DO BANKS GAME ON DYNAMIC PROVISIONING?

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Abstract:

Reducing credit procyclicality represents one of the key challenges on the regulatory agenda to reform the financial system architecture. The Spanish dynamic provisions scheme implemented in 2000 is one of the main reference points in this context. We analyze the effects of dynamic provisions on managerial accounting discretion and ex-ante risk-taking behavior by banks. We empirically examine a sample of Spanish banks using quarterly information from 1995Q1 to 2013Q4. Our findings suggest that the counter-cyclicality of provisions has been reduced over time as it has been the case of managerial discretion (income smoothing and profit signaling). However, the results also suggest that banks game on dynamic provisions by taking an ex-ante riskier behavior once the dynamic provisioning scheme is adopted.

JEL Classification: G21, G28
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I. Introduction

Reducing procyclicality is one of the key questions under discussion in the reform of financial regulation following the recent banking crisis. In a broad sense, procyclicality is the phenomenon of amplifying feedbacks within the financial system and between the financial system and the macroeconomy. In this regard, organizations such as the G-20 and the Bank for International Settlements are developing proposals on countercyclical buffers within the developments of the Basel 3 new capital agreements.[1] A second area of concern is how to mitigate the cyclical effects of bank lending. The focus of this paper is on this latter issue.[2]

An important dimension in the management of loan-loss provisions is the extent to which they are subject to discretion. By introducing discretion, the effectiveness of loan-loss provisions in covering expected losses will be diminished and, therefore, the cyclical relationship between the financial system and the macroeconomy could be exacerbated. In most countries, including the USA, loan-loss provisions are left to managers' judgment, while in the few remaining countries, such as Spain, the loan-loss provisions are specified in rules. Leaving provisioning to the decisions of managers may introduce discretion into the sum of loan-loss provisions accruing in the income statement. The alternative of introducing rules does not necessarily eliminate all sources of managerial discretion. In order to be fully effective, rules must cover loan losses and limit the ability of managers to use provisions for discretionary purposes, such as to smooth income or "artificially" alter their capital ratios. The growth in bank loans is also related to this discretionary behavior. In particular, banks usually loosen credit standards in an upturn, due to the low level of contemporaneous non-performing loans. The longer the upswing, the more likely it is that managers will play down the lessons of the latest downturn and enter into a process of high loan growth at the expense of loan quality standards.

Another key aspect of loan-loss provisioning schemes is the extent to which provisions cover not only realized losses but also expected losses. In many countries, such schemes (whether based on rules or discretion) are backward-looking and, therefore, the credit losses arising from economic downturns are more likely to require banks to recognize more loan losses during recessions, thereby negatively affecting loans and encouraging greater cyclicality. Spain is an exception in this respect, since its supervisory authorities implemented the so-called 'dynamic provisions' back in 2000, as a macroprudential tool to enhance bank soundness and to help mitigate part of cyclicality of loan-loss provisioning and lending[3]. These dynamic (also called statistical or general) provisions are computed as the difference between expected credit losses and specific provisions. The basic idea is to raise bank provisions significantly in

[1]See the following link: http://www.bis.org/bcbs/basel3.htm?ql=1

2 Both the Basel Committee of Banking Supervisors (BCBS) and the International Accounting Standards Board (IASB) are working on proposals to help improve banks' provisioning schemes and set aside provisions against expected losses (IASB, 2009; BIS, 2010).

[3] Other countries also have various counter-cyclical prudential instruments in use, although they are not directly related to the provisioning scheme. Some well-known examples are the caps on loan-to-value ratios for property lending (Hong Kong SAR, Korea, Malaysia or Singapore), the caps on ratios of debt service to income for household lending (Hong Kong SAR, Korea), or caps on loan-to-deposit ratio, core funding ratios, reserve and other liquidity requirements (Argentina, China, Hong Kong SAR, Korea and New Zealand). See BIS (2010) for a detailed description of these prudential policy tools.

good times, while allowing them to fall in bad times, thereby smoothing risk over the business cycle.

