged low interest rate environment, economic recovery and improvement in the residential real estate market, leading to the intensification of competition among institutions, this trend was expected to intensify. By anchoring the adoption of credit conditions on prudent standards, the calibration of the limits aimed at reducing lending to borrowers with a riskier profile, preventing excessive risk taking by the Portuguese financial system, and, at the same time, contributing to dampening residential real estate prices dynamics to avoid feedback loops between credit and prices spirals in this market.

In addition, monetary policy stance is expected to become less accommodative in the near future, leading to a gradual increase of interest rates. According to market expectations, short-term interest rates are likely to reach positive values in the second semester of 2019. Households are often "short-sighted" and focus on the short term neglecting the future, and a protracted low interest rates environment may induce households to take floating rate mortgages without considering that interest rates may increase in the future, and to borrow excessively [see ESRB (2016)]. In Portugal most mortgage credit is granted at a floating rate, the most common being loans with interest rates linked to the Euribor rate. More recently, the mixed interest rates regime has gained importance in new mortgage loans, though interest rates are fixed over periods that are significantly shorter than the maturity of the loan.

Banco de Portugal took into account the possible adverse effects of a future rise in interest rates in households' debt servicing capacity and designed and calibrated the measure so as to prevent or mitigate credit defaults from occurring due to a change of the monetary policy stance in the euro area. This was implemented through the consideration of interest rates shocks in the calculation of the DSTI limit. Specifically, interest rate increases of, at most, 3 percentage points were considered in the calculation of the numerator of the DSTI, to ensure that the value of the indicator resulting from a loan granted at a variable or mixed rate would be able to accommodate an expected rise in interest rates, by creating a buffer to withstand future shocks. As already mentioned, the calibrated values of the interest rate positive shocks varied according to the maturities of the loans.

Banking Conduct Supervision

Banco de Portugal has also the responsibility to supervise the banking conduct and its role encompasses, among others, the regulation, oversight and sanctioning the conduct of credit institutions, financial companies, payment institutions and electronic money institutions offering retail banking products and services.

Along the design and implementation process with respect to the borrower-based measure adopted by Banco de Portugal, there was intense collaboration with the Banking Conduct Department, since it is also responsible for the regulation of the institutions' conduct regarding consumer and mortgage lending in Portugal. There was an effort to align the concepts of consumer and mortgage lending, taking into account the need to avoid regulatory arbitrage and circumvention of the measure.

A close cooperation was also undertaken regarding the drafting of the criteria for the assessment of the impact on creditworthiness of borrowers of increases in the reference rate applicable to variable or mixed interest rates loans. In particular, the calibration of the interest rates shocks in accordance to credit maturities was jointly defined by the two teams.

5 External communication strategy

It could be argued that external communication may be used as a separate tool of macroprudential policymaking. In this vein, Banco de Portugal has put forward an external communication framework for systemic risk assessment and macroprudential policy as one of the four pillars of the strategy framework of macroprudential policy. The main purpose of Banco de Portugal's communication on systemic risk assessment and macroprudential policy is to inform the public and targeted institutions regarding the identified risks to financial stability and the implementation of macroprudential measures. To achieve this goal, communication to the public should be as clear, concise and transparent as possible.

In general terms, the views on financial stability and systemic risk assessment are communicated to the public mainly via the *Financial Stability Report*. This publication assesses emerging or existing systemic risks in the Portuguese markets and financial system, entailing the identification of adverse shocks and the likelihood of their materialization, as well as an evaluation of the implications of such shocks for the stability of the financial system. The announcement of policy measures is generally accompanied by the disclosure of background assessments, information on the operational features of activated instruments and the connection with the associated policy objectives. Moreover, a dedicated webpage was created with an overview of the macroprudential toolkit as well as information on the underlying legal framework.

The external communication framework laid down in the macroprudential policy strategy was followed in the case of the macroprudential borrower-based measure, although some

aspects were carefully thought of in view of the specific nature of the macroprudential measure. Borrower-based measures may require a different communication strategy compared to capital-based measures, since they have a direct impact on potential borrowers. In turn, capital-based measures may only indirectly affect borrowers, given that the impact of higher capital requirements on borrowers may occur through higher spreads and the underlying magnitude depends on how the institution reacts to increase capital ratios.

Against this background, Banco de Portugal has set forth a tailor-made strategy to communicate the borrower-based measure. The main challenge was to clearly communicate the objectives of the measure. The intended policy goals consisted of reinforcing the resilience of financial sector to withstand adverse shocks and to promote access to sustainable financing by Portuguese households. These goals should be attained through the anchoring of lending standards in credit granted to households at adequate levels. By simultaneously introducing limits to LTV, DSTI and maturity, housing demand will tend to decrease via the impact on credit for house purchase, and may lead to a dampening effect on residential real estate prices. By the same token, the risk of loops between credit and residential real estate prices is mitigated. However, the objective of the macroprudential measure was not to directly target residential real estate prices. At the current juncture there is no evidence of domestic credit dynamics being the key factor driving the growth in residential real estate prices, given that the stock of mortgage credit continues to decline. As mentioned, the dynamics in residential real estate markets are associated, to a significant extent, to the demand from non-residents and the increase in tourism.

In the course of this process, Banco de Portugal organised a press conference and television interviews with the member of the Board of Directors in charge of financial stability issues to carefully present the policy objectives, the design of the measure and its underlying rationale. Moreover, a dedicated internet page within the institutional website of Banco de Portugal was created with relevant information, and, besides the usual information disclosure, such as background analysis documents and short descriptions of the goals of the macroprudential measure, a frequently asked questions section was also included to respond to questions that a wider audience could have regarding the measure. More recently, a video containing a detailed explanation of the measure, including a numerical example, has been disseminated via Youtube and other social media. As a result, so far, the response to the adoption of the measure has been positive.

6 Discussion on knowledge gaps

In this section, we discuss topics raised upon the recent experience of Banco de Portugal in designing and implementing borrower-based measures that, in our view, need further research and experience. From the experience of Banco de Portugal, the main challenges in setting macroprudential borrower-based measures relate to: i) improving micro-data coverage; ii) the development of methodological frameworks to calibrate the instruments and assess their potential impact and unintended effects on key macro-financial variables; iii) the choice between capital-based or borrower-based instruments, and iv) the choice between rules and discretionary actions from macroprudential policymakers in the case of adoption of borrower-based measures.

First, in order to be able to identify vulnerabilities and risks related to consumer and mortgage lending to households, it is important to have access to aggregate credit data, but most importantly to data at the loan level, as it allows to explore the distributions of variables used to assess credit standards. Micro-data is crucial to calibrate borrower targeted macroprudential measures and to evaluate their impact on lending. Micro-level

data can be reported by institutions in credit registers or collected based on loan-level or household surveys. There is a Central Credit Register, in Portugal, which is managed by Banco de Portugal. In addition, loan-level information concerning credit contracts secured by immovable property was collected in the recent years with the purpose of assessing risks related to household lending. Still, there was the need to gather additional information for a wider range of variables to assess the compliance with the macroprudential measure and also for the *ex-post* evaluation process.

Second, with the aim of assessing *ex-ante* the potential impact of macroprudential measures on a set of macro-financial variables, macroprudential authorities must be endowed with methodological frameworks to calibrate the level of the instruments and assess their potential impact on key variables, such as credit, house prices, and other macroeconomic variables. As already referred, to evaluate the *ex-ante* impact of the borrower-based measure, Banco de Portugal has used a range of modelling techniques, such as general equilibrium frameworks, econometric analysis and structural models. In fact, given their complexity, these models should be developed well in advance by macroprudential authorities to inform policymakers on the potential impact of the measures on lending, house prices, GDP, among other aggregates, and help fine-tuning the decision-making process. Policymakers, central bankers and researchers have advanced significantly in the development of models and methods to evaluate the transmissions mechanisms, measure the costs and benefits and effectiveness of macroprudential instruments. Nonetheless, these models usually focus on the impact of the implementation of one single macroprudential tool, such as the ones developed and used by Banco de Portugal to assess the impact of the macroprudential measure, and not on the effects of a combination of several instruments.

There is indeed a lack of models and tools to assist the *ex-ante* calibration and the *ex-post* assessment of a combination of instruments, such as envisaged in the Portuguese macroprudential measure that has introduced three limits simultaneously. There are overlaps and differences in the transmission channels of instruments, as discussed in Section 4.1, and models could be developed to inform the design and calibration process of borrower-based measures. For example, more knowledge is needed regarding the impact of certain combinations of instruments on segments of credit and the potential for assets' reallocation by banks, the impact of potential leakages and circumvention on the adequacy and sufficiency of certain combinations of instruments, or the implications of country specificities and other policies on the transmission channels of combinations of instruments.

In addition, the targeting of specific activities or exposures may have unintended or unexpected effects on the allocation of credit. For example, the activation of the countercyclical capital buffer on mortgages in Switzerland triggered a rise in the amount and in the cost of lending to corporations, that is, a targeted macroprudential measure led to the squeeze of lending in "one place" and an expansion of lending in another "adjacent place" [see Auer and Ongena (2016)]. Borrower-based measures that target mortgage loans only, namely through the setting of limits to LTV, may face this problem, since lenders may offer consumer credit to top up the amount of housing credit demanded by the borrower. In this case, there is a shift from mortgage credit to consumer credit that may hamper the effectiveness of the measure. In the Portuguese case though, given the systemic risk associated to lending to households, the scope of the macroprudential measure includes both mortgage and consumer lending. Compared to other countries experiences, the wider scope of the measure entails the benefit of preventing, to some

extent, this reallocation effect from happening between sub segments of household credit.

Third, the choice of the type of instruments should be motivated by the phase in the cycle of the financial stability risk. Commonly, the choice of borrower-based measures, which restrain the flow of new lending, is more appropriate in the case the risk is starting to building up and policymakers prefer to take a pre-emptive action. The selection of capital-based instruments, which also affect the stock of credit, may be more adequate when systemic risk is already elevated and close to materialize. Certainly there are situations in which the macroprudential toolkit is not complete and the policymaker may have to choose an (imperfect) substitute of the most adequate instrument to tackle the identified risk.

Along the process of choosing and designing the most adequate borrower-based instruments, macroprudential policymakers also need to evaluate how to operationalize them: should the instrument be designed as a rule or should the macroprudential authority choose to act in a discretionary manner? If the latter option is chosen, should it commit to regular reviews of the impact and effectiveness of the measure to mitigate against any potential inaction bias? Would this commitment contribute to enhance the effectiveness of such measures? Should the macroprudential authority start by adopting a binding measure or opt for a non-binding one and monitor the degree of compliance and effectiveness? Banco de Portugal opted for choosing a non-binding legal instrument given the initial stage of systemic risk build up and the necessity to gather experience on how institutions will implement such a complex macroprudential measure and on its potential impact. Although it is not a binding measure, the degree of compliance by institutions will be assessed and the justifications they present will be duly appraised.

International experience is quite heterogeneous on these matters, which may be a consequence of the specific characteristics of national housing markets, the position in the business and credit cycles and the preferences of macroprudential authorities, among other factors. There are, therefore, important operational aspects to consider when designing instruments to tackle financial stability risks associated to lending to households, of which these are only a few examples.

7 Concluding remarks

Banco de Portugal considers that, in the current Portuguese economic environment, there is a still high household indebtedness level by international standards, although declining very significantly in the last few years, and that the financial system is still highly exposed to credit secured by residential immovable property. In Portugal, the proportion of owner occupied housing is among the highest of EU countries. Also, new mortgages have increased strongly, despite the still declining stock, and the outstanding amount of consumer credit has grown significantly. In addition, the recent economic recovery, amid very low interest rates and a rebound in house prices, has been accompanied by some easing of credit standards, in an environment of increased competition among institutions.

Based on the analysis of the transmission channels of each borrower-based instrument and the position in the business and credit cycles, Banco de Portugal decided to combine LTV, DSTI and maturity limits, coupled with regular payment of principal and interest requirements, to enhance the effectiveness of the policy action in the domain of household credit (both mortgage and consumer credit).

In order to be effective, the macroprudential measure was designed to act in a preventive way, seeking to mitigate risks, strengthening the resilience of credit institutions and

creating conditions for borrowers to have access to sustainable financing. With these policy goals in mind, Banco de Portugal will monitor the compliance with the measure at least once a year. The monitoring process is very important for the adequate implementation and effectiveness of the measure, especially in the case of a recommendation where exceptions are foreseen. As such, Banco de Portugal will assess in a thorough way banks' justifications under the comply-or-explain mechanism, underlying the recommendation, and has already defined the type of information that needs to be reported by each institution at the contract level. This additional information was included in the new version of the Portuguese Central Credit Register and it will be reported on a monthly basis. The new loans granted from 1 July to 31 December 2018 will be monitored first based on that dataset.

Given the innovative nature and complexity of this measure, we are aware that experience must be gained first. Although its design and calibration entails a thoughtful consideration of the strengths and weaknesses of each adopted macroprudential instrument (which justified their combined use), unexpected spillover effects may occur. The transmission mechanisms of such a combination of multiple instruments are not yet fully assessed in practice, since there is not, to the extent of our knowledge, empirical evidence regarding the impact of a measure with these specificities. The cross-country experience with borrower-based measures tends to opt for LTV and / or DSTI / LTI limits, and, in the majority of the cases, consumer lending is not targeted and interest rate and income shocks are not considered.

Against this background, Banco de Portugal will evaluate *ex-post* the effects of the measure, not only with respect to the impact it might have on credit aggregates and the distribution of credit conditions, but also in terms of the potential unintended effects, regulatory arbitrage and leakages that may occur, and will take additional action if needed.

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THE SECOND PAYMENT SERVICES DIRECTIVE

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Summary

This study offers a succinct overview, from a legal and regulatory standpoint of Directive (EU) 2015/2366 on payment services (PSD2). It begins by describing the general aspects of the PSD2 within its considerable geographical, transitional, regulatory framework of reference together with its legislative policy purpose and its regulatory background. Next the study sets out the regulatory structure of payment services in the EU under the PSD2 which consists of the parties involved, namely the different types of service providers and users, and defined payment services, which are classified by identifying those that are included and those that are excluded. The study is completed with a description of how payment services function in the EU under the PSD2, starting with the proper identification of the agreements arising from those services, followed by a description of the rules on transparency and the legal status of the parties involved comprising their rights and obligations when payment transactions are authorised and carried out.

1 Introduction: the PSD2 within the financial regulatory tsunami of 2018

The implementation of new European regulations on different financial market aspects, which notably impact intermediaries as well as customers and investors, has been particularly prolific in 2018 and, in particular, in January 2018. Specifically, those rules have affected the banking market and, within it, payments systems and mechanisms.

We can classify the financial regulatory impacts into two categories:

a) Regulation of the banking market was changed significantly by the entry into force on 25 November 2017 of the rules on bank accounts and the comparability of fees set forth in Directive 2014/92/EU of the European Parliament and of the Council of 23 July 2014 on the comparability of fees related to payment accounts, payment account switching and access to payment accounts with basic features,[1] which was transposed into Spanish law by Royal Decree-Law 19/2017 of 24 November 2017 on payment accounts with basic features, payment account switching and the comparability of fees.[2]

b) Regulation of the securities market was profoundly affected by the entry into force on 3 January 2018, of MiFID II, comprising Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments (MiFID II) and by Regulation (EU) No. 600/2014 of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Regulation (EU) No. 648/2012 (MiFIR). MiFID II has been partially transposed into Spanish law by Royal Decree-Law 21/2017 of 29 December 2017 on urgent measures for the adaptation of Spanish law to European Union regulations on the securities market.[3]

1 *OJEU* of 28.8.2014.

2 *Official State Gazette* No. 287, of 25 November 2017. See Tapia Hermida (2018), "La nueva regulación de las cuentas de pago en la Unión Europea. La Directiva 2014/92/UE y su trasposición al Ordenamiento español mediante el Real Decreto-Ley 19/2017", *La Ley Unión Europea,* No. 56, 28 February.

3 *Official State Gazette* No. 317, of 30 December 2017. See Tapia Hermida (2018), "La aplicación de la normativa MIFID II desde el 3 de enero de 2018 y su trasposición al Ordenamiento español", *Revista de Derecho Bancario y Bursátil* (RDBB), No. 149, pp. 187-202.

2 General aspects

2.1 REGULATORY TIME FRAMEWORK: THE IMPLEMENTATION AS FROM 13 JANUARY 2018 AND ITS POSSIBLE DIRECT EFFECT

The landscape which we have just described of new European regulations governing different aspects of the financial market was completed with the implementation – as from 13 January 2018 – of Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No. 1093/2010, and repealing Directive 2007/64/EC (PSD2).[4] Article 115 of the PSD2 on its transposition states that, "By 13 January 2018, Member States shall adopt and publish the measures necessary to comply with this Directive" and "They shall apply those measures from 13 January 2018".[5]

The importance and direct impact of the PSD2 on daily banking operations could be verified by checking how, in the closing weeks of 2017, Spanish banks informed their customers of the main effects of the imminent implementation of the PSD2 as from 13 January 2018. Further to this, and given that the PSD2 is not fully integrated into Spanish law, it is appropriate to consider the possible direct effect of certain of its provisions should, for example, any payer, user, payment initiation service provider or account information service provider claim the right to access those accounts or the information in them in the terms laid down in Articles 66 and 67 of the PSD2. In such cases, it will be necessary to contrast, on one hand, the scope of a possible request to exercise the right of access and, on the other, the direct enforceability of the rule.

2.2 REGULATORY MATERIAL FRAMEWORK: THE TWO STRANDS (STATUS AND FUNCTIONAL) OF THE SCOPE

The PSD2 has a two-pronged regulatory[6] scope:

a) A status or subjective scope because it defines six categories of payment service providers which can be organised into the following two groups: on one hand, institutions which have their own status established in rules external to the PSD (the main example is that of credit institutions) and, on the other, payment institutions whose specific status – comprising the conditions of taking up and pursuit of the business of payment services – is laid down in the PSD2 [Article 1(1)].

   Interestingly, the PSD2, in addition to the specific status of payment institutions (Chapter I of Title II), establishes a series of common provisions for all types of payment service providers (Chapter II of Title II). This enshrines, on one hand, the principle – inherent to financial regulation – that the activity of providing payment services be reserved to authorised providers, by prohibiting natural or legal persons that are neither payment service providers nor explicitly excluded from the scope of the PSD2 (Article 37) from providing payment services; and, on the other, the right of those providers to access payment services in objective, proportionate and non-discriminatory conditions (Article 35).

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4 *OJEU* 23.12.2015. It is a formal and materially extensive directive with 113 recitals, 117 articles and 2 annexes. As for its general aspects, see Alonso Ledesma (2018), "Los nuevos proveedores de servicios de pagos: una primera aproximación a la Segunda Directiva de Servicios de Pagos", *Revista General de Derecho de los Sectores Regulados,* 1, pp. 2 et seq.

5 The press release of the European Commission of 12 January 2018 "Payment services: Consumers to benefit from cheaper, safer and more innovative electronic payments" (IP/18/141) called on the Member States that have still not transposed the Directive – which include Spain – "to do so as a matter of urgency".

6 Recital 6 of the PSD2 covers the importance of an adequate regulation for the efficiency of the payments system as a whole in the EU.

The PSD2 – also called the revised Payment Services Directive – is the latest in a series of rules adopted by the EU to establish modern, efficient and inexpensive payment services to strengthen the protection of consumers and European firms. It incorporates and repeals Directive 2007/64/EC (the first Payment Services Directive or PSD1) which laid the legal foundations for creating a single market in payment services throughout the EU. The PSD2 adapts the previous rules from PSD1 to take into account the new payment services, including internet and mobile payments, and ensures a safer environment for consumers.[1]

The European Commission has underlined the following highlights of the PSD2: it prohibits surcharging, which are additional charges for payments with consumer credit or debit cards, both in shops or on-line; it opens the EU payment market to companies offering payment services, based on them gaining access to information about the payment account; it introduces strict security requirements for electronic payments and for the protection of consumers' financial data; and it enhances consumers' rights in numerous areas, such as reducing the liability for non-authorised payments and introducing an unconditional refund right for direct debits in euro.

1 See Tapia Hermida (2018), "Las tecnofinanzas (FINTECH). Retos a la regulación y a la supervisión financieras", *Revista Iberoamericana del Mercado de Valores* (RIMV), No. 54 (July), pp. 1 et seq.

b) A functional or objective scope because it sets out common rules on transparency and the rights and obligations of users and of payment service providers. Note that these common rules affect all categories of providers with regard to the provision of these services as a regular occupation or business activity [Article 1(2)].

It should be recalled that, from a legal standpoint, payment is the first of the forms to discharge the obligations envisaged and regulated in Article 1156 et seq. of the Civil Code.

2.3 REGULATORY GEOGRAPHICAL FRAMEWORK: PAYMENT SERVICES PROVIDED WITHIN THE EU AND THE PARTIAL EXTENSION

The general geographical scope of the PSD2 covers payment services provided in the EU (Article 2) without prejudice, in some cases, to a partial geographical extension. This is because, for example, its provisions on transparency requirements and information requirements for payment service providers and on rights and obligations in relation to the provision and use of payment services should also apply, where appropriate, to transactions where one of the payment service providers is located outside the European Economic Area (EEA) in order to avoid divergent approaches across Member States to the detriment of consumers. Furthermore, where appropriate, those provisions should be extended to transactions in all official currencies between payment service providers that are located within the EEA.[7]

2.4 REGULATORY ENVIRONMENT

The PSD2 has a two-pronged regulatory background where subjective and functional European financial regulations coexist:

2.4.1 Subjective financial regulations

This coexistence arises because the PSD2 includes – within the categories of payment service providers which can legitimately provide payment services throughout the EU – together with payment institutions, whose specific status it regulates, credit institutions

7 See Recital 8.

which take deposits from users that can be used to fund payment transactions and which should continue to be subject to the prudential requirements laid down in Directive 2013/36/EU of the European Parliament and of the Council; electronic money institutions which issue electronic money that can be used to fund payment transactions and which should continue to be subject to the prudential requirements laid down in Directive 2009/110/EC; and post office giro institutions which are entitled to provide payment services under national law. It is for that reason that the subjective specific scope of the PSD2 is confined to service providers which provide payment services as a regular occupation or business activity.[8]

2.4.2 Functional financial regulations

The functional regulatory coexistence of the PSD2 arises in several areas for the following reasons:

a) In order to protect consumers against unfair and and misleading practices, the PSD2 coexists with Directives 2005/29/EC, 2000/31/EC, 2002/65/EC, 2008/48/EC, 2011/83/EC and 2014/92/EU. Consequently, the provisions of these Directives continue to apply.[9]

b) In order to ensure the appropriate processing of personal data when payment services are provided by payment service providers, the PSD2 coexists with Directive 95/46/EC of the European Parliament and of the Council and Regulation (EC) No. 45/2001 of the European Parliament and of the Council.[10]

c) To ensure respect for fundamental rights in general and, in particular, the right to respect for private and family life, the right to protection of personal data, the freedom to conduct a business, the right to an effective remedy and the right not to be tried or punished twice in criminal proceedings for the same offence, the PSD2 coexists with the Charter of Fundamental Rights of the European Union.[11]

3 Structure of payment services in the EU

The type of payment service providers[12] can be classified according to the following criteria:

3.1 PARTIES

3.1.1 Payment service providers (1). Type

a) The legal status of the institution: accordingly, the PSD2 delimits its subjective scope by referring to six categories of payment service providers (Article 1) which can be organised, in turn, into the following two groups:

a.1) Institutions with their own generic status established in rules that are external to the PSD2, which are credit institutions (essentially banks), including their branches located in the EU; electronic money institutions; post office giro institutions which are entitled under national law to provide payment services; the ECB and national central banks when not acting in their capacity as monetary authority or other public authorities; and Member States or their regional or local authorities when not acting in their capacity as public authorities.

8 See Recital 24.
9 See Recital 55.
10 See Recital 89.
11 See Recital 90.
12 See Alonso Ledesma (2018), op. cit., pp. 7 et seq.

a.2) Institutions with a specific status established in the PSD2. These are payment institutions which are business legal persons – other than the above-mentioned institutions – and authorised to provide and execute payment services throughout the EU [Articles 1(1)(d), 4(4) and 11(1)].

b) The type of payment services provided: we can differentiate between two large categories of payment service providers with crucial regulatory consequences in the field of access to payment accounts and to information on payment accounts, as we will see below. The two categories are as follows:

b.1) Account servicing payment service providers (essentially banks), which are defined as "a payment service provider providing and maintaining a payment account for a payer" [Article 4(17)].

b.2) Providers of other payment services (frequently adopting the form of fintechs) which, in turn, may be providers of payment initiation services, and are defined as "a service to initiate a payment order at the request of the payment service user with respect to a payment account held at another payment service provider" [Article 4(15)];[13] or providers of account information services, which are defined as "on-line service to provide consolidated information on one or more payment accounts held by the payment service user with either another payment service provider or with more than one payment service provider" [Article 4(16)].[14]

The regulatory significance of this distinction between the different types of payment service providers according to the various types of payment services they provide is underlined in two aspects relating to the following conditions required for the pursuit of their business. On one hand, the own fund requirements which it would be disproportionate to impose on these new market players since payment initiation service providers and account information service providers, when exclusively providing those services, unlike account servicing payment service providers, do not hold client funds. On the other, the guarantees which they must provide in the form of professional indemnity insurance or a comparable guarantee so that they are able to meet their liabilities in relation to their activities.[15]

3.1.2 Payment service providers (2). Special mention of the status of payment institutes

As indicated in the previous section, payment institutions are business legal persons which are authorised to provide and execute payment services throughout the EU [Articles 1(1)(d), 4(4) and 11(1)]. Since their specific status is established in the PSD2, it warrants particular attention.[16]

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13 See as regards their legal status, Alonso Ledesma (2018), op. cit., pp. 9 et seq.

14 See as regards their legal status, Alonso Ledesma (2018), op. cit., pp. 25 et seq.

15 In this respect, Recital 35 indicates: "EBA should develop guidelines in accordance with Article 16 of Regulation (EU) No. 1093/2010 on the criteria to be used by Member States to establish the minimum monetary amount of professional indemnity insurance or comparable guarantee. EBA should not differentiate between professional indemnity insurance and a comparable guarantee, as they should be interchangeable."

16 As regards the previous system in the PSD1, see García Rodríguez (2012), "La Directiva 2007/64/CE, sobre servicios de pago en el mercado interior y la nueva figura de las entidades de pago en España y el Reino Unido", *Revista de Derecho Bancario y Bursátil* (RDBB), No. 128, pp. 183 et seq., and Linares Polaino (2012), "Las entidades de pago y las entidades de dinero electrónico: los cuasibancos", *Derecho Bancario y Bursátil,* Madrid, pp. 393 et seq.

The status of payments institutions is established in the PSD2[17] in accordance with the typical system of European regulation of financial intermediaries which includes the following five phases:

a) The first phase is the definition of the financial activity inherent to this type of institutions which, in this case, comprises the professional provision in the EU of the payment services defined in Annex I of the PSD2, which we will examine below.

   It should be noted that payment institutions, apart from the provision of payment services, shall be entitled to engage in other activities such as the provision of operational and closely related ancillary services such as ensuring the execution of payment transactions, foreign exchange services, safekeeping activities, and the storage and processing of data; the operation of payment systems and business activities other than the provision of payment services, having regard to applicable Union and national law (Article 18).

b) The second phase is that said activity of the professional provision of payment services be reserved to authorised intermediaries which, in this case, are payment institutions together with the other payment service providers listed in Article 1(1) of the PSD2. This vetted access to activity operates in the form of a prohibition of persons other than payment service providers from providing payment services and an imposition on authorised suppliers of notification duties in respect of competent authorities (Article 37).

c) The third phase consists of a requirement that the intermediary – in this case, the payment institution – fulfil a set of conditions for taking up the professional business of payment services which is verified through the authorisation of such professional business and in public registers. This covers a series of subjective requirements (significant shareholders and directors), objective requirements (initial capital) and functional requirements (corporate governance and business organisation) which are reflected in the documents accompanying the application for authorisation as a payment institution that its promoters should send to the competent authorities of the home Member State. These documents are as follows: the programme of operations setting out in particular the type of payment services envisaged; the business plan including a forecast budget calculation for the first three financial years which demonstrates that the applicant is able to employ the appropriate and proportionate systems, resources and procedures to operate soundly; the evidence that the payment institution holds the initial capital required; the governance arrangements and internal control mechanisms, including administrative, risk management and accounting procedures, which demonstrate that those governance arrangements, control mechanisms and procedures are proportionate, appropriate, sound and adequate; the description of the procedure in place to monitor, handle and follow up a security incident and security related customer complaints, etc. (Article 5 et seq.).

17 Chapter I of Title II, Article 5 et seq.

The granting of authorisation shall entail the registration of the payment service providers in the register of the home Member State and of the EBA (Articles 14 and 15).

d) The fourth phase consists of a requirement that the payment institution fulfil a set of conditions for exercising the professional business of providing payment services which comprise maintaining over time the above-mentioned conditions for the taking up of the business and other supplementary conditions such as the control of the shareholding (Article 6), the maintenance of adequate own funds (Article 8 et seq.) and the safeguarding of funds received from users of payment services or received through another payment service provider to execute payment transactions (Article 10), etc. As regards the latter, it is particularly important to recall that user funds should be kept separate from the payment institution's funds, for which purpose safeguarding requirements need to be established when a payment institution is in possession of payment service user funds. In particular, where the same payment institution executes a payment transaction for both the payer and the payee and a credit line is provided to the payer, it might be appropriate to safeguard the funds in favour of the payee once they represent the payee's claim towards the payment institution.[18]

Noteworthy within this phase, on account of its practical importance in the new primarily digital environment of payment services, is the regulation of the use of third parties by payment institutions to provide their services. To this end, the distinction should be drawn between the following two assumptions regulated in the PSD2 (Article 19):

On the one hand, the use of agents. Thus, payment institutions intending to provide payment services through an agent shall inform the competent authorities of their home Member State of certain information (name and address of the agent, a description of the internal control mechanisms that will be used by the agent in respect of money laundering and terrorist financing, the identity of directors and persons responsible for the management of the agent, etc.). Within two months of receipt of this information, the competent authority shall communicate to the payment institution whether the agent has been entered in the appropriate public register, after which the agents may commence providing payment services. Conversely, before listing the agent in the register, if the competent authority considers that the information provided to it is incorrect, it will take further action to verify the information. Additionally, if the payment institution wishes to provide payment services in another Member State by engaging an agent, it shall follow the procedures set out in Article 28 of the PSD2 for exercising the right of establishment and shall ensure that the agent acting on its behalf inform payment service users of this fact.

On the other, the outsourcing of functions. Therefore, where a payment institution intends to outsource operational functions of payment services, it shall inform the competent authorities of its home Member State accordingly. Furthermore, in the case of important operational functions, including IT

18 See Recital 37.

At the other extreme of the legal relations arising from payment services are payment service users who are defined as "a natural or legal person making use of a payment service in the capacity of payer, payee, or both" [Article 4(10)].

The type of payment service users can be classified according to the following two criteria:

a) Their legal status, distinguishing between "consumer users" – defined as "a natural person who, in payment service contracts covered by this Directive, is acting for purposes other than his or her trade, business or profession" [Article 4(20)] – and "non-consumer users" who – conversely – in payment service agreements, are acting for the purposes inherent to their trade, business or profession.

b) Their position or role in the payment service agreement, it is possible to draw a distinction between the "consumer" or "non-consumer user" in their capacity as a payer, defined as "a natural or legal person who holds a payment account and allows a payment order from that payment account, or, where there is no payment account, a natural or legal person who gives a payment order" [Article 4(8)]; or as payee, defined as "a natural or legal person who is the intended recipient of funds which have been the subject of a payment transaction" [Article 4(9)].

systems,[19] the payment institution shall comply with a series of general conditions, such that the outsourcing "shall not [...] impair materially the quality of the payment institution's internal control and the ability of the competent authorities to monitor and retrace the payment institution's compliance with all of the obligations" as laid down by the PSD2; and it shall comply with special conditions, whereby the outsourcing shall not result in the delegation by senior management of its responsibility; the relationship and obligations of the payment institution towards its users shall not be altered; the conditions with which the payment institution is to comply in order to be authorised and remain so in accordance with this Title shall not be undermined; and none of the other conditions subject to which the payment institution's authorisation was granted shall be removed or modified.

As common factors of the above-mentioned two assumptions, the PSD2 lays down two duties of payment institutions where they rely on third parties for the performance of operational functions which are that they are fully liable for any acts of their employees, or any agent, branch or entity to which activities are outsourced (Article 20) and that they keep all appropriate records to comply with the duties imposed by the PSD2 (Article 21).

e) The fifth phase of the status of payment institutions under the PSD2 is their public supervision because compliance by payments institutions with the conditions of taking up and pursuit of the professional business of payment services is verified by competent authorities whose controls shall be proportionate, adequate and responsive to the risks to which payment

19 "[A function where] a defect or failure in its performance would materially impair the continuing compliance of a payment institution with the requirements of its authorisation [...], its other obligations [...], its financial performance, or the soundness or the continuity of its payment services" is deemed an important operational function."

institutions are exposed. Accordingly, the PSD2 lays down a complete system of public supervision of payment institutions[20] which covers the following aspects: the designation of competent authorities; the scope of supervision; the duty of professional secrecy by which all persons who work or who have worked for the competent authorities, as well as experts acting on behalf of the competent authorities will be bound; cooperation and the exchange of information by the competent authorities of the Member States; the right to apply to the courts with regard to decisions taken by the competent authorities in respect of a payment institution; the settlement of disagreements between competent authorities of different Member States; the application to exercise the right of establishment and freedom to provide services in the EU by an authorised payment institution and the corresponding supervision; and the measures in case of non-compliance ("including precautionary measures") by a payment institution with its obligations.

3.2 PURPOSES AND FUNCTIONS: PAYMENT SERVICES

3.2.1 Payment services that are included

The objective and functional scope of the PSD2 comprises payment services provided within the EU, meaning the activities listed in Annex I which are: "1. Services enabling cash to be placed on a payment account as well as all the operations required for operating a payment account. 2. Services enabling cash withdrawals from a payment account as well as all the operations required for operating a payment account. 3. Execution of payment transactions, including transfers of funds on a payment account with the user's payment service provider or with another payment service provider: (a) execution of direct debits, including one-off direct debits; (b) execution of payment transactions through a payment card or a similar device; (c) execution of credit transfers, including standing orders. 4. Execution of payment transactions where the funds are covered by a credit line for a payment service user: (a) execution of direct debits, including one-off direct debits; (b) execution of payment transactions through a payment card or a similar device; (c) execution of credit transfers, including standing orders. 5. Issuing of payment instruments and/or acquiring of payment transactions. 6. Money remittance. 7. Payment initiation services. 8. Account information services".

In view of this list, it is possible to distinguish – with legal relevance – between payment services involving the deposit and withdrawal of funds, between direct payments and payments on credit, and between bilateral and trilateral payments, etc.

3.2.2 Payment services that are excluded

Article 3 of the PSD2 excludes from its scope a set of payment transactions for three types of reasons:

a) Objective reasons: payment transactions made exclusively in cash directly from the payer to the payee, without any intermediary intervention; professional physical transport of banknotes and coins, including their collection, processing and delivery; cash-to-cash currency exchange operations where the funds are not held on a payment account; etc.

b) Subjective reasons: such as payment transactions from the payer to the payee through a commercial agent authorised via an agreement to negotiate or conclude the sale or purchase of goods or services on behalf of only the payer or only the payee; services where cash is provided by the payee to the payer as part of a payment transaction following an explicit request by the payment

20 Section 3 of Chapter I of Title II, Article 22 et seq.

service user just before the execution of the payment transaction through a payment for the purchase of goods or services; payment transactions and related services between a parent undertaking and its subsidiary or between subsidiaries of the same parent undertaking, without any intermediary intervention by a payment service provider other than an undertaking belonging to the same group; etc.

c) Functional reasons: such as payment transactions consisting of the non-professional cash collection and delivery within the framework of a non-profit or charitable activity; payment transactions carried out within a payment or securities settlement system between settlement agents, central counterparties, clearing houses and/or central banks and other participants of the system, and payment service providers; payment transactions related to securities asset servicing, including dividends, income or other distributions, or redemption or sale, carried out by certain persons or by investment firms, credit institutions, collective investment undertakings or asset management companies providing investment services and any other entities allowed to have the custody of financial instruments; etc.

4 Functioning of payment services in the EU

The PSD2 regulates two essential aspects of the functioning of payment services in the EU which are, on one hand, their transparency and, on the other, the rights and obligations of payment service users and of payment service providers. As indicated above, these common rules affect all categories of payment service providers with regard to the provision of these services as a regular occupation or business activity [Article 1(2)].

4.1 BASES OF THE LEGAL STRUCTURE OF AGREEMENTS ARISING FROM PAYMENT SERVICES

A requirement for clearly describing the regulation of these functional aspects of payment services, is to begin by clarifying the essential bases of the legal structure of agreements arising from payment services because we will see that they will influence the specific aspects regulated in the PSD both as regards their transparency and the rights and obligations of each party.

4.1.1. Framework contracts vs. single payment transactions

The PSD2 treats very differently single or sporadic payment transactions performed outside a framework contract between supplier and user, and those which are part of a framework contract. Note that, in practice, framework contracts and the payment transactions covered by them are far more common and economically significant than single payment transactions. Furthermore, if there is a payment account or a specific payment instrument, a framework contract is required.

The varied regulation of the above-mentioned two assumptions is seen, in particular, in the area of transparency where the following can be verified:

a) In single payment transactions,[21] the essential information should be given on the payment service provider's own initiative since the payer is usually present when giving the payment order and, therefore, it should not be necessary to require in every case that information be provided on paper or on another durable medium. Thus, the payment service provider should be able to give information orally over the counter or make it otherwise easily accessible, for

21 The PSD2 defines a payment transaction as "an act, initiated by the payer or on his behalf or by the payee, of placing, transferring or withdrawing funds, irrespective of any underlying obligations between the payer and the payee" [Article 4(4)].

example by keeping the conditions on a notice board on the premises. Notwithstanding the foregoing, information should also be given on where to find other, more detailed, information (for example, on the website) and, if the consumer so requests, the essential information should also be given on paper or on another durable medium.[22]

b) In the case of framework contracts,[23] the requirements for prior information should be comprehensive and information should always be provided on paper or on another durable medium, such as printed account statements from ATMs, CD-ROM, DVD and the hard drives of personal computers on which electronic mail can be stored, and internet sites, provided that such sites are accessible for future reference, for a sufficient period of time for the purposes of accessing the information and provided that these sites allow the reproduction of the information stored there in an unaltered form. It should be added that the framework contract between the payment service provider and the payment service user should allow to stipulate the manner in which subsequent information on executed payment transactions is to be given, for example, that in internet banking, all information on the payment account be made available on-line.[24]

   The regulatory nature of these framework contracts can also be seen with respect to their duration or possible changes to their content:

   b.1) First, as regards duration, the directive regulates the conditions of the possible termination of the framework contract by the parties. On the one hand, the payment service user may terminate the contract at any time, unless the parties have agreed on a period of prior notice which shall not exceed one month. Termination shall be free of charge except where the contract has been in force for less than six months and charges, if any, shall be appropriate and in line with costs. On the other, the payment service provider may terminate a framework contract concluded for an indefinite period by giving at least two months' notice, and may charge the user for the proportional part of the expenses up to the termination of the contract (Article 55).

   b.2) Second, as regards changes to the content of the framework contract, the directive regulates any changes to the framework contract conditions made by the payment service provider, giving the information specified and notice of no less than two months before the proposed date of application, and the payment service user can either accept or reject the changes before their proposed date of entry into force. In particular, changes in the interest and exchange rates may be applied immediately and without notice by the payment service provider, provided that this has been agreed upon in the framework contract and that the changes in the interest and exchange rates are based on the reference interest or exchange rates agreed on (Article 54).

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22 See Recital 58.

23 The PSD2 defines framework contracts as follows: "a payment service contract which governs the future execution of individual and successive payment transactions and which may contain the obligation and conditions for setting up a payment account" [Article 4(21)].

24 See Recital 57.

CONTRACTS BETWEEN PAYMENT SERVICE PROVIDERS AND USERS VS. CONTRACTS BETWEEN PAYMENT SERVICE PROVIDERS AND OTHER FINANCIAL INTERMEDIARIES

BOX 3

The PSD2 regulates, in principle, the transparency and the rights and obligations of contracts between payment service providers and users. However, this regulation has indirect and collateral effects on the following two types of contracts:

a) Contracts between different types of payment service providers. We found evidence (through omission) of the importance of such contracts in the stipulation that the provision of payment initiation or account information services shall not be dependent on the existence of a contractual relationship between the payment initiation or account information service providers and the account servicing payment service providers for that purpose [Articles 66(5) and 67(4)].

b) Contracts between payment service providers and other financial intermediaries, since the proper functioning of transfers and other payment services requires that payment service providers and their intermediaries (for example, payment processors) have contracts in which their mutual rights and obligations are laid down. Regarding their content, the PSD2 notes the following key aspects: the liabilities of each party to ensure legal certainty to the effect that a non-responsible payment service provider is compensated for losses incurred or sums paid; further rights; the details of content of recourse; and how to handle claims towards the payment service provider or intermediary attributable to defective payment transactions[1].

1 See Recital 87.

4.2 TRANSPARENCY OF PAYMENT SERVICES

4.2.1 The regulation of transparency as a communication phenomenon: issuers, receivers and messages

The regulation of the "transparency of conditions and information requirements for payment services", in Title III of the PSD2 (Article 38 et seq.) can be explained in terms of the classical structure of communication, identifying the issuers (in this case, the payment service providers),[25] the receivers (the payment service users) and the messages (the payment service conditions), and based on the general principle of the appropriateness of the information, in a dual sense: appropriate for the parties, since, in order to enhance efficiency, the information required should be proportionate to the needs of users and should be communicated in a standard format; and appropriate for the type of relationship between the parties, since the information requirements for a single payment transaction should be different from those of a framework contract providing for a series of payment transactions.[26]

In the first sense mentioned, it is important to distinguish between two assumptions that condition the way in which the payment service providers must fulfil their information obligations:

a) The first assumption is that of general transparency, as it relates to the information obligations with respect to all types of payment service users. The PSD2 establishes two ways in which the payment service provider can provide the necessary information to the payment service user. In this case, on the basis that the needs of the user, as well as practical technical aspects

25 For the information and transparency obligations of payment initiation service providers, see Alonso Ledesma (2018), op. cit., pp. 21 et seq.

26 See Recital 56.

and cost-efficiency, must always be taken into account, there are two ways in which information is to be given by the payment service provider:[27]

a.1) Actively and at the appropriate time, without any prompting by the payment service user.

a.2) Passively, by making the information available to the payment service user, considering any possible request by the latter for further information. In this case, the payment service user must take active steps to obtain the information, such as requesting it explicitly from the payment service provider, logging into a bank account mail box or printing account statements using a bank card.

b) The second assumption is that of specific transparency, since it relates to the information obligations with respect to users who are also consumers. In this case, the PSD2, to ensure their special protection, enshrines the right of consumers to receive relevant information free of charge before being bound by any payment service contract. Consumers should also be able to request prior information as well as the framework contract, on paper, free of charge at any time during the contractual relationship, so as to enable them both to compare the services and conditions offered by payment service providers and, in the event of a dispute, to verify their contractual rights and obligations.[28]

The two regulatory assumptions mentioned above should be completed with two important stipulations of an opposing nature: exclusive, since Member States may decide that transparency rules shall not apply in whole or in part when the payment service user is not a consumer; and inclusive, since Member States may apply the provisions in this Title to micro-enterprises in the same way as to consumers (Article 38).

4.2.2 Appropriate for the type of relationship that exists between payment service providers and users

As mentioned in section 4.1.1 of this study, the PSD2 treats occasional or single payment transactions very differently from those that are conducted under a framework contract, particularly as regards transparency. Thus, compliance with information obligations by providers depends on which of the two types of relationship exists between the payment service providers and users, as follows:

a) Single payment transactions not covered by a framework contract. In this case, the PSD2 establishes information obligations in the following situations and between the respective parties:[29] prior general information that the payment service provider must make available to the payment service user, information for the payer and the payee after the initiation of a payment order, information for the payer and the payer's account servicing payment service provider in the event of a payment initiation service, information for the payer after receipt of the payment order and information for the payee after execution.

b) The framework contracts and payment transactions covered by such contracts. In this case, the PSD2 establishes information obligations in the

27 See Recital 60.
28 See Recital 59.
29 Chapter 2 of Title III, Article 38 et seq.

following situations and between the respective parties:[30] general prior information that the payment service provider must make available to the payment service user (covering the following: information on the payment service provider, on use of the payment service, on charges, interest and exchange rates, on communication, on safeguards and corrective measures, on changes to, and termination of, the framework contract and on the resolution of disputes), information before the execution of each payment transaction and information for the payer and the payee on each payment transaction.

4.3 LEGAL STATUS OF THE PARTIES INVOLVED IN PAYMENT SERVICES

The regulation by the PSD2 of this second key aspect of the proper functioning of payment services in the EU, that is, the rights and obligations of both payment service users and of the providers of such services,[31] is appropriate, first of all, for the type of user[32] since such rights and obligations are applied differently depending on the status of the payment service user:

4.3.1 Appropriate for the type of payment service user. Special reference to the consumer

a) They shall be applied fully and obligatorily to payment services provided to payment service users who are consumers. It should be noted that under the PSD2, Member States may also apply the provisions on the rights and obligations of consumers to micro-enterprises.

b) They shall be applied in part and by default to users of payment services who are not consumers, since, in such cases, the payment service users and providers may agree that certain provisions on rights, obligations and time limits do not apply in whole or in part.

4.3.2 Appropriate as regards the time of provision of the payment service: authorisation and execution of payment transactions

The PSD2 uses a second, chronological, criterion to regulate the rights and obligations of the parties involved in the provision and use of payment services, grouping them under two points in time:

4.3.2.1 Rights and obligations at the time of authorisation of payment transactions

Regarding this first point in time, the directive regulates the consent and withdrawal of consent, the confirmation of the availability of funds, etc.[33]

Worth mentioning, in this respect, are the new regulations on access to and communication of customer data by banks to the new fintech companies. Under the PSD2, traditional banks (as managers of their customers' payment accounts) are required to give payment initiation and payment account information service providers (mostly fintech companies) access to their customers' payment accounts, thus opening the gates to the banks' core business. Specifically, the PSD2 sets three types of conditions for such access to information on payments accounts, as follows:

a) Common conditions for access to payment accounts. For a company providing payment initiation or payment account information services (generally, a fintech) to be able to gain access to a payment account or information on this

30 Chapter 3 of Title III, Article 50 et seq.

31 Title IV (Article 61 et seq.) stipulates "the rights and obligations in relation to the provision and use of payment services". For the legal status of payment initiation service providers, see Alonso Ledesma (2018), op. cit., pp. 19 et seq.

32 For the obligations of payment service users, see Alonso Ledesma (2018), op. cit., pp. 24 et seq.

33 Chapter 2 of Title IV, Article 64 et seq.

account, held by an account servicing payment service provider (generally, a bank), two conditions should exist: one that is positive, in that the payer or user must give their explicit consent; and one that is negative, in that neither the provision of payment initiation or account information services shall be dependent on the existence of a contractual relationship for that purpose between the payment initiation or account information service providers and the account servicing payment service providers.

b) Access to the payment account in the case of payment initiation services. This is based on the right of every payer to have recourse to a payment initiation service provider. Such a right will not apply where the corresponding payment account is not accessible on-line. To make the right workable in practice, if the payer gives explicit consent for a payment to be made, the two payment service providers involved will be required to adopt the following measures to guarantee that the payer can exercise the right to use the payment initiation service:

   The payment initiation service provider (generally, a fintech company) shall be subject to a series of affirmative or "active" obligations (to ensure that the personalised security credentials of the payment service user are not, with the exception of the user and the issuer of the personalised security credentials, accessible to other parties and that they are transmitted by the payment initiation service provider through safe and efficient channels; to ensure that any other information about the payment service user, obtained when providing payment initiation services, is only provided to the payee and only with the payment service user's explicit consent; to identify itself towards the account servicing payment service provider of the account holder every time a payment is initiated, and to communicate with the account servicing payment service provider, the payer and the payee in a secure way). The payment initiation service provider shall also be subject to a series of negative or "omissive" obligations (not to hold at any time the payer's funds in connection with the provision of the payment initiation service; not to store sensitive payment data of the payment service user; not to request from the payment service user any data other than those necessary to provide the payment initiation service, etc.).

   The account servicing payment service provider (generally, a bank),[34] shall be subject to certain obligations, such as establishing secure communication with the payment initiation service providers; providing the latter with all information on the initiation of the payment transaction and all information to which it has access regarding the execution of the payment transaction, immediately after receipt of the payment order; treating payment orders transmitted through the services of a payment initiation service provider without any discrimination other than for objective reasons (in particular in terms of timing, priority or charges vis-à-vis payment orders transmitted directly by the payer).

34 For the obligations of the account servicing payment service provider regarding access to customer accounts, see Alonso Ledesma (2018), op. cit., pp. 24 et seq.

c) Access to and use of payment account information in the case of account information services. This is based on the right of any payment service user to make use of services enabling access to account information. Such a right will not apply where the corresponding payment account is not accessible on-line. To make the right workable in practice, if the user gives explicit consent, the two payment service providers involved will be required to adopt the following measures:

   The account information service provider (generally, a fintech company) shall be subject to a series of positive or "active" obligations (to ensure that the personalised security credentials of the payment service user are not, with the exception of the user and the issuer of the personalised security credentials, accessible to other parties and that when they are transmitted by the account information service provider, this is done through safe and efficient channels; for each communication session, to identify itself towards the account servicing payment service provider(s) of the payment service user and to securely communicate with the account servicing payment service provider(s) and the payment service user; to access only the information from designated payment accounts and associated payment transactions, etc. The account information service provider shall also be subject to a series of negative or "omissive" obligations (not to request sensitive payment data linked to the payment accounts; not to use, access or store any data for purposes other than for performing the account information service explicitly requested by the payment service user, in accordance with data protection rules, etc.).

   The account servicing payment service provider (generally a bank) shall be subject to a series of obligations such as communicating securely with account information service providers and treating data requests transmitted through the services of an account information service provider without any discrimination for other than objective reasons.

   In view of its legal relevance, the discussion of this first stage of the regulation of rights and obligations relating to the authorisation of payment transactions should conclude with a reference to the liabilities of the parties involved: on one hand, in the case of an unauthorised payment transaction, the payment service provider shall refund the user for the amount of the unauthorised transaction immediately, and in any event no later than by the end of the following business day, after noting or being notified of the transaction, except where the payer's payment service provider has reasonable grounds for suspecting fraud and communicates those grounds to the relevant national authority in writing (Article 73). On the other, the payer may be obliged to bear the losses relating to any unauthorised payment transactions, up to a maximum of EUR 50, resulting from the use of a lost or stolen payment instrument or from the misappropriation of a payment instrument (Article 74).

4.3.2.2 Rights and obligations at the time of execution of payment transactions

Regarding this second point in time, the PSD2 deals with payment orders and amounts transferred, execution times and value date, etc.[35] Here, from a legal standpoint, the provisions on the liability of the payment service provider are of particular importance.

35 Chapter 3 of Title IV, Article 78 et seq.

They conform to a classical approach to both contractual and non-contractual civil liability which requires three elements for civil liability to arise: an illegal act by the liable party, of a culpable or fraudulent nature; direct financial loss sustained by the claimant, in the form of consequential damages or loss of profits; and a clear causal relationship between the act and the loss.

The PSD2 regulates three aspects of this civil liability:[36]

a) First, it establishes the assumption of incorrect unique identifier[37] in the dual sense that, if a payment order is executed in accordance with the unique identifier, the payment order shall be deemed to have been executed correctly with regard to the payee specified by the unique identifier, and that if the unique identifier provided by the payment service user is incorrect, the payment service provider shall not be liable. All the foregoing without prejudice to the payer's payment service provider making reasonable efforts to recover the funds involved in the payment transaction and the payee's payment service provider cooperating in those efforts also by communicating to the payer's payment service provider all relevant information for the collection of funds (Article 88).

b) Second, it distinguishes between two cases of providers' liability: the first is liability for non-execution, defective or late execution of payment transactions (Article 89) and the second relates to payment initiation services, for non-execution and defective execution of payment transactions (Article 90).

c) Third, it stipulates that, on top of the compensation for the user envisaged in the above two cases, additional financial compensation may be determined under the contract concluded between the payment service user and the payment service provider (Article 91). It also provides for the right of recourse of the payment service provider who has to pay a user compensation attributable to another payment service provider or to an intermediary, ultimately liable for wilful non-compliance (Article 92).

4.3.3 Obligations of payment service providers in respect of data protection, operational and security risks and authentication

The legal status of payment service providers is completed by the regulation of a series of conditions for the exercise of their activities in the professional provision of payment services, consisting, firstly, of the obligations relating to data protection.[38] In relation to the provision of information to individuals about the processing of personal data, the PSD2 refers to Directive 95/46/EC and Regulation (EC) No. 45/2001, specifically establishing that payment service providers shall only access, process and retain personal data necessary for the provision of their payment services, and only with the explicit consent of the payment service user.

Secondly, the PSD2 establishes obligations on these providers in relation to "operational and security risk and authentication",[39] noting that, "Member States shall ensure that

36 See Recital 86.

37 The PSD2 defines them as "a combination of letters, numbers or symbols specified to the payment service user by the payment service provider and to be provided by the payment service user to identify unambiguously another payment service user and/or the payment account of that other payment service user for a payment transaction" [Article 4(33)].

38 Chapter 4 of Title IV, Article 94.

39 Chapter 5 of Title IV, Article 95 et seq.

payment service providers establish a framework with appropriate mitigation measures and control mechanisms to manage the operational and security risks, relating to the payment services they provide". Regarding this last point, the obligations of the providers can be organised under two points in time with respect to major operational or security incidents:[40]

a) As preventive measures, since the payment service providers are responsible for having in place security measures that are proportionate to the existing security risks, by setting up a framework to mitigate risks and maintain effective incident management procedures and reporting to the competent authorities, on a regular basis, with an updated assessment of their security risks and the measures that they have taken in response to those risks.

b) As mitigating measures, since the payment service providers, in order to ensure that damage to users, other payment service providers or payment systems, is kept to a minimum, are required to report major security incidents without delay to the competent authorities.

4.3.4 Alternative dispute resolution and penalties arising from infringements of the provisions by payment service providers

The regulatory framework of the legal status of the parties involved in payment service naturally culminates in the regulations applicable to the consequences of any infringements by the payment service providers of the provisions of the PSD2 and of national law transposing them. Such infringements may have two types of consequences:

a) the civil liability of payment service providers, the key aspects of which have already been referred to when discussing the rights and obligations of the parties involved in payment services at the time of authorisation and execution of payment transactions in sections 4.3.2.1 and 4.3.2.2 above. From a procedural viewpoint, this civil liability can take the form of disputes before the judicial authorities of each State. The PSD2 regulates alternative dispute resolution proceedings before other types of institutions which Member States must shall guarantee and which shall take the form of procedures that allow payment service users and other interested parties including consumer associations, to submit complaints to the competent authorities with regard to payment service providers' alleged infringements.[41]

b) The administrative liability of payment service providers, which shall take the form of penalties applicable to infringements of the national law transposing the PSD2. The Member States shall ensure that such penalties are effective, proportionate and dissuasive and shall take all necessary measures to ensure that they are implemented.

5 Conclusions

5.1 The PSD2 has a two-pronged regulatory scope: on the one hand, a status or subjective scope because it defines six categories of payment service providers and establishes the conditions of taking up and pursuit of the business of payment services; on the other, a functional or objective scope because it sets out common rules on transparency and the rights and obligations of users and of payment service providers.

40 Recitals 91 and 92.
41 Chapter 6 of Title IV, Article 99 et seq.

5.2 The regulatory structure of payment services in the EU set out in PSD2 is based on the identification of the parties involved in these services, that is, the service providers and users.

5.3 Payment service providers can be classified using two criteria. First, they can be organised into two groups according to their legal status: institutions which have their own status established in rules external to the PSD (for example, credit institutions); and payment institutions whose specific status – comprising the conditions of taking up and pursuit of the business of payment services – is laid down in the PSD2.

5.4 Second, payment service providers can be classified according to the type of payment services provided, into another two groups: Account servicing payment service providers and providers of other payment services which, in turn, may be providers of payment initiation services or providers of account information services.

5.5 The specific status of payments institutions established in the PSD2 is in line with the typical system of European regulation of financial intermediaries which includes the following five phases: the definition of the financial activity inherent to this type of institutions which, in this case, comprises the professional provision in the EU of the payment services; reservation of said activity for authorised intermediaries which, in this case, are payment institutions together with the other payment service providers listed in Article 1(1) of the PSD2; requirement that the payment institution fulfil a set of conditions for taking up and pursuit of the defined activity; and the public supervision of compliance by payments institutions with the conditions of taking up and pursuit of their activity.

5.6 At the other end of the regulatory structure of payment services in the EU are the users who can be classified according to the following two criteria: their legal status, distinguishing between consumer users and non-consumer users; and their position or role in the payment service agreement, drawing a distinction between consumer or non-consumer users in their capacity as a payer or as a payee.

5.7 The regulatory structure of payment services in the EU under the PSD2 is completed by the definition of payment services in Annex 1 thereof and by identifying those that are included and those that are excluded.

5.8 The system for payment services in the EU set out in the PSD2 is based on the two-fold distinction between framework contracts and single payment transactions, and between contracts between payment service providers and users and contracts between payment service providers and other financial intermediaries.

5.9 The first key aspect of the system for the proper functioning of payment services in the EU set out in the PSD2 is the transparency of such services, which can be explained in terms of the classical structure of communication, identifying the issuers (in this case, the payment service providers), the receivers (the payment service users) and the messages (the payment service conditions).

5.10 The information obligations under the transparency system are based on the general principle of the appropriateness of the information, in a dual sense: appropriate for the parties, since, in order to enhance efficiency, the information required should be proportionate to the needs of users and should be communicated in a standard format; and appropriate for the type of relationship between the parties, since the information

requirements for a single payment transaction should be different from those of a framework contract providing for a series of payment transactions.

5.11 The second key aspect of the system for the proper functioning of payment services in the EU set out in the PSD2 is the legal status of the parties involved in such payment services, which is regulated according to two appropriateness criteria: first, appropriate for the type of payment service user, with specific protection of consumers; and, second, appropriate for the time at which the service is provided, whether at the authorisation or execution of payment transactions.

5.12 The legal status of payment service providers established by the PSD2 is completed with a set of obligations relating to major operational or security incidents and arising at two points in time: As preventive measures, since they are responsible for having in place security measures that are proportionate to the existing security risks; and as mitigating measures, since they are required to report major security incidents without delay to the competent authorities to ensure that damage to users, other payment service providers or payment systems, is kept to a minimum.

5.13 Essential from a legal and regulatory standpoint are the substantive and procedural provisions governing the liability (civil and administrative) established by the PSD2 as a result of infringements by the payment service providers of the provisions of the PSD2 and of national law transposing them.

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A NEW REGIME FOR ACCESS TO PAYMENT ACCOUNTS: THE PSD2

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Abstract

The finance industry is currently facing a further competitive challenge, on top of ongoing digitalisation: a new type of payment service provider that acts either as an account information service provider or as a payment transaction initiator. These emerging entities, authorised under the Second Payment Services Directive of the European Parliament and of the Council, are now able to establish direct relationships with the customers of credit institutions, conducting transactions in their own name, without having to manage themselves a payment account, and accessing information of undoubted commercial value. This new scenario anticipates a change in the banking status quo and in banks' current business models, promising the development of new value propositions that will be to the benefit of bank customers and society as a whole. This article sets out the main changes introduced by the European Directive, highlights aspects still to be resolved and considers its possible impact on the different types of service providers.

1 Introduction

For some years now banks have been facing the challenge of how to improve their profitability in a setting marked by increasing regulatory demands and sustained low interest rates. This has been compounded recently by the potentially disruptive challenge of digitalisation, given the emergence and growth of new competitors from other industries.

While innovative initiatives are discernible in virtually every area of banking service provision, it is in retail payments that the emerging group of "FinTech firms" (see Chart 1) is having the greatest impact.

Given the importance of this business for financial institutions,[1] the industry has reacted by trying to speed up its digitalisation in an attempt to safeguard its leading role in payment services. Thus, for example, numerous steps have been taken, such as boosting mobile channels, promoting new ways of initiating transactions (contactless cards, QR codes, etc.) and reducing the time it takes for a payment order to be completed (e.g. instant payments). In parallel, traditional institutions, seeing opportunities to improve efficiency and to operate in other business areas that can provide alternative sources of revenue, are stepping up their collaboration with other players.[2]

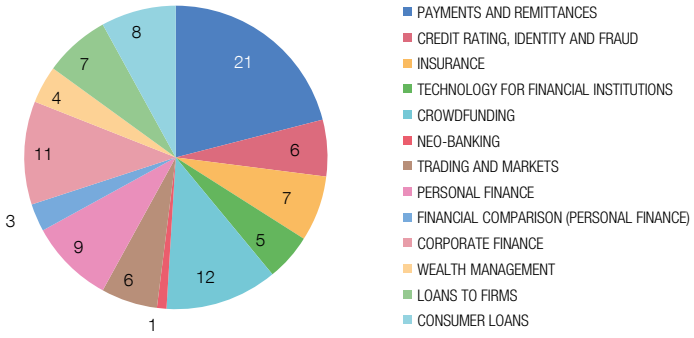
Against this background, the main legislation governing payment services in Europe has been comprehensively revised, providing players with new challenges and contributing to standardising the structure of the market. The Second Payment Services Directive *[Directive (EU) 2015/2366 of the European Parliament and of the Council on payment services in the internal market],*[3] known as "PSD2", is an ambitious and complex piece of legislation that aims to further accelerate the achievement of an integrated, competitive,

1 Fees and commissions have progressively played a bigger role in banks' income statements, given the contraction of net interest income; and, in particular, those associated with transaction and payment services. Thus, for instance, Ernst & Young estimate that the amounts received for charges on payment services provided by global financial institutions, without including net interest income, account for between 40% and 50% of their total revenue. In Spain alone, 2016 fees and commissions, which include other activities such as those relating to investment funds, employee pension and insurance schemes and operations with securities, gave rise to revenue of €8,839 million for the eight listed credit institutions. This figure was 1.2% up on the previous year and accounts for 32.6% of their recurring billings (net interest income plus fees and commissions).

2 These sources are largely, though not exclusively, based on the harnessing of personal data to personalise services, marketing and advertising.

3 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L2366&from=EN.

FINTECH FIRMS BY FINANCIAL SERVICES CATEGORY (%) CHART 1



SOURCE: Finnovista.

innovative and efficient market for payment services in the EU, without undermining user safeguards. Hence the importance the Directive attaches to aspects relating to the security of payment services and, in particular, to regulating the activities of new entrants that bank customers may authorise to access their payment accounts at a different financial institution.

This article sets out the main changes introduced by the European Directive and its implementing legislation, highlighting certain aspects still to be resolved and addressing the possible impact on different types of service providers. Following this introduction, Section 2 analyses the PSD2 in detail, focusing first on security-related aspects and then describing the new account information and payment initiation services, analysing the various communication channels between account servicers and entities that provide these new services and, finally, detailing the interaction between the various types of providers and the main problems still to be resolved. Section 3 includes some of the possible effects of the PSD2 and considers its potential impact on the various types of providers. The article ends with a section devoted to drawing the main conclusions.

2 The PSD2: the regulatory framework as a galvanising factor

In Europe, the regulator has not wished to remain a mere spectator to the far-reaching changes taking place in payment services. A fundamental part of such changes has been the result of plans for a broad range of measures that meet users' new expectations and ultimately aim to achieve a more robust and integrated European economy. Initiatives include most notably the European Commission's proposal for *A Digital Single Market Strategy for Europe* (2015)[4] and, more recently, the *Consumer financial services action plan: better products, more choice.*[5]

However, in the payments area the main focus has been on the revision of the first Payment Services Directive (Directive 2007/64), known as "PSD1", the basic legislation regulating these services for many years, which was superseded by PSD2 in 2015. The new Directive includes two major changes: a) greater attention to the risks associated with the new

4 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015DC0192&from=ES.

5 http://eur-lex.europa.eu/resource.html?uri=cellar:055353bd-0fba-11e7-8a35-01aa75ed71a1.0013.02/DOC_1&format=PDF and its annex http://eur-lex.europa.eu/resource.html?uri=cellar:055353bd-0fba-11e7-8a35-01aa75ed71a1.0013.02/DOC_2&format=PDF.

strategies arising from the digital transformation and, b) an extension of its scope to cover new payment services.[6]

2.1 THE PSD2 AND SECURITY MEASURES FOR ELECTRONIC PAYMENT TRANSACTIONS

As regards payment transaction security, the PSD2 focuses particularly on remote payment transactions, whether via Internet or using mobile devices. This emphasis is a direct consequence of the notable increase in these transactions in recent years, boosted by the e-commerce boom (see Table 1).

Building on the recommendations of the ECB *(Recommendations for the security of internet payments)*[7] and the European Banking Authority's (EBA) guidelines *(Guidelines on the security of internet payments),*[8] the PSD2 has made the security of electronic payments one of its main pillars. The Directive requires specific security measures and procedures to be applied in electronic payment transactions and, in particular, in those carried out remotely.

These measures and procedures are based on the concept of "strong customer authentication",[9] the main characteristics of which are summarised in Table 2.

It was not possible, however, to give a detailed definition of strong customer authentication in the Directive, owing to the technical complexity of this concept and the granularity that would have had to be included, but also because of the great diversity of the cases subject to its application. Consequently, the PSD2 confined itself to laying down a series of general principles, and entrusted development of the detailed legal framework that should govern the security of electronic payments to the EBA, in collaboration with the ECB.

To this end, the EBA began work on drafting *Regulatory Technical Standards (RTS) on strong customer authentication and common and secure communication.*

These RTS include the main features of strong authentication, seeking to be neutral from a technological standpoint and respecting the different business models. They also include certain exceptions, depending on the risk of the transaction, its amount and the channel through which it is conducted (see Table 2). The RTS likewise set out the legal arrangements applicable to access to payment accounts, a vital aspect when determining how the different payment service providers will interact. This is explained in greater detail in the following section.

After a tortuous process, the RTS eventually led to *Commission Delegated Regulation (EU) 2018/389 of 27 November 2017 supplementing Directive (EU) 2015/2366 of the European Parliament and of the Council with regard to regulatory technical standards for strong customer authentication and common and secure open standards of communication,*[10] published on 13 March 2018.

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6 Along with this, the PSD2 introduces other fine-tuning measures relating, in the main, to its scope of application and to the prudential arrangements for the payment service providers it specifically regulates (payment institutions).

7 http://www.ecb.europa.eu/pub/pdf/other/pubconsultationoutcome201405securitypaymentaccountaccessservicesen.pdf?3b8c24c7dc9fa5f57204d212c66f2dc7.

8 https://www.eba.europa.eu/documents/10180/1004450/EBA_2015_ES+Guidelines+on+Internet+Payments.pdf/44d07cf8-1721-4407-94a6-3a8c256149fa.

9 SCA, by its abbreviation.

10 – https://eur-lex.europa.eu/legal-content/ES/TXT/?uri=uriserv:OJ.L_.2018.069.01.0023.01.SPA&toc=OJ:L:2018:069:TOC.

B2C E-COMMERCE TURNOVER FIGURES (2011-2016) (a) TABLE 1

$bn

	2011	2012	2013	2014	2015	2016
North America	327.77	373.03	419.53	469.49	523.09	580.24
Asia-Pacific	237.86	315.91	388.75	501.68	606.54	707.60
Western Europe	218.27	255.59	291.47	326.13	358.31	387.94
Eastern and Central Europe	30.89	40.17	48.56	57.96	64.35	68.88
Latin America	28.33	37.66	45.98	55.95	63.03	69.60
Middle East and Africa	14.41	20.61	27.00	33.75	39.56	45.49
WORLD TOTAL	**856.97**	**1,042.98**	**1,221.29**	**1,444.97**	**1,654.88**	**1,859.75**

SOURCE: eMarketer (2013).

a These include purchases via any digital channel (PC, mobile and tablets) of travel, digital downloads and tickets for events. On-line gambling is excluded. The totals may not coincide with the sum of the individual items due to rounding.

However, this article retains references to the RTS for two reasons. First, in view of market practice, which prefers to continue referring to this Delegated Regulation as *RTS on Strong Customer Authentication and Common and Secure Communication.* And further, because this Regulation will only apply from 14 September 2019. In any event, references to the RTS should be understood as being to Delegated Regulation (EU) 2018/389.

2.2 NEW PAYMENT SERVICES UNDER THE PSD2: PAYMENT INITIATION SERVICES (PISS) AND ACCOUNT INFORMATION SERVICES (AISS)

Traditionally, credit institutions have been the main providers of payment services, to their current-account holding customers. The PSD1 regulated payment services in detail and laid down the vetted access principle, which restricted such services to authorised entities subject to supervision, which became generally known as payment service providers (PSPs).

Basically, this term included credit institutions and payment institutions.[11] The main innovation of the PSD1 was, precisely, the creation of this latter type of service provider, with a supervisory regime proportionate to the risks of their activity, which was restricted to payment intermediation, in contrast to the broad range of services characterising the operations of credit institutions.

However, the services provided by some specialist institutions to the holders of accounts at other institutions remained outside the scope of the PSD1 and, therefore, these were

– Prior to this, the EBA had published its proposal on 23.02.2017: https://www.eba.europa.eu/documents/10180/1761863/Final+draft+RTS+on+SCA+and+CSC+under+PSD2+%28EBA-RTS-2017-02%29.pdf.
– In a letter addressed to the EBA, the European Commission announced on 24.05.2017 its intention to make certain changes to specific articles of the RTS proposed by the EBA. These changes can be viewed in: http://www.eba.europa.eu/documents/10180/1806975/%28EBA-2017-E-1315%29%20Letter+from+O+Guersent%2C%20FISMA+re+Commission+intention+to+amend+the+draft+RTS+on+SCA+and+CSC+-Ares%282017%292639906.pdf/efbf06e1-b0e9-4481-88e5-b70daa663cb9.
– This letter led the EBA to issue an Opinion on 29.06.2017 in which it expressed its position on the changes announced by the European Commission: https://www.eba.europa.eu/documents/10180/1894900/EBA+Opinion+on+the+amended+text+of+the+RTS+on+SCA+and+CSC+%28EBA-Op-2017-09%29.pdf/df60c6ac-a284-4772-b1d5-66c7073d28af.

11 Electronic money institutions, along with post office giro institutions and the public and monetary authorities in certain circumstances, are also part of the group of payment service providers. Nonetheless, given that the market share of these institutions and agencies is very small, and since the regulation of electronic money institutions in their capacity as payment service providers is the same as that for payment institutions, in this article, for the sake of simplicity, the term payment institutions refers to all these payment service providers and, in particular, to electronic money institutions when they act as such providers.

MAIN REGULATORY CHARACTERISTICS OF STRONG CUSTOMER AUTHENTICATION UNDER THE PSD2 TABLE 2

Strong Customer Authentication under the PSD2

Involves: authentication based on the use of two or more independent security elements		Security features:	— Knowledge (something only the user knows) — Possession (something only the user possesses) — Inherence (something the user is)
		Independent:	— The breach of one does not compromise the reliability of the others — No requirement for different devices
		Personalised security credentials:	Personalised security features provided by the payment service provider (PSP) or linked by the PSP to the customer
Obligatory if:	— Online payment account access — Electronic payment transaction — Remote action entailing risk — Presence of a TPP	Dynamic security feature if:	— Remote electronic payment transaction — Presence of a PISP
Possibility of exemptions based on:	— Level of risk (TRA) — Amount — Channel		
Accompanied by:	Transaction monitoring mechanisms		

SOURCE: Banco de España.

provided within the EU without being specifically regulated. The main services of this type are the initiation of a payment in an account of another institution (known as a payment initiation service or PIS) and the offering of consolidated information on the outstanding balances and transactions on more than one payment account at different institutions (known an account information service or AIS). The fundamental characteristic of these services is that the provider does not need to service a payment account; rather, it needs the customer's consent to operate or obtain information on accounts held at other institutions. Firms that have specialised in these types of services are "third-party firms" in the traditional bilateral relationship between the PSP and its customer; accordingly, they are usually called third-party providers (TPPs).

Initially, and until the RTS implementing the PSD2 come into force, the main method used by TPPs to gain access to their customers' payment accounts at other institutions involved using customers' personalised security credentials. Hence, TPPs would request the credentials of account holders and access their customers' accounts in the same way and with the same credentials as the holders themselves,[12] using techniques habitually referred to as "screen scraping". From a technical standpoint, screen scraping is a programming method which, through reverse engineering, enables data to be extracted from a screen-displayed representation (via a website or a pdf file, for example) and uploaded onto another application. In banking, this technique enables any entity with access to a customer's online payment account to extract and use the account data.

Operating in this way had security and efficiency implications since, without identifying themselves, TPPs (not linked to the account servicing entity) could gain access to customer

12 There has been and continues to be much debate on whether this practice complies with Directive 2007/64/EC or PSD1, as the sharing of personalised security credentials may be understood as a breach of the obligations imposed by the Directive upon the payment service user. However, as the Directive does not expressly forbid such sharing, its prohibition in the context of new payment services has been dismissed by some courts on the grounds that it would restrict free competition.

data using a channel intended for the customer itself. Therefore, TPPs were "impersonating customers" and could potentially access more information than was strictly necessary to provide the services requested by such customers. This situation was possible because, as a general rule, account servicing entities set up a single mechanism for access to all the accounts, products and positions of their customers.[13] Through this route, TPPs were therefore able to obtain full view of the customer's overall position, without the customer necessarily being aware of this and regardless of the scope of the permission granted.

However, payment initiation or account information services may offer useful solutions to merchants and consumers (such as a consolidated view of their balances and transactions) or alternative payment channels for online commercial transactions that do not require the use of specific payment instruments, such as payment cards. Also, as part of the widespread shift towards "open banking",[14] it may be thought that PSP customers should be able to use their own information and assign it to third parties if they so wish. Consequently, the PSD2 is a response to the regulator's aim of allowing these payment initiation and account information services (PISs and AISs) to be developed and consolidated, in a setting that provides consumers with adequate protection both for their payments and for the information associated with their accounts.

Additionally, the PSD2 entitles any holder of a payment account that is accessible online to initiate a payment order through a PSP other than the one at which the account is open. The Directive also recognises the right of any holder of one or more payment accounts accessible online to gain access to the information contained in the accounts through a payment service provider other than that or those at which the account(s) is/are open. In other words, AISs and PISs are included within the regulatory perimeter, with the appropriate safeguards, to provide consumers with adequate protection.

The PSD2 allows for the existence of PSPs that only provide PISs or AISs, without directly servicing payment accounts. Accordingly, the set of entities that are recognised as PSPs has been expanded, resulting in a complex landscape (see Scheme 1). PSPs are divided into two basic groups: those which service their customers' payment accounts, commonly known as "account servicing payment service providers" (ASPSPs), and TPPs which provide AISs or PISs, without servicing customer accounts.[15] The first group basically includes credit institutions and payment institutions, while in the second group, a distinction is usually drawn between payment initiation service providers (PISPs) and account information service providers (AISP). It is important to note, however, that ASPSPs may provide all manner of payment services, including PISs and AISs, and that TPPs may provide both payment initiation services and account information services, provided they comply with the applicable regulatory requirements (see Table 3).