In this paper we examine the degree to which dynamic provisions have achieved some of their key objectives in reducing cyclicality of bank lending. Previous papers have explored particular aspects of earnings and capital management under a dynamic provisioning regime in the pre-crisis period. Our paper extends this approach by analyzing the effects of loan growth on managerial discretion and, ultimately, on the effectiveness of dynamic provisions before and during the crisis.[4] By way of preview, our results show that the Spanish counter-cyclical provisioning scheme has been reasonably effective in restricting capital management and reducing the procyclicality of loan-loss provisions but has also allowed banks to game on them by assuming higher ex-ante risk. A dual regime is also identified whereby a threshold estimated at 4% of quarterly loan growth before the crisis could trigger non-performing loans during the crisis. Importantly, income smoothing, profit signaling and the gaming on loan-loss provisioning are significantly larger in banks showing the higher loan growth rates before the crisis.

The structure of the paper is as follows. Section II discusses the relationships between provisions, managerial discretion and loan growth. Section III describes Spanish dynamic provisions. Section IV defines the empirical strategy, hypotheses, data and empirical methodology. The results are presented in Section V. A summary of the main results and conclusions in Section VI ends the paper.

II. Loan-loss provisions, managerial discretion and loan growth

II.a. Managerial discretion in loan-loss provisioning

From a theoretical standpoint, a primary objective of loan-loss provisioning is to cover all loan losses, including both realized and latent or expected losses. However, many provisioning schemes and accounting practices are based on rules which exclude losses that are expected but not yet recorded. In particular, there are various sources of discretionary behavior in loan-loss provisioning, principally earnings management and capital management, which are potentially able to alter the primary objective of covering losses.

Earnings management: income smoothing and profit signaling

One of the main manifestations of earnings management is income smoothing, which is aimed at reducing the variability of net profits over time. During upswings, managers use some accounting items (mainly provisions) to decrease net operating income. In downturns, the same accounting items are used conversely to increase profits (Kim and Santomero, 1993). In principle, smoothing income may have a positive impact upon reducing the cyclicality of lending. In one sense, income smoothing is considered "desirable", because it

[4] As the BIS (2010) notes, "Spanish dynamic provisions may have contributed towards increasing the resilience of the Spanish banking sector, forcing banks to build up buffers against particular types of lending but dynamic provisioning has done little to smooth the supply of credit".

reduces the perceived volatility of income, thereby maintaining stock price stability. However, income smoothing may discourage bank managers from accurately disclosing loan losses, resulting in misleading information concerning the bank's condition. To the extent that the variability of net income is a measure of risk, income smoothing may reduce the perceived riskiness of the bank, yet the "true" risk could be higher than the perceived risk. With regard to empirical research into income smoothing, some studies have found evidence of income smoothing in the US banking sector (Greenawalt and Sinkey, 1988; Wahlen, 1994) while others have found no evidence of this type of earnings management (Beatty et al., 1995; Ahmed et al., 1999). Bikker and Metzemakers (2005) analyze earnings behavior in 29 OECD countries using 8,000 bank-year observations. They find statistical evidence of income smoothing in countries such as the USA, France or Italy, but none in Japan, the UK or Spain. However, Perez et al. (2006) encounter evidence of income smoothing in Spanish banking, although they observe a decline in its intensity following the establishment of the dynamic provisions.

Together with income smoothing, earnings management can be used as a signaling mechanism[5]. Bank managers may use loan-loss provisions to manage earnings and signal' private information about future prospects. If managers have information indicating that the book value of the bank is higher than the market value, such banks may use provisions as a signal of strength (the potential to absorb future losses), thereby increasing their market value. The empirical evidence on the existence of signaling behavior is mixed. In the USA, Wahlen (1994) and Beaver and Engel (1996) have found evidence of such behavior, contradicting Ahmed et al. (1999). Bouvatier and Lepetit (2006) have also demonstrated the use of loan-loss provisions for profit signaling in France, Germany, Italy and the United Kingdom. As for the Spanish case, Anandarajan et al. (2003) have found no evidence of signaling.

Capital management

In capital management behavior, banks use loan-loss provisions to alter their regulatory capital ratios. From among the reasons for managing the capital ratio through provisions, some previous studies have highlighted the significant costs of raising new capital on the market or the trade-off between reserves and dividend payments (Kim and Kross, 1998; Ahmed et al., 1999; Cortavarria et al., 2000; Das and Ghosh, 2007). Capital management may then have undesirable effects for bank risk management since it implies an "artificial" increase in capital ratios at the expense of a reduction in the coverage of expected losses. By exerting capital management, banks decide the current loan-loss provision of the period, and enable retained earnings to contribute to reducing the distance between the target and the level of regulatory capital. In the Spanish case, once the dividend policy is fixed, banks can only change regulatory capital ratios through retained earnings, because general provisions are not considered to be regulatory capital.[6] Under this regime, if banks use

[5] Earnings management may also occur due to moral hazard and agency problems beyond the scope of this paper, such as perceived bankruptcy concerns or attempts by managers to move share prices upwards when they trade for liquidity reasons and shareholders perceive a potential decline in the bank's value (see, for example, Fudemberg and Tirole, 1995 or Goel and Thakor, 2003).