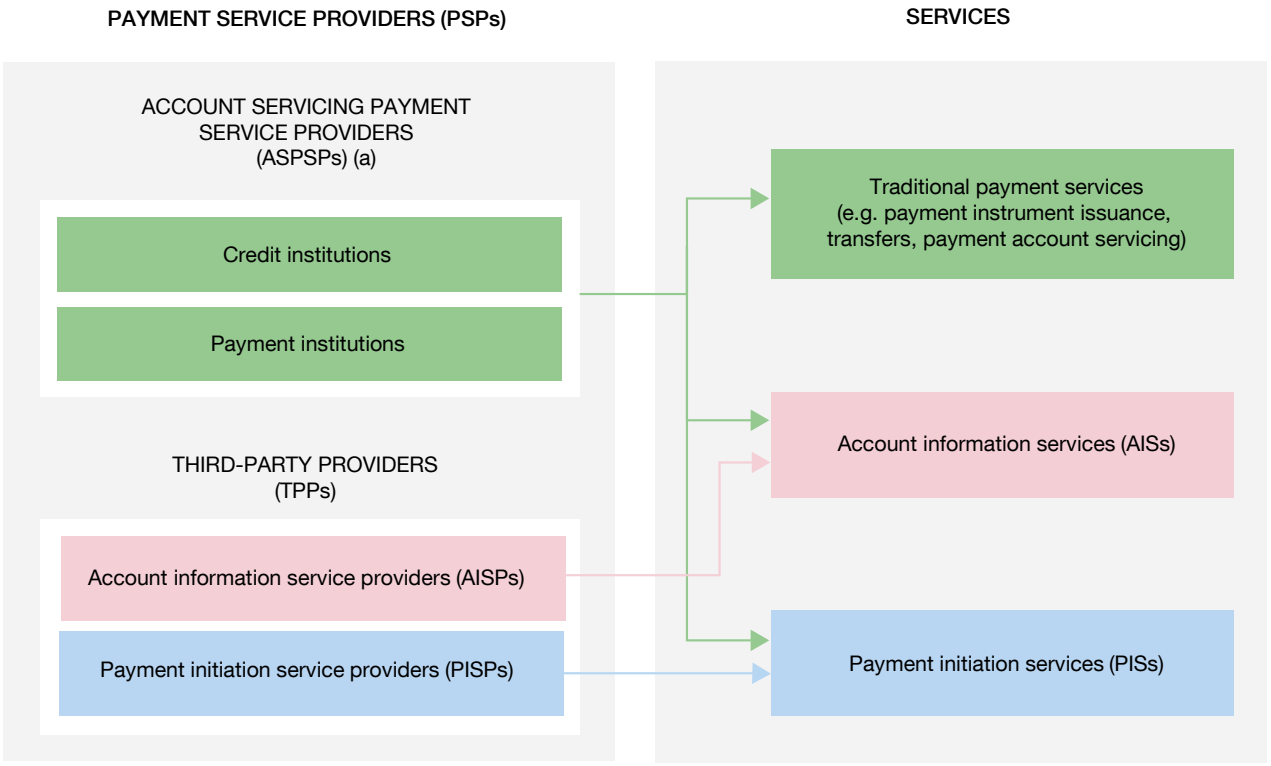
13 This is the way things are done for reasons such as maximising customers' user experience, commercial policy, reducing costs, ease of maintenance, application updating, etc.

14 Open banking can be defined [Brodsky and Oakes (2017)] as a collaborative model in which banking data are shared between two or more unrelated actors to provide services to the market. Although it is not strictly necessary, it is usually assumed that data exchanges between banks take place through application programming interfaces (APIs). APIs are standard communication interfaces that enable information to be exchanged between computer applications. This is dealt with in greater detail in the next section.

15 Some payment services, such as money remittance, for example, do not require the existence of payment accounts.

PAYMENT INSTITUTIONS AND SERVICES

SCHEME 1



SOURCES: European Payments Council and Banco de España.

a For the sake of simplicity, only the main categories of ASPSP are included (credit institutions and payment institutions). There are, however, other less significant institutions which may act as ASPSPs, such as, for instance, electronic money institutions and post office giro institutions.

The PSD2 sets out the prudential requirements for entities acting solely as PIS or AIS providers.[16] Owing to the limited activities carried out by these entities (and the risks inherent in them), these requirements are less stringent than those applicable to entities that service payment accounts. Table 3 provides a summary of the main requirements applicable to the various different categories of PSPs.[17]

The PSD2 also establishes the basic rules necessary to regulate the exchange of information between ASPSPs and entities providing AISs and PISs, which are summarised in Table 4. A fundamental aspect determining the interaction between these two groups of providers is the possible absence of a contractual relationship between them, since under the PSD2 a specific agreement between the account-servicing provider and the entity providing payment initiation or account information services is not required. Also, the latter entity will be entitled to use the authentication procedures that ASPSPs have provided to their own customers. In addition, the Directive does not allow unjustified discrimination against orders given by a user through a PISP or an AISP, in particular in terms of timing, priority and charges.

16 These requirements refer to payment service providers that are not subject to other prudential requirements owing to their nature, i.e. those applicable to payment institutions acting as ASPSPs.

17 In the case of ASPSPs, payment institutions are considered, since credit institutions are subject to stricter requirements owing to the wide range of services they provide.

PRUDENTIAL REQUIREMENTS UNDER THE PSD2 TABLE 3

Comparison between the requirements applicable to payment service providers that only provide payment initiation or account information services and those applicable to account-servicing payment service providers.

Criterion	ASPSP	PISP	AISP
Payment services	All	Payment initiation	Information on payment accounts and designated payment transactions
Possession of customer funds	Yes	No	No
Minimum capital (€)	125,000	50,000	No
Own funds	Yes	No	No
Professional indemnity insurance	No	Yes	Yes
Authorisation	Yes	Yes	No
Registration	Yes	Yes	Yes
Passport	Yes	Yes	Yes
Organisational requirements	All	All	Security and continuity-related only
Application of the PSD2	Yes	Yes	Limited: supervision plus information and security requirements
Possibility of exemptions	Yes, based on average value of payment transactions, with loss of passport	No	Yes, mandatory and without loss of passport

SOURCE: Banco de España.

As a result of the foregoing, ASPSPs are required to facilitate customer operations through PISPs and AISPs (which in practice act like direct competitors of ASPSPs), even if they are unable to receive any specific consideration for doing so.[18] This approach has very broad implications since, in the absence of a contractual relationship between an ASPSP and an AISP or PISP, the way in which these two groups of entities, often with conflicting interests, should exchange information sensitive for their common customer in a secure manner must be laid down in the PSD2 and its implementing regulations (RTS). The following sections analyse in greater detail how the PSD2 tackles this particular issue.

2.3 INTERACTION BETWEEN PAYMENT SERVICE PROVIDERS UNDER THE PSD2: DIRECT ACCESS VERSUS DEDICATED INTERFACE (API)

The situation described in the preceding paragraphs evidences the increasing importance of security-related aspects in the regulation in connection with access to payment accounts. For this reason, the PSD2 imposes the use of common and secure open standards of communication (CSC) for identifying entities, authenticating customers and notifying information, and for implementing the security measures that should govern relationships between the different payment service providers participating in a transaction. Thus, the aim is to ensure the integrity of funds, the confidentiality of information and the safeguarding of users' personalised security credentials.

However, the Directive does not prescribe a specific communication standard. Instead, it mandates the EBA to specify, in close collaboration with the ECB, the requirements to be met by such standards so that they are in line with the spirit of the Directive. The PSD2 only states that such standards must at least ensure the interoperability of different technological

18 ASPSPs must apply to TPPs the same conditions they would apply to their customers if the latter were carrying out the transaction directly rather than through an intermediate entity. Therefore, ASPSPs cannot charge TPPs additional fees and are obliged to provide services free of charge if the direct consultation of information or initiation of payment is free of charge for the customer, as is usually the case.

OPERATIONAL FRAMEWORK APPLICABLE TO PISPS AND AISPS

TABLE 4

Criterion	PISP	AISP
Service linked to existence of online accounts	Yes	Yes
Contractual relationship with ASPSP	No	No
Obligation to identify itself to ASPSP	Yes	Yes
Possibility of using credentials and authentication procedures provided by ASPSP	Yes	Yes
Obligation to use SCA	Yes	Yes
With dynamic element	Yes	No
Obligation to use CSC	Yes	Yes
Information and security credentials safeguard	Yes	Yes
Existence of a framework agreement with the payer	No	Yes
Possibility of access being refused by ASPSP	Only if there are objective and documented grounds	Only if there are objective and documented grounds
Discrimination between orders by ASPSP	No	No

SOURCE: Banco de España.

communication solutions and permit the use of all kinds of devices commonly used in the market in connection with payment services.

Conversely, the PSD2 does expressly address one of the most controversial aspects of the main method used to date to access payment accounts by a third party: TPPs "impersonate customers" using their personalised security credentials and gaining access to their accounts in the same manner and with the same permits as the account holders, without identifying themselves as a third party. To mitigate the risks associated with this practice, the PSD2 obliges PISPs and AISPs to identify themselves to the ASPSP every time they access a customer's payment accounts. However, it does not prescribe a specific access model. Under the RTS, such identification is to be through the use of qualified certificates for electronic seals or for website authentication,[19] which ensure the origin and authenticity of the data associated with a legal entity and authenticate the website linked to it, respectively.

However, the Directive does not expressly address the practice of "screen scraping", which therefore falls solely within the scope of the RTS on communication standards.

In light of this, the RTS do not impose a specific form of access, allowing both that known as "direct access" and the setting up of "dedicated interfaces".

– *Direct access* consists in the use by a TPP of the communication channel established by the ASPSP for its customers (usually an online banking application), which is the customary channel on which PISPs and AISPs have based their business models and which they have been using to date to access information on their customers' payment accounts using "screen scraping" techniques. A priori, this is the access most commonly preferred by TPPs,

19 The two certificates are defined by Articles 3(30) and (39), respectively, of Regulation (EU) No 910/2014 of the European Parliament and of the Council on electronic identification and trust services for electronic transactions in the internal market. (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2014.257.01.0073.01.ENG).

COMPARISON BETWEEN THE REGIME FOR ACCESS TO PAYMENT ACCOUNTS UNDER THE PSD2 AND THE UK OPEN BANKING INITIATIVE

TABLE 5

PSD2	UK Open Banking
It is mainly a **regulatory framework.**	It is mainly a **business philosophy.**
It is the tool chosen by the **European authorities** to integrate retail payments in the EU.	It is the path chosen by **UK authorities** to put an end to the retail banking status quo in the United Kingdom.
Its **main purpose** is to harmonise payment services in the EU, provide security in the payment chain and protect consumers.	Its **main purpose** is to increase competition in the banking industry, enhance efficiency and foster innovation.
To this end, it establishes the **security measures** for the provision of payment services, includes all **payment services** in the regulated perimeter and sets the prudential and operational requirements that must be met by **payment service providers.**	To this end, **access** by authorised third parties was first opened (March 2017) to certain **standardised information,** such as banking products and reference data and, subsequently (January 2018), to personal and SME **current accounts.**
This should lead to greater competition in equivalent conditions across the EU and, therefore, to innovative, efficient, convenient and secure **payment services and methods.**	The former enables the map of **retail banking products and services** (including payment products and services) in the United Kingdom to be traced; the latter enables: i) such products and services to be **personalised,** either by their first providers or by duly regulated third entities, and ii) initiation and information services to be rendered.
Based on a holistic approach to payment services, it regulates **access to payment accounts by authorised third parties,** whether to initiate payments or to obtain aggregated account information.	**Access** to current accounts by third parties is carried out through application programming interfaces **(APIs),** based on an **open standard** which governs the **secure** sharing of data.
It does not establish any specific form of **access** to payment accounts, but does set the **conditions** under which such access should take place; it is account payment service providers which determine access by third parties to payment accounts.	The **standard** was developed by the Open Banking Implementation Entity, which was founded in 2016. Its governance, composition and funding was determined by the UK authorities; the **nine** largest **banks and mortgage companies** in the United Kingdom participate in it and they are required to apply the standard.
The access conditions are set out in the RTS laid down by the EBA in collaboration with the European Commission. **All account servicing payment service providers** should provide a means to access payment accounts that meets these conditions, but no standard is specified. However, European authorities have shown their preference for the use of APIs for such access and they trust the industry as whole will design the **standards** accordingly.	The **design** follows the recommendations of the Open Banking Working Group and the applicable mandates of the PSD2.

SOURCE: Banco de España.

which were already providing these services before the implementation of the PSD2. A substantial change wrought by the PSD2 in the use of this channel is that TPPs are now obliged to identify themselves as such when gaining access to customer information.

– Access by means of a *dedicated interface* involves the development by the ASPSP of a specific communication channel for the TPP other than the online one used by the entity's customers. Although not specified by the RTS, the practical implementation of this option will generally be assumed to take place through application programming interfaces (APIs), the technique currently used by the industry for interconnection and development of applications.[20]

This lack of specification is precisely one of the most significant differences between the opening of payment accounts promoted by the PSD2 and the general concept of "open

20 APIs are a technique that enables two software applications to be connected to each other to access their functionalities by exchanging messages or data in standard format.

banking", which is strictly linked to the opening of accounts through data structuring and the use of standardised APIs. One of the most salient examples of open banking is the UK's open banking initiative. Table 5 briefly summarises the main differences and similarities between this initiative and the PSD2. Although the differences are mainly the result of the different objectives underlying the two operational frameworks, the similarities are such that they allow the PSD2 to be included in the broad concept of open banking.

In any event, and whichever the option finally chosen by an ASPSP to transfer data, it should allow for secure communication between the ASPSP and the TPP and, as noted previously, for the identification of third parties to the ASPSP. It should also permit the use of any authentication procedures implemented by the ASPSP. Additionally, since the access mechanism should be based on open, common and secure communication standards, the interfaces should follow communication standards issued by European or international standardisation organisations and their technical specifications should be documented and made available free of charge to the AISPs and PISPs at least six months[21] prior to the implementation date. The PISPs and AISPs will have in place sufficient mechanisms to validate their applications and programmes over an equivalent period of time.

2.4 THE DISCUSSIONS ON RTS AND CHALLENGES PENDING

The EBA has faced numerous difficulties setting the legal regime for access to payment accounts by PISPs and AISPs; reconciling the multiple and, on occasions, contradictory objectives pursued by the PSD2 has proven complicated.

From a technical viewpoint, the decision had to be made whether to draft highly detailed RTS, unequivocally strengthening the security of the standards (with the danger of linking RTS to a specific technology) or whether to formulate a number of broad, durable principles that would not prejudice innovation (at the risk of not sufficiently strengthening security). From the perspective of homogenisation, the choice was between precise regulation, ensuring an adequate degree of harmonisation at European level, and the introduction of more flexible standards, permitting the development of different payment solutions within the EU.

The main problems, however, have arisen due to the different approaches of the various types of suppliers and their conflicting interests. Given the direct competition between the agents involved, it was sought when drafting the RTS to find the best way of reconciling the legitimate interests of the PISPs and AISPs, on one hand, and of the ASPSPs, on the other. Moreover, regulations do not allow the relations between them to be adjusted contractually in order to establish appropriate security measures for the risks introduced or to agree appropriate consideration for access to a very costly infrastructure. This latter circumstance meant, moreover, that the PISPs and the AISPs were openly distrustful of any mechanism to access payment accounts other than the direct access the ASPSPs provide to their customers, since they considered that there were no incentives for ASPSPs to offer truly effective and operationally reliable solutions through purpose-designed APIs.

To dispel the above-mentioned distrust, the RTS explicitly provided that the dedicated interfaces would have to offer, at all times, availability and performance levels at least as high as those of the direct accesses (online banking interfaces), while introducing an

21 In the EBA's initial proposal this period was three months, which in the final resolution of the European Commission is maintained only for subsequent interface modifications.

obligation to monitor such levels and to make the resulting statistics available to the national competent authority. Also, dedicated interfaces were required to have contingency mechanisms equivalent to those of direct accesses, in case dedicated interfaces did not operate with the same levels of availability and performance as online banking interfaces.

However, PISPs and AISPs declared in various fora that these contingency measures might be insufficient. In their opinion, these proposals did no more than establish mechanisms to restore, without delay, the availability of the dedicated interface, without guaranteeing its proper functioning at all times and, as a result, could jeopardise the continuity of the activity of PISPs and AISPs. This view was shared by the European regulator, which, as a result, opted to include in the RTS measures to encourage ASPSPs to implement truly efficient dedicated interfaces.

Consequently, the European Commission promoted inclusion among the contingency measures[22] of the so-called fall-back mechanism, which enables PSPs and AISPs to make use of direct access via the interfaces that ASPSPs offer their customers directly through online banking, in the event that the dedicated interface does not function correctly. The problem with this proposal is that its mere existence is a powerful disincentive to dedicated interfaces being developed, as it means that ASPSPs will not only have to implement the specific relevant interfaces but will also have to adjust their online banking interfaces to the provisions of the RTS should they have to be used by PISPs or AISPs under the fall-back mechanism.

To avoid these collateral effects, the European Commission has contemplated the possibility that national competent authorities may, after consulting the EBA, exempt ASPSPs from the obligation to adapt their online banking interfaces (direct access) to the rules laid down in the RTS, provided that they fulfil certain requirements. Notable among these are that dedicated interfaces must be designed and tested to the satisfaction of PISPs and AISPs, and used for at least three months to verify that any incidents are resolved without undue delay.

The European Commission's solution seeks to balance the interests and obligations of the two parties, but its practical implementation poses some significant challenges. On one hand, the RTS lack a desirable level of detail on questions such as key performance indicators, objective service levels and the requirements that dedicated interfaces must satisfy to be exempt from the implementation of the fall-back mechanism. This lack of precision is exacerbated by the fact that the evaluation of performance and service level compliance is performed by the parties in conflict (ASPSP, PISP and AISP), to whose satisfaction it must be possible to validate the dedicated interfaces.

The EBA is working on guidelines on the conditions to be met to enable the exemption from the obligation to adapt online banking interfaces to the rules laid down in the RTS to be granted. The aim is to mitigate the lack of detail mentioned above and, at the same time, to facilitate the necessary prior consultation by the national competent authorities so

22 According to the RTS, the contingency measures must be activated when the functioning of the specific interfaces is not in line with the RTS requirements or when such interfaces are not capable of attending to five consecutive access petitions within 30 seconds. For the purposes of evaluating the functioning of the specific interfaces, ASPSPs must define fully transparent key performance indicators, as well as objective service levels, that must be at least as stringent as those for online banking interfaces. The interfaces, indicators and objectives must be monitored by the authorities and submitted to stress tests conducted by ASPSPs.

that ASPSPs may be exempted from implementing the fall-back mechanism. To this end, on 13 June 2018 the EBA published the relevant consultation document, inviting all interested parties to submit any comments they might deem appropriate.[23]

However, these guidelines will not be sufficient to mitigate a second factor of uncertainty arising from the lack of specification of common and secure open standards of communication satisfying the requirements laid down in the RTS. This means that ASPSPs do not have valid references when designing the dedicated interfaces, which may hamper the rollout of effective solutions consistent with the RTS in a time and resource-limited environment.

As if that were not enough, the lack of detail in the RTS on the access of PISPs and AISPs to payment accounts via online banking interfaces (direct access) is another significant obstacle to implementation of the RTS. In this respect, the RTS merely recall that these suppliers must take all measures necessary to comply with the operating restrictions imposed by the PSD2 and, in particular, the ban on accessing, storing or processing customer data for a purpose other than the service contracted. No specific measures are offered to ensure compliance beyond some provisions relating to transaction recording and notification. One foreseeable consequence will be that, insofar as screen scraping continues to be a habitual access method, compliance with the requirements of the PSD2 by PISPs and AISPs will depend on self-imposed restraint by the latter.

Mindful of these problems, the European Commission has promoted the creation of an analysis group with representatives from all the relevant parties. The aim is to establish the basic functionalities that must be met by APIs for which validation of adaptation to the RTS is sought. For this purpose, among other initiatives, the group intends to informally review the technical specifications of some standardised pan-European APIs. This will provide a reasonable number of standards in line with the requirements of the RTS and PSD2 that can serve as a reference for the ASPSPs and for the respective national authorities.

The European Commission trusts that this analysis group will be able to complete the RTS effectively and consensually, fostering the widespread implementation of dedicated interfaces based on a limited number of standardised APIs. This would ensure the eradication of screen scraping and, moreover, lay the foundations for extensive use of a business model truly based on an open banking environment, albeit limited to payment accounts. In addition, this would help ensure compliance with other regulatory provisions, in particular those relating to data protection.

However, the experience of the work carried out here by the Euro Retail Payments Board[24] highlights the difficulties involved in reaching agreement in areas as important as the

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23 This consultation document is available at: https://www.eba.europa.eu/regulation-and-policy/payment-services-and-electronic-money/guidelines-on-the-conditions-to-be-met-to-benefit-from-an-exemption-from--under-article-33-6-of-regulation-eu-2018/389-rts-on-sca-csc-.

24 The Euro Retail Payments Board (ERPB) was created in December 2013 by the ECB to replace the SEPA Council, with the aim of promoting an integrated, innovative and competitive market for retail payments in euro in the European Union. At the end of 2016, the ERPB decided to set up a working group on payment initiation services which presented its final report in November 2017. This report is available at: https://www.ecb.europa.eu/paym/retpaym/shared/pdf/8th-ERPB-meeting/PIS_working_group_report.pdf?483e4d28242cd84322850a01e549d116.
As regards the technical aspects of APIs, the work of this group is being continued by the analysis group promoted by the European Commission,
A second report by this group, relating to other requirements necessary for European integration of payment initiation services, may be consulted here: https://www.ecb.europa.eu/paym/retpaym/euro/html/index.en.html.

treatment of the consent of the payment account holder, the sphere in which customer authentication should occur, the information that the ASPSP must provide to the PISP, the combined provision of payment initiation and account information services or key indicator identification.

In order to ensure smooth implementation of the RTS, the analysis group promoted by the European Commission must not only be capable of completing this work but also of aligning its interpretations with those of the national authorities and of the EBA in the area of their respective competencies. For there to be a chance of success of the RTS and, therefore, of the basic aspects of the new regulation of payment services in Europe, these ambitious objectives must be achieved.

Lack of agreement in this group would lead to a proliferation of divergent solutions that would enormously hamper both the implementation of the RTS and the harmonisation of payment services in the EU. If, on the other hand, the group successfully completes its work, the RTS will be an effective instrument to accommodate reasonably and adequately the significant biases and commitments imposed by the PSD2 and to ensure that the industry works together on matters that, apart from being fundamental to its daily operations, are strategic for its future.

3 The possible impact of the PSD2

Having analysed the main payment services digitalisation trends and the complexity of the PSD2, it is now time to evaluate the possible impact of these changes on the future structure and configuration of the market. Naturally, it is impossible to anticipate the precise scale of this transformation, especially when many of the regulatory changes still lack the necessary detail. However, it is possible to identify some underlying trends on the basis of which potential scenarios can be envisaged, along with their foreseeable implications for the different types of suppliers.

One of the characteristic features of the new digital environment for payment services is the increasing disconnect between payment account servicing and access to information on the transactions made with such account. The opening and servicing of payment accounts (mostly bank accounts) is a stringently regulated activity because, as public funds are involved, they have to be safeguarded. Traditionally, ASPSPs and the customer account holder have been the only parties to whom such transactions are visible, meaning that payment service provision required a direct commercial relationship between them. However, the popularisation of online payment solutions, based on card use and integrated into merchants' web portals, has contributed to weakening this link, although the underlying relationship remains very much present.

The application of the PSD2 can be expected to accentuate such disconnection, as it recognises the possibility of establishing an intermediary (a PISP) that interacts, on the customer's behalf, between the customer and the account-servicing payment service provider. AISPs will also be able to access customers' payment accounts and interact directly on their behalf with diverse entities.

As mentioned in the preceding section, the consequence of this regime is that intermediate entities may now establish a direct relationship with customers, thereby gaining access to data of undoubted commercial value, without having to bear the burden associated with the servicing of payment accounts, such as infrastructure maintenance and improvement, consumption of own funds, IT security costs, regulatory compliance, etc. This asymmetry seeks to foster competition within the payments industry and, as a result, its efficiency and

modernisation, but it needs to be scrutinised to avoid situations in which intermediate entities have unjustified competitive advantages.

This system of openness to authorised third parties is, in turn, the cause of a potential conflict between the growing interest in improving the protection of personal data (something the PSD2 reflects in its provisions on security) and the aspiration of fostering innovation and competition in the payment services space. Both banks and other payment service providers are obliged to comply with increasingly stringent data protection rules[25] and with the requirements arising from the PSD2 and its implementing regulations. Accordingly, there is a clear need to ensure that information of a personal nature supplied by an account-servicing payment services provider to a PISP or an AISP is treated securely and that data protection regulations are fulfilled.

In this context, in their account-servicing role, banks point to serious difficulties in being able to establish the necessary safeguards to ensure that third parties treat such information on the terms requested by customers. Among other reasons, this is because of the lack, as mentioned above, of a direct contractual framework between the parties that clearly defines their obligations. Given the responsibilities of ASPSPs arising from data protection regulations, the industry is thus exposed to a highly complex situation, necessitating a detailed analysis of its implications, possible guidelines and the cooperation of the various competent authorities.

Finally, the information-sharing regime advocated by the PSD2 is still rather asymmetric. The directive establishes that information on payment accounts should be accessible to third parties, although it confines its storage, consultation and use exclusively to the provision of the payment service envisaged (i.e. in the terms in which the latter is regulated). That said, the directive does not prevent, with the customer's explicit consent and irrespective of the payment service concerned, the simultaneous collection of this same information for other purposes.

Also, insofar as third-party providers do not, in turn, service payment accounts (as is the case of AISPs), they are under no obligation whatsoever to share with ASPSPs or any other interested third party the content of their respective databases.[26] This lack of reciprocity may, in turn, lead to greater concentration of the "market for data" owing to the presence of economies of scale and network effects in this area. Consequently, the tensions generated by this situation will foreseeably force a discussion in future as to whether similar rules to those of the PSD2 should be established in other areas unrelated to payment services. Until this occurs, the scenario described above may lead to competitive disadvantages for ASPSPs vis-à-vis other suppliers.

As mentioned, it is difficult to anticipate clearly the implications of the PSD2, although some preliminary comments can be made, taking into account the heterogeneity of the various types of supplier, which we have so far referred to as predominantly homogeneous groups.

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25 The basic legislation is Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC.

26 This is particularly important in the case of large technology businesses that have chosen to operate as AISPs and that have a large customer database and extensive commercial information on their customers to be expanded on the basis of these new inputs.

Considering, first, account-servicing payment service providers (ASPSPs), banks clearly have a hegemonic position in this group, although it seems that not all banks are reacting in the same way to the PSD2 changes. Some traditional banks,[27] especially the small and medium-sized ones, will foreseeably not change their competitive behaviour and will react passively to the PSD2, introducing only those changes essential for compliance with the directive. This type of bank will restrict itself to transmitting to authorised third parties the payment account information that their customers wish to hand over to these new suppliers. It seems likely that these banks will not develop a specific API to facilitate the data transfer, but will allow the electronic banking channel they offer to their customers to be used.

On the other hand, other banks, possibly the largest and the recently created ones (internet banks without branches), may see the PSD2 as an opportunity. In consequence, although they will be ASPSPs vis-à-vis third parties, as required by the directive, they may also consider the possibility of acting as authorised third parties to obtain account data or to initiate payments in the accounts of their customers (old and new) at other banks. As ASPSPs, they will foreseeably develop dedicated interfaces, based on APIs, to improve the security and efficiency of data transmission. Conceivably, too, this type of bank will strive more to improve the on-line payment experience, adapting its communication interfaces with customers and successfully maintaining its links with them.

As for providers of payment initiation or account information services (TPPs), even greater heterogeneity is discernible, with three major categories distinguished. First, there would be small companies dedicated solely to providing payment initiation or account information solutions. The greatest challenge and limitation for this type of entity will foreseeably be the initial lack of a customer database, which may mean that they base their business model on providing a specific service or a specific technological solution covering specific gaps in the market.

Second, it is possible that large technology businesses (sometimes known as Big Tech), with a broad customer base and an extensive catalogue of non-financial services, may show interest in acting as account information service providers or payment initiators. The cost of obtaining a licence to provide account information services would be minor for these companies and, in exchange, would allow them to combine the considerable data they already have on their customers' tastes and preferences with financial data on their payment accounts. The latter, combined with the use of advanced analytical techniques, could help widen and improve the range of products and services offered to their customers, including, moreover, the experience of payment on their platforms when they choose to apply for a licence as a PISP. In this case, the provision of payment services could be the first step towards growing involvement in financial services.

Finally, as already noted, it should be borne in mind that there is no restriction on banks themselves acting as providers of account information or payment initiation services. In principle, banks may provide these types of services to try and retain and boost the loyalty of their customers, but also to gain market share, attempting to win customers from other banks.

The interactions between these groups of ASPSPs and TPPs will necessarily be complex, and it is difficult to anticipate the final scenario when there is still no clarity on some

27 Those other than digital banks, set up specifically to operate via the internet (also known as challenger banks).

important aspects of the PSD2. The final outcome will depend on diverse factors such as the nature of each country's banking structure, the appetite for innovation of its banks, the number and size of the banks interested in entering the market as authorised third parties, the loyalty of bank customers and, where applicable, the possible regulatory response.

In any case, the most likely outcome is that a situation will arise in which some banks will adapt and be capable of prospering in the new environment, while others have difficulty maintaining a fluid relationship with their customers. As regards new entrants (small start-ups), given the challenge posed by their limited customer base, they may form alliances with banks. However, the large technological platforms are the big unknown in this equation. If they are capable of harnessing the opportunity before them, these emerging actors will be called upon to be the main competitive threat to traditional banks, with a serious potential to transform the financial sector as hitherto known.

4 Conclusions

Today, the rate and depth of financial innovation are closely linked to the intensive application of new technologies, both as regards the design and provision of typical banking products and services, and how the processes and procedures needed for their marketing and support are organised and implemented.

The payment services industry has, so far, been the most visible outlet for most of these changes. Even so, this may still be the area liable to see the most far-reaching changes in the immediate future. With the PSD2 as prime example, the regulator has not wished to limit the competitive pressures currently on the industry, but, on the contrary, to enable broad access, by authorised third parties, to payment accounts that have been serviced mainly by banks.

Hence the use of customer information, the strategic nature of which remains intact, ceases to be an exclusive prerogative of banks, becoming – with the appropriate guarantees – more universal, and benefiting the customers themselves and society as a whole.

A scenario of uncertainty is opening up for traditional banks. As on many occasions in the past, they will have to find the most appropriate formula to mitigate the risks associated with the new reality and to make the best possible use of the major opportunities offered. The biggest challenges for banks are redefining business models and cooperating with new agents, along with the potential threat from big tech. These factors will set the pace of change, which will, without a doubt, leave a profound mark on the financial services markets.

Glossary of terms

AIS: Account Information Service

AISP: Account Information Service Provider

API: Application Programming Interface

AS-PSP: Account-servicing Payment Service Provider

B2C: Business-to-Consumer

CSC: Common and Secure Communication

ERPB: Euro Retail Payments Board

PIS: Payment Initiation Service

PISP: Payment Initiation Service Provider

PSD1: Directive 2007/64/EC of the European Parliament and of the Council of 13 November 2007 on payment services in the internal market, amending Directives 97/7/EC, 2002/65/EC, 2005/60/EC and 2006/48/EC and repealing Directive 97/5/EC

PSD2: Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC

PSP: Payment Service Provider

RTS: Regulatory Technical Standards

SCA: Strong Customer Authentication

TPP: Third-Party Provider

TRA: Transaction Risk Analysis

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VIRTUAL AND LOCAL CURRENCIES: ARE PARACURRENCIES THE NEW FORM OF MONEY?

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VIRTUAL AND LOCAL CURRENCIES: ARE PARACURRENCIES THE NEW FORM OF MONEY?

The phenomenon of virtual and local currencies, which we will call "paracurrencies" in this paper, is not new. However, in recent years, new technological developments have encouraged their development and have led to them becoming widespread at global level. This increasing expansion and the potential money substitution effect of these currencies have prompted regulators and supervisors to begin to pay particular attention to them.

Currently, despite the initial intentions that they might have to substitute money, they cannot be considered as money and they will not foreseeably replace money in future. Nevertheless, the increasing popularity of paracurrencies could lead to a rise in the risks to the financial system. The identified risks to the stability of the financial system are limited for the moment, since paracurrencies are not widespread and their connection with the financial system is limited. However, the risks for consumers can be significant, even when they are used within a limited scope, as is the case at present.

Supervisors' and regulators' efforts to date have focused on the assessment of the phenomenon and the monitoring of these risks, with the purpose of evaluating whether to adopt measures to mitigate them and the advisability or not of developing a specific regulatory framework for paracurrencies.

1 Introduction

In recent years there has been a proliferation of the issuance and use of the so-called virtual and local "currencies". To avoid confusion with any notion of money, they can also be called jointly, "paracurrencies". In most jurisdictions they do not have legal coverage and are potential replacements for money, although they only partially fulfil the characteristic functions of money, broadly speaking, in its various physical and electronic forms; these being to act as a medium of exchange, as a store of value and as a unit of account.

It is precisely the growing, albeit still limited, expansion of virtual and local currencies, and their potential money substitution effect, which has prompted regulators and supervisors to begin to pay more attention to both phenomena. In other developed countries and international institutions efforts are currently focused on accurately evaluating the attendant risks with a view to possibly adopting measures centred on mitigating them and evaluating the possibility of regulation in the future, or the possible regulation of some of the more significant or problematic aspects of virtual and local currencies.

To this end, Section 2 first defines conceptually the rather ambiguous notions of "virtual currency" and "local currency", marking the boundaries between them and the various other forms of money: commodity money, central bank money, cash, scriptural money and e-money. Next, Section 3 aims to determine more precisely the nature of virtual and local currencies, attempting to specify their characteristics and underline the differences between them; it is only possible to do so in general terms, given the diversity of the existing types of these currencies, each having their own particular features. Section 4 looks at the similarities and differences between these currencies and money. Section 5 provides a systematic summary of the risks of issuing and using paracurrencies for financial stability and consumers. Finally, Section 6 describes the measures adopted to date by the authorities and outlines certain possible regulatory actions in relation to both virtual and local currencies.

2 Identification of the types of money

It is difficult to pinpoint the moment in history when the monetisation of society occurred, although it seems that as early as approximately 2200 BC payments were made using some type of money. That embryonic money, initially of very limited scope, was "commodity money", namely an object with an intrinsic value (cattle, seeds, etc. and later gold and silver) which facilitated trade in goods and services.

Around the 18th century the use of money issued with the backing of a commodity ("fiduciary money") became widespread; it consisted of representative elements of that underlying asset (e.g. gold certificates). These documents, that lacked intrinsic value, but which were backed by the attendant commodity, could be exchanged for a fixed amount of the underlying commodity and, consequently, the advantages of the transferability of money and of the possibility of sending or moving amounts of money from one place to another were added. The international monetary system was based on "fiduciary money" until 1971 when the United States decided to abandon the Bretton Woods agreement of 1944 and the dollar, the international benchmark currency, was no longer convertible into gold.

Since the gold standard was abandoned, economies have been based on so-called "fiat money", which in appearance is similar to money backed by a commodity (or "fiduciary money") but conceptually it is very different since the holder is not entitled to the reimbursement of any commodity. Thus, "fiat money" is like any other legal tender designated as such and issued by a central authority,[1] whose only backing is the confidence in that central authority. Individuals are willing to accept it in exchange for the delivery of goods or the provision of services simply because "they trust" that central authority. Consequently, all "fiat money" systems turn purely on public confidence, which is also the basis for fiat money being widely accepted in society.[2]

Irrespective of the form adopted by money, the latter has been associated traditionally with the fulfilment of three different functions:

- *A medium of exchange.* Money is used as an instrument of exchange in trade, so as to avoid the disadvantages of a barter system (the needs of two parties to a transaction and the amount of what is provided and the consideration coincide).

- *A unit of account.* Money operates as a standard numerical unit to measure the value and cost of goods, services, credit claims and debts.

- *A store of value.* Money retains a certain value (not necessarily invariable) over time and thus can be saved (or stored) for use by the holder at a future point in time.

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1 In pure terms, a central bank, which calculates the money that should be put into circulation, and private banks, which create money through loans extended to the public, intervene in the money creation mechanism. For more details see McLeay et al. (2014).

2 Note that economic literature does not always attribute the same meaning to the concept of "fiduciary money":
i) occasionally it seems to be used merely as a synonym of what we have called here "fiat money" (perhaps as a consequence of the English term "fiat money" having being translated interchangeably as "fiat money" or "fiduciary money");
ii) at other times its meaning is more generic, comprising both "fiat money" and money backed by a commodity;
iii) lastly, it can also be understood as referring solely to money backed by a commodity (and, therefore, the opposite to what we have called "fiat money"). In order to avoid ambiguity, this criterion was chosen with the result that "fiduciary money" and "fiat money" are treated as two separate concepts.

MONEY AND OTHER SIMILAR FORMS TABLE 1

With physical backing		
Commodity money		
Fiduciary money		
Without physical backing		
With the backing of a state central authority	Funds (Article 2(15) of the Payment Services Law)	Cash
		E-money
		Scriptural money (deposits at credit institutions)
	Deposits at central banks	
Without the backing of a state central authority	Virtual currencies	
	Local currencies	

SOURCE: Devised by authors.

Thus, money is a social institution which has been created and shaped according to society's needs and has evolved and adapted over time. Logically, recent technological innovations (the internet, telecommunications, etc.) have had a particular impact on these developments and are not immune to the emergence of modern forms such as e-money and also the above-mentioned proliferation of virtual and local currencies.

In order to better understand the terms used, it is useful to define conceptually the various forms of money according to the EU and national legal provisions in force. We can perform an initial basic classification of money – understood in a broad sense – based on how issues are backed (commodity-backed money as compared with unbacked money). In turn, money not backed by a commodity can be subdivided into regulated money, with the backing of a central authority, and unregulated money, which comprises local and virtual currencies.

Thus, using this approach we can distinguish:

– *Commodity money.* Although strictly speaking there is no legal definition, commodity money means an asset which has an intrinsic value and this value is the same as a monetary unit and as a commodity (gold, precious stones, etc.). The commodity chosen as money should have the qualities of being lasting, transferable, divisible, homogeneous and of limited supply (usually commodities).

– *Central bank money.* A concept not defined legally, it comprises cash, as a whole, and the accounts opened by the central bank for its customers. Note that the accounts opened at the central bank are typically only available to certain institutions and can be used to make interbank payments but they are not accessible to the general public.

– *Funds.* Article 4(25) of Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market and Article 2(15) of Law 16/2009 of 13 November 2009 on payment services define the term "funds" as, "banknotes and coins, scriptural money or electronic

money [...]", i.e. as a term comprising the three concepts delimited below: cash, scriptural money and e-money.

- *Cash (banknotes and coins).* According to the provisions of Articles 10 and 11 of Council Regulation (EC) No 974/98 of 3 May 1998 on the introduction of the euro, and Article 3 of Law 46/1998 of 17 December 1998 on the introduction of the euro, banknotes and coins denominated in euro are the only banknotes and coins with the status of legal tender in Spain and, therefore, the full power to discharge debts (Article 1170 of the Civil Code). In Spain, therefore, "cash" (euro banknotes and coins) are the "legal tender".

- *Scriptural money.* A term not legally defined which means the equivalent of "commercial bank money" or "bank money", but which is different to e-money. This refers to the balances held in deposit accounts at commercial banks which are reimbursable on demand: these balances can be transferred from one individual to another through money transmission services, such as credit transfers, direct debits or card payments. The notion of scriptural money coincides with sight deposits held by the public at credit institutions.

- *E-money.* As provided in Article 2(2) of Directive 2009/110/EC of the European Parliament and of the Council of 16 September 2009 on the taking up and pursuit of the business of electronic money institutions, and the transposition by Article 1(2) of Law 21/2011 of 26 July 2011 on electronic money, electronic money is defined as, "electronically, including magnetically, stored monetary value as represented by a claim on the issuer which is issued on receipt of funds for the purpose of making payment transactions as defined in Article 2(5) of Law 16/2009 of 13 November 2009 on payment services, and which is accepted by a natural or legal person other than the electronic money issuer".

– *Paracurrencies.* A general term with which we will designate virtual currencies and local currencies.[3] Given the absence of widely accepted definitions and the range of existing models, nowadays the difference between them is not clear; a single scheme may have the features associated with local and virtual currencies.

3 Paracurrencies: concept and scope

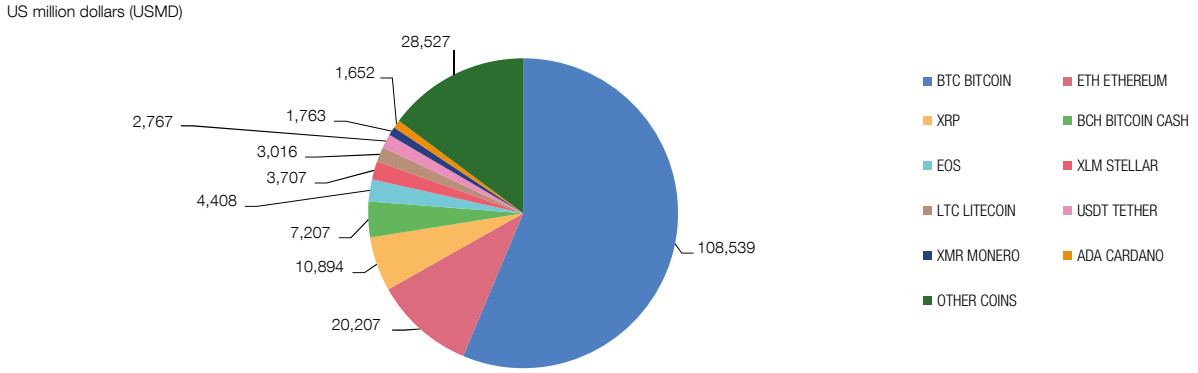
Virtual and local currencies are characterised more precisely below with a view to addressing the risks which they pose and their regulatory treatment in the following sections.

3.1 VIRTUAL CURRENCIES

Virtual currencies are not a new phenomenon but until a short time ago their issuance and exchange were usually restricted to only one entity and the scope for using them was very limited (for example, on-line gamers or certain platforms' or companies' customers). However, recent technological developments have permitted the emergence of numerous virtual currencies which generally use decentralised methods of issuance and exchange and have a global reach via the internet.

3 Strictly speaking, we would also have to include closed-loop paracurrencies which can only be used to acquire goods and services in the issuer's distribution channels (for example, the use of air miles, loyalty points or on-line games). Due to its limited scope, this type of paracurrencies is of scant interest for the purposes of this paper and, consequently, it has been excluded from our analysis.

MARKET VALUES OF THE TOP TEN VIRTUAL CURRENCIES CHART 1



SOURCE: https://coinmarketcap.com.
NOTE: Data from 1 September 2018 in US million dollars (USMD).

This type of virtual currency which does not have a specific issuer and is not subject to centralised control, but is distributed and based on cryptography is called "cryptocurrency". The most notable example is the bitcoin which uses a registration and transfer mechanism based on Distributed Ledger Technology (DLT). DLT allows the decentralised recording of the history of bitcoin transactions. The ledger consists of a database shared by all users, in which the transactions are entered and users are responsible for verifying the transactions and receive virtual currencies as a compensation for the verification cost (mainly hardware and electricity). There is no central body which takes responsibility for verification of the transactions.

In fact, the underlying technology of these virtual currencies, the distributed ledgers, transcends the environment of the currencies themselves and is a field for development which, albeit incipient, in certain financial areas could lead to significant efficiency improvements.

The debate prompted by this new technology has even given rise to several countries currently considering the possibility of issuing central bank money in a digital format which is accessible to the general public. This issue, which has proponents and detractors, is currently subject to intensive doctrinal discussions. In any event, this paper does not examine in depth the possible applications of decentralised ledgers in the financial sectors and, similarly, does not address their application to a virtual currency issued by a central bank or the general problems of an issue of this type.

Today there are more than 1,500 virtual currencies in circulation, each with their own features, and their total market capitalisation in September 2018 amounted to slightly less than $200 billion.[4]

In the absence of a legal definition there was a prolific discussion about whether virtual currencies were a medium of exchange or a means of payment. In 2014 the European Banking Authority (EBA) considered them to be medium of exchange:[5] "a digital representation of value that is neither issued by a central bank or public authority nor

4 Source: https://coinmarketcap.com/ consulted on 1 September 2018.
5 See EBA (2014).

necessarily attached to a FC [fiat currency], but is used by natural or legal persons as a means of exchange and can be transferred, stored or traded electronically". However, subsequently, the Court of Justice of the European Union[6] compared the bitcoin virtual currency to a means of payment, since it considered that it had no other purpose than to be a means of payment and that it was accepted as such by certain operators. This issue is not trivial from a regulatory standpoint, given that whether prior authorisation is needed to issue a virtual currency may depend on this consideration.

Recently, with the approval of Directive (EU) 2018/843 of the European Parliament and of the Council of 30 May 2018 (5AMLD) amending Directive (EU) 2015/849 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing (4AMLD), providers engaged in exchange services between virtual currencies and fiat currencies, and custodian wallet providers were included in the scope of the latter directive.

In an initial draft of this directive, the European Commission had suggested considering virtual currencies as a means of payment. However, following a dissenting opinion issued by the European Central Bank (ECB), a definition of virtual currencies was finally included in the text of the directive which treats them as a medium of exchange since it considers them a "digital representation of value that is not issued or guaranteed by a central bank or a public authority, is not necessarily attached to a legally established currency and does not possess a legal status of currency or money, but is accepted by natural or legal persons as a means of exchange and which can be transferred, stored and traded electronically". It is stated, furthermore, that they are not deemed to be funds, as defined in Article 4(25) of Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015, nor are they deemed to have a monetary value stored in excluded instruments, as specified in Article 3(k) and (l) of this directive.[7]

Although the key issue during the legal passage of the 5AMLD was, as far as virtual currencies are concerned, whether they are considered a means of payment or a medium of exchange, it was also underlined that the main difference between this type of currency and e-money is their different level of connection with "fiat" money: while e-money can be considered in a sense as another form of legal tender, virtual currencies do not have that direct relationship with the latter.

3.2 LOCAL CURRENCIES

There is no legal concept to encompass "local currencies", "local area currencies" or "social currencies" either. Based on their different forms, we can typify them generally as complementary or alternative media of exchange to legal-tender means of payment which are accepted and used voluntarily in a limited (territorial or sectoral, etc.) area. They may have a physical or digital representation.

The main objective usually pursued by local currencies is to encourage economic activity within a geographical area or specific group so that a substantial portion of spending is undertaken within that community. There are various mechanisms to incentivise their use by consumers (for example, applying discounts to the acquisition of local currency or to purchases made in local currency). Similarly, one characteristic that local currencies can

6 Judgment C-264/14 of 22 October 2015 on the treatment for Value Added Tax purposes of the exchange of bitcoin for traditional currencies.

7 Since virtual currencies are conceived to be a medium of exchange – not a means of payment – and are explicitly denied the legal status of currency or money, this emphasises that they do not have one of the characteristics inherent to legal tender, such as the power to discharge bearer debts.

be given to encourage this spending is depreciation (the so-called "demurrage") which in certain cases means the value of the local currency falls as from a certain date or expires in full.[8]

Throughout history different systems or models have been developed with the aim of becoming complementary or alternative media of exchange to legal-tender means of payment. Especially in times of economic recession (such as at the end of the 19th century and during the interwar period in the 20th century), diverse local currency systems proliferated in some countries. These schemes, operating within defined territorial areas, to varying degrees of success and of mixed duration, sought to act as a channel for payments made in a specific region, district or town.[9] In all of these cases, the purpose and aims pursued with the implementation of such currencies was to prompt the general public to focus their spending on that geographical area, fostering among them a greater sense of belonging and commitment to the local community and contributing, likewise, to money circulating more rapidly in that area so as to stimulate demand and achieve higher economic growth within that territorial area of reference.

The functioning of local currencies generally met the needs of a model in which participants (the general public and retailers) could request to voluntarily become a member of the scheme, with the result that once they had joined, they could exchange legal tender for the local currency (usually at a parity of one to one). In many cases, this local currency was considered a "voucher" which was issued on paper and could be used to pay for goods and services acquired within the network of all the participants. Local currencies which function according to the scheme described currently exist in several European countries.[10]

Note, however, that these currencies are not regulated by law insofar as they are the result of an agreement by a relatively limited specific group of individuals which is ready to accept them as a means of payment for transactions carried out between them. The only existing regulatory reference we can find is in Directive (EU) 2018/843 of the European Parliament and of the Council of 30 May 2018 (5AMLD) amending Directive (EU) 2015/849 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing (4AMLD), which is limited simply to clarifying in Recital (11) that, "Local currencies, also known as complementary currencies, that are used in very limited networks such as a city or a region and among a small number of users *should not be considered to be virtual currencies*". Aside from this exclusion and the general description above, it is not possible to find a legal definition of local currencies.

The application of new technologies has made it possible to issue local currencies in digital format. Consequently, the distinction between local and virtual currencies appears to be more diffuse since both are alternative digital media of exchange to legal tender (although local currencies are usually characterised by being centralised with a scope limited to a geographical area or a specific group, whereas the majority of virtual currencies are decentralised and global in nature).

8 For example, the Stroud pound depreciates by 3% every six months and the Lewes and Bristol pounds have an expiry date.

9 The local currency brought into circulation during the interwar period in Wörgl, Austria to rekindle the local economy, which has subsequently inspired other similar models, is paradigmatic in this sense.

10 See Naqvi and Southgate (2013).

CHARACTERISTICS OF MONEY AND OTHER SIMILAR FORMS TABLE 2

	Cash (coins and banknotes)	Deposits at commercial banks (scriptural money)	E-money	Virtual currencies	Local currencies
Legal-tender means of payment for the discharge of debts	Yes	No	No	No	No
Issuer	Central bank	Credit institutions	Credit or e-money institutions	Generally decentralised	Generally centralised
Scope	Global	Global	Global	Global	Limited
Physical or digital representation	Physical	Digital	Digital	Digital	Physical or digital
Management	Centralised	Decentralised	Decentralised	Generally decentralised	Generally centralised
Immediate reimbursement	Yes	Yes	Yes	Not in general	Not in general
Existence of a general regulatory framework	Yes	Yes	Yes	No	No

SOURCE: Devised by authors.

4 Similarities to and differences from money

Having defined the concepts of virtual and local currencies, Table 2 shows their main characteristics in accordance with various assessment parameters.

Both virtual and local currencies aim to fulfil, to some extent, the functions traditionally associated with money (to serve as a medium of exchange, a store of value and unit of account), but at present they only achieve these objectives in a very limited way. Both currencies are designed to be used as a medium of exchange (at least within their respective scopes of use) and can likewise serve as an instrument in which a value is stored. With these objectives, they are homogeneous and fungible and divisible without loss of value, like cash.

However, despite any pretensions they may have to replace money – and their misleading name in this sense ("currencies") – they can neither be considered as money nor will they foreseeably replace legal tender in the future, given their marked limitations.

Thus, in the case of virtual currencies, their possible function as a unit of account and medium of exchange is rather mediocre both on account of their limited acceptance for making retail payments[11] and the high cost of those "payments", as well as on account of their volatile and unforeseeable value, which makes it extremely difficult to set prices in these currencies. Given their very high volatility they are not very reliable either as a store of value towards which the general public can channel their savings. Furthermore, their lack of both an intrinsic and extrinsic value (since they are not backed by any authority) also makes it difficult for them to comply with the functions of money. In fact, virtual currencies have begun to be used increasingly frequently as investment instruments, often for speculation.

11 It is difficult to monitor their level of acceptance, since there are no reliable statistics available on the degree to which virtual currencies are used in commercial transactions (at present it is estimated that globally approximately 250,000 transactions are performed in bitcoins on a daily basis, compared with 300 million transactions performed in euro).

It does not seem foreseeable that in the near future these limitations will be overcome, since in most of these initiatives there are problems of scalability arising from the high energy cost of producing these currencies, the elevated transaction costs,[12] governance problems and the rigidity of their supply mechanism. In itself, the underlying technology is a brake on the development of these currencies since it does not provide a simultaneous response to the three properties or requirements which would be necessary: decentralisation, cost efficiency and proper performance of operations.

As a result, payments made with these currencies are not perceived as efficient payments, unlike payments made with legal tender. Currently, the existence of a public authority which backs legal tender contributes to sustaining the robustness of the payment systems and confidence in money as a generally accepted, common medium of exchange: the general public understands that payments made using money are safe and are performed immediately, without any setbacks.

However, it should also be admitted that in certain jurisdictions and in situations where there is a deterioration of the sovereign currency, the use of virtual currencies could spread since it is an alternative or replacement mechanism which satisfies the needs of the general public: consider, for example, countries where the official currency is not convertible or where there is hyperinflation in the economy.

Industry is proposing alternatives to attempt to solve the stability problems of the value of virtual currencies[13] and to resolve technological limitations in order to facilitate their use as a means of payment, although this seems difficult given the governance problems of many of these proposals.

As for local currencies, their use as a medium of exchange is also very restricted since they operate in small territorial or sectoral areas. Although they do not pose volatility problems (on account of the one-to-one parity rate usually set with legal tender), they may not be appropriate as a store of value, especially if they have certain rapid depreciation rates (e.g. "demurrage"-charged local currencies). Additionally, since they lack the backing of a sovereign authority and often have established depreciation rates to incentivise their circulation they are not conceived and are not especially attractive to serve as money.

To conclude, it cannot be said that nowadays paracurrencies fulfil the functions of money since they are not a common and generally accepted means of payment or medium of exchange. In fact, the term "currencies" is somewhat misleading and the name of virtual currencies or cryptocurrencies has evolved recently towards "virtual assets" or "crypto-assets", precisely with the intention of clarifying them with respect to the notion of "money". Nor will they foreseeably replace legal tender in the near future, even if their use spreads, given their limitations.

In any event, the phenomenon of paracurrencies in respect of their use as a medium of exchange and as a financial instrument entails certain risks which are analysed in the next section.

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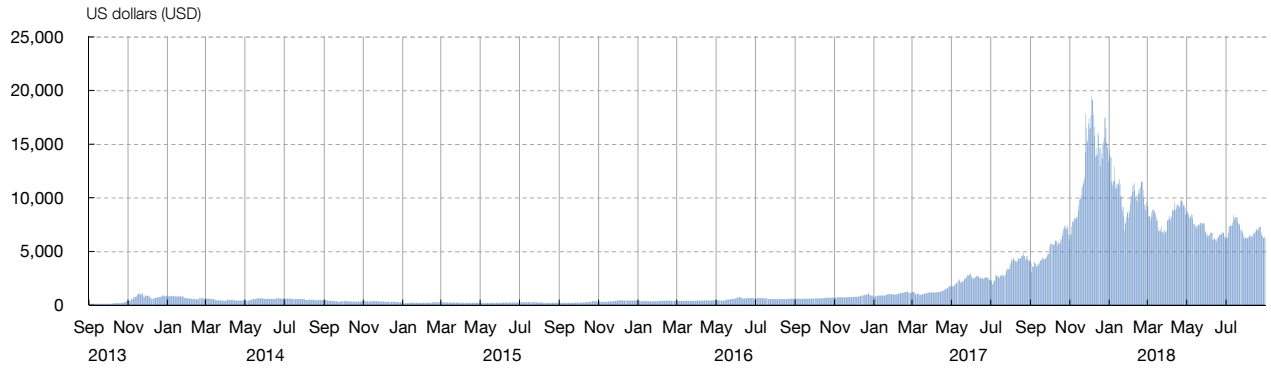
12 With their existing design, virtual currencies are not optimal for those exchanges in which the product is delivered immediately.

13 One example is the recent emergence of "stable coin" currencies, which seek to hold a stable value since they are pegged to a stable fiduciary currency, or collateralised by goods.

BITCOIN TRADING PRICE BETWEEN SEPTEMBER 2013 AND AUGUST 2018 CHART 2



SOURCE https://coinmarketcap.com.

5 The risks of paracurrencies

5.1 VIRTUAL CURRENCIES

As we have seen, virtual currencies are digital representations of value, issued through private bodies and denominated in their own unit of account. Most of these currencies are "quasi-anonymous", since the transactions are recorded so that users are only known by their virtual currency public addresses and their real identity cannot be easily retrieved. The better known virtual currencies habitually use distributed ledgers; for instance, in the case of bitcoin a registration and transfer mechanism based on DLT technology is used. DLT allows the decentralised recording of the history of bitcoin transactions.[14]

The rigidity of supply and the high volatility of these currencies may lead to the risk of a speculative bubble in the virtual currencies market. In fact, the extreme appreciation of the bitcoin at end-2017 was immediately followed by a swift value correction: from almost reaching US$20,000 in December 2017, it collapsed to less than US$7,000 barely two months later (see Chart 2).

The bitcoin's appreciation by more than 1500% during 2017, is inevitably reminiscent of other speculative bubbles including, most notably, the tulip bubble (1634-1637) which was one of the most important in history.[15]

Virtual currencies pose important risks for consumers, potentially entailing an economic loss. These risks can be summarised as follows:

– *Financial risks.* These currencies lack intrinsic value, legal coverage and institutional backing, with the result that there is a risk of non-payment since, if there is any non-compliance by the counterparty, the user does not have the protection afforded by international payment systems (credit risk). Their value is solely reliant on there being users willing to acquire them and they usually experience sharp swings without any apparent objective cause (market risk). Price formation is not transparent and could be manipulated by exchange platforms. The holders might not have the option to convert their virtual

14 Although virtual currencies do not function as a sound substitute for money, their innovative underlying technology could be a significant catalyst for the transformation of the financial sector.

15 Considered one of the first financial bubbles in history, tulipmania, also known as the tulip crisis, occurred in the Netherlands in the 17th century. The object of the speculation was tulip bulbs whose price reached exorbitant levels (one bulb was worth as much as 15 times the annual salary of a skilled craftsman or the equivalent of five hectares of land). When the bubble burst in spring 1637, the sudden collapse of bulb prices led to the ruin of vast numbers of the general public and bankrupted the Dutch economy.

currencies into conventional money at will (liquidity risk). Even if there is the possibility of selling the virtual currencies, there may be limited transparency relative to the commission applicable.

– *Operational risk,* since the technology on which most virtual currencies are based is not consolidated and the security offered by the platforms supporting virtual currencies is not yet comparable with that of traditional payment systems. There are many examples of operational incidents and theft through computer attacks which have affected providers engaged in exchange services and custodian wallet providers.

– *Risk of fraudulent use and unlawful activity.* The anonymity of many virtual currencies means that they have been used occasionally for money laundering and the financing of terrorism or other unlawful activities, such as tax evasion, trade in illegal goods, extortion, the collection of ransomware as well as for avoiding restrictions on exchange controls or the movement of capital in certain jurisdictions.

– *Legal risk,* since virtual currencies are not backed by any central bank or other authority, they do not fit clearly into any pre-existing legal form and are not regulated or supervised. Virtual currencies do not have a direct relationship with legal tender and are usually considered a medium of exchange and not a means of payment from a legal standpoint. Consequently, no type of authorisation is required to operate with them, since this activity can be performed outside the regulatory framework applicable to credit, e-money or payment institutions as well as of that referring to foreign currency exchange services.

  Whenever goods and services are acquired by using virtual currencies, the purchasers might not be fully protected by consumer protection legislation if any problem arises with the payment or with the product acquired or service engaged, especially in cross-border transactions. Nor is there a system of rights and obligations which sets out certain rules to protect virtual currency users (among others, the right to repayment if transactions are carried out incorrectly or are not authorised and reporting transparency obligations).

The high volatility of virtual currencies and the risks they entail (operational, legal, credit and liquidity risks, etc.) could adversely affect the stability of the financial system. However, since the use of virtual currencies is not currently widespread, compared with legal tender, and their interconnectedness with the financial system is limited, these instruments do not seem to involve significant risks for the moment. If they were used more widely, or if the financial sector were to increase its exposure to these currencies, which to date has been very low, this assessment could, however, be changed.

5.2 LOCAL CURRENCIES

As seen above, local currencies generally have a fixed parity to the national currency. Additionally, the use of these currencies is largely based on trust in the issuer, which furthermore – unlike virtual currencies – is usually a known entity that, as a last resort, could be held accountable.

Based on these premises, it could be considered that the risks associated with the use of local currency schemes are less serious than those indicated in the previous section for virtual currencies. However, it is essential to analyse in detail the rules which, in each case,

establish how these schemes operate and regulate the rights and obligations of each participant, especially as regards the possible convertibility into euro of the units of value, so as to adequately assess the possible risks.

Notwithstanding this, one of the most relevant risk for consumers is the legal risk arising from potential legal uncertainty, in particular in the case of local currencies not issued by a public authority. Since local currencies are not regulated, users may be affected by the limited clarity concerning the regulations applicable to local currencies and the lack of protection should any incident arise.

Operational risk is also significant, due to the fragility of the scheme. For example, an interruption or failure in the functioning of the scheme would lead to the holders of units of value not being able to convert them into national currency. Also noteworthy is the risk of fraud or currency counterfeiting, especially where the currencies are issued on physical media.

Lastly, the bankruptcy of a local currency scheme could generate risks for financial stability if the volume of transactions in this currency were high enough to trigger a reduction in the capacity to make payments. At present, the implications of this type of currency are clearly limited, essentially because of their small volume.[16]

6 Regulatory responses to paracurrencies

6.1 VIRTUAL CURRENCIES

The increasing popularity of virtual currencies – with the bitcoin in the lead – could trigger an increase in risks both for economic and financial stability and for consumers in general. Although the risks identified related to the stability of the monetary and financial system are deemed to be limited for the moment, conversely, the risks for consumers, as we have seen, are significant, despite the restricted scope of use of these currencies.

Virtual currencies pose a regulatory challenge to the extent that, without fitting into any of the existing economic-legal forms, they share certain features with several of them, such as legal tender, payment systems and financial instruments. Also, they can impact market integrity and be used as a mechanism for tax evasion, money laundering and the financing of unlawful activities. This explains why regulators and supervisors are paying increasing attention to them in order to adequately assess the risks and, where appropriate, attempt to mitigate them through the various tools available.

Virtual currencies do not currently have specific legal coverage in most jurisdictions, "their use moves within the boundaries of what is permitted but not necessarily regulated". This is essentially what happens in the most developed – and most flexible – countries (the United States, Canada, European Union Member States, Japan, Australia and New Zealand); in some of these countries (among others, the United States and Spain) for the moment the authorities have confined themselves to issuing public warnings about the risks inherent in their use by the general public. However, a minority group of countries, including most notably Russia, have chosen to declare them illegal, while another minority group (China, Egypt, Saudi Arabia and Mexico) have subjected them to very stringent legal restrictions.

16 For example, the value in circulation of the Bristol pound, which is the local currency with the highest volume in the United Kingdom, is approximately 250,000 pound sterling, while the value in circulation of the banknotes issued by the Bank of England amounts to more than 54 billion pound sterling.

Within the European Union the initial public information comprised the above-mentioned opinion issued by the EBA (July 2014)[17] and the report issued by the ECB (February 2015)[18] which referred to the main risks of virtual currencies and the requirements for developing a regulatory approach to them. More recently, virtual currencies have only been regulated with the particular purpose of preventing the use of the financial system for money laundering and terrorist financing. Specifically, with the approval of Directive (EU) 2018/843 of 30 May 2018 (5AMLD) providers engaged in exchange services between virtual currencies and fiat currencies and custodian wallet providers were included in its scope.

As far as Spain is concerned, to date there has been no specific regulation for virtual currencies. That means that no type of authorisation is needed to operate with them since this activity can be performed outside the regulatory framework applicable to credit, e-money or payment institutions as well as that referring to foreign currency exchange services.

From a national standpoint, for the time being there does not seem to be a need for virtual currencies to be given general regulatory treatment aside from the regulation of certain specific aspects linked to their use, such as the necessary transposition of the 5AMLD. However, this could change in the future and it should not be ruled out that the virtual currencies boom and their degree of acceptance by the general public may ultimately make it necessary to readjust the regulatory perimeter. In any event, it should be noted that the regulation of virtual currencies, given their global nature, would presumably only be effective if it were coordinated at supranational level.

At international level, the Financial Stability Board, the Basel Committee on Banking Supervision, the International Organisation of Securities Commissions and the Committee on Payments and Market Infrastructures (FSB, BCBS, IOSCO and CPMI, respectively) are analysing the phenomenon of virtual currencies. In July 2018, the FSB together with the above-mentioned institutions published a report to the G20 on crypto-assets which updates the work currently in progress on this subject. The report details the various sources of risk of these instruments and concludes that they do not pose a significant risk to financial stability for the moment. However, it is considered necessary to continue to monitor their development and to this end monitoring metrics are being designed.

In sum, although virtual currencies were originally conceived for use as an unregulated and decentralised means of "payment", everything seems to suggest that they are mainly becoming a financial instrument for investment and speculation. Nevertheless, this trend could be reversed, if the use of the above-mentioned currencies in commercial transactions, which at present is very limited, were to begin to grow and become more widespread.

6.2 LOCAL CURRENCIES

In the aftermath of the protracted economic crisis, the upsurge and boom experienced by local currencies has also occurred in Spain. As with virtual currencies, in Spain local currencies currently do not have general legal coverage and they are issued, brought into circulation and used "within the boundaries of what is permitted but not necessarily

17 See EBA (2014).
18 Available at https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf.

As from 2017 the use of virtual currencies in an innovative form of financing has boomed significantly: the so-called "Initial Coin Offering" (hereinafter "ICO"). It can be defined as an unregulated process undertaken by an entity (usually a start-up) to raise capital by issuing tokens or digital coins using distributed ledger technology. Payment of the tokens acquired can be made in virtual currencies or legal tender, a priori it is open to any investor and the remuneration of the assets acquired may be of different types (among others, project management, remuneration in the form of interest or dividends, entitlement to use products or services and the possibility of selling these assets).

In view of the growth of this phenomenon and the risks which might be associated with ICOs, some regulators began to take measures in this respect, by suspending these activities (which is the case of the People's Republic of China, where they were declared illegal), and warning consumers or providing information on the regulations applicable to ICOs.

In Europe, ESMA issued two public statements on ICOs on 13 November 2017, the first on the risks they involve for investors and the second on the rules applicable to entities involved in ICOs. The first public statement alerts investors to the high risk of the total loss of their investment since ICOs are highly speculative investments. The price of digital coins or tokens is extremely volatile and investors may not be able to redeem them for a prolonged period. Another risk factor stems from the fact that, depending on how they are structured, ICOs may fall outside the EU's regulatory framework, in which case investors would not benefit from the protection afforded by EU regulations. Lastly, ICOs also entail the risk of fraud and money laundering. ESMA's second statement warns investors that where ICOs qualify as financial instruments, the entities involved must pay particular attention so that their activity complies with the applicable EU regulations (MiFID, Anti-Money Laundering Directive, etc.).

In the United States the Securities and Exchange Commission (SEC) issued a statement in December 2017[1] to report that all those activities which can be considered as offerings of securities are subject to the corresponding regulations, irrespective of the term used to describe the asset in question or the technology used to perform them.[2] Next, the International Organisation of Securities Commissions (IOSCO) issued on 18 January 2018 a media release on risks relating to "initial coin offerings (ICOs)".[3]

The Banco de España and the National Securities Market Commission underlined again that both virtual currencies and ICOs involve a high risk of loss or fraud for investors, in a joint statement issued on 8 February 2018.[4] Additionally, through a joint statement issued in February 2018 the European Supervisory Authorities for securities (ESMA), banking (EBA) and insurance and pensions (EIOPA) warned consumers about the risks of buying virtual currencies.[5]

1 Available at https://www.sec.gov/news/public-statement/statement-clayton-2017-12-11.
2 In addition, in December 2017, the US Commodity Futures Trading Commission authorised the launch of bitcoin futures products in its futures markets, specifically the Chicago Mercantile Exchange Inc. (CME), the CBOE Futures Exchange (CFE) and the Cantor Exchange.
3 Available at https://www.iosco.org/news/pdf/IOSCONEWS485.pdf.
4 Joint statement by the CNMV and the Banco de España. Available at https://www.bde.es/f/webbde/GAP/Secciones/SalaPrensa/NotasInformativas/18/presbe2018_07en.pdf.
5 Available at https://www.esma.europa.eu/press-news/esma-news/esas-warn-consumers-risks-in-buying-virtual-currencies.

regulated". This means that in each case local currencies are governed by the rules of the party that issues them.

A similar situation is observed in most other developed countries: for instance in the United Kingdom they have a comparable status to vouchers but they are not considered legal tender; in Germany they are considered alternative currencies, not issued by the central bank, and consequently, not legal tender; and in Italy they do not have any legal form, they are used voluntarily and do not have the power to discharge debts. Conversely, in France they were regulated by Law 2014-856 of 31 July 2014 amending the Monetary and Financial Code. This law specifies who can issue a complementary local currency and subjects local currency issuers and managers to supervision in their capacity as providers of bank payment services or as e-money institutions; certain exemptions are considered if the local currencies refer to a limited number of users or to a restricted activity.

As these currencies have expanded, some of them showed certain unique characteristics which distinguish them from the local currency model presented above in Section 3.2, since sometimes it is not clear that all the components of certain schemes are going to observe the fully voluntary membership principle of participants in these exchange systems. That would make it all the more necessary to precisely delimit the conceptual framework of local currencies and to assess their possible risks to and effects on market unity.

7 Conclusions

In recent years there has been a proliferation of the issuance and use of the so-called virtual and local "currencies" which we have jointly called paracurrencies. Both forms are presented as potential substitutes for money, since they attempt to fulfil the characteristic functions of money broadly speaking. However, despite any pretensions they may have to replace money, and their misguided name in this sense ("currencies"), they cannot be considered as money nor will they foreseeably replace legal tender in the future, given the marked limitations of their form.

It should be underlined that the increasingly widespread prevalence of this type of currencies could lead to higher risks for economic and financial stability and for consumers in general. For the moment, the risks to the stability of the monetary and financial system are limited since, despite the continued growth of both types of currency, their scope and the extent to which they are used are constrained. However, even within their limited scope, the risks for consumers, especially in the case of virtual currencies are significant; noteworthy, among others, are the high economic risks mainly associated with their extreme volatility as well as operational and legal risks.

Paracurrencies pose a regulatory challenge to the extent that, without fitting into any of the existing economic-legal forms, they share certain features with several of them, such as legal tender, payment systems and financial instruments. Virtual currencies do not currently have specific legal coverage in most jurisdictions and "their use moves within the boundaries of what is permitted but not necessarily regulated". The authorities of the vast majority of countries have preferred, for the moment, to issue public warnings about the risks inherent in the general public using these currencies or to regulate certain specific aspects of their use.

This explains why regulators and supervisors are paying more attention to these phenomena in order to adequately assess the risks and, where appropriate, attempt to mitigate them through the various mechanisms at their disposal.

For now, there does not seem to be a need for virtual currencies to be given general regulatory treatment aside from the regulation of certain specific aspects linked to their use. However, this could change in the future and it should not be ruled out that the virtual currencies boom and their degree of acceptance by the general public may ultimately make it necessary to readjust the regulatory perimeter. In addition, it is essential that both the monitoring of the risks and the analysis of their regulatory "fit" be undertaken in coordination with international bodies which are competent in this subject; given the global nature of virtual currencies, this would only be effective if it were coordinated at international level.

As for local currencies, it is important to monitor those initiatives which, arising in territorial areas, explore innovative mechanisms of digital media since their gradual introduction could affect market integrity.

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THE IMPACT OF THE INTEREST RATE LEVEL ON BANK PROFITABILITY AND BALANCE SHEET STRUCTURE

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THE IMPACT OF THE INTEREST RATE LEVEL ON BANK PROFITABILITY AND BALANCE SHEET STRUCTURE

Abstract

We study the sensitivity of bank profits and balance sheet structure to changes in the level of interest rates in Spain during the 2000-2016 period. Autoregressive distributed lag (ARDL) models with controls for the business cycle and interest rate levels are estimated for the time series of key asset and liability categories (credit, financial securities, time deposits, etc.) and profit components (returns on asset and liabilities, provision charges, etc.). We find a non-linear relation between interest rates and net interest income, which is positive at low interest rate levels. This relation is driven by the effect of interest rates on asset and liability returns, and also on credit growth, and on the bank mix of credit, deposits and financial securities. Broader profit measures also present a non-linear relation with interest rates, which can be negative even for low interest rate levels if provisioning charges are high enough.

1 Introduction

The observation of low interest rates and low bank profitability in the years after the financial crisis initiated in 2008 has renewed the interest on the relation between interest rate levels and bank profits. The question of whether low interest rates actually erode bank profits has been well present in the current public debate between financial market participants and monetary authorities.[1] However, there is a relative scarcity of empirical studies of the link between interest rate conditions and bank profits.

Furthermore, existing work has focused on studying the effect of monetary policy on profit measures relative to total assets, that is, bank returns. The size and composition of the balance sheet of banks is however also affected by the level of interest rates, and these balance sheet changes can contribute to better explain bank profit variations. For example, there exists long-standing evidence that contractionary monetary policy is linked to lower aggregate credit, e. g., Bernanke and Blinder (1992), Kayshap et al. (1993), which in turn will contribute to lower interest income. Banks can also alter the composition of their assets (e. g., bank credit relative to debt securities holdings) and liabilities (e. g., term deposits relative to wholesale funding) in response to changes in interest rates, creating a further channel for interest rates to affect bank income. We contribute to the literature with a combined study of the effect of interest rate levels on bank income and balance sheet evolution, examining the growth in the level of these variables in addition to the bank returns that constitute the focus of the existing work on bank profitability and interest rates. This comprehensive approach can help to understand better the transmission of monetary policy to bank profitability and, ultimately, solvency.

We study the effect of the interest rate level on different components of the Net Interest Income (NII henceforth) including both volumes and average interest rates of different categories of assets and liabilities (credit, financial securities holdings, tem deposits, etc.). This breakdown of the NII provides a comprehensive view of the different impact of interest rate changes on different bank stakeholders (loan borrowers, depositors, securities issuers, etc.). Additionally, we evaluate the effect of interest rates on provision charges and other financial income (e.g., income from trading activities), allowing us to form a measure

1 There are multiple examples of association of low interest rates with weak bank profits among financial market participants, especially in the European context, e. g., Dobbs et al. (2013) and S&P Global (2016). The possible negative effect of low interest rates on bank profitability is recognized in public statements of regulators, e.g., Constancio (2016), Fischer (2016) and Rajan (2013), though there is no consensus on its quantitative significance, and low interest rates generate broader macroeconomic concerns beyond their effect on bank profits.

of net interest related income (NIRI henceforth) that adds up the effects of interest rates on different lines of P&L accounts. A priori, the conclusions on the impact of interest rates on NII do not necessarily apply to NIRI due to possible countervailing effects in other income components such as provision charges. In periods of economic stress, the negative weight of provision charges on bank profits can be substantial and the effect of interest rate levels on borrower defaults can have a greater impact on bank profits than fluctuations in interest income.[2]

In this article, we estimate with time series data of the Spanish banking system Autoregressive Distributed Lag (ARDL henceforth) models for the average interest rate and volume growth of each component of NII and for the growth rates of the rest of income sources, e.g., provision charges, in NIRI. The models include controls for the state of the business cycle (GDP Growth, Unemployment, etc.) and the interest rate level (12 month Euribor). Following the work of Borio et al. (2017), we consider a quadratic relation between the bank profitability and the interest rate level, but we introduce a more granular decomposition of profit in volume and return components, we use more general temporal dynamics, and consider systematic specification selection based on economic and statistical criteria. For those models for which the quadratic interest rate term is significant, the response of bank profitability to rate changes will depend on the level of interest rates. Dynamic sensitivity analysis to interest rate levels is carried out to evaluate the effect of interest rate shocks on the different components of bank profitability.