[6] In many countries, as in the USA, general provisions are included in regulatory capital. In these regimes, a positive relationship is to be expected between the current loan-loss provisions and the beginning-of-period capital ratios in economic downturns and a negative association between the two in upturns.

loan-loss provisions to manage capital, current total loan-loss provisions will be positively correlated with capital at the beginning of the period. If banks observe that their regulatory capital at the beginning of the period is low (high), they may then decide to reduce (increase) provisions to increase (reduce) net profits and retained earnings.

Turning to the empirical evidence on capital management behavior, Moyer (1990) and Scholes et al. (1990) have shown that US banks use loan-loss-provisions to manage capital ratios when regulatory capital is low. However, Collins et al. (1995), Kim and Kross (1998) or Ahmed et al. (1999) have found no evidence of such behavior in US banks. The cross-country analysis by Bikker and Metzemakers (2005) suggests that capital management behavior exists in the USA, Japan and most EU countries, although no evidence is found for Spain. Perez et al. (2006) also find no evidence of capital management in Spanish banks.

II.b. Loan provisioning, loan growth, and risk behavior

The capacity of bank loan officers to evaluate risk and identify potential problem loans declines as time elapses since their last loan bust. As shown by Berger and Udell (2004) this deterioration in managerial ability may result in an easing of credit standards, as officers become less able to recognize potential loan problems and distinguish lower-quality from higher-quality borrowers. This behavior may exacerbate fluctuations in lending cycles. Concretely, in good times an accumulation of potential risk (expected losses) is built up, while this risk emerges in bad times as a result of previous high loan growth rate with a declining credit quality. This behavior has been identified as a key ingredient of the 'inherent instability' of financial systems (Minsky, 1982). In this context some scholars have stressed the effects of disaster myopia, that implies underestimating the likelihood and magnitude of financial crises (Guttentag and Herring, 1984; Herring, 1999)- or herd behavior, when loans officers do what others are doing rather than using the information available to them (Banerjee, 1992; Rajan, 1994; Berger and Udell, 2004).7

With regard to the evidence of the effects of loan provisioning on loan performance and growth, there are some previous studies that deal with specific aspects of the effectiveness of the Spanish scheme. In particular, Perez et al. (2006) study the extent to which earnings and capital management affected Spanish banks during 1986-2002. They construct an accounting and empirical model which shows that, following the introduction of the statistical provision, general and specific loan-loss provisions depended more on the "true" credit risk of loans than on net operating income. Similarly, Jimenez and Saurina (2005) find strong empirical support of a positive, although quite lagged, relationship between rapid credit growth and loan losses in Spain after the implementation of the countercyclical provisions.

[7] During the current financial crisis, herd behavior in lending may have intensified in certain countries. Some empirical studies have shown that in the last three decades a loosening of bank credit conditions has occurred during upturns due, inter alia, to a low level of contemporaneous non-performing loans and the extraordinary (although temporary) opportunities for profit in lending to the real estate and construction sector. Among other consequences, this behavior produced housing bubbles (Borio et al. 2001; Berger and Udell, 2002; Gerardi et al., 2008). Herding behavior may cause managers of different banks to ease credit standards simultaneously, and supervisors enforcement may be perceived as lighter when many banks are exerting such herding simultaneously (Rajan 1994; Acharya 2001; Shleifer and Vishny, 2009).

Considering this evidence and the extent to which credit can be exacerbated over the business cycle, we aim to contribute to the analysis of dynamic provisions by studying the extent to which banks can game on them to take more risk during upturns given that they consider that a expected by not yet materialized risk is covered with such provisions. The closest work to our approach is the paper by Jimenez *et al.* (2013). They use (non-publicly available) data from the Credit Register (CIR) of the Bank of Spain and study the effects of dynamic provisioning on the supply of credit to firms and the real effects of such relationship in Spain from 1999 to 2010. Their results show that dynamic provisioning generates countercyclical bank capital buffers and mitigates bank procyclicality. Our paper differs from that of Jimenez *et al.* (2013) as we aim to (i) show the effects of loan provisioning scheme on bank behavior; and (ii) analyze whether banks game on provisioning to take onto more ex-ante risk.