We find that the response of bank profits to interest rate changes is a function of interest rate levels. For periods of high rates such as 2007-2009 in Spain, the estimated models reveal that interest rate increases are associated to a sizeable contraction of credit and rapid growth of provision charges and financing costs. These negative effects on bank profits dominate mitigating factors, such as the rise of interest rates earned on assets and the partial substitution of credit with debt securities, leading to lower bank profitability. On periods of very low interest rates such as 2013-2015 in Spain, interest rate hikes contribute to NII growth, as financing cost increase at a slower pace than interest rates earned on assets and the volume of activity is not too adversely affected. However, the impact of the interest rate increase on provision charges can still lead to a net reduction of bank profits in a low interest rate environment.

The rest of the article is organized as follows. Section 2 discusses the related literature. We present theoretical considerations that motivate the analysis in Section 3 and describe the available dataset in Section 4. The methodological approach is detailed in Section 5 and results are presented in Table 6. Section 7 adds final considerations.

2 Literature Review

As pointed out in Borio et al. (2017), the literature studying the relation of monetary policy and bank profitability is relatively small, but there is still some evidence that serves as a reference for our work. The authors in that article use data for an international panel of banks in the period 1995-2012 and explore how monetary policy, through its effect on interbank rates and the yield curve, impacts several measures of profitability relative to total assets (NII over total assets, ROA, etc.). The dynamic panel data models in Borio et al. (2017) incorporate a single lag of dependent variables and a contemporaneous

2 Interest rate levels and business cycle conditions are found to be significant explanatory factors of credit risk in multiple studies, e. g., Duffie et al. (2007) for the United States, Pesaran et al. (2006) for an international sample, and Jiménez and Saurina (2006) and Jiménez and Mencía (2009) for Spain. The effects of the economic cycle on defaults have also been found to be stronger during recessions, as in the study of Italian defaults of Marcucci and Quagliariello (2009).

quadratic term for interest rates, allowing for a varying effect of interest rate changes as a function of their level. That article finds a positive relation between bank returns and interest rates, which is more significant when these rates are low. In terms of profit components, they find a positive relationship of interest rates with NII and loan loss provisions, and a negative relation with non-interest income (all accounting variables measured relative to total assets).

Related to the work in Borio et al. (2017), the present article studies the possibly non-linear effect of interest rate levels on bank profits, but the contributions of the two articles differ in several respects. As mentioned in the introduction, we consider not only average returns, but also levels of bank profits and variations in the volume and composition of bank balance sheets, decomposing in greater detail than other works the channels through which interest rates impact bank profitability. We generalize the model dynamics in Borio et al. (2017), who use a single lag of the dependent variable as dynamic control, allowing for an ARDL model with up to second order lags of all the explanatory variables. Models are selected after an exhaustive specification process, and we calculate dynamic responses to examine explicitly the effect of interest rate shocks over time.

The work in Borio et al. (2017) and most other references measure the average relation between interest rates and bank profits across a panel of multiple countries. On the contrary, our work is focused on aggregate time series data for Spain. The particular relation and dynamics of bank variables in a given country can differ from the average effect observed internationally, and there is potential value in identifying this country specific information. Spain is an interesting target for study as it is a large European economy, whose banking sector was materially affected by the financial crisis initiated in 2008, as documented for example in Banco de España (2017).

Our work is also related to recent contributions by Claessens et al. (2017) and Altavilla et al. (2017). Claessens et al. (2017) examine a large panel of banks from 2005 to 2013 and focus on Net Interest Margin over total earning assets (NIM) and ROA. They find that a reduction in interest rates harms both NIM and ROA, and that this effect is more pronounced if the initial level is low. Moreover, that article finds that a prolonged period of low interest rates further deteriorates NII and ROA. Altavilla et al. (2017) study profitability in a panel of European banks in the period 2000-2016. They do not find evidence of a significant effect of interest rates on ROA if current and expected macro conditions are included as controls in panel regressions. They find though a significant effect of interest rates on profit components (relative to total assets) such as NII or provisions.[3] The relative contribution of the current work relative to these articles are in line with the commented differences with respect to Borio et al. (2017): more granular decomposition of the impact of interest rates on bank profit components, time series analysis of a specific crisis-hit country and more general dynamics of model variables.

The earlier literature contains additional examples of international studies of bank profitability. Demirgüç-Kunt and Huizinga (1999) examine for the 1988-1995 period the relation of NII and profits (relative to total assets) with bank level characteristics and macro variables, finding a positive effect of interest rates on both profit measures, which is attenuated or even nullified in countries with higher income. Saunders and Schumacher (2000) study a sample of European and American banks in the 1988-1995 period

3 Altavilla et al. (2017) contains complementary analysis of the aggregate time series of the European sample, in line with their panel data results, and stock return analysis, which is less related to the current work.

decomposing NII in several factors and finding that lower interest rate volatility can reduce bank margins. Beckmann (2007) examines a sample of Western European banks in the period 1979-2003 and finds that both market structure and business cycle variables are significant explanatory variables for bank profitability (relative to total assets). Albertazzi and Gambacorta (2009) examine the effect of banking sector structure and macro variables on bank profitability with a country-level panel of Euro Area and anglo-saxon countries. They find that short term market rates affect provisioning ratios whereas long term rates are positively associated with the ratio of NII over total assets. Bolt et al. (2012) study over a long 1979-2007 sample the relation between macro variables and several bank profit measures relative to total assets. The main finding in this article is an asymmetric (stronger) relation of bank profits with cycle measures such as GDP growth during recessions.

The literature also includes some examples of country specific studies such as Lehmann and Manz (2006), which identify significant effects of business cycle and interest rates on the profitability of Swiss banks, and Alessandri and Nelson (2015) for the United Kingdom. This latter article introduces a model of monopolistic competition and analyzes empirically the determinants of different profit ratios of British banks. Alessandri and Nelson (2015) find a long run positive effect of the level and slope of the yield curve on bank interest margins, and that NII variations are not fully hedged by other income components such as trading income.

As the current article also considers other interest related components of bank income (fees, trading income, etc.) in addition to NII, the literature on hedging of banking income is a relevant reference. Gorton and Rosen (1995) find that interest rate swap positions of US banks are exposed to rate increases, but that banks hedge most of those exposures. Purnandam (2007) finds that US banks with higher probability of distress use more intensely derivatives to cover interest rate risk and that banks that do not use derivatives follow more conservative balance sheet policies. Respecting the possible hedge of interest income through diversification of bank activities, the early literature was positive on this hypothesis, as seen for example in the survey by Saunders and Walter (1994), but later work has not found convincing evidence, suggesting that this form of diversification might even increase income risk. Examples of this later work include DeYoung and Roland (2001) and Stiroh (2004) in the US, Lepetit et al. (2008) in Europe and Williams (2016) in Australia.

Finally, our work is also related to the literature examining the transmission and amplification of monetary policy through the financial sector. Changes in interest rates affect the balance sheet strength of borrowers (balance sheet channel) and the volume of lending activity of banks (lending channel), creating a credit channel for monetary policy amplification, as considered in Bernanke and Gertler (1995). Banks with different balance sheet characteristics can be affected differently by monetary shocks creating a bank balance sheet channel. For example, Kashyap and Stein (2000) identify that US banks with higher proportion of securities are less affected by monetary contractions, a result in line with the earlier finding in Kashyap et al. (1993) that credit is substituted with commercial paper after a negative monetary shock.[4] The working of these different channels of monetary policy transmission impacts the profitability and solvency of banks, potentially generating a bank

4 The transmission channels considered affect both the demand and supply of credit, generating a challenging identification problem for those studies trying to separate exactly the supply effects. Jiménez et al. (2014) contribute to this literature with use of a granular dataset to separate demand, supply volume and risk composition factors, identifying that low capital banks take more risks with lower short term rates.

balance sheet channel that amplifies further policy shocks, e. g., Gambacorta and Mistrulli (2004) and Van den Heuvel (2007). The current work provides evidence on the aggregate effects of the fluctuation of monetary conditions on key Spanish macrofinancial magnitudes related to the aforementioned transmission channels. This analysis at the system level can help macroprudential policy and serve as a guide for work with more granular datasets.

3 Theoretical Considerations

The empirical exercise in this article is motivated by some key features of workhorse theoretical models, which suggest that an exclusive focus on average returns offers an incomplete evaluation of the effects of monetary policy on bank profitability. The indeterminacy of theoretical results on the net effect of monetary policy on bank profits, due to the presence of multiple profit components through which this policy can operate, also highlights the importance of quantifying empirically the effects on each of these components.

Theoretical bank competition models, as the well-known Monti-Klein model,[5] show that the amounts of loan demand and deposit supply in the banking sector are not independent of the average returns earned and paid on assets and liabilities. An increase in reference interest rate levels might be associated with higher returns, but it will also typically be related to lower bank balances, leading to welfare losses for bank borrowers and potentially reducing the level of bank profits. A small investor solving a portfolio allocation problem can safely assume that she can scale up and down her position in a given security without affecting the expected return on that security. The expected return of this small investor on a given security is thus independent of the volume invested. This assumption is not expected to hold when studying the banking sector as a whole, where the feasible volume and composition of bank activity at a given time depends reasonably on prevailing interest rates and average bank returns.

An increase in the reference rate is expected to contract the volume of total assets, and in particular credit, and also affect the relative volumes of the different categories of assets and liabilities: substitution of loans with debt securities on the assets side, or sight deposits with term deposits on the liability side, etc. The amount of non performing exposures is also expected to increase with a rise in the reference rate, with a detrimental effect on bank income. Financial and market structure characteristics of the banking sector (varying degree market power in different segments, different mix of variable and fixed rate contracts on asset and liability sides of the balance sheet, differing demand and supply conditions for existing and new loans and deposits, maturity structure, etc.) lead us too to presume that the elasticity of the bank rates to the policy rate varies across assets and liabilities categories. For example, market power in retail segments could make loan rates more responsive to raises in the policy rate than deposit rates.

These reasonable *a priori* conjectures on the effects of changes in reference interest rates highlight the convenience of modelling NII in terms of the volumes and rates of the different categories of assets and liabilities that comprise it, rather than directly at the aggregate level. The question of the final effect that a change in the reference rate may have in NII is complex to answer based exclusively on theoretical arguments, since different components may respond in opposite directions or with different velocity, and then we advocate to assess this question empirically.

5 The Monti-Klein model is originally derived in a monopoly framework, Klein (1971) and Monti (1972), but it has been since extended to an oligopoly setting. See Freixas and Rochet (2008) for more extensive treatment of this matter.

Regarding the broader profit measure NIRI, which includes commissions and fees and provision charges, the magnitude and direction of the response to a change in the policy rate are also unclear on purely theoretical grounds. For example, existing literature clearly shows that and increase in the reference rate produces, ceteris paribus, an increase in default rates and therefore an increase in provision charges, although the intensity and velocity of the impact has to be measured empirically. The response of NIRI, which is the sum of NII, Other Financial and Banking Income (OFBI) and provision charges, to an increase in the reference rate will depend on whether a potential increase in NII and OFBI can compensate the reduction of profits via the increase in provision charges. This possibility depends, in turn, on multiple factors (asset and liability positions, maturity structure, history of interest rates, etc.), and therefore empirical analysis can be a priori expected to find a differing impact of interest rates on bank profits for different periods and financial conditions. In particular, we would expect that loan demand and default rates respond more negatively to rate increases in periods of high interest rate levels.

4 Dataset

We use aggregate system-level information for all deposit institutions in Spain for the NIRI variables. This dataset originates from the regulatory reports of these institutions to Banco de España. In order to account only for the exposures in Spain and exclude exposures abroad, the system-level series are built through the aggregation of individual level statements instead of consolidated statements.[6] Time series are measured at quarterly frequency and cover 16 years from 2000Q1 to 2015Q4, which allow us to study a full economic cycle including both expansive and recessive years. Mergers and acquisitions can generate unbalanced individual bank profit series, but this issue does not affect the current study as we use aggregate data and focus on the systemic evolution of bank profitability.

For the components of NII, six volume series are obtained from balance sheet reports and six average interest rates series are constructed from the ratio of P&L income or expense items and balance sheet stocks for the corresponding asset and liability categories. For example, the series of average interest rate on credit is obtained by dividing the series of interest income from credit exposures by the volume of interest producing credit. Asset and liability categories include credit, debt securities holdings, rest of assets (derived as difference of total interest producing assets and loan credit and debt securities, reflecting mostly cash and interbank positions),[7] sight deposits, term deposits and rest of liabilities (derived as difference of total interest bearing liabilities and sight and term deposits, reflecting mostly wholesale funding). The variable NII can be recovered from the formula

$$NII = \sum_a Vol_a \times Rate_a - \sum_l Vol_l \times Rate_l \qquad [1]$$

where Vol denotes balance sheet stock, Rate denotes average interest rate, a indexes the three categories of assets and l indexes the three categories of liabilities.

6 This approach is reasonable given that we use as potential profit determinants macroeconomic variables specific to Spain (GDP Growth, Unemployment, etc.) that would not be connected with business abroad, and that foreign exposures are heavily concentrated in the largest entities. Therefore, consolidated level data would be less representative of bank profitability in Spain.

7 All asset side categories used (credit, debt securities and rest of assets) refer to performing or interest producing assets (non performing positions are not computed). This definition of volume variables facilitates their interpretation as a proxy of value generation in the banking sector, which would be less adequate if non-performing assets where included, as many non-performing exposures plausibly reduce social surplus.

Provision charges capture the flow of new provisions for asset value deterioration recognized in the P&L in each quarter, rather than the stock of provisions in the balance sheet, and it is obtained directly from the regulatory database. Other financial and banking income (OFBI henceforth) is derived as the difference between the gross income series (income excluding provisioning charges, operating expenses and taxes) and the NII series, which are both in the regulatory report database. OFBI captures mostly earnings coming from banking fees and financial operations (e.g. securities trading), whose profitability can be affected by interest rate levels. We combine the different income items (NII, OFBI and Provision Charges) into the single measure of net profitability NIRI, i. e.,

$$NIRI = NII + OFBI - Provision\ Charges \quad [2]$$

For the interbank rate, we use the 12-month Euribor series *(Euribor),* obtained from the Statistical Bulletin of Banco de España. We use the 12-month maturity instead of the 3-month rate, which is often considered in the literature, because most credit products in Spain use the 12-month rate as reference. Additionally, correlation between 3-month and 12-month Euribor rates is very high (99.01% over the sample period), so this choice is not critical. We consider as measure of the slope of the interest rate curve the difference *(Slope)* of the 10-year Spanish bond rate, also obtained from the Statistical Bulletin, minus the 12-month Euribor. As controls for the state of the business cycle, we consider house price growth, unemployment, and real GDP growth data obtained from the Spanish Ministry of Public Works and the National Statistical Institute.[8] These macroeconomic variables are measured quarterly, but growth rates for house prices and real GDP are calculated in inter-annual terms.

Table 1 presents the main descriptive statistics of the interest rate and macro variables, the components of NII and the components of NIRI (NII, OFBI, and Provision Charges). This table shows the wide range of values of the macro variables over the sample period (e. g., inter-annual real GDP growth varies from –4.2% in 2009Q2 to 6.5% in 2000Q1). Regarding bank income variables, NII growth is more stable along the cycle than the growth of other components of NIRI, presenting a lower standard deviation (12.5%) than OFBI (19.6%) and provisioning charges (108.8%). The high volatility of provision charges growth is due to the big differences in provision charges between periods of economic expansion and recession. Concerning the components of NII, sight deposit growth is much more stable (6.0% Std. Dev.) along the cycle than term deposit growth (16.8% Std. Dev.) or rest of liabilities growth (11.0%). The average interest rate paid for sight deposits (0.7%) is, as expected, lower than for term deposits (2.9%) and other liabilities (2.6%). On the asset side, the interest rate earned on loan credit (4.1%) is approximately 1% higher than that paid for term deposits (2.9%), and it is the highest rate of all the three asset components of NII, given average rates of 3.8% and 2.7% for debt securities and rest of assets. Similarly, the term deposit rate is the highest average rate paid on liabilities.

Chart 1 presents graphically the evolution of the main components of NIRI. NII and OFBI follow a mostly positive growth trend in the period 2000-2008. OFBI peaks in year 2007 whereas NII peaks in year 2009, which is a year of maximum interest rates in which the effects of recession had not still materialized fully in the bank balance sheets. In 2010, we see how NII and OFBI are clearly below their peak values, and they remain relatively stable

8 The links to the sources of macroeconomic and interest rate variables are the following: Statistical Bulletin of Banco de España (www.bde.es/bde/en/areas/estadis/), National Institute of Statistics (www.ine.es) and Spanish Ministry of Public Works (www.fomento.gob.es).

DESCRIPTIVE STATISTICS OF BANK INCOME AND MACROECONOMIC VARIABLES TABLE 1

	Mean	Std. Dev.	Min.	Max.
Macro Variables				
House Index Growth (%)	4.21	9.18	-10.05	18.45
Unemployment (%)	15.74	6.32	7.93	26.94
Slope (%)	1.84	1.48	-0.80	5.48
Euribor (%)	2.45	1.55	0.09	5.37
Euribor Square (%)	8.38	8.39	0.01	28.80
Real GDP Growth (%)	1.69	2.70	-4.22	6.50
Interest Related Income Variables				
Growth (%)				
Net Interest Income	3.10	12.54	-23.99	27.21
Other Financial and Banking Income	8.58	19.59	-36.07	65.55
Provision Charge	43.22	108.84	-75.20	361.62
Net Interest Income Variables				
Growth (%)				
Credit	7.11	12.11	-15.10	29.05
Debt Securities	7.99	12.76	-17.91	41.48
Rest of Assets	4.31	10.46	-17.97	24.94
Sight Deposits	7.23	6.01	-4.18	17.37
Term Deposits	9.90	16.82	-16.86	50.13
Rest of Liabilities	4.87	10.99	-23.98	21.46
Interest rate (%)				
Loan Credit	4.15	1.03	2.43	6.24
Debt Securities	3.78	0.92	2.19	5.54
Rest of Assets	2.67	1.37	0.82	5.41
Sight Deposits	0.67	0.33	0.16	1.49
Term Deposits	2.95	0.63	1.77	4.23
Rest of Liabilities	2.59	1.25	0.70	4.81

NOTES: Data series are available at quarterly frequency and cover the sample period 2000 Q1 – 2015 Q4. Euribor is the 12-month Euribor rate. Slope is the difference "10-year Spanish bond rate" – "12-month Euribor". Growth variables represent inter-annual growth. Interest rates for the Net Interest Income variables represent average values over the quarter. Statistics for Net Interest Income are presented for completion, although this element is not modelled directly and therefore this time series is not used in the empirical exercise.

in later years, with a mild decline of NII. Provision charges represent the most volatile component of NIRI, presenting a quick rise during the double-dip recession.[9]

5 Methodology

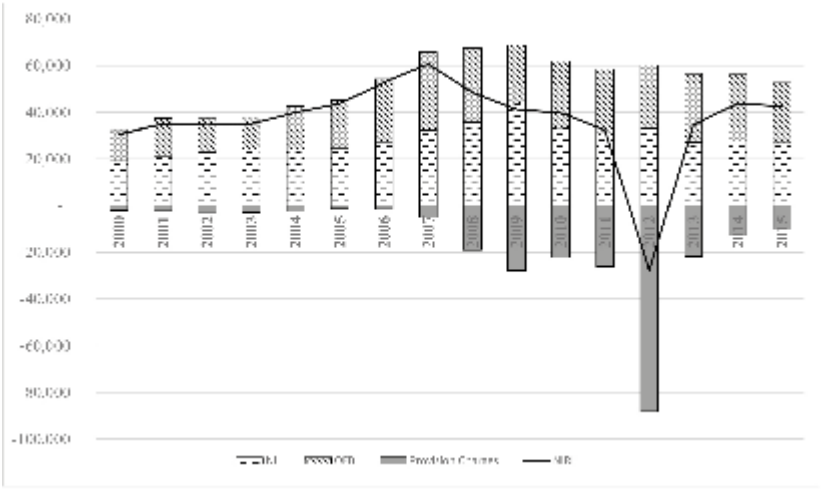
5.1 ESTIMATION FRAMEWORK

As mentioned in the introduction, we adopt an ARDL model for each of the components of NIRI, which add up to a total of 14: one model for OFBI and other for provision Charges, which are modelled directly, and one model for each of the 12 components of NII, which is not modelled directly but through the aggregation defined in formula (1). Formally, we estimate through OLS the following ARDL equation for the variable of interest y_t:

$$y_t = \rho_0 + \sum_{j=1}^{J} \rho_j \cdot y_{t-j} + \sum_{m=1}^{M} \sum_{s=0}^{S(m)} \beta_{m,s} \cdot x(m)_{t-s} + \varepsilon_t \quad [3]$$

9 Spanish Banks were required to charge additional provisions in 2012 following Royal Decrees 2/2012 and 18/2012, and coinciding with the second dip of the recession. The large increase in absolute value of provision charges in 2012 is related to these factors. Results are found to be robust to the exclusion or treatment via dummies of these quarters with high provisioning levels. It must also be taken into account that the highest growth in provision charges takes place in 2006-2007, as credit quality began deteriorating, rather than in 2012.

EVOLUTION OF BANK INCOME CHART 1



NOTE: This figure depicts the evolution of year-end NIRI (Net Interest Related Income) and its P&L components: NII (Net Interest Income), OFBI (Other Financial and Banking Income) and Provision Charges.

where ε_t is the model error, parameters (ρ_0, ρ_1,..., ρ_J) determine the autoregressive dynamics of y_t up to lag order J, and parameters ($\beta_{1,1}$,..., $\beta_{1,S(1)}$,..., $\beta_{m,s}$,..., $\beta_{M,1}$,..., $\beta_{M,S(M)}$) determine the effect of explanatory variables $x(m)_{t-S}$ for m = 1,..., M on y_t, with the lag order of each variable S(m) being potentially different. This model can be recast in an error correction model (ECM) form:

$$\Delta y_t = \rho_0 + \alpha \cdot \left(y_{t-1} - \theta \cdot x_{t-1}\right) + \sum_{j=1}^{J-1} \delta_{yj} \cdot \Delta y_{tj} + \sum_{m=1}^{M} \sum_{s=0}^{S(m)-1} \delta_{m,s} \cdot \Delta x(m)_{t-s} + \omega_t \quad [4]$$

where the long term relationship between dependent variable and the set of all explanatory variables ($x_t \equiv x_t(1),..., x_t(M)$) is governed by θ, correction of short term deviations is governed by α, and short run dynamics in y_t are given by parameters $\left\{\delta_{yj}\right\}_{j=1}^{J-1}$ and, for each variable x_m, $\left\{\delta_{m,s}\right\}_{s=0}^{S(m)-1}$. Pesaran and Shin (1999) establish that OLS estimates of models of this form (and more general ARDL specifications with trends) are consistent and allow using normal asymptotic theory not only when variables (y_t, x_t) are I(0), that is, integrated of order zero and thus stationary, but also when they are pure I(1) process and there is a single long-run cointegrating relation between dependent and explanatory variables.[10]

The estimation framework and tests in Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001) admits either pure I(0), pure I(1) or a combination of both types of variables in the set (y_t, x_t). However, the framework would cease to be applicable if the variables are

10 Furthermore, Pesaran, Shin and Smith (2001) derive the non-standard distribution for F-tests and t-tests of the hypothesis that there is a cointegrating relation between the variables (y_t, x_t). The F-test tests the null hypothesis $H_0^F \equiv \alpha = 0 \cap \alpha \cdot \theta = 0$ against the alternative that $H_A^F \equiv \alpha \neq 0 \cup \alpha \cdot \theta \neq 0$ whereas the t-test exclusively tests the hypothesis $H_0^t \equiv \alpha = 0$ against the alternative $H_A^t \equiv \alpha \neq 0$. The result of rejection of both tests is interpreted as evidence in favor of existence of a long run cointegrating relationship between variables (y_t, x_t). Both the F-test and the t-test have associated upper and lower bounds for the test statistic, with an indetermination region. We utilize the implementation of the tests in Kripfganz and Schneider (2016) to carry out these bound tests in Pesaran, Shin and Smith (2001).

integrated of higher order. We perform standard Dickey Fuller tests (with one lag of the variable examined in the supporting regression) to examine evidence of unit root behavior of dependent and explanatory variables. For robustness, we also perform the KPSS test for level-stationarity in Kwiatkowski et al. (1992).[11] These tests are also applied to the differences of the original series to test for I(2) behavior. The time horizon of the sample (16 years) might limit the power of unit root tests against a true alternative hypothesis of stationarity, leading to the wrong conclusion of existence of unit root behavior when data is indeed stationary. For example, Cochrane (1991) points out the limited power of unit root tests. Actually, the explosive dynamics implied by I(1) processes for interest rate and growth variables are troublesome from a theoretical perspective, as these variables would need to diverge infinitely. In any case, the wrong conclusion of the presence of an I(1) process when data are I(0) would not affect the validity of the ARDL framework employed, as presented in Pesaran and Shin (1999).

The validity of the estimation exercise also requires the absence of serial correlation in the model residuals, and we thus examine this condition with the autocorrelation test of Arellano-Bond (1991), AB test henceforth. Although this test is originally developed in panel data context, it can be applied to time series data and it is equivalent to Cumby and Huizinga (1992) time series test when checking the existence of autocorrelation at a particular lag, as it is done in the current article.[12] These tests are valid under more general assumptions than earlier tests for autocorrelation in times series context, in particular, they do not require normality and conditional heterocedasticity is allowed.

5.2 MODEL SPECIFICATION

We select the specification for the ARDL equation for each component of NIRI based on an exhaustive search over a wide set of potential specifications. We firstly screen specifications based on statistical and economic requirements, and then choose the final specification to be implemented based on an information criterion. The procedure is related to the approach of the European Central Bank (ECB) top-down stress test framework, Henry and Kok (2013), with the main departure being that we select a single optimal model, whereas the ECB approach implements a Bayesian average of several admissible specifications.

In order to have a certain degree of precision in inferences, we require for each explanatory variable that the set of all its lags included in the model is jointly significant.[13] For example, a model with GDP growth and its first two lags as explanatory variables will be admissible if these three variables are jointly significant. Additionally, we evaluate the coefficients on lagged dependent variables to ensure the specification is stationary, and require that at least the first order coefficient is statistically significant.[14] We also require that admissible specifications do not reject the null of absence of residual autocorrelation based on the AB test, and that the specifications conform to a suitable ARDL structure. In particular, if lag

11 In Dickey-Fuller tests, the null hypothesis is unit root behavior and the alternative is generation through a stationary AR(1) process. On the contrary, the KPSS test has stationarity as null hypothesis. For KPSS, we choose maximum lag order with the Schwert criterion and empirical autocorrelation estimated with the Barlett kernel.

12 We use Roodman (2006) implementation in Stata of AB tests. Baum and Schaffer (2013) implement in Stata a general autocorrelation test command for times series data that can be used to verify Arellano-Bond test results are equivalent to those of Cumby-Huizinga (1992).

13 We use as benchmark a joint significance level of 10% and find non-empty lists of admissible specifications for all equations except term deposit growth. For this variable, we relax the significance level requirement to 15% to explore whether it actually lacks any significant relation with macro variables, or just some macro control is marginally insignificant. The latter case applies and we find specifications with generally significant macro controls also for term deposit growth.

14 For an AR(2) specification, we would verify stationarity by checking that: (i) $\rho_1 + \rho_2 \leq 1$, (ii) $\rho_2 - \rho_1 \leq 1$ and (iii) $|\rho_2| < 1$. The requirement of significance in at least the first order coefficient is weak. Given the persistence in the data, lagged values of the dependent variable are easily found to be significant.

S(m) of a variable x(m) is included, all lags in $\{t, t-1, \ldots, t-S(m)\}$ must be incorporated in the model. The F-test and the t-test in Pesaran, Shin and Smith (2001) must reject the absence of a long term relation.

In addition to statistical requirements, we impose sign restrictions on the coefficients of some explanatory variables based on economic considerations. For example, we require that the long run effect of GDP growth (determined by the sum of the coefficients on contemporaneous and lagged values of the variable) on credit growth is positive. As another example, 12 month Euribor is required to have a positive relation with average interest rates on bank balance sheet items (from credit loans to rest of liabilities) for all levels of this interbank rate. Annex A details the full-set of restrictions imposed, which are fairly general.[15]

We choose the final specification to be implemented as that with the lowest value of the Bayes-Schwartz Information (BIC) criterion among those specifications that are no screened out by the statistical and economic restrictions described in the above paragraphs. We aim to pick with this criterion a parsimonious specification among those that satisfy admissibility criteria.

Even with the relatively parsimonious set of explanatory variables used for this study, the number of possible specifications rapidly grows into hundreds of thousands of variants. In general, for a set of N explanatory variables, the number of potential specifications is $2^N - 1$. For example, this would yield approximately 1 million possible specifications given a set of 20 potential explanatory variables. This high number of potential specifications makes the search for an optimal specification very costly in terms of computing time. We impose several simplifying assumptions to make the search process feasible. Firstly, we limit the maximum lags of any explanatory variable to two (J = 2 and S(m) = 2), leaving a maximum of 18 exogenous explanatory variables[16] and a maximum of two lags of the dependent variable. Preliminary trials reveal that relatively few explanatory variables suffice to obtain a high fit to the data. We limit to 9 the maximum number of exogenous explanatory variables in a given model. These assumptions leave $2 \times \left(\sum_{r=1}^{9} C(18, r) - 1 \right) \approx 310{,}000$ possible specifications for each of the 14 models, making the specification selection process feasible.

6 Estimation Results

We present first in subsections 6.1 to 6.3 the estimates resulting from the application of the methodology presented in Section 5 to the dataset described in Section 4. As NII is modelled through the aggregation of volumes and average rates ($NII = \sum_a Vol_a \times Rate_a - \sum_l Vol_l \times Rate_l$ for asset and liability categories a and l), sections 6.1 and 6.2 present the models for these components rather than a single model for NII. Section 6.3 presents the models for OFBI and provision charges. In order to better gauge the dynamic response of bank income to changes in the levels of interest rate variables, we compute and present in subsection 6.4 the effect on bank income of 100 basis points shock to 12 month Euribor in different time periods of the sample horizon.

6.1 ESTIMATED MODELS FOR BALANCE SHEET GROWTH

We display the estimated ARDL models for the growth of the different balance sheet elements of banks in Table 2. We observe that house price growth is the most common control for the state of the business cycle, being present in all models except those for the debt securities and other liabilities, where the relevant macro control is real GDP. On

15 The sign restrictions ensure that we do not use specifications with potential omitted-variable bias inducing inconsistent signs with economic theory and well established previous evidence.

16 For six original exogenous variables (House Price Growth, Real GDP growth, Unemployment, Slope, Euribor and Euribor Squared), each of them entering contemporaneously and with lags t-1 and t-2.

ESTIMATED MODELS FOR NII COMPONENTS: BALANCE SHEET GROWTH

TABLE 2

	Credit	Debt Securities	Other Assets	Sight Deposits	Term Deposits	Other Liabilities
ARDL Coefficients						
Lag(1)	0.9030 (0.0442)***	1.0708 (0.1004)***	0.5282 (0.0892)***	1.0147 (0.1126)***	0.7935 (0.1111)***	1.1545 (0.1050)***
Lag(2)		-0.4188 (0.1037)***		-0.2245 (0.1289)*		-0.4353 (0.1057)***
House Price Growth	0.1431 (0.0298)***		-2.4256 (0.7814)***	0.1135 (0.0454)**	-1.4320 (0.6389)**	
House Price Growth (t-1)			2.5204 (0.8213)***		1.3964 (0.5933)**	
Unemp.					-0.0118 (0.0055)**	-0.0044 (0.0019)**
Slope	-0.0059 (0.0029)**				-0.0102 (0.0143)	
Slope (t – 1)					0.0038 (0.0176)	
Slope (t – 2)					0.0382 (0.0129)***	
Euribor		0.0146 (0.0054)***	0.0427 (0.0248)*	-0.0071 (0.0019)***	-0.0318 (0.0211)	
Euribor Sq.	0.0001 (0.0007)		-0.0076 (0.0041)		0.0053 (0.0030)*	-0.0010 (0.0005)**
Euribor Sq. (t – 1)	-0.0015 (0.0005)***					
Real GDP Growth		-1.1525 (0.3713)***				-0.1662 (0.4929)
Real GDP Growth (t – 1)						-0.9461 (0.8631)
Real GDP Growth (t – 2)						1.2368 (0.5672)**
Constant	0.0216 (0.0098)**	0.0103 (0.0153)	-0.0279 (0.0232)	0.0284 (0.0070)***	0.1790 (0.1082)*	0.0887 (0.0367)**
ARDL metrics						
R-squared	0.98	0.76	0.72	0.87	0.95	0.94
BIC	-331.8	-154.2	-164.6	-287.7	-198.5	-252.2
AB test p-value	0.38	0.20	0.22	0.70	0.75	0.72
ECM coefficients						
Correction term	-0.0961 (0.0353)***	-0.3432 (0.0782)***	-0.4942 (0.0962)***	-0.2420 (0.0754)***	-0.1955 (0.0721)***	-0.2714 (0.0683)***
LT House Index	1.4403 (0.4114)***		0.1774 (0.2237)	0.5281 (0.1436)***	-0.5055 (0.6939)	
LT Unemp.					-0.0711 (0.0231)***	-0.0152 (0.0038)***
LT Slope	-0.0678 (0.0280)**				0.1710 (0.0756)**	
LT Euribor		0.0424 (0.0199)**	0.0972 (0.0470)**	-0.0303 (0.0107)***	-0.2222 (0.1618)	
LT Euribor Sq.	-0.0155 (0.0076)**		-0.0167 (0.0079)**		0.0326 (0.0263)	-0.0036 (0.0025)
LT Real GDP		-3.2543 (1.1116)***				0.6276 (1.0789)
ECM metrics						
ECM R-square	0.4	0.3	0.4	0.3	0.4	0.4
Bounds F-test estat.	10.9	7.2	7.3	4.9	3.9	5.8
Bounds F-test 10% LB	2.7	3.2	2.7	3.2	2.3	2.7
Bounds F-test 10% UB	3.8	4.1	3.8	4.1	3.3	3.8
Bounds t-test estat.	-2.7	-4.4	-5.1	-3.2	-2.7	-4.0
Bounds t-test 10% LB	-3.5	-3.2	-3.5	-3.2	-3.9	-3.5
Bounds t-test 10% UB	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6

NOTES: For each of the asset and liability items indicated in the cols., the panel *ARDL Coefficients* reports OLS estimates for ARDL models in levels as in equation (3) with the year-on-year growth of the stock of the corresponding balance sheet item as dependent variable. These balance sheet items are the volume components of NII in equation (1) ($NII = \sum_a Vol_a \times Rate_a - \sum_l Vol_l \times Rate_l$). For a given explanatory variable, the coefficient is provided with standard error (in parentheses) below it. Reported standard errors are robust to heterocedasticity of arbitrary form. Coefficients for the first and second lag of the dependent variable are provided in rows Lag(1) and Lag(2). When an explanatory variable is not included in any model, it is removed from the table for clarity. Panel *ARDL Metrics* includes the p-value for a first order autocorrelation test of the form given in Arellano-Bond (1991) applied to the residuals of the ARDL models. The panel ECM coefficients reports OLS estimates of correction term α and long term (LT) parameters $\boldsymbol{\theta}$ for the Error Correction Model reformulation (ECM) of ARDL models as in equation (4). In the panel *ECM metrics, Bounds F-test estat* and *Bounds t-test estat* provide statistic values for the test for the presence of an integration relation as in Pesaran, Shin and Smith (2001). The null hypothesis is absence of an integration relation for both the F-test and the t-test. For the F-test, the null is (i) accepted if *Bounds F-test estat* is below the lower bound *Bounds F-test 10% LB* and (ii) rejected if *Bounds F-test estat* is above upper bound *Bounds F-test 10% UB.* For the t-test, the null is accepted if *Bounds t-test estat* is above the upper bound *Bounds t-test 10% UB* and (ii) rejected if *Bounds t-test estat* is below lower bound *Bounds l-test estat 10% LB.* A statistic value between the two bounds is inconclusive for any of the tests. *, **, *** denote significance at the 10%, 5% and 1%.

the other hand, unemployment is present in the models for term deposits and other liabilities, while the interest rate slope measure is present in credit and term deposits. First order autoregressive dynamics are found sufficient to fit the data in credit, other assets and term deposits, with AR(2) specifications chosen for the models of debt securities, sight deposits and other liabilities.

Focusing on the controls for the levels of market interest rates, the 12 month Euribor enters exclusively through non-linear terms in the models for credit and other liabilities, it enters only through linear terms in the model for debt securities and sight deposits, and it presents both linear and non-linear effects in the model for the rest of assets and term deposits. The net effect of the 12 month Euribor on credit is negative and non-linear, with interest rate hikes reducing credit more at higher interest rate levels.[17] On the contrary, 12 month Euribor receives a positive and linear coefficient in the model for debt securities holdings. This means that banks tend to invest more in marketable debt securities relative to bank credit products when the level of interest rates is higher, altering the product mix of their asset side. On the liability side, we observe that sight deposits present a negative and linear (thus independent of interest rate levels) relation with the Euribor 12 month, whereas other liabilities present a negative but non-linear relation with the interbank rate. The case of term deposits is mixed: the linear coefficient is negative but the non-linear one is positive, which means a positive relation with the interbank rate at higher levels. At lower levels, the linear and non-linear effects cancel each other and the effect is expected to be non-significant. Thus, given these estimates, banks will substitute sight deposits and other liabilities with term deposits as interest rates increase if the starting interest rate level is sufficiently high. These patterns can be interpreted as consistent with traditional predictions of competition models of the banking sector, e. g., Monti-Klein, with banks reducing credit, increasing deposit funding and adopting a longer position in financial markets as result of an interest rate increase.