III. The Spanish provisioning scheme

III.a. The Spanish provisioning scheme

The cyclical behavior of bank loan-loss provisions has been a trend common to many countries in the last three decades, Spain being no exception. In 2000, the Bank of Spain introduced the so-called counter-cyclical, dynamic or statistical provision aimed at forcing banks to set aside provisions for the expected losses which are embedded in their expanding credit portfolios during good times, allowing them to use the reserve to cover realized losses during bad times.[8] The mechanism of statistical or dynamic provisions is depicted in Figure I. When a Spanish bank grants a loan, it must set aside a provision consistent with the historical loss experience of such loans (even if there is no current sign of impairment). By using long-run historical losses, dynamic provisions are intended to counter the natural procyclicality of specific provisions. With dynamic provisions (DPt), the loan-loss provision system in Spain functions as follows[9]:

$$\Delta DP_t = \sum_{i=1}^{6} \alpha_i \Delta L_{it} + \left(\sum_{i=1}^{6} \beta_i L_{it} - \Delta SP_t \right) \qquad (1)$$

where ΔDP_t is the change in dynamic provisions; α_i is an average estimate of loan losses in year t from a cyclical perspective for loans in risk category i (i=1,...6); ΔL_{it} is the change in the stock of loans of risk category i in period t; β is the average specific provision for the six risk categories over a business cycle and SP_t is the specific provision made in period t. The difference between $\sum_{i=1}^{6} \beta_i L_{it}$ and ΔSP_t is indicative of the strength (or weakness) of the lending cycle. During expansionary periods non-performing loans and specific provisions are very low; thus, the difference between $\sum_{i=1}^{6} \beta_i L_{it}$ and ΔSP_t is positive and that amount is charged to the profit and loss account, increasing the counter-cyclical (general) loan-loss provision fund and accumulating provisions. However, during recessions non-performing loans and specific provisions rush to the fore and the

8 Together with Spain, countries such as Uruguay, Peru or Bolivia have set aside similar dynamic provisioning schemes. See Wezel (2010) for a detailed description.

9 For a detailed description of the accounting framework of the Spanish dynamic provisions, see Saurina (2009).

difference between $\sum_{i=1}^{6} \beta_i L_{it}$ and ΔSP_t becomes negative. If the amount of loans (L) declines, $\sum_{i=1}^{6} \alpha_i L_{it}$ is also negative. The final negative amount is drawn down from the counter-cyclical/statistical fund, provided it has a positive balance, and written down in the profit and loss account. It should also be noted that there is a ceiling on the fund for counter-cyclical loan-loss provisions, fixed at 125% of the product of parameter α and the total volume of credit exposures. The definitions and weights of the risk for different loan categories within this system are given in Table I.[10]

Dynamic provisions may have contributed to reducing the possibility of earnings management, by curbing the effect of specific loan-loss provisions upon bank profits (Balla and McKenna, 2009)[11]. From a descriptive perspective, Fernandez de Lis and Garcia Herrero (2010) compare some international initiatives and conclude that it is realistic to assume that any system would require "ad hoc" adjustments and certain degree of discretion "as illustrated by the Spanish experience". They, however, maintain that this does not imply that total discretion is a superior option as in the
Colombian system.

Anecdotal evidence also suggests that the counter-cyclical system has had a significant impact upon loan-loss provisioning levels in Spain. As Saurina (2009) demonstrates, in 1999 the loan-loss provisions of Spanish banks were the lowest among OECD countries. In 2006, the Spanish banking system had by far the highest coverage ratio among Western European countries, at 255 percent.