The reparametrization of the ARDL models in error correction form also offers relevant information. The error correction term α measures the speed of adjustment of growth rates to their long term value, with a lower absolute value of this coefficient indicating a slower adjustment given a deviation from this long term benchmark. We observe that sight deposits and term deposits present a slower adjustment than rest of liabilities, whereas credit is the asset category with the slowest speed of adjustment. The volumes related to the traditional activities of deposit taking and granting of bank credit adjust more slowly than the volumes associated to investment and funding in wholesale financial markets. Regarding the long term effects θ of the 12 month Euribor in the different volume growth series, these are significant for credit, debt securities, other assets and sight deposits, but not on term deposits and rest of assets. Additionally, we find that both house price growth and the slope measure have a long term effect on credit growth. Finally, the Pesaran-Shin-Smith bound tests in Table 2 are supportive of the presence of a long run integration relation between dependent and explanatory variables for all balance sheet categories, as required in the admissibility criteria.

6.2 ESTIMATED MODELS FOR AVERAGE INTEREST RATES

The estimation results for the ARDL models of average bank interest rates are presented in Table 3. For this set of models, the most relevant control for the state of the business

17 The negative effect of interbank rates on credit growth is imposed as a requisite on the set of admissible specifications, but we do not impose linear or non-linear specifications, with the final estimated model produced as result of the model selection methodology in section 5.2. The signs of interbank rate coefficients on the rest of models for balance sheet growth are not constrained. See Annex A.

ESTIMATED MODELS FOR NII COMPONENTS: AVERAGE BANK INTEREST RATES

TABLE 3

	Credit	Debt Securities	Other Assets	Sight Deposits	Term Deposits	Other Liabilities
ARDL Coefficients						
Lag(1)	0.4362 (0.1448)***	0.3860 (0.1297)***	0.6946 (0.0778)***	0.6392 (0.1097)***	0.5583 (0.1058)***	0.6264 (0.0615)***
Lag(2)	0.1635 (0.0725)**					
House Price Growth				-0.0024 (0.0008)***		
Unemp.	-0.0006 (0.0004)	-0.0009 (0.0003)***	-0.0010 (0.0004)**			-0.0009 (0.0004)**
Unemp. (t – 1)	0.0004 (0.0005)	0.0011 (0.0002)***	0.0000 (0.0006)			0.0009 (0.0004)***
Unemp. (t – 2)	0.0004 (0.0003)		0.0010 (0.0003)***			
Slope		0.0010 (0.0003)***				
Euribor	0.0004 (0.0007)	0.0026 (0.0006)***	0.0028 (0.0006)***	0.0009 (0.0002)***		0.0036 (0.0005)***
Euribor (t – 1)	0.0012 (0.0011)	0.0025 (0.0011)**				
Euribor (t – 2)	0.0023 (0.0011)**					
Euribor Sq.					0.00003 (0.0001)	
Euribor Sq. (t – 1)					0.0003 (0.0001)***	
Real GDP Growth					-0.0705 (0.0199)***	
Constant	0.0028 (0.0024)	0.0050 (0.0020)**	0.0009 (0.0019)	0.0002 (0.0003)	0.0109 (0.0028)***	-0.0013 (0.0015)
ARDL metrics						
R-squared	0.97	0.95	0.97	0.95	0.91	0.97
BIC	-585.8	-588.0	-572.8	-725.5	-598.4	-583.7
AB test p-value	0.19	0.49	0.28	0.49	0.67	0.45
ECM coefficients						
Correction term	-0.4048 (0.0635)***	-0.6266 (0.0838)***	-0.3159 (0.0535)***	-0.3706 (0.0516)***	-0.4419 (0.0776)***	-0.3717 (0.0538)***
LT House Index				-0.0065 (0.0032)**		
LT Unemp.	0.0006 (0.0002)***	0.0003 (0.0001)***	-0.0001 (0.0003)			0.0003 (0.0002)
LT Slope		0.0017 (0.0005)***				
LT Euribor	0.0096 (0.0010)***	0.0082 (0.0005)***	0.0083 (0.0011)***	0.0025 (0.0002)***		0.0095 (0.0009)***
LT Euribor Sq.					0.0009 (0.0001)***	
LT Real GDP					-0.1598 (0.0266)***	
ECM metrics						
ECM R-square	0.6	0.6	0.5	0.5	0.5	0.6
Bounds F-test estat.	17.0	15.0	12.6	22.1	16.0	20.3
Bounds F-test 10% LB	3.2	2.7	3.2	3.2	3.2	3.2
Bounds F-test 10% UB	4.1	3.8	4.1	4.1	4.1	4.1
Bounds t-test estat.	-6.4	-7.5	-5.9	-7.2	-5.7	-6.9
Bounds t-test 10% LB	-3.2	-3.5	-3.2	-3.2	-3.2	-3.2
Bounds t-test 10% UB	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6

NOTES: For each of the asset and liability items indicated in the cols., the panel *ARDL Coefficients* reports OLS estimates for ARDL models in levels as in equation (3) with the average interest rate on the corresponding balance sheet item as dependent variable. These balance sheet items are the interest rate components of NII in equation (1) ($NII = \Sigma_a Vol_a \times Rate_a - \Sigma_l Vol_l \times Rate_l$). For a given explanatory variable, the coefficient is provided with standard error (in parentheses) below it. Reported standard errors are robust to heterocedasticity of arbitrary form. Coefficients for the first and second lag of the dependent variable are provided in rows Lag(1) and Lag(2). When an explanatory variable is not included in any model, it is removed from the table for clarity. Panel *ARDL Metrics* includes the p-value for a first order autocorrelation test of the form given in Arellano-Bond (1991) applied to the residuals of the ARDL models. The panel ECM coefficients reports OLS estimates of correction term α and long term (LT) parameters $\boldsymbol{\theta}$ for the Error Correction Model reformulation (ECM) of ARDL models as in equation (4). In the panel *ECM metrics, Bounds F-test estat* and *Bounds t-test estat* provide statistic values for the test for the presence of an integration relation as in Pesaran, Shin and Smith (2001). The null hypothesis is absence of an integration relation for both the F-test and the t-test. For the F-test, the null is (i) accepted if *Bounds F-test estat* is below the lower bound *Bounds F-test 10% LB* and (ii) rejected if *Bounds F-test estat* is above upper bound *Bounds F-test 10% UB*. For the t-test, the null is accepted if *Bounds t-test estat* is above the upper bound B*ounds t-test 10% UB* and (ii) rejected if *Bounds t-test estat* is below lower bound *Bounds l-test estat 10% LB.* A statistic value between the two bounds is inconclusive for any of the tests. *, **, *** denote significance at the 10%, 5% and 1%.

cycle is unemployment, which enters the specifications for the interest rates of credit, debt securities holdings, rest of assets and rest of liabilities. The use of house price growth and GDP growth provides parsimonious specifications for the interest rates on sight and term deposits. As in the models for volume growth, the AR(1) specification prevail over the AR(2) alternative, which applies only to the model for average interest rate earned on bank credit.

The 12 month Euribor enters linearly all the interest rate models except that of the interest rate on term deposits, where it presents a non-linear lagged positive effect. The higher cost of market financing implied by a higher 12 month Euribor is translated more strongly to the cost of term deposits when the interest rate level is high. This result is consistent with the compression of profit margins on term deposit funds as interest rates near the zero level.

For the remaining categories of assets and liabilities, changes in reference interest rate are translated linearly to their corresponding average interest rates. For traditional bank credit products, this translation is lagged with a high and significant coefficient being applied to the second lag of the 12 month Euribor. There is also a lagged reaction in the debt securities holding category, whereas the relation between 12 month Euribor and the rest of assets and liabilities (interbank positions, wholesale financing products, etc.) is contemporaneous, plausibly reflecting the shorter maturities in these categories.

Examining the ECM reparametrization of the bank average interest rate models, we see that the estimated speed of adjustment α for different interest rates is quite comparable across balance sheet categories, as opposed to the more heterogeneous pattern found for the balance sheet growth models. The exception to this homogenous pattern is the interest rate on debt securities holdings, which presents a faster speed of adjustment than the rest of the models. The long run coefficients on the 12 month Euribor, or the squared term of 12 month Euribor in the model for interest rate on term deposits, are significant and point to the existence of a long term relation between the interbank rate and the average interest rates on different bank balance sheet categories. As regards cointegration, the Pesaran-Shin-Smith bound tests in Table 3 strongly point to the presence of an integration relation. Both the F-test and the t-test reject the null hypothesis of no cointegration relation at the 10% level in all cases.

6.3 ESTIMATED MODELS FOR OTHER BANK INCOME: OFBI AND PROVISIONING CHARGES

The models implemented for OFBI and provisioning charges are presented in Table 4. The two models present some common elements, such as the inclusion of AR(1) dynamics, a purely non-linear effect of the 12 month Euribor and the use of a single macro variable to control for the state of the business cycle. Additionally, the Pesaran-Shin-Smith bound tests support the presence of an integration relation with macro and interest rate controls for both of these variables, with both tests rejecting the null hypothesis. However, there are also significant differences between the two models. The effect of changes in 12 month Euribor on provisioning charges are more persistent due to both a higher AR(1) coefficient and the absence of compensating lagged terms (the first and second lag of 12 month Euribor have opposing signs and comparable magnitude in the model for OFBI). The effect of the business cycle is controlled with the unemployment variable in the model for OFBI, whereas house price growth (a variable related to general economic conditions, but also specifically to the value of real estate collateral) is applied in the model for provisioning charges.

6.4 BANK INCOME DYNAMICS AND INTEREST RATE SHOCKS

We perform in this subsection a dynamic sensitivity analysis of bank income components to market interest rates by introducing a temporary 100bp one-period shock to the 12 month Euribor at the start date of the 3 year study horizon. This is a pure sensitivity analysis

ESTIMATED MODELS FOR ADDITIONAL BANK INCOME COMPONENTS

TABLE 4

	OFB Income	Provision Charge
ARDL Coefficients		
Lag(1)	0.3154	0.6010
	(0.1171)***	(0.1430)***
House Price Growth		-2.0561
		(0.6482)***
Unemp.	-0.0082	
	(0.0047)*	
Euribor Sq.	0.0027	0.0599
	(0.0082)	(0.0183)***
Euribor Sq. (t – 1)	0.0226	
	(0.0143)	
Euribor Sq. (t – 2)	-0.0290	
	(0.0095)***	
Constant	0.2251	-0.1593
	(0.1115)**	(0.1054)
ARDL metrics		
R-squared	0.50	0.82
BIC	-47.3	87.0
AB test p-value	0.57	0.74
ECM coefficients		
Correction term	-0.6556	-0.3990
	(0.1095)***	(0.0834)***
LT House Index		-5.1537
		(1.7662)***
LT Unemp.	-0.0132	
	(0.0062)**	
LT Slope		
LT Euribor		
LT Euribor Sq.	-0.0071	0.1502
	(0.0052)	(0.0250)***
LT Real GDP		
ECM metrics		
ECM R-square	0.4	0.4
Bounds F-test estat.	13.4	9.6
Bounds F-test 10% LB	3.2	3.2
Bounds F-test 10% UB	4.1	4.1
Bounds t-test estat.	-6.0	-4.8
Bounds t-test 10% LB	-3.2	-3.2
Bounds t-test 10% UB	-2.6	-2.6

NOTES: For each of the P&L income categories indicated in the cols., the panel *ARDL Coefficients* reports OLS estimates for ARDL models in levels as in equation (3) with the year-on-year growth rate of the corresponding P&L category as dependent variable. For a given explanatory variable, the coefficient is provided with standard error (in parentheses) below it. Reported standard errors are robust to heterocedasticity of arbitrary form. Coefficients for the first and second lag of the dependent variable are provided in rows Lag(1) and Lag(2). When an explanatory variable is not included in any model, it is removed from the table for clarity. Panel *ARDL Metrics* includes the p-value for a first order autocorrelation test of the form given in Arellano-Bond (1991) applied to the residuals of the ARDL models. The panel ECM coefficients reports OLS estimates of correction term α and long term (LT) parameters $\boldsymbol{\theta}$ for the Error Correction Model reformulation (ECM) of ARDL models as in equation (4). In the panel *ECM metrics, Bounds F-test estat* and *Bounds t-test estat* provide statistic values for the test for the presence of an integration relation as in Pesaran, Shin and Smith (2001). The null hypothesis is absence of an integration relation for both the F-test and the t-test. For the F-test, the null is (i) accepted if *Bounds F-test estat* is below the lower bound *Bounds F-test 10% LB* and (ii) rejected if *Bounds F-test estat* is above upper bound *Bounds F-test 10% UB*. For the t-test, the null is accepted if *Bounds t-test estat* is above the upper bound *Bounds t-test 10% UB* and (ii) rejected if *Bounds t-test estat* is below lower bound *Bounds l-test estat 10% LB*. A statistic value between the two bounds is inconclusive for any of the tests. *, **, *** denote significance at the 10%, 5% and 1%.

under ceteris paribus conditions rather than a scenario analysis, as we keep constant the remaining factors of the model (macro variables and error term) when we introduce the one-period shock on interest rates. This choice of analytical method seeks exclusively to isolate the sensitivity of bank income to a perturbation of interest rates.[18]

The sample covering 2000-2015 presents periods with very different interest rate levels and business cycle conditions. Given this historical sample and the finding of non-linear terms for interest rates in several of the estimated models in subsections 6.1-6.3, the sensitivity of bank income to interest rates can be expected to differ over different subperiods. Thus, we perform the exercise for both the periods 2007-2009 (including a severe economic downturn and the highest interest rate level in sample) and 2013-2015 (a period of economic recovery combined with the lowest level of interest rates in the sample).

For each modelled variable, we compute first the effect of the 100bp one-period shock on the initial quarter. Then, we measure the effect of the shock propagation through the autoregressive terms of the modelled variable and, when applicable, the lagged terms of the Euribor variables. Finally, we take the difference between the generated path induced by the shock and the historical path observed in the data[19]. We measure in this way the impact of the Euribor shock on each of the 12 quarters of the 3 year period of analysis. For NII, we present both the impact of the temporary interest rate shock on each of its volume and interest rate components, and the figure of NII itself that results from aggregating these components: $NII = \sum_a Vol_a \times Rate_a - \sum_l Vol_l \times Rate_l$ (for asset and liability categories α and l). In order to infer a confidence interval around the estimated effect of the shock, we employ a bootstrap methodology. We take a 1,000 draws of the coefficients of the different estimated models and recompute the effect of the 100bp shock on all the variables of interest.[20] This provides a bootstrapped distribution of the effect of the 12 month Euribor shock on all the components of bank income.

6.4.1 Dynamic effect of interest rate shocks in 2007-2009

In year 2007, the 12 month Euribor was already above the 4% level, a high level relative to the sample average value of 2.45%, and bank provisioning charges were escalating quickly. Thus, a 100bp shock to 12 month Euribor can be a priori expected to put pressure on the debt servicing capacity of bank borrowers and push further the cost of financing for banks. The estimated models allow to quantify more precisely the effect of this Euribor shock.

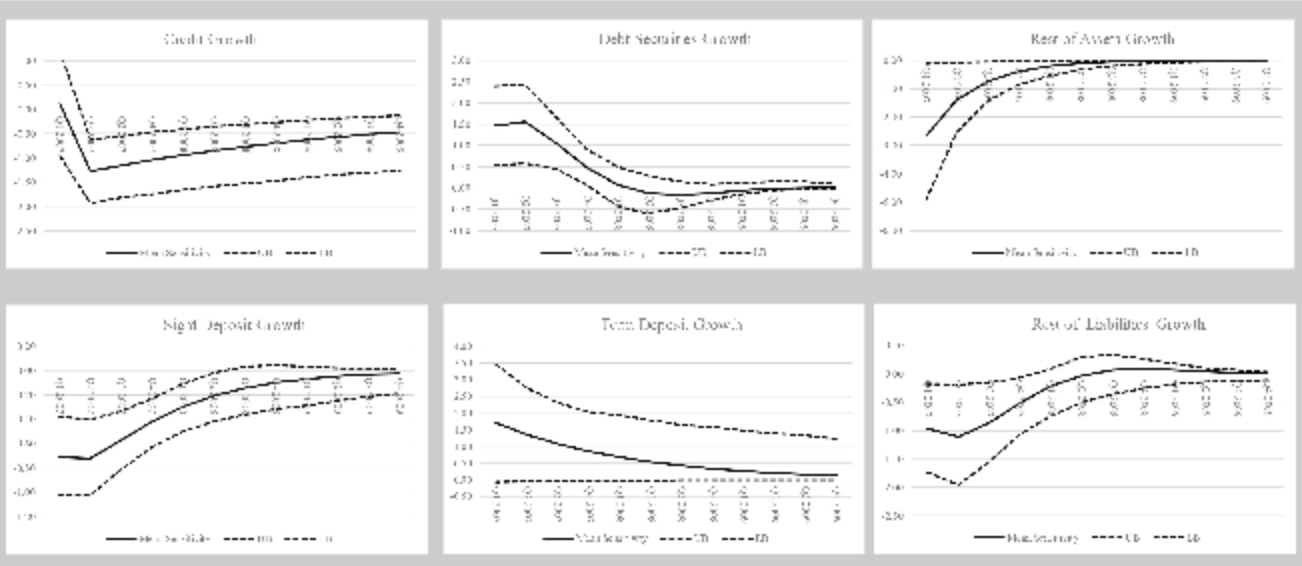
Chart 2 presents the effect of the transitory shock on the year-on-year growth of different assets and liabilities, measured as difference of counterfactual and actual growth rates. Credit growth is slowed down significantly as result of the 100bp shock to 12 month Euribor. Despite the absence of significant initial response on Q1 2007, the decline of 1.3 pp on Q2 2007 is sizeable and confidence intervals stay in the negative territory for the rest of the horizon of analysis. The effect on Q4 2009 is still –0.5 pp with negative confidence

18 Alternative analysis could be constructed, with a staggered calendar of rate changes and permanent changes to the level of the reference rate. Additionally, a consistent macro scenario (with macro variables adapted to the alternative interest rate path) could be applied to obtain the full net effect on bank profitability beyond the pure interest rate effect. In this article, we limit the analysis to this pure rate effect and we use the one period 100bp change as a natural unit of reference.

19 Macro variables other than the 12 month Euribor take the same values in the shock-generated path and in the historical path, so the difference between both paths only reflects the effect of the shock to the 12 month Euribor on the initial quarter, which propagate over several quarters because of the autoregressive structure on the dependent variable and the 12 month Euribor itself.

20 We use the estimated coefficients and their associated variance covariance matrix for each ARDL model in levels to obtain normal random draws.

BALANCE SHEET GROWTH DYNAMICS AFTER 100BP SHOCK TO 12 MONTH EURIBOR (2007-2009) CHART 2



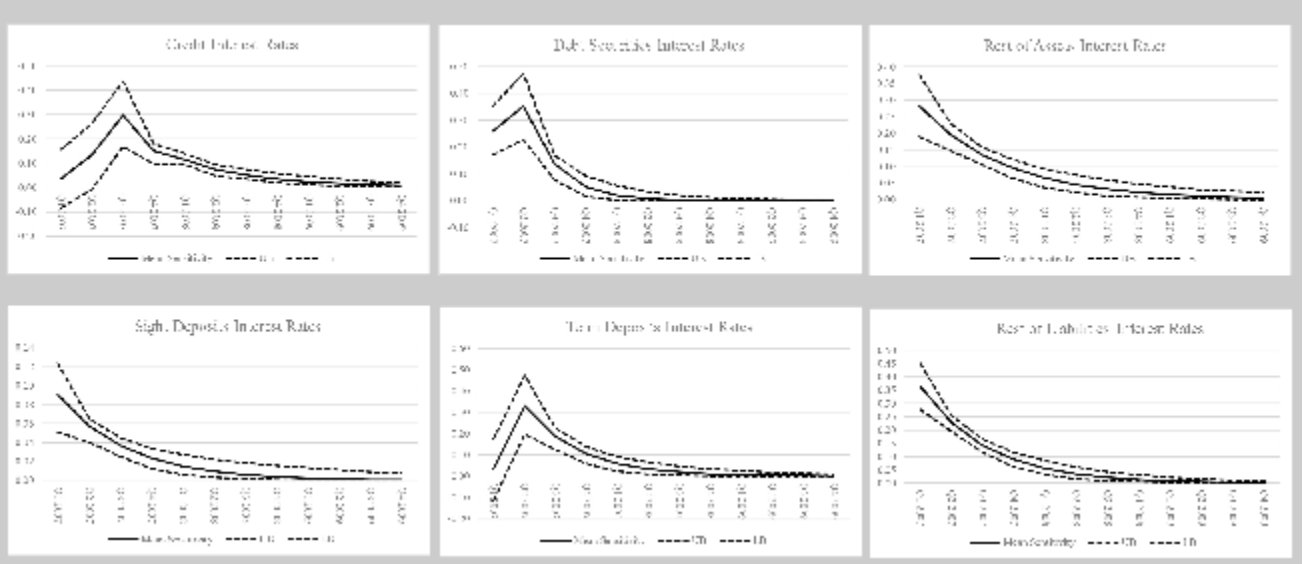
NOTES: For a transitory 100bp shock to 12 month Euribor on Q1 2007, each panel of this figure shows the difference ($y_t^* - y_t$) between counterfactual (y_t^*) and actual (y_t) year-on-year growth rates for the corresponding balance sheet category (e.g., the left-most top panel shows this difference for bank credit growth rate) for each quarter t in the period Q1 2007 – Q4 2009. The models for balance sheet categories are reported in Table 2. The lower (LB) and upper (UB) bounds of the confidence interval correspond with the 5th and 95th percentiles of the distribution of a 1,000 bootstrapped evaluations of the impact of the 12 month Euribor shock.

interval, indicating that the effect on credit does not dissipate quickly. The effect on the growth rate of the rest of assets category (covering for example interbank exposures) is also negative, with a big initial decline of –2.7 pp on Q1 2007 that dissipates rapidly (–0.2 pp on Q1 2008 and –0.002 pp on Q4 2009). On the contrary, the volume of debt securities holdings increases as result of the shock, even though the increase is only significant over the first four quarters of analysis (Q1 2007 – Q4 2007). As the 12 month Euribor goes up, we observe a substitution of traditional bank credit towards debt securities holdings.

On the liability side, we observe substitution from sight to term deposits, which is natural given the rise in their reference interest rate. The confidence intervals for the reduction in growth of sight deposits stay in the negative region from Q1 2007 to Q2 2008, whereas the confidence intervals for the impact on term deposit growth are in the positive region, but they marginally contact zero. The effect on the rest of liabilities is clearly negative, with an initial decline of 0.95 pp that persists as significant for four quarters. The additional market tension introduced by the interest rate shock, plausibly leads to a decline of market financing and greater reliance on term deposits.

Chart 3 displays the effect of the transitory 100bp shock to 12 month Euribor on the average interest rates corresponding to the different asset and liability categories. The rise in the 12 month Euribor increases the levels of all bank interest rates, with a maximum effect of the shock in a given quarter in the 0.3 pp-0.4 pp range for all the series, except sight deposits (with maximum initial reaction of 0.1 pp that dissipates quickly). The differences in the speed of adjustment of different categories are relevant to understand the net changes in NII growth over time. On the asset side, it takes up to three quarters to observe a significant positive effect on credit interest rates, whereas the effect is immediately positive on the debt securities and rest of assets categories, which are more directly linked to wholesale financial markets. On the liability side, the interest rate

AVERAGE BANK INTEREST RATE DYNAMICS AFTER 100BP SHOCK TO 12 MONTH EURIBOR (2007-2009) CHART 3



NOTES: For a transitory 100bp shock to 12 month Euribor on Q1 2007, each panel of this figure shows the difference ($y_t^* - y_t$) between counterfactual (y_t^*) and actual (y_t) average interest rates, in pp, for the corresponding balance sheet category (e.g., the left-most top panel shows this difference for the average interest rate on bank credit) for each quarter in the period Q1 2007 – Q4 2009. The models for interest rates are reported in Table 3. The lower (LB) and upper (UB) bounds of the confidence interval correspond with the 5th and 95th percentiles of a 1,000 bootstrapped evaluations of the impact of the 12 month Euribor shock.

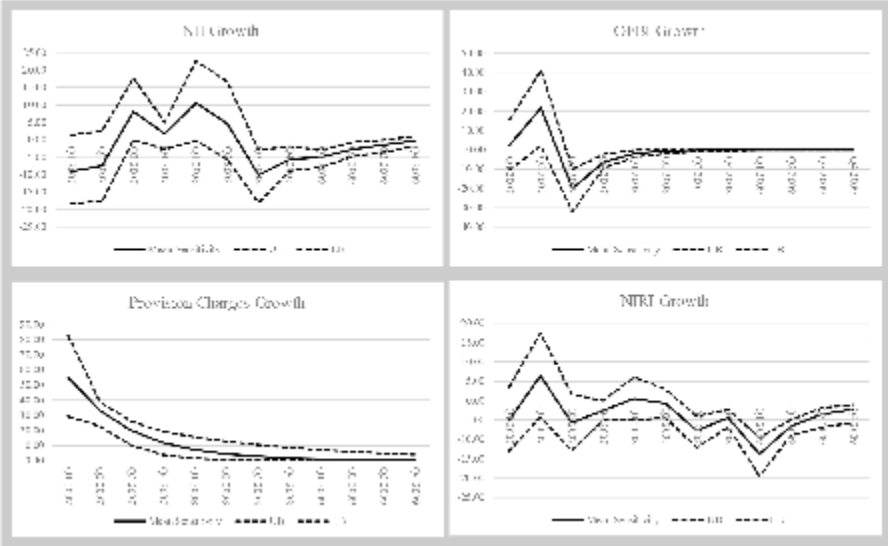
cost of the rest of liabilities experiences the strongest effect on the first quarter of analysis (Q1 2007), but the effects of the shock remain sizeable for the whole first year. The response of the cost of term deposits is more lagged (with a peak on Q2 2007), but it is still sizeable.

Chart 4 presents the effects of the 12 month Euribor transitory shock on year-on-year growth rates of NIRI and its components (NII, OFBI and provisioning charges). Firstly, the changes in volume growth and interest rates displayed in Charts 2 and 3 lead to an initial decline of NII year-on-year growth (–9.1 pp on Q1 2007) that is then reversed for some periods (increases in 5 pp-10 pp range from Q3 2007 to Q2 2008) as some of the initial shocks on volumes dissipate and the interest rate on credit picks up, boosting interest rate income. Once all effects have peaked, we observe however a negative, albeit declining, negative effect on NII growth for the last six quarters of analysis (Q4 2008 to Q4 2009). The net effect over the three years of analysis is a lower NII growth, as decline in volume of activity and higher cost of funding dominate over the higher interest rates earned on bank credit and securities holdings.

For OFBI, we observe a sizeable though short-lived effect, with positive increases in year-on-year growth on the first two initial quarters (2.5 pp on Q1 2007 and 21.5 pp on Q2 2007). The effect turns however negative on Q3 2007 (–19.8 pp on Q3 2007), compensating the initial positive effect, and declines quickly afterwards. This pattern is consistent with the use of OFBI to hedge variations in NII, as we observe opposite signs to the effects over NII and the response of OFBI is mostly short term.

The effect of the interest rate shock on provision charges is clearly positive (over 50 pp on Q1 2007) and it remains sizeable until the second half of 2008. Finally, examining the net effect on the year-on-year growth of NIRI, we observe that it is negative on all quarters except on Q2 2007, where the hedging effect of OFBI compensates the negative impact

BANK PROFITABILITY DYNAMICS AFTER 100BP SHOCK TO 12 MONTH EURIBOR (2007-2009) CHART 4



NOTES: For a 100bp shock to 12 month Euribor on Q1 2007, each panel of this figure shows the difference ($y_t^* - y_t$) between counterfactual (y_t^*) and actual (y_t) year-on-year growth rates for the corresponding P&L component (e.g., the left-most top panel shows this difference for NII growth rate) for each quarter t in the period Q1 2007 – Q4 2009. The lower (LB) and upper (UB) bounds of the confidence interval correspond with the 5th and 95th percentiles of the distribution of a 1,000 bootstrapped evaluations of the impact of the 12 month Euribor shock. The following variable definitions apply: NII (Net Interest Income), OFBI (Other Financial and Banking Income) and NIRI (Net Interest Related Income). NII is modelled as a function of balance sheet growth and interest rates according to equation (1), OFBI and provision charges are modelled directly, and NIRI is modelled as function of the other variables based on equation (2).

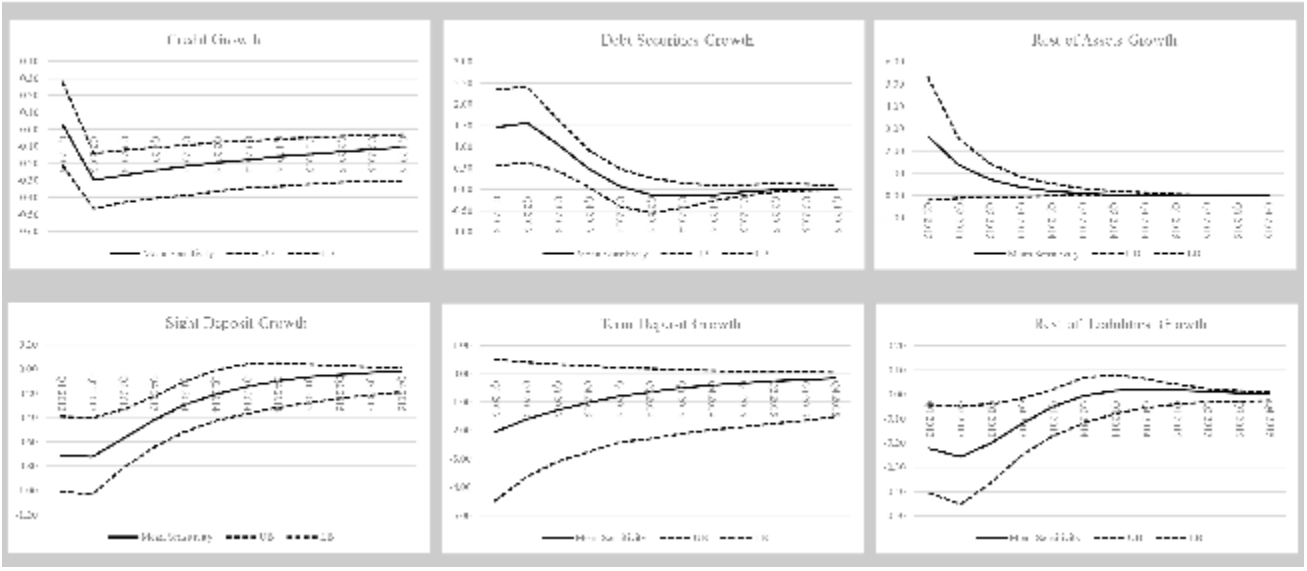
on other profit components. It must be noted however that the confidence interval for quarters in the first half of the study period crosses zero, reducing the significance of the effect of the 12 month Euribor on NIRI growth. Starting on Q3 2008, the confidence intervals stay consistently below zero, indicating a significant effect of the shock in these latter quarters. As the positive effects on NII growth disappear, the negative effects on profitability through lower NII and higher provision charges become dominant and bring down NIRI growth.

6.4.2 Dynamic effect of interest rate shocks in 2013-2015

In year 2013, the Spanish economy was in recession and the provisioning charges of banks remained at high historical levels, but the 12 month Euribor was at a relatively low level (approx. 1%) and the following two years would present a path of positive GDP growth and declining interest rates. Under these different conditions relative to the 2007-2009 period, the 100bp Euribor shock would introduce a priori less pressure on the profit margins of banks. We verify whether this is the case with the model projections.

Chart 5 presents the effect on the growth of different balance sheet categories of a transitory 100bp shock to 12 month Euribor on Q1 2013. As in subsection 6.4.1, the impact on credit growth is negative and persistent, but the effect is weaker. For example, the initial effect (Q1 2013) is again insignificant and the slowing of credit growth begins in the second quarter (Q2 2013) with a shock of –0.3 pp, which is smaller than the shock of –1.3 pp on Q2 2007 measured in the previous experiment. Given that the model implemented for debt securities is linear in 12 month Euribor, the projected path of this variable is positive and coincides with that of the previous experiment in subsection 6.4.1. Interestingly, the effect on the growth of the rest of assets is now found to be positive, though the wide confidence intervals do not allow to preclude a null effect. Based on the results of the two experiments, the increase in 12 month Euribor contracts (expands) this form of exposure when this reference rate is at high (low) levels.

BALANCE SHEET GROWTH AND 12 MONTH EURIBOR DYNAMICS (2013-2015) CHART 5



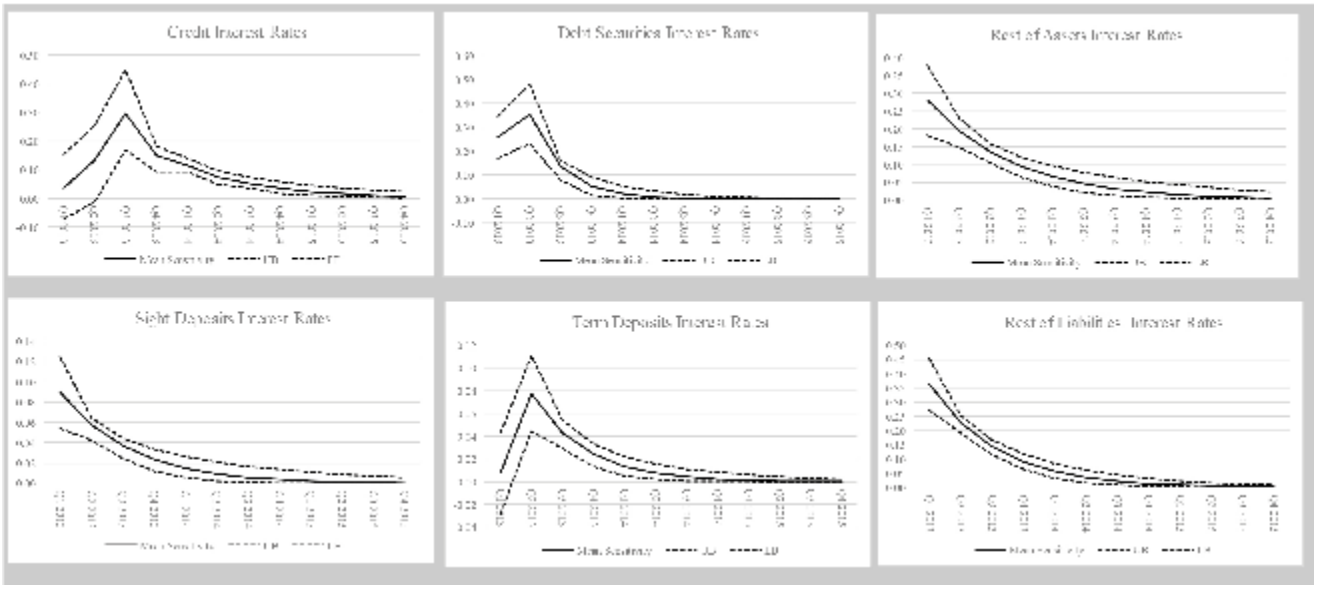
NOTES: For a transitory 100bp shock to 12 month Euribor on Q1 2013, each panel of this figure shows the difference ($y_t^* - y_t$) between counterfactual (y_t^*) and actual (y_t) year-on-year growth rates for the corresponding balance sheet category (e.g., the left-most top panel shows this difference for bank credit growth rate) for each quarter t in the period Q1 2013 – Q4 2015. The models for balance sheet categories are reported in Table 2. The lower (LB) and upper (UB) bounds of the confidence interval correspond with the 5th and 95th percentiles of the distribution of a 1,000 bootstrapped evaluations of the impact of the 12 month Euribor shock.

The lower decline on asset growth as result of the shock to 12 month Euribor is also translated into a more stable liability structure. The positive effect on the growth of term deposits in the previous experiment now disappears, and we observe instead a contraction also in this term of financing. However, the confidence intervals for the impact on term deposit growth are wide and cross zero, so we conclude there is no significant effect on this variable. The negative effect on sight deposits stays the same as the model for this variable is linear on 12 month Euribor. The negative effect on the growth of the rest of liabilities is also smaller (e.g., a reduction of approx. –0.22 pp on Q1 2013 relative to approx. –1 pp. on Q1 2007 on the previous experiment). We still observe in the liability mix a relative substitution towards term deposits, as this form of financing stays approx. constant whereas sight deposits and rest of liabilities decline.

The effect of the transitory shock to the 12 month Euribor is presented in Chart 6. As before, a higher 12 month Euribor implies higher term deposit rates, but the effect of a 100bp hike to the interbank rate has now a much weaker effect, with a peak effect of 0.08 pp rather than 0.33 pp in the previous experiment. For the rest of bank interest rates, their projected reactions coincide with those presented in the previous experiment, since their models are linear in 12 month Euribor.

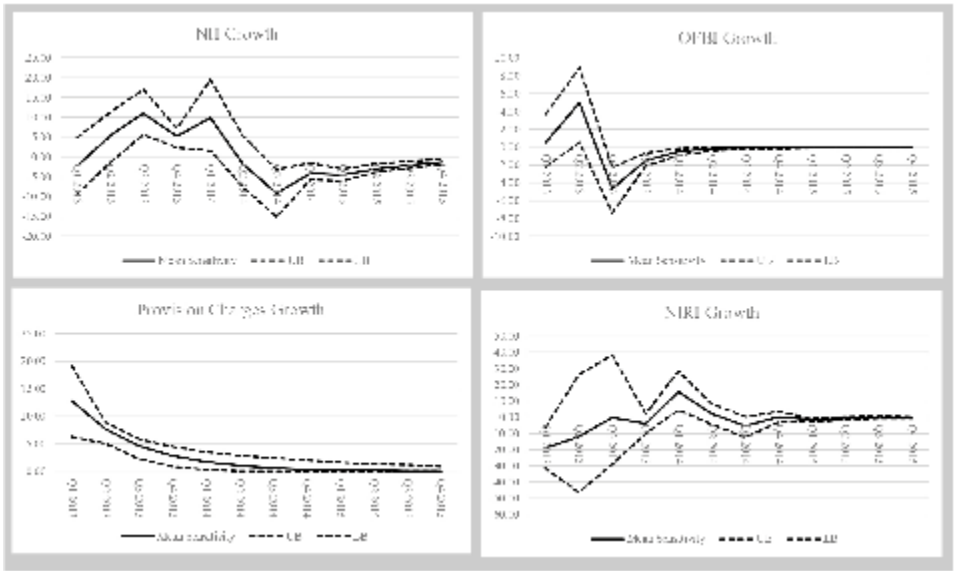
Chart 7 collects the impact of the transitory 100bp shock to 12 month Euribor on NIRI growth and its components. The patterns observed are comparable to the previous experiment, but the levels of the effects and the quantitative conclusions differ. Firstly, the weaker contraction of credit volume and the more moderate increase of the cost of term deposits lead to a lower initial contraction of NII (–2.3 pp on Q1 2013 relative to –9.1 pp on Q1 2007) and a significant acceleration of NII growth from Q2 2013 to Q2 2014 (this effect on NII results from the combination of effects on its components displayed in Charts 3, 5 and 6). In the low interest rate environment of the latter period of the sample, the increase

AVERAGE BANK INTEREST RATE DYNAMICS AFTER 100BP SHOCK TO 12 MONTH EURIBOR (2013-2015) CHART 6



NOTES: For a transitory 100bp shock to 12 month Euribor on Q1 2013, this figure shows the difference ($y_t - \dot{y}_t$) between counterfactual ($\dot{y}_t$) and actual (y_t) average term deposit rates, in pp, for each quarter t in the period Q1 2013 – Q4 2015. The models for interest rates are reported in Table 3. The lower (LB) and upper (UB) bounds of the confidence interval correspond with the 5th and 95th percentiles of a 1,000 bootstrapped evaluations of the impact of the 12 month Euribor shock.

BANK PROFITABILITY DYNAMICS AFTER 100BP SHOCK TO 12 MONTH EURIBOR (2013-2015) CHART 7



NOTES: For a 100bp shock to 12 month Euribor on Q1 2013, each panel of this figure shows the difference ($\dot{y}_t - y_t$) between counterfactual ($\dot{y}_t$) and actual (y_t) year-on-year growth rates for the corresponding P&L component (e.g., the left-most top panel shows this difference for NII growth rate) for each quarter t in the period Q1 2013 – Q4 2015. The lower (LB) and upper (UB) bounds of the confidence interval correspond with the 5th and 95th percentiles of the distribution of a 1,000 bootstrapped evaluations of the impact of the 12 month Euribor shock. The following variable definitions apply: NII (Net Interest Income), OFBI (Other Financial and Banking Income) and NIRI (Net Interest Related Income). NII is modelled as a function of balance sheet growth and interest rates according to equation (1), OFBI and provision charges are modelled directly, and NIRI is modelled as function of the other variables based on equation (2).

of 12 month Euribor allows banks to earn higher interest rates on their assets, suffering a smaller penalty in terms of lower volume of activity or increased cost of funds. The impact on OFBI growth is again observed to be short term and to offset to some extent the fluctuations on NII year-on-year growth, but the effect is now smaller in absolute terms (±4 pp range as compared to ±20 pp range in the previous experiment).

CUMULATIVE EFFECT OF INTEREST RATE SHOCKS TABLE 5

	2007-2009 (a)			2013-2015 (b)		
	Δ%	LB	UB	Δ%	LB	UB
NII	-2.3	-6.1	0.4	3.0	1.1	5.0
NIRI	-6.1	-9.7	-3.2	-3.2	-6.5	-0.1
Total Assets	-1.4	-2.8	-0.5	-0.2	-0.5	0.1

NOTES: Each panel of this table displays the cumulative effect of a 100bp shock to 12 month Euribor on key bank profit and volume of activity variables. For a given variable, we provide the relative variation $\Delta\% = (\hat{y} - y) / y$ between the counterfactual level of the variable $\hat{y}$ implied by the Euribor shock and the actual value y. The lower (LB) and upper (UB) bounds of the confidence interval correspond with the 5th and 95th percentiles of the distribution of a 1,000 bootstrapped evaluations of the impact of the 12 month Euribor shock. Panel (a) displays results for the period 2007-2009 with Euribor shock on Q1 2007 and Panel (b) displays results for the period 2013-2015 with Euribor shock on Q1 2013. The following variable definitions apply: NII (3 year cumulative sum of net interest income), NIRI (3 year cumulative sum of net interest related income) and Total Assets (sum of credit, debt securities holdings and rest of assets on the last quarter of the horizon of analysis). For example, the table displays in panel (a) the change Δ% in cumulative NII and NIRI for 2007-2009, and the change Δ% in the standing volume of total assets on final quarter Q4 2009. Neither NII nor NIRI are modelled directly. NII is modelled in terms of equation (1) ($NII = \sum_a Vol_a \times Rate_a - \sum_j Vol_j \times Rate_j$) and it is thus a function of the 6 models for balance sheet items (reported in Table 2) and the six models for bank rates (reported in Table 3). NIRI is computed with equation (2) and it is thus a function of NII and the models for OFBI and provisions in Table 4.

The increase in provision charges growth is also less marked, with an initial effect of approx. 12 pp on Q1 2013 that has largely dissipated by Q2 2014. It must be noted however that the level of provision charges at the beginning of 2013 was much higher than on the year 2007 (as shown in Chart 1) so a smaller acceleration of the growth of provision charges can have a greater impact on NIRI than in the experiment for the 2007-2009 period. When we observe the net impact on NIRI growth, we effectively observe a higher initial decline (–20 pp on Q1 2013 relative to –5.2 pp on Q1 2007) despite the lower negative impact on NII growth. As the effect on provision charges growth dissipates and the higher NII growth takes hold during 2014, the initial negative effect is reversed and we observe higher NIRI growth due to the shock to the Euribor. For the last year of analysis, 2015, the effect on NIRI growth is almost nil as opposed to the negative effect that we found on the previous experiment.

6.4.3 Cumulative effects of interest rate shocks

In this subsection, we measure the cumulative effect of the interest rate shocks on bank profits and volume of activity over the complete horizon of the experiments for 2007-2009 and 2013-2015. This information complements the quarter by quarter analysis of subsections 6.4.1 and 6.4.2 and allows for a more precise comparison of the two periods. Table 5 shows that the effect of the transitory 100bp Euribor shock on the total NII (sum of NII for the corresponding three year study period) is positive (+3%) during the latter low interest rate period of 2013-2015, but negative (–2.3%) during the high interest rate period of 2007-2009. The confidence interval for this earlier period is wide and crosses zero so a nil effect can not be ruled out. This aggregate result is driven by factors already commented, such as the very different impact of interest rate hikes on the volume of activity of banks and cost of funds for high and low interest rate levels (NII is not modelled with a single aggregate model, but with the combination of 12 models for balance sheet items and bank rates). It is important to notice that the higher NII attained after a positive Euribor shock at low interest rate levels is made possible partly through a substitution of credit towards debt securities, potentially hurting some bank borrowers.

Table 5 also displays the net effect on total NIRI produced over the different study periods, which is significantly negative for both experiments, but greater in magnitude for the 2007-2009 period (–6.1% relative to –3.2%). The shock to 12 month Euribor reduces NII more and contributes to faster growth of provision charges during high interest rate periods. The

volume of interest producing assets, which proxies for the total value creation of the banking sector beyond bank profits, is negatively and significantly affected (–1.4%) in the 2007-2009 period, but is associated to an almost nil effect for 2013-2015. The interest rate increase from a very low level would not affect significantly the size of productive assets of the banking sector.

7 Final Considerations

A careful analysis of the relation of bank profitability, and more generally value creation in the banking sector, with the level of interest rates must recognize the multiple channels through which interest rates affect bank profits. The changes in the level of interest rates do not affect only the return on funds through its impact on the average interest rates corresponding to bank assets and liabilities, but also the maximum volume of activity that the banking sector can attain in a given period. The analysis of the return on funds can be insufficient to determine whether an interest rate change will lead to higher bank profits, because the return on funds and volume of activity are interconnected.

Breaking down the components of profit variation can be useful to evaluate the impact of these changes on different bank stakeholders. We find that higher interest rates lead to substitution from bank credit to debt securities on the asset side, and, to some extent, from wholesale financing to term deposits on the liability side. These shifts in asset and liability composition will plausibly hurt bank borrowers and benefit bank depositors. Bank shareholders (through lower profits) are generally negatively affected by interest rate increases in the studied environment. Even though higher rates can boost NII growth at low interest rate levels, they lead to higher provisioning charges, dragging net interest related profitability. At high interest rate levels, further interest rate increases are found to deteriorate profitability both through NII and provisioning channels. The relation between the interest rate level and bank profitability and balance sheet structure is therefore nonlinear, varying as a function of the level of interest rates and bank balance sheet composition.

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Annex A – Additional Elements of the Model Selection Framework

The restrictions on the signs of the model coefficients impose a positive (negative) relation of the business cycle with credit loan growth (provision charges). Restrictions also require a negative (positive) relation of the interbank rate with credit loan growth (provision charges). For interest rate models, we impose generally a positive relation with the interbank rate and a negative relation with the business cycle. We refrain from imposing restrictions over variables for which there is weaker a priori information, such as most volume growth models. For example, OFBI might increase or decrease with the economic cycle as a function of the financial market position of banks.

As the interbank rate potentially enters the models with a quadratic term, the restrictions are imposed on the derivatives at the extremes of the range of possible interbank rate values. For example, if we take Euribor as the interbank rate measure and assume that it enters a model just contemporaneously as $\beta_0 \cdot \text{Euribor} + \beta_1 \cdot \text{Euribor}^2$, the derivative with respect to Euribor is then given by $\beta_0 + 2\beta_1 \cdot \text{Euribor}$, which is a monotonically increasing (decreasing) function if $\beta_1 > 0$ ($\beta_1 < 0$). Given this monotonicity of the derivative, restricting its sign to be positive (or negative) at both extremes of the range of interbank values is sufficient to restrict the sign in all that range. Table B1 sums up all the restrictions imposed on the models.

DEPENDENT VARIABLES WITH SIGN RESTRICTIONS — TABLE A.1

Variable	Type	House price growth	Unemployment	Slope	Real GDP growth	Euribor
Credit	Volume Growth	≥0	≤0	—	≥0	≤0
Credit	Rate	≤0	≥0	—	≤0	≥0
Debt Security	Rate	≤0	≥0	—	≤0	≥0
Rest of Assets	Rate	≤0	≥0	—	≤0	≥0
Sight Deposits	Rate	≤0	≥0	—	≤0	≥0
Term Deposits	Rate	≤0	≥0	—	≤0	≥0
Rest of Liabilities	Rate	≤0	≥0	—	≤0	≥0
Provision Charge	Aggregate	≤0	≥0	—	≤0	≥0

NOTES: For macroeconomic variables different from Euribor, the sign restriction applies to the sum of the three potential coefficients in the model (β_0, and the two lags β_1 and β_2): $\beta_0 + \beta_1 + \beta_2$. For example, the sign restriction for the effect of house price growth on credit growth is $\beta_0 + \beta_1 + \beta_2 \geq 0$. For the relation of Euribor with credit growth, we consider linear (β_0, β_1, β_2) and quadratic effects (β'_0, β'_1, β'_2), and we require a negative long term derivative, i.e., $\beta_0 + \beta_1 + \beta_2 + 2 \cdot \text{Euribor}\ (\beta'_0 + \beta'_1 + \beta'_2)$ for all the range of Euribor values. The role of Euribor as reference rate connects it more directly with average interest rates on bank assets and liabilities and with provision charge growth (the prevalence of variable rate contracts in Spain links financial burden to Euribor). Thus, we apply a stricter sign restriction for these variables, requiring each lag component ($\beta_0 + 2 \cdot \text{Euribor} \cdot \beta'_0$, $\beta_1 + 2 \cdot \text{Euribor} \cdot \beta'_1$, $\beta_2 + 2 \cdot \text{Euribor} \cdot \beta'_2$) of the long term derivative to satisfy the corresponding restriction. If a particular coefficient does not appear in a specification, then it is taken as zero for the verification of the sign conditions.

Annex B – Unit Root Tests

As described in subsection 5.1., we use Augmented Dickey-Fuller and KPSS tests to examine whether there is evidence of I(1) and I(2) behavior of the variables in the data set. The results of these unit root tests in Table B1 are consistent with I(1) dynamics in the data,

ADF AND KPSS TESTS **TABLE B.1**

	ADF	KPSS		
		Min.	Max.	Lag Order
A Macro Variables				
Euribor	-2.01	0.51**	1.91***	10
Euribor Sq.	-2.73*	0.41*	1.37***	10
House Price Growth	-1.26	0.50**	2.43***	10
Unemp.	-0.83	0.51**	2.45***	10
Real GDP	-2.02	0.42*	1.61***	10
Slope	-2.08	0.31	1.23***	10
Dif. - Euribor	-5.32***	0.06	0.08	10
Dif. - Euribor Sq.	-6.56***	0.05	0.06	10
Dif. - House Price Growth	-3.07**	0.15	0.34	10
Dif. - Unemp.	-4.31***	0.18	0.39*	10
Dif. - Real GDP	-4.11***	0.20	0.28	10
Dif. - Slope	-5.02***	0.09	0.12	10
B Bank Variables				
Prov. Charges Growth	-2.18	0.11	0.28	10
OFBI Growth	-3.20**	0.30	0.51**	10
Credit Growth	-1.01	0.46*	2.16***	10
Debt Securities Growth	-3.49***	0.13	0.22	10
Rest of Assets Growth	-2.14	0.23	0.73**	10
Sight Deposits Growth	-2.10	0.21	0.61**	10
Term Deposit Growth	-1.09	0.37*	1.52***	10
Rest of Liabilities Growth	-1.81	0.46**	1.83***	10
Credit Int. Rate	-1.01	0.49**	1.81***	10
Deb Securities Int. Rate	-1.52	0.51**	1.73***	10
Rest of Assets Int. Rate	-1.42	0.58**	2.35***	10
Sight Deposits Int. Rate	-1.42	0.34	1.18***	10
Term Deposit Int. Rate	-1.41	0.13	0.37*	10
Rest of Liabilities Int. Rate	-1.47	0.50**	1.85***	10
Dif. - Prov. Charges Growth	-4.42***	0.06	0.09	10
Dif. - OFBI Growth	-7.45***	0.03	0.09	10
Dif. - Credit Growth	-2.80*	0.10	0.23	10
Dif. - Debt Securities Growth	-4.90***	0.06	0.13	10
Dif. - Rest of Assets Growth	-6.84***	0.10	0.19	10
Dif. - Sight Deposits Growth	-4.17***	0.15	0.22	10
Dif. - Term Deposit Growth	-4.13***	0.15	0.20	10
Dif. - Rest of Liabilities Growth	-3.90***	0.07	0.15	10
Dif. - Credit Int. Rate	-4.06***	0.06	0.09	10
Dif. - Debt Securities Int. Rate	-4.43***	0.06	0.07	10
Dif. - Rest of Assets Int. Rate	-4.65***	0.05	0.07	10
Dif. - Sight Deposits Int. Rate	-4.09***	0.09	0.14	10
Dif. - Term Deposit Int. Rate	-4.32***	0.14	0.19	10
Dif. - Rest of Liabilities Int. Rate	-4.27***	0.05	0.08	10

NOTES: *Growth* indicates the year-on-year growth series and *Int. Rate* the average interest rate series of the corresponding variable. *Dif.* - indicates the first differenced series of the corresponding variable. *ADF* denotes Augmented Dickey Fuller test statistic (Null: Unit Root). For KPSS test (Null: Stationarity), Schwert criterium indicates a 10 lag order, we report the minimum and maximum KPSS test statistic for lag orders 1 to 10. *, **, *** indicates rejection at 10%, 5%, 1% significance level.

but not with I(2) dynamics. It must also be noted that unit root tests can have low power against the alternative of a stationary and persistent process, especially in a limited 16 year time span in the available sample, so I(0) dynamics for the variables of interest cannot be completely ruled out. The ARDL approach used is valid with either I(0) or I(1) dynamics, but not with I(2) dynamics. The results for the unit root tests in this annex thus confirm the adequacy of applying ARDL to the estimation of the models in the main text.

SPANISH HOUSEHOLD DEBT DEFAULTS: RESULTS OF THE SPANISH SURVEY OF HOUSEHOLD FINANCES (2002-2014)

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SPANISH HOUSEHOLD DEBT DEFAULTS: RESULTS OF THE SPANISH SURVEY OF HOUSEHOLD FINANCES (2002-2014)

Abstract

According to the EFF (the Spanish Survey of Household Finances), the proportion of indebted households that had incurred a debt default over the past 12 months increased from 13.7% in 2002 to 21.1% in 2014. This article has two objectives. First, to characterise the population groups among whom debt defaults have most increased, drawing on EFF data from 2002 to 2014. And second, using panel and cross-section components of the EFF, to estimate how defaults respond to declines in the income and changes in the labour market status of household members throughout the economic cycle. The results suggest that the high incidence of declines in household income and changes in the labour market status of the main household earner are important factors when seeking to understand the increase in debt defaults over the 2002-2014 period. Throughout the economic cycle, one-fifth of indebted households underwent reductions in their income that led them to fall, at least, to a lower quartile of the income distribution. During the recession, the probability of incurring debt defaults following declines in income on this scale increased substantially. Further, among the 10% of indebted households, the main earner experienced job loss during the three years between the survey span. Such job loss was associated with a high probability of incurring defaults during the recession. These results confirm that the course of household defaults during the recession was closely linked to changes in their disposable income.

1 Introduction

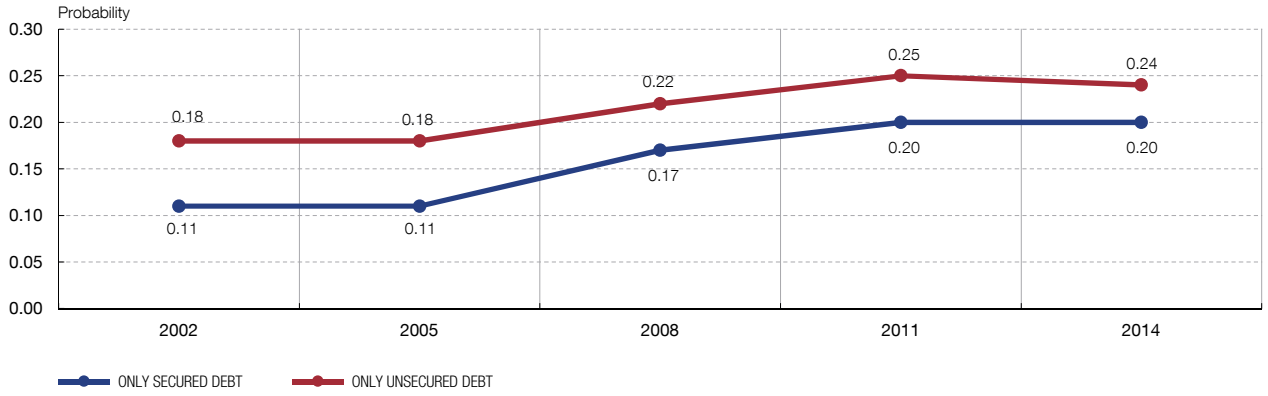
According to the EFF (the Spanish Survey of Household Finances), the proportion of indebted households that had incurred debt defaults over the past 12 months increased from 13.7% in 2002 to 18.6% in 2008. Since then the proportion has held around 20%, rising in 2014 to 21.1% of indebted households. The percentage of all households (indebted or not) incurring defaults rose from 6% in 2002 to 10.3% in 2014.

We first examine the incidence of default by type of debt. Among the households that solely have unsecured debt, the percentage that incurred defaults grew from 18% in 2002 to 24% in 2014. Among the households that only had secured debt, the incidence of defaults rose from 11% in 2002 to 20% in 2014 (see Chart 1).

This article seeks to analyse the causes inherent in the increase in debt defaults, compared with the explanations offered by the recent economic literature. Thus, on one hand, we have emphasised the role of the greater incidence of unemployment and of the decline in household income as from 2008. An increase in unemployment would result in debt defaults if households did not have financial savings enabling them to offset discrete declines in their level of income. There is also an alternative explanation which argues that households have adopted a more permissive attitude towards debt default even when their resources allow repayment. For example, Guiso, Sapienza and Zingales (2013) use US survey-based information to document the fact that the percentage of households that would cease to pay their mortgage in the face of hypothetical declines in the value of their house increased by 10 pp between 2009 and 2010. Underpinning this attitude is the perception that defaults do not entail significant consequences for wealth, even in those States where all debtors' assets are liable when it comes to responding to the payment of their debts.[1]

1 This perception would suggest that many households are not aware of the legal and economic consequences of default. In Spain, there is less direct evidence on perceptions and attitudes in the face of household defaults than

INCIDENCE OF DELAYS IN DEBT PAYMENT AMONG BORROWERS BY DEBT HELD CHART 1



SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).
NOTE: Households which have both secured and unsecured debt are excluded from both series and, consequently, the percentage of defaults and that presented in the text for the total population do not coincide.

This article has two aims. First, to characterise the population groups among whom debt defaults have most increased, drawing on EFF data from 2002 to 2014. And second, to estimate how defaults respond to declines in income and changes in the labour market status of household members during the economic cycle. The results suggest that the changes in the employment status of the main main earner and declines in income have had an especially high impact on the probability of incurring defaults between 2008 and 2014, substantially greater than that observed during the economic expansion from 2002 to 2005.

2 Previous papers

Blanco and Gimeno (2012) use aggregate, provincial-level data from the Banco de España Central Credit Register to analyse what impact unemployment and the debt burden have on the increase in defaults during the period from 1984 to 2009. These authors find that the strong increase in the unemployment rate between 2008 and 2009 explains the increase in defaults at the start of the recession that began in 2008.

Aller and Grant (2018) analyse a related issue. Starting with the fact that the incidence of unemployment grew as from 2008, but that household income and formation also changed, they ask what the proportion of households incurring debt defaults would have been had the characteristics of the indebted not changed. If this hypothetical proportion were similar to that observed, it could be concluded that changes in the level of employment or income did not account for the increase in defaults. Using cross-section data from the EFF between 2002 and 2011, they conclude that the changes in the characteristics of the indebted explain at most 20% of the increase in defaults. They further argue that the increase in late payments was due to a change in household preferences, with the latter perceiving there to be less stigma associated with not repaying debts.[2]

The differences between both studies may lie in the change in the behaviour of unemployed or low-income households during the recession. According to the findings of Aller and Grant, unemployment was more of an explanation for defaults during the expansion than

in the case of the United States.

2 Apart from the differences caused by the use of data with a different aggregation level, Blanco and Gimeno (2012) do not consider the role of household income, whereas Aller and Grant (2018) do not consider the role of the debt burden.

during the recession, a result contrary to that of Blanco and Gimeno (2012). According to Aller and Grant, being unemployed in 2002 increased the odds ratio of incurring debt defaults by 2.85 times compared with being in paid employment. In 2011, the ratio had fallen to 1.95.[3] As regards the effect of income on defaults, in 2002 the odds ratio of households incurring defaults in the second lowest quartile of the income distribution was 50% compared with those of the lower quartile. In 2011 this difference had disappeared.[4] The fact that defaults should increase among groups that are not unemployed, or whose income is not low, might be due to changes in attitude towards defaults.

This article uses the EFF between 2002 and 2014 to understand in which population groups debt defaults have been concentrated. Secondly, it examines in detail the influence of unemployment and income on defaults using both the cross-section and panel components of the EFF. It is important to combine both information sources. On one hand, using the panel component enables households to be monitored throughout the cycle and to identify whether a household begins to incur defaults when the main earner loses his/her job or the household's income falls. This type of analysis is very different from that which compares households with a different labour market status or income level at a given moment in time. The reason is that the panel analysis enables the same individuals to be followed over time and characteristics such as the initial amount of credit granted or the availability of guarantees, for example, to be held constant. On the other hand, both access to credit by new households and the characteristics of indebted households may change over time if credit institutions change their lending standards. Given that these changes are difficult to detect in the panel, it is important to combine the panel dimension with the representativeness of the data in the cross-sections.

3 Information sources and methodology

As earlier stated, the main source used in this article is the EFF. The three-year survey was launched in 2002 and contains information on households' assets and debts, and on their demographic composition and the labour market status of each of their adult members. Section 4 uses all the indebted households in the survey (the cross-section) and Section 5 uses its panel component, which allows for examination of income transitions, labour market status and debt defaults of the same households between each pair of waves of the survey.

The information on debt defaults in the EFF arises from the question: "In the last 12 months, have you had any financial difficulties which resulted in your delaying the payment of any of your debts?".[5]

As regards the definition of the characteristics of a household in this article, we use either those of the person that best knows the household's financial situation (the reference person) or those of the latter's partner, if they live together. For example, in order to define a household's educational level, we consider both that of the reference person and that of

3 In this case, the odds ratio is defined as the ratio of two quotients. The quotient in the numerator is the probability of an unemployed person incurring defaults with respect to the probability of not doing so. The quotient in the denominator is the probability of a person in paid employment incurring defaults with respect to the probability of not doing so.

4 Blanco and Gimeno do not explicitly compare the influence of unemployment in expansions and recessions, but they do examine the differential effects of increases and declines in unemployment. They consider a sample period with two recessions (1992 and 2008), whereas Aller and Grant consider only the 2008 recession.

5 This measure is not strictly compatible with that of other sources, such as the Central Credit Register, which considers that a household incurs a default when the debt payment is at least 30 days late. Moreover, the evidence available from other surveys (e.g. the Survey of Financial Competences) suggests that some households may include under this heading late payments of non-bank debts.

their partner, if any. Hence, the household educational level refers to that of the person who has the highest level of educational attainment from among the reference person and the partner. Similarly defined are age – that of the reference person or that of their partner – and labour market status – that of the reference person or the partner if the latter receives higher income from work, unemployment benefit or pensions.[6]

The first row of Table 1.A shows the changes in the proportion of households that have incurred payment delays between 2002 and 2014, and in other household characteristics. Table 1.B shows changes in the characteristics of indebted households. Analysing the households as a whole, Table 1.A shows that the proportion of under-35s households has fallen from 15% of the total in 2002 to 7% in 2014. Secondly, the proportion of households in which the main earner is inactive or unemployed has increased from 17% to 21% (with the proportion of those employed falling similarly) and, finally, the proportion of households with a single adult has increased by 10 pp.

These three trends are observed in indebted households as a whole. The decline in the proportion of young households is even more marked among the indebted than in the total population, with the under 35s accounting in 2014 for one-third of their weight in 2002. As regards labour market status, the proportion of indebted households in which the reference person is in paid employment has fallen by 6 pp between 2002 and 2014 (the most pronounced decline is between 2005 and 2008), with the weight of the unemployed or inactive increasing in parallel from 11% to 18%. Moreover, the proportion of indebted households in which the reference person has a partner has declined by 10 pp, on a similar scale to the increase in the proportion of indebted households in which there is a single adult.

Turning to income distribution, the proportion of indebted households in the lower quartile of the distribution has increased slightly from 11% in 2002 to 14% in 2014, with the proportion of households in the highest income quartile holding constant at around 34%. Section 5 shows that these limited changes mask high mobility between income quartiles.

By way of summary, factors such as the increase in unemployment or the greater presence of single-adult households would denote a lesser ability to pay on the part of households and, therefore, a greater incidence of defaults, particularly between 2005 and 2008. However, other characteristics would indicate that the indebted would have more resources in 2014 than in 2002; for instance, the proportion of individuals with debts and a university education increased. Given that the different effects counter one another, a detailed analysis based on characteristics is needed to explain both the increase observed in the proportion of defaults between 2005 and 2008, and their subsequent persistence.

3.1 METHODOLOGY

In order to separately examine the contribution of each characteristic, we examine the changes in the probability of default for a reference group of the population. The characteristics of this reference group are defined by age, labour market status, household composition, level of educational attainment of the household members

6 In order to reflect the characteristics of the two main household members when the reference person has a partner, Tables 1.A and 1.B include the age, educational level and labour market status of the second member. Specifically, the difference in age between the reference person and partner is included, as is an indicator of whether the reference person and their partner have different educational levels. Finally, there is an indicator of whether the person with the lowest income level is employed. See Bover et al. (2016) for a discussion on the advisability of reflecting a household's characteristics in this way.

CHARACTERISTICS OF ALL HOUSEHOLDS

TABLE 1.A

Percentage

Panel A: all households	2002	2005	2008	2011	2014
Households incurring payment delays	6.0	6.6	9.3	10.7	10.3
Age (a)					
16-34	14.7	13.2	12.0	9.5	7.6
35-44	22.3	21.6	22.6	22.2	21.7
45-54	19.4	20.8	21.0	21.3	22.4
55-64	16.5	16.1	16.0	17.5	18.2
Over 64	27.1	28.3	28.3	29.4	30.2
Age difference between reference person and their partner (median of absolute value)	2.0	2.0	2.0	2.0	2.0
Education (b)					
Primary	54.0	49.1	49.3	47.1	44.9
Secondary	19.0	18.5	19.9	19.4	17.1
University	27.0	32.3	30.8	33.5	37.9
Indicator that the reference person and their partner have different educational levels	29.5	28.3	25.1	26.6	27.1
Employment status (c)					
Employee	47.3	49.1	44.9	43.5	42.0
Self-employed	11.5	10.1	10.7	10.4	9.4
Retired	24.5	25.1	23.8	28.1	27.2
Inactive/unemployed	16.6	15.7	20.7	18.1	21.4
Other main member of household works (c)	20.5	27.4	31.2	27.3	26.4
Number of adults					
One	16.7	17.8	19.9	21.5	27.0
Two	46.2	47.0	49.8	50.5	48.8
Three	20.8	19.6	17.7	17.3	14.6
Four or more	16.2	15.6	12.7	10.7	9.6
Reference person has partner	71.0	67.8	66.7	66.0	62.0
Number of observations	**5,143**	**5,962**	**6,197**	**6,106**	**6,120**

SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).

a The age is that of the reference person. If the household includes their partner, and the partner is older than the reference person, the partner's age is shown.
b The educational level is that of the reference person. If the household includes their partner who has achieved a higher educational level than the reference person, the partner's educational level is shown.
c The employment status is that of the reference person. If the household includes their partner who has a higher level of income than the reference person, the partner's employment status is shown. The variable "other main member works" takes a value of 1 if the member with the lower income works.

and the income level of the household as a whole. This article focuses on the characteristics most closely relating to the household's ability to pay, in both the short and long term.

One initial variable of interest is educational level. Households with a higher educational level have higher wage earnings on average throughout their life [see Carrasco et al. (2015) and Bonhomme and Hospido (2017)]. Accordingly, comparisons of the propensity to incur defaults across households with different levels of educational attainment indicate the extent to which debt defaults are due to their ability to generate income in the long term. In the absence of credit constraints, individuals with higher income during their life may finance one-off losses in income by applying for a loan, for example.

CHARACTERISTICS OF INDEBTED HOUSEHOLDS

TABLE 1.B

Percentage

Panel B: indebted households	2002	2005	2008	2011	2014
Households incurring payment delays	13.7	13.4	18.7	21.7	21.1
Age (a)					
16-34	22.3	16.5	14.2	14.2	7.5
35-44	32.1	31.6	33.0	32.0	33.5
45-54	22.4	26.8	25.5	27.7	29.4
55-64	15.4	16.6	16.9	16.3	17.7
Over 64	7.7	8.5	10.4	9.8	12.0
Age difference between reference person and their partner (median of absolute value)	2.0	2.0	2.0	2.0	2.0
Education (b)					
Primary	40.3	38.2	37.3	38.9	33.2
Secondary	36.1	35.1	35.6	32.5	32.7
University	23.7	26.6	27.1	28.6	34.0
Indicator that the reference person and their partner have different educational levels	39.2	41.0	41.2	38.7	42.3
Employment status (c)					
Employee	64.5	67.3	60.9	61.5	59.1
Self-employed	15.4	13.1	13.2	13.3	11.3
Retired	9.4	9.7	10.4	10.7	11.4
Inactive/unemployed	10.7	9.9	15.5	14.5	18.2
Other main member of household works (c)	33.4	38.7	41.9	38.6	35.6
Number of adults					
One	6.8	8.4	11.4	11.4	17.6
Two	53.7	54.0	56.4	59.4	55.7
Three	21.2	20.2	17.7	17.6	16.9
Four or more	18.3	17.3	14.5	11.6	9.8
Reference person has partner	84.0	80.2	78.1	77.3	72.8
Total income (d)					
25% lower	11.0	11.1	9.5	13.0	14.5
Between 25% lower and the median	23.3	24.6	25.7	22.9	21.3
Between the median and 25% higher	31.1	31.2	31.3	30.4	29.6
25% higher	34.5	33.0	33.5	33.6	34.6
Number of observations	**1,691**	**2,437**	**2,456**	**2,406**	**2,433**

SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).

a The age is that of the reference person. If the household includes their partner, and the partner is older than the reference person, the partner's age is shown.
b The educational level is that of the reference person. If the household includes their partner who has achieved a higher educational level than the reference person, the partner's educational level is shown.
c The employment status is that of the reference person. If the household includes their partner who has a higher level of income than the reference person, the partner's employment status is shown. The variable "other main member works" takes a value of 1 if the member with the lower income works.
d Household income is that of the year prior to the survey.

Consideration is given to variables that measure the household's disposable funds in the short term: total income in the year prior to the survey and, at the time of the survey, the labour market status of the main household members. Insofar as households have accumulated financial savings or can gain access to the credit market, job loss or a fall in income would not prevent the household from continuing to satisfy repayment of its debts. Therefore, a high

sensitivity of defaults to declines in income or job loss would indicate that indebted households have limited access to credit and that they have a limited amount of financial savings.

The reference household considered in this article comprises two people aged 35-44, with secondary education, in which the person who earns most is in paid employment both in the year of the survey and the previous year, and whose total gross income is in the second-to-bottom quartile of the income distribution. The demographic characteristics of the reference group (age, labour market status, household composition, educational level) have been chosen as they are particularly common to the indebted. The choice of income group, however, responds to a group with sufficient population-based weight and, in turn, with a propensity to incur comparatively high debt defaults.[7]

The changes between survey waves of the incidence in respect of the reference group's defaults enables comparisons adjusted for the population changes detected in Tables 1.A and 1.B to be made. Secondly, to determine how household defaults change according to each characteristic, a comparison is made of the incidence of the defaults according to this characteristic keeping the rest of the variables constant. For example, to compare the effect of household income on the probability of incurring debt defaults, the frequency of defaults is compared among households with different income levels, but whose members have a similar educational level, age and labour market status.[8]

4 Cross-section results

First, the role of the composition effects in debt payment defaults is documented. Then, the breakdowns of the population by education, labour market status and level of income are presented.

4.1 COMPOSITION-ADJUSTED DIFFERENCES

An initial look at the data suggests that the changes in the distribution of indebted household characteristics in the cross-section do not alone explain the course of defaults, a similar finding to that in Aller and Grant (2018). By way of illustration, Chart 2 tracks the probability of incurring defaults in the period 2002-2014 for the reference household, one comprising two adult members, and in which the main earner is in paid employment.

From 2002 to 2014, the course of debt payment defaults has been very similar in indebted households as a whole and in the reference group. That is to say, a group whose labour market status, education and position in the income distribution has held constant throughout the cycle has incurred defaults in a similar way to all indebted households.[9] The role of each characteristic is separately examined below.

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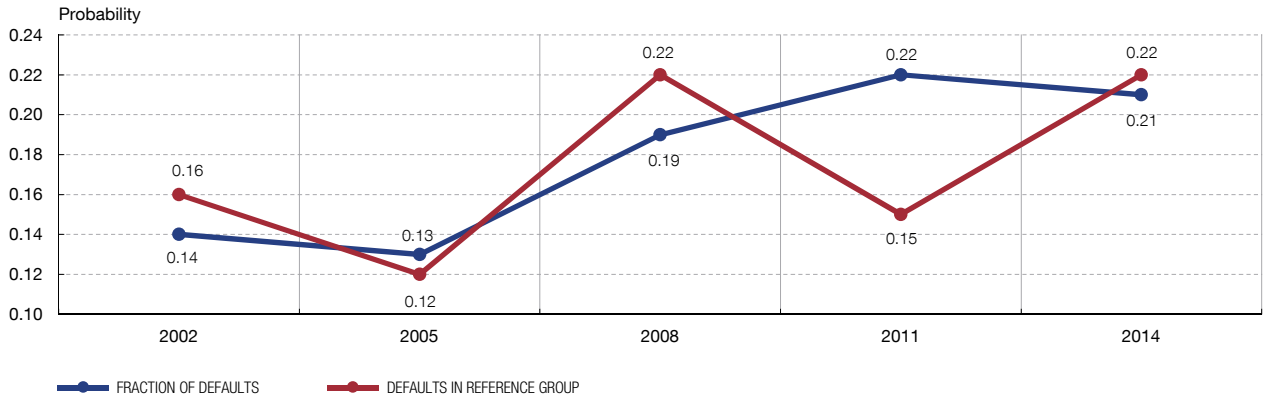
7 Note that household income refers to the year prior to the survey, while labour market status and the number of adults are measured at the time of the survey. The time difference enables the influence of labour market status to be examined while holding constant household gross income for the year prior to the survey, for example. Moreover, the specification of the cross-section also includes indicators of labour market status for the year prior to the survey, for retirees, dependent employees and the inactive.

8 Finally, to predict the probability of the reference group defaulting, Logit models are used in which the dependent variable is dichotomous and takes the value one when the household has incurred defaults over the last 12 months. The independent variables are the age group of the person (in 10-year groups), education (three dichotomous variables which indicate whether the person with the highest level of educational attainment has a primary or university education and whether the other member has a lower level), labour market status (self-employed, retired, inactive), number of adults in the household (the logarithm of the number of adults) and household income.

9 Note that the distribution of educational level differences is similar in 2002 and 2011, despite the fact that in the second year the average fraction of defaults was greater (21% in 2011 and 13.7% in 2002). The reason for this is that the estimates in Chart 2 assess the probability of incurring defaults for the reference group, which is aged 35-44 and whose income is in the second quartile of the income distribution. The behaviour of both groups was similar in 2002 and 2011, since the defaults were concentrated in the lower quartile of the income distribution, as shown in Chart 5.

FRACTION OF HOUSEHOLDS INCURRING DEFAULTS: TOTAL AND REFERENCE GROUP CHART 2



SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).
NOTE: Default in the reference group is the predicted probability of incurring delays for households with some type of debt and formed by two adults aged 35-44, with secondary education, who are employees and whose income is in the second quartile of the distribution.

4.2 EDUCATIONAL LEVEL DIFFERENCES

First, educational level differences in the propensity to incur defaults are examined. In 2002, the probability of a university-educated household incurring defaults was 13 pp lower than primary-education households (see Chart 3); that said, it is notable that the proportion of defaults should have doubled between 2005 and 2014 among households with a university education. Insofar as educational level measures the resources available over the course of the life cycle, the increase in defaults is observed even among households whose permanent income is high.[10]

4.3 LABOUR MARKET STATUS DIFFERENCES

We examine below the differences in the probability of incurring defaults according to the labour market status of the main main earner. In 2002, the indebted groups with a greater probability of incurring defaults were the unemployed and the inactive, among whom 22% had paid their debts late (see Chart 4). Among the other groups with a similar age, income or demographic composition, but whose main main earner was employed or retired, the probability was 15% at most.

Between 2005 and 2008, the year the recession began, payment delays increased in all groups, but the increase was particularly marked among those in self employment (a group in which delayed payments increased from 22% to 44%) and among the inactive or unemployed (among whom it increased from 19% to 48%). In the longer term, comparing the 2014 wave with that of 2002, the probability of incurring debt payment defaults has increased irrespective of the main earner's labour market status.[11] Section 5 further discusses this result.

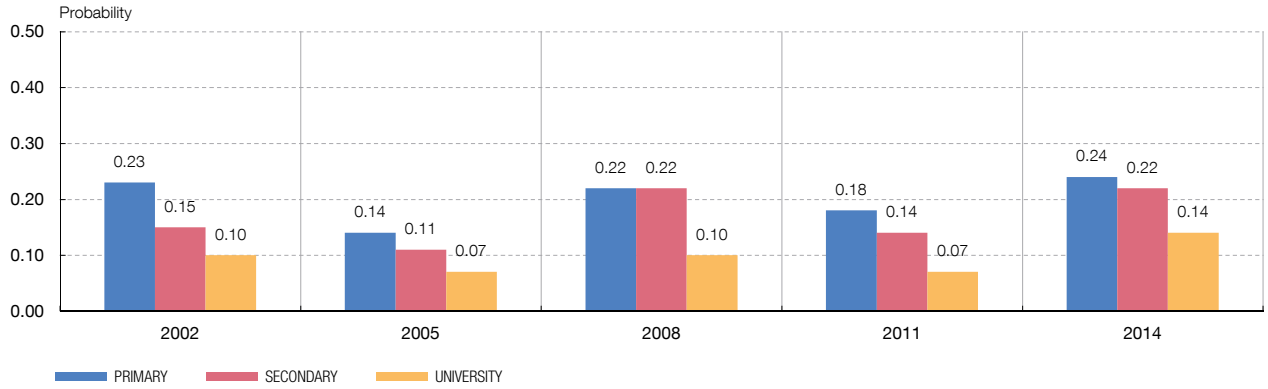
4.4 LEVEL OF INCOME

The probability of incurring debt payment delays diminishes with the household's level of income, indicating the importance of short-term resources when punctually meeting debt payments. The distribution of payment delays has indeed varied substantially across

10 Another possible explanation for this phenomenon is the fact that households with a high educational level have seen their long-term income fall. However, the aforementioned papers by Carrasco et al. (2015) or Bonhomme and Hospido (2017) suggest that in the period considered the differences in wage income associated with holding a university qualification will, in any event, have increased.

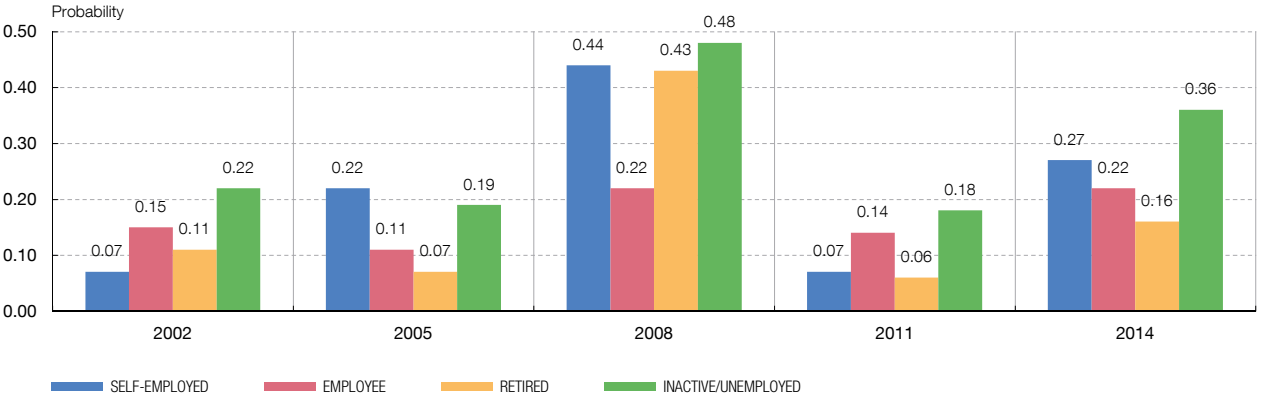
11 Aller and Grant (2018) present their results in the form of odds ratios, instead of probabilities. Expressing the estimates in Chart 3 in terms of odds ratios, unemployment is seen to increase the odds of incurring debt payment delays (relative to being in paid employment) by 2.05 in 2002, and by 1.74 in 2014. The differences arise because their sample differs slightly from ours (it excludes the under-30s) and because the reference group considered is different.

PAYMENT DELAYS AMONG INDEBTED HOUSEHOLDS: BREAKDOWN BY EDUCATIONAL LEVEL CHART 3



SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).
NOTE: Chart 3 shows how the predicted probability of incurring payment delays varies due to educational level differences for households with some type of debt and formed by two adults aged 35-44, who are employees and whose income is in the second quartile of the distribution.

PAYMENT DELAYS AMONG INDEBTED HOUSEHOLDS: BREAKDOWN BY EMPLOYMENT STATUS CHART 4



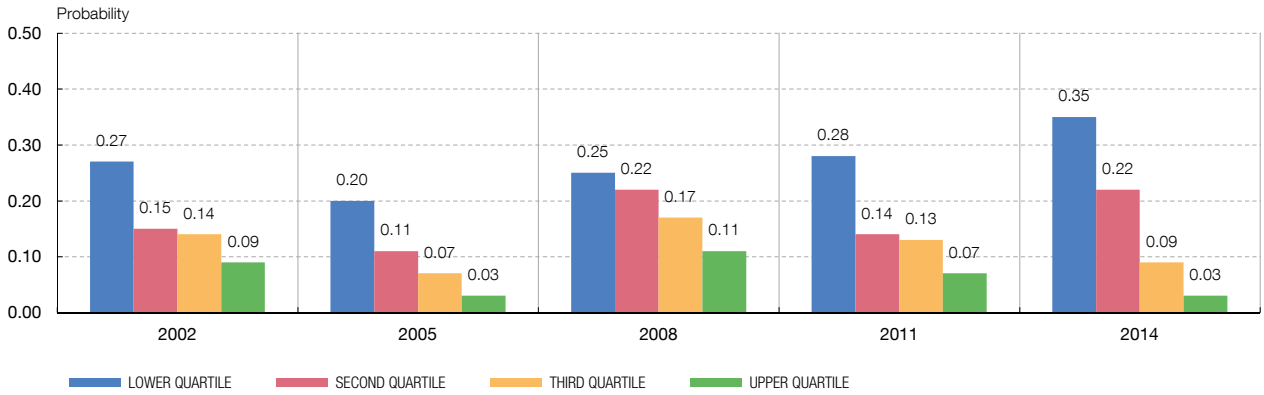
SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).
NOTE: Chart 4 shows the predicted probability of incurring payment delays according to the employment status of the household member who earns the highest income. The comparison is for households with some type of debt and formed by two adults aged 35-44, with secondary education and whose income is in the second quartile of the distribution.

income groups during the 2002-2014 period. In 2008 – at the start of the recession – the percentage of households with payment delays doubled in all quartiles of the income distribution except the lower one (see Chart 5). However, comparing 2005 and 2014, there is widely differing behaviour between households whose income is above or below the median. Specifically, payment delays have increased by 10 pp among households whose income is below the median, and declined for the remaining households.

To summarise this section, between 2002 and 2008 – the start of the recession – the percentage of households with debt payment delays increased among all income, education and labour market status groups. As from that date, debt payment delays continued increasing among households whose income stood in the lower quartile of the distribution, holding constant or falling for the other income groups.

When the population is broken down by labour market status of the main main earner, defaults are seen to have doubled from 2005 to 2014 among households whose main

PAYMENT DELAYS AMONG INDEBTED HOUSEHOLDS: BREAKDOWN BY INCOME QUARTILE CHART 5



SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).
NOTE: Chart 5 shows the predicted probability of incurring debt payment delays by household income quartile, for households with some type of debt and formed by two individuals aged 35-44, who are employees with secondary education.

earner is in paid employment, a similar increase to that observed among the unemployed. As to educational level, defaults have increased among households with a university education to a greater extent than among primary-education households. Both results would suggest that household resources – in both the short and long term – have had a limited explanatory power in accounting for the rise in debt defaults.

However, concluding that income and employment do not affect defaults on the sole basis of cross-sectional comparisons between households may be mistaken. There are differences between households in terms of characteristics which banks use to grant credit, such as their credit history or the availability of guarantees, which are difficult to observe. It is thus illustrative to analyse the debt payments of these same households before or after a decline in their income or a job loss. The panel component of the EFF enables such analysis to be conducted, the results of which are shown below.

5 Debt payment delays: income dynamics and household size

The increase in the probability of incurring delays may be due to two factors. The first is that households that had not incurred debt payment delays in one period may then pay with a delay in the following wave. Alternatively, the proportion may increase owing to greater persistence in the delay in debt payment: those who had previously incurred delays in early periods have a greater propensity to incur delays in subsequent periods. Given that the proportion of indebted households that incurred delays was relatively small before the recession (13.7% in 2002), it is useful to focus on the group of indebted households that pay a debt with a delay after not having incurred defaults in the previous wave. This analysis is directed at the earlier-mentioned variables that may change from wave to wave, whereby education (which is time-invariant) and age (which changes mechanically) are excluded.

Table 2 shows the changes in characteristics in those indebted households that had not yet incurred debt payment delays in the initial period. Among the indebted households, whereas from 2002 to 2005 the proportion of household main earners whose labour market status changed from employed to unemployed was 6.5%, from 2011 to 2014 this figure climbed to close to 10%. The proportion of main earners whose status changed from inactive to employed also increased during the recession, although on a lesser scale. Possibly, this increase is associated with the high labour turnover in the Spanish labour market.

CHANGES IN THE COMPOSITION, INCOME AND EMPLOYMENT OF INDEBTED HOUSEHOLDS WHICH DID NOT DEFAULT IN WAVE T (a) TABLE 2

Percentage

	2002-2005	2005-2008	2008-2011	2011-2014
Households incurring defaults in wave t + 3	8.1	14.8	16.0	13.6
Labour market transitions of the main earner				
From employment to unemployment	6.5	7.8	10.6	9.6
From unemployment to employment	2.1	3.4	3.5	4.3
Change in the number of adults in the household				
Increases	12.1	12.2	9.9	6.9
Decreases	10.1	10.5	11.4	10.3
Remains the same	77.8	77.2	78.7	82.8
Changes in the income quartile (b)				
Moves into a higher income quartile	21.3	27.3	24.9	21.3
Same income quartile	52.9	51.0	52.0	55.9
Moves into a lower income quartile	25.8	21.7	23.1	22.8
Magnitude of change in household income (median, €) (c)				
Moves into a higher income quartile	15,996.0	20,307.0	14,396.0	9,984.4
Moves into a lower income quartile	-18,328.0	-10,935.0	-14,338.0	-17,360.0
Number of observations	**606**	**1,022**	**953**	**830**

SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).

a In each pair of waves indebted households which had not defaulted in the initial wave are included.
b Income is annual income of the year prior to each wave. For example, the increase in the income quartile between 2005 and 2008 measures the proportion of households whose income in 2007 was in a higher quartile than the household's quartile in the distribution of income in 2004.

As regards the demographic composition of households, Table 2 confirms the reduction in household size shown in Table 1.B. Hence, the proportion of indebted households in which the number of adults increases fell from 12% between 2002 and 2005 to 6.9% between 2011 and 2014, with the proportion of households undergoing a reduction in the number of members holding constant.

Finally, the mobility of indebted households' income between the waves of the survey was high, but varied little over the course of the cycle. The proportion of indebted households whose income fell to a lower quartile held at around 23% throughout the economic cycle, in both the upturn and in the recession.[12] The probability of increases in households' income grew slightly during the recession. Thus, while the probability of indebted households moving up an income quartile was 21% from 2002 to 2005, this percentage reached 25% between 2008 and 2011.[13]

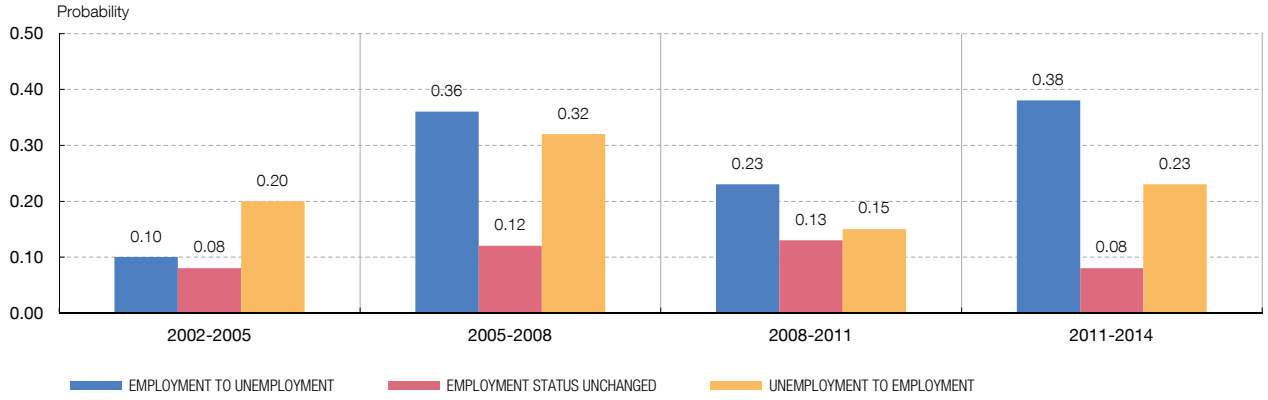
In sum, the changes in the characteristics of indebted households are along the lines of a reduction in their disposable resources. Firstly, the proportion of households in which the

12 An analysis of the instability of Spanish households' income before the recession can be found in Bover (2008). This paper shows that in households with a stable demographic composition (whether indebted or not), the probability that a household whose income was between the 40th and 60th percentiles in 2002 might fall to a lower quintile stood at 34% in 2005.

13 The increase in the proportion of households whose income increases between 2005 and 2008 may be a consequence of the fact that the income included in each wave is that of the previous year. Thus, income in the EFF2008 relates to 2007, before the recession.

INDEBTED HOUSEHOLDS INCURRING DELAYS IN THE FOLLOWING WAVE BY LABOUR MARKET TRANSITION OF THE MAIN EARNER

CHART 6



SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).
NOTE: Chart 6 shows the predicted probability of incurring debt payment delays in wave t + 3 among indebted households in wave t according to changes in the employment status of the main earner in wave t. The comparison is made for households with some type of debt in which the number of adults does not change and whose income remains in the same quartile.

main earner has lost his/her job increases to 4 pp, while the proportion of households in which the main earner's status changes from inactive to employed increases to a lesser extent. The proportion of households whose income declined held constant from 2002 to 2014.

We examine below the probability of a transition to incurring defaults on the basis of demographic, employment and income-related changes. As in the previous section we analyse the impact of each characteristic, holding the others constant. In this case, the reference household is one in which the main earner's employment status has not changed, the number of adults in the household has held constant and the household's income has held in the same quartile.

5.1 EFFECT OF CHANGES IN LABOUR MARKET STATUS

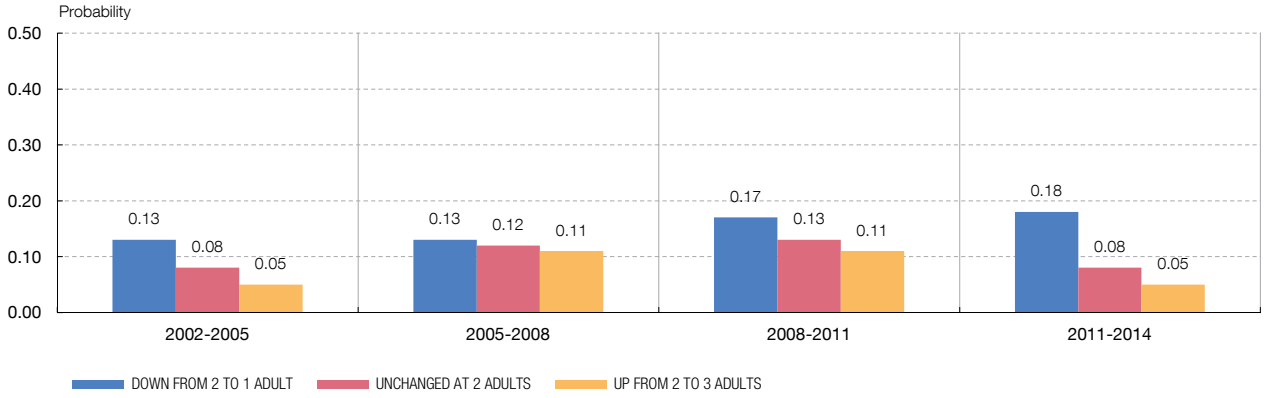
Chart 6 shows that, during the period of expansion from 2002 to 2005, changes in the labour market status of an indebted household's main earner played a modest role in predicting whether a household might begin to incur debt payment delays. Hence the probability of incurring delays among households in which main earners maintained their labour market status in both waves was 8%, only slightly below the figure of 10% relating to households whose main earner went from employed to unemployed. Note that these effects are estimated holding income and the number of adults in the household constant. Notably, too, the probability of incurring delays was 20% among indebted households in which the main earner's status changed from inactive to employed. This positive effect on delays of what in principle should be an increase in household resources may be due to the fact that households in which the main earner's labour market status changes generally have unstable and low income, and therefore have a greater propensity to incur defaults.[14]

From 2005 to 2008, the first year of the recession, the probability of beginning to incur delays grew by around 4 pp among those households whose labour market status, income or demographic composition did not change (rising from 8% to 12%). In contrast, the probability of incurring defaults exceeded 30% among households whose main earner's status changed from employed to unemployed between 2005 and 2008.

14 Alternatively, it may reflect the fact that in the face of difficulties resulting in debt payment delays, the main earner may opt to work.

INDEBTED HOUSEHOLDS INCURRING DELAYS IN THE FOLLOWING WAVE BY CHANGES IN THE NUMBER OF ADULTS

CHART 7



SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).
NOTE: Chart 7 shows the predicted probability of incurring debt payment delays in wave t + 3 among indebted households in wave t by changes in the number of adults. The comparison is for households with some type of debt whose income remains in the same quartile and in which the employment status of the main earner remains unchanged in wave.

The longitudinal analysis in Chart 6 complements the cross-section results in Chart 4. Firstly, during the recession, the probability of incurring defaults was much greater among households in which there is a transition to unemployment; this is a relative increase that is not discerned in the cross-section comparisons of Chart 4, as is later set out in Section 5.4. Secondly, while Chart 4 shows that the incidence of defaults doubled at least between 2005 and 2008 among those in paid employment and the self-employed, Chart 6 suggests that among indebted households whose main earner is employed there is a group that moves between employment and inactivity, and which has a high propensity to incur debt payment delays. The presence of this group would explain the increase in defaults among the self-employed and those in paid employment observed in Chart 4.

5.2 EFFECT OF CHANGES IN THE NUMBER OF ADULTS

Among the indebted households with the same number of adults in 2002 and 2005, the probability of incurring delays was 8% (see Chart 7). The probability was 4 pp greater among households that now had one adult as opposed to two. Probably, the reductions in the number of adults in the household are associated with divorces, deaths or people leaving the family home, which tend to reduce the future income of a household. The negative relationship between the growth in the number of adults in the household and the probability of incurring defaults has held practically constant throughout the economic cycle.[15]

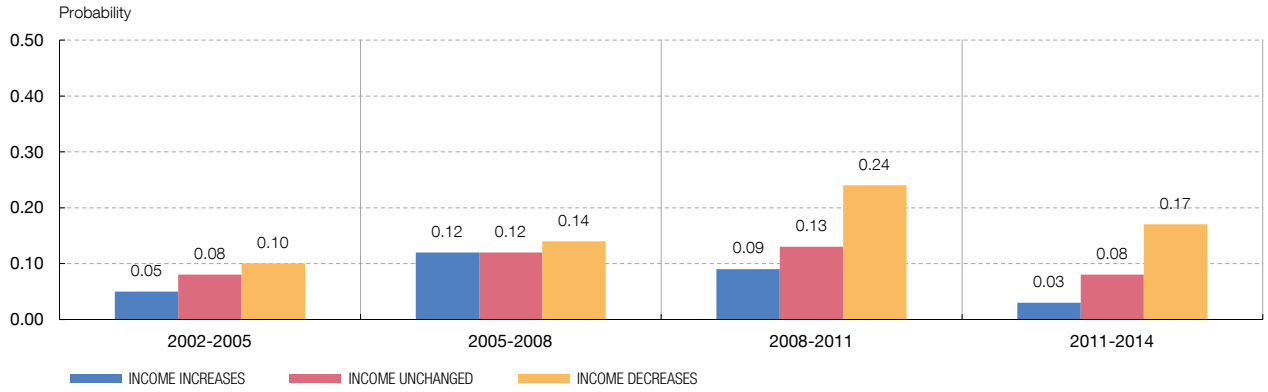
5.3 EFFECT OF CHANGES IN INCOME

Chart 8 shows that, during the expansion, changes in the income quartiles of indebted households had a limited explanatory power when predicting that the household would begin to incur debt payment delays three years later. Thus, in the 2002-2005 period, among households whose income stepped up a quartile, the probability of incurring defaults was 5 pp less than among households whose income fell to a lower quartile, compared with 14 pp from 2011 to 2014, the recession phase.

These panel results complement, once again, the cross-section results. Chart 5 shows that payment delays are concentrated among households in the lower quartile of the

15 It may be concluded that, during the period considered, there have been composition effects whereunder households incur defaults when new members join that have been obliged to abandon their dwelling owing to failure to pay their debts. If this were the case, payment delays would be concentrated in households whose number of adults grows. Chart 7 does not detect this relationship.

INDEBTED HOUSEHOLDS INCURRING DELAYS IN THE FOLLOWING WAVE BY CHANGE OF INCOME QUARTILE CHART 8



SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).
NOTE: Chart 8 shows the predicted probability of incurring debt payment delays in wave t + 3 among indebted households in wave t by changes between waves in the household income quartile. The comparison is for indebted households in which the number of adults and the employment status of the main earner in wave t do not change.

income distribution. Chart 8 suggests that the concentration of payment delays in the lower income quartile is not so much due to households with permanently low income having a particular propensity to incur delays as to the fact that a high proportion of households has experienced substantial declines in their income which, during the recession, has entailed a high probability of incurring defaults. Accordingly, defaults in the lower income quartile detected in Chart 5 reflect the outcome of substantial declines in household income.

Table 3 shows the coefficients of the Logit regressions with which the results presented in Charts 6, 7 and 8 are obtained. The results quantify the greater sensitivity of defaults to transitions from employment to employment and to declines in household income.

5.4 COMPARISON OF CROSS-SECTION AND PANEL RESULTS

The cross-sectional analysis found that defaults increased between 2005 and 2014 by around 7 pp among households with university education and among those with primary education. Similarly, defaults rose by 10 pp among households whose main earner was inactive or unemployed and among those whose main income earner was employed. For Aller and Grant (2018), this kind of result suggests that there are households which had funds to pay their debts but preferred not to do so.

However, this interpretation does not seem valid, since comparing the default rates of households of differing labour market status, as cross-sectional analysis implicitly does, is not the best way to analyse whether households did or did not have funds to pay their debts. The reason is that the risk profile of households whose main earner is unemployed – or at risk of being unemployed – differs greatly from that of households whose main earner is employed, since jobholders can borrow more easily and in larger amounts.[16] Therefore households which have a different labour market status not only have different levels of income with which to pay their debts, but also different debt service burdens.

16 Akin et al. (2014) show that the loan-to-value ratios granted in the expansión were lower for the households hit by unemployment.

DETERMINANTS OF INCURRING DELAYS IN DEBT DEFAULT: PANEL COMPONENT (a) TABLE 3

Variables	2002-2005	2005-2008	2008-2011	2011-2014
Change between waves in the number of adults				
Growth in the number of adults in the household (b)	-0.920*	-0.0975	-0.442	-1.235***
	(0.515)	(0.460)	(0.565)	(0.466)
Changes between waves in household income				
Income quartile in final wave higher than in initial wave	-0.341	0.0543	-0.427	-0.952*
	(0.560)	(0.370)	(0.696)	(0.578)
Income quartile in final wave lower than in initial wave	0.327	0.162	0.756**	0.842**
	(0.474)	(0.355)	(0.371)	(0.411)
Change of labour status of main breadwinner				
Transition from employee to unemployed/inactive	0.276	1.422***	0.692	1.921***
	(0.816)	(0.485)	(0.446)	(0.542)
Transition from unemployed/inactive to employee	1.095	1.253	0.163	1.191*
	(1.116)	(0.862)	(0.730)	(0.705)
Constant	-2.507***	-2.013***	-1.887***	-2.394***
	(0.316)	(0.214)	(0.226)	(0.266)
Number of observations	**606**	**1,022**	**953**	**830**

SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).
NOTE: *,**,*** over an estimate indicates that the estimate is significantly different from zero at the 10, 5 and 1 percent confidence level, respectively.

a Sample of indebted homes present in consecutive waves which had not incurred debt payment delays in the initial wave. The dependant variable takes a value of 1 if the household incurs in debt payment delays in the final wave, and a value of zero, if the opposite occurs.

By contrast, panel analysis, which examines households over time, allows characteristics such as the risk profile at the loan date to be kept constant, so the effect of job loss or lower income can be isolated. Therefore panel results are considered to provide a more reliable estimate of the default response of households to changes in income and labour market status than cross-section results. Thus, when the panel component of the EFF was used, it was observed that during the recession the upturn in defaults was concentrated in households beset by job losses or income falls.

The estimates from the panel analysis are used below to decompose the increase in defaults into changes in borrowers' characteristics (changes in characteristics) and changes in the reaction of borrower households (changes in coefficients).

6 What factors explain the increase in loan defaults?

The increase in the probability of default may be due to various factors, the main three of which are as follows: a change in the composition of the population; a change in the composition of borrower households; and a change in the propensity to default given the same household profile.

Rigorously distinguishing between the contribution of changes in the overall population and in the population of borrower households requires a complex estimation of the contributions from, firstly, changes in the probability of applying for a loan and, secondly, the credit standards applied by banks (see Grant and Padula, 2016). This study analyses the contributions of changes in population characteristics and of changes in the propensity to default in two groups: the total population of households and borrower households. If the results for the two samples differ, it can be inferred that the changes in the borrower household population significantly influence defaults.

INCREASES IN THE PERCENTAGE OF HOUSEHOLDS INCURRING DEFAULTS UNDER ALTERNATIVE SCENARIOS TABLE 4

	2002-2005	2005-2008	2008-2011	2011-2014
Total households				
1 Percentage incurring defaults in the following wave (observed)	2.9	5.8	6.0	5.1
2 Percentage incurring defaults in the following wave (characteristics of 2002) (a)	2.9	5.6	5.9	4.8
3 Percentage of change between waves explained by characteristics	—	6.4	3.3	14.5
Total indebted households				
4 Percentage incurring defaults in the following wave (observed)	8.2	14.9	16.1	13.6
5 Percentage incurring defaults in the following wave (characteristics of 2002) (a)	8.2	14.4	15.8	12.1
6 Percentage of change between waves explained by characteristics	—	7.6	3.4	27.7

SOURCE: Spanish Survey of Household Finances 2002-2014 (Banco de España).

a The characteristics of the population of households in 2002 considered are those in Table 3, namely: an indicator that the main earner in wave t - 3 is employed in that wave but not in the following wave; an indicator that the main earner in wave t - 3 is not employed in that wave but is employed in the following wave; an indicator that household income is in a lower quartile in wave t than in wave t - 3; an indicator that household income is in a higher quartile in wave t than in wave t - 3; and the growth in the number of adults between waves.

6.1 EFFECT OF CHANGES IN THE CHARACTERISTICS OF THE POPULATION ON DEFAULTS.

Between 2002 and 2014 there were three significant changes in the population. The first two changes are demographic: the proportion of young households has fallen and the size of households has decreased. As for the income dynamic, the incidence of both unemployment-inactivity among the main earners as well as the number of households in which the main earner has experienced job loss has increased between waves.

In order to quantify the importance of the changes observed, Table 4 shows the findings of the following simulation: what would have been the probability of incurring defaults between 2011 and 2014 if the changes in labour market status, household income and household size had been similar to those which occurred during the boom of 2002-05? This type of simulation isolates the contribution of changes in the characteristics to the probability of incurring defaults.[17] As can be seen, if during 2011 and 2014 the population had experienced changes in its income, labour market status or demographic breakdown similar to those that occurred during the boom between 2002 and 2005, the probability of incurring defaults would have been 4.8% (instead of 5.1%). The change in these three characteristics would therefore explain 15% of the higher probability of incurring defaults between 2011 and 2014.

A second source of changes in defaults is that, owing to changes in access to credit, the characteristics of borrowers may have represented a group which is gradually becoming different to the population as a whole. Accordingly, if between 2011 and 2014 indebted households had experienced changes in labour market status, household size and income similar to those which happened during the boom, the probability of incurring defaults would have been 12.1% (instead of 13.6%). That is to say, changes in the characteristics of the indebted would explain 27% of the increase in defaults, possibly because the incidence of transitions from employment to unemployment between 2011 and 2014 was relatively higher among the indebted.

17 Age does not have a clear or stable effect on defaults during the recession or during the boom and, consequently, it was not included among the factors which may explain changes in defaults. The simulation was undertaken by re-weighting the sample, following Di Nardo, Fortin and Lemieux (1996).

In short, the increase in the incidence of unemployment, falls in income or reductions in household size would account for up to 27% of the increase in the probability of incurring defaults between 2002 and 2014. The evidence from Table 4 suggests, therefore, that most of the increase in defaults would be explained because during the recession defaults became more sensitive to falls in income or job loss.

6.2 The increase in the sensitivity of defaults to falls in income or employment status.

Understanding the increase in the sensitivity of late payment to changes in income would require a detailed analysis of households' financial positions which is beyond the scope of this study. Nevertheless, there is evidence which indicates that during the recession indebted households had low financial savings and limited access to credit. Under these conditions, the financial decisions of these household would be closely linked to changes in their income. In Banco de España (2014) it is shown that, during the recession, 22% of indebted households had a spending level above that of their income, whereas for households without debt the percentage stood at around 16%. The same study documents the fact that there was a higher probability that new loan applications by the indebted would be rejected in full or in part than those of households without debt. Finally, the elasticity of spending to increases in income was 0.35 among the more indebted households and 0.2 among those that had no debt.[18] A limited amount of financial savings, together with greater difficulties in access to credit during the recession, would explain the increase in the sensitivity of the delays in the repayment of debt to changes in income.[19]

7 Conclusions

Between 2002 and 2014, the proportion of indebted households which repaid their debts late grew from 13.7% to 21%. This study used the cross-section and longitudinal components of the EFF to assess the determinants of the increase in defaults.

First, it is documented that the increase in the late payment of debt has been similar among groups with very different educational levels – an indicator of greater resources over the life cycle. In a setting where the ability of households to change the conditions governing their loans is limited, their ability to generate long-term resources may be less significant for avoiding delays in repayments than the immediate availability of liquid resources.

Based on the longitudinal component of the EFF, it can be seen that the high incidence of falls in household income and changes in the labour market status of the household main earner are important factors when understanding the increase in the delays in debt repayment between 2002 and 2014. During the economic cycle, one-fifth of indebted households saw declines in their income which led them to drop, at least, one quartile lower in the income distribution. During the recession, the probability of incurring delays in debt payments following declines in income on this scale rose substantially. Secondly, among the 10% of indebted households, the main earner experienced job losses during the three years between the surveys. These job losses were associated with a high probability of incurring defaults during the recession. The results confirm that developments

18 These features would be associated with access to credit during the boom. In the United States, Mian and Sufi (2009) show that during the boom mortgages were acquired by households with a low ability to repay their debts faced with changes in the value of the asset securing the loan. In Spain, Masier and Villanueva (2011) interpret that around 30% of those who acquired mortgages during the boom acted as though they had credit restrictions. These households would have limited saving capacity and would trust in changes in their income to repay their debts.

19 Another alternative explanation is that, given the greater uncertainty and change in expectations, households perceived that a decline in income meant a greater decrease in their present and future resources in a recession than in a boom. This possibility would not explain the higher incidence of total or partial rejections of loan applications during the recession.

in household defaults during the recession were closely tied to those in their disposable income.

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ABBREVIATIONS

€	Euro
AIAF	Asociación de Intermediarios de Activos Financieros (Association of Securities Dealers)
ABCP	Asset-backed commercial paper
ATA	Average total assets
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
BLS	Bank Lending Survey
bn	Billions
bp	Basis points
BRRD	Bank Recovery and Resolution Directive
CBE	Banco de España Circular
CBSO	Banco de España Central Balance Sheet Data Office
CCyB	Countercyclical capital buffer
CCR	Banco de España Central Credit Register
CDO	Collateralised debt obligation
CDS	Credit Default Swap
CEBS	Committee of European Banking Supervisors
CEIOPS	Committee of European Insurance and Occupational Pensions Supervisors
CET1	Common equity Tier 1 capital
CIs	Credit institutions
CNMV	Comisión Nacional del Mercado de Valores (National Securities Market Commission)
CPSS	Basel Committee on Payment and Settlement Systems
DIs	Deposit institutions
EAD	Exposure at default
EBA	European Banking Authority
ECB	European Central Bank
EFSF	European Financial Stability Facility
EMU	Economic and Monetary Union
EONIA	Euro overnight index average
EPA	Official Spanish Labour Force Survey
ESFS	European System of Financial Supervisors
ESM	European Stability Mechanism
ESRB	European Systemic Risk Board
EU	European Union
FASB	Financial Accounting Standards Board
FLESB	Forward-Looking Exercise on Spanish Banks
FROB	Fund for the Orderly Restructuring of the Banking Sector
FSA	Financial Services Authority
FSAP	Financial Sector Assessment Program
FSB	Financial Stability Board
FSF	Financial Stability Forum
FSR	Financial Stability Report
FVC	Financial vehicle corporation
GAAP	Generally Accepted Accounting Principles
GDI	Gross disposable income
GDP	Gross domestic product
GHOS	Group of Central Bank Governors and Heads of Supervision
G-SIIs	Global systemically important institutions
GVA	Gross value added
GVAmp	Gross value added at market prices
IASB	International Accounting Standards Board
ICO	Instituto de Crédito Oficial (Official Credit Institute)
ID	Data obtained from individual financial statements
IFRSs	International Financial Reporting Standards
IMF	International Monetary Fund
INE	Instituto Nacional de Estadística (National Statistics Office)
IOSCO	International Organization of Securities Commissions
ISDA	International Swaps and Derivatives Association
JST	Joint Supervisory Team
LGD	Loss given default
LTROs	Longer-term refinancing operations
LTV	Loan-to-value ratio (amount lent divided by the appraised value of the real estate used as collateral)
m	Millions
MiFID	Markets in Financial Instruments Directive
MMFs	Money market funds

MREL	Minimum Requirement for own funds and Eligible Liabilities
NPISHs	Non-profit institutions serving households
NPLs	Non-performing loans
OFIs	Other financial intermediaries
OMT	Outright Monetary Transactions
OTC	Over the counter
PD	Probability of default
PER	Price earnings ratio
pp	Percentage points
RDL	Royal Decree-Law
ROA	Return on assets
ROE	Return on equity
RWA	Risk-weighted assets
SCIs	Specialised credit institutions
SMEs	Small and medium-sized enterprises
SIV	Structured investment vehicle
SPV	Special purpose vehicle
SRI	Systemic Risk Indicator
SSM	Single Supervisory Mechanism
TA	Total assets
TARP	Troubled Asset Relief Program
TLTROs	Targeted Longer-term Refinancing Operations
VaR	Value at risk
WTO	World Trade Organisation

ISO COUNTRY CODES

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BG	Bulgaria
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CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
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