III.b. The effects of the financial crisis

Spain is also an interesting case in that the majority of Spanish banks were hit by the international financial crisis later than those in most countries, a circumstance commonly associated with the existence of a loan-loss provisioning scheme acting as a buffer. However, a significant number of financial institutions were eventually severely affected. Regarding restructuring policy, the starting point is the constitution of the Fund for Orderly Bank Restructuring (in Spanish, FROB). The FROB was created to manage the restructuring and resolution processes of credit institutions and assist in the enhancement of their solvency position (Royal Decree-law 9/2009). The FROB, in coordination with the Bank of Spain, has been leading the restructuring process and, as noted above, the actions concentrated mostly (although not exclusively) on savings banks. Out of 45 savings banks, 43 participated in a

[10] Between 2000 and 2004, the dynamic provisions were implemented in addition to specific and "general" provisions. At that time, general provisions were a fixed provision applied to the total loan portfolio. In 2004, the Bank of Spain revised the counter-cyclical provisioning system in response to the adoption of the International Financial Reporting Standards (IFRS) by the European Union. The changes involved a reversion to only two types of loan-loss provisions: specific and counter-cyclical or statistical provisions (from 2004 onwards, dynamic provisions were also called "general" provisions). Additionally, dynamic provisions were included in Tier 2 capital i.e. up to 1.25 percent of risk-weighted assets.

[11] Some studies have simulated what would have happened if a dynamic provisioning framework (akin to that implemented in Spain) had allowed a build-up of reserves during the boom years in the United States. In particular, Balla and McKenna (2009) and Sacasa (2010) show that such implementation would have smoothed bank income and provisioning levels over the cycle.

consolidation process. The average size of the 45 institutions was 29.44 billion Euros and in 2013 there were only 12 institutions average total assets of 90.83 billion Euros.

Importantly, accumulated provisions to cover impairment losses by Spanish banks as of December 2012 summed up 191.5 billion Euros. As shown by Saurina and Trucharte (2013), accumulated countercyclical provisions were 25.8 billion Euros as of 2007 and by December 2012 3.2 billion Euros were left.

IV. Hypotheses, data and methodology

IV.a. The Spanish case as a laboratory: data and hypotheses

Our principal empirical goal is to evaluate the effectiveness of the Spanish dynamic provisions system by analyzing the extent to which this scheme has in fact reduced procyclicality, restricted managerial discretion and curbed loan growth. Our sample consists of an unbalanced panel which starts with 55 Spanish banks (45 savings banks and 10 commercial banks), employing quarterly information from 1995Q1 to 2013Q1 (3,040 bank-year observations). This sample represents 92% of total bank assets in Spain. The sample period covers a period before the implementation of the counter-cyclical provisioning scheme, its implementation in the pre-crisis and crisis environment; and the sharp deceleration in lending together with a significant rise in non-performing loans.

Following the theoretical predictions regarding managerial discretion and the relationship between loan growth and loan quality, we would expect the following relationships to hold:

- As a counter-cyclical tool, statistical provisions potentially are expected to reduce the impact of the business cycle on total loan-loss provisioning. Therefore, following the implementation of statistical provisions, the expected negative relationship between loan-loss provisions and GDP growth should decrease over time.

- Dynamic provisions have a profit smoothing effect by definition. However, this smoothing is subject to rules and, if provisioning is fully effective, it lessens the effect of specific loan-loss provisions upon bank profits. Specifically, loan-loss provisions should depend upon the "true" credit risk of loans and not upon net operating income. Therefore, if the implementation of dynamic provisions is effective in reducing profit smoothing, we would expect the statistical significance (if any) of the relationship between loan-loss provisions and net operating income to diminish over time or to become not statistically significant after the implementation of the counter-cyclical scheme. Additionally, since statistical provisions are intended to reflect (incurred and expected) bank losses, we would not expect the use of loan-loss provisions to produce profit signaling. Therefore, we would expect to find no relationship between current loan-loss provisions and end-of-period net operating income. Finally, we would expect to find no evidence of capital management if the relationship between beginning-of-period regulatory capital ratio and loan-loss provisions is not statistically significant.

- In order for dynamic provisions to be fully effective, they should (for a given desired leverage) provide incentives for banks to grant loans more carefully, due

to these mandatory provisions for performing loans. In this case, we would expect lagged loan growth rates (and, in particular, high-order lags reflecting a longer time since the crisis started) to be unable to explain current loan default rates.

In order to test these relationships, we obtain bank-level information for the discretionary and non-discretionary components of loan-loss provisioning, as well as for a set of determinants of non-performing loans.

IV.b. Empirical setting: equations, identification strategy and estimation method

In our empirical setting, loan-loss provisions are explained as a function of discretionary and non-discretionary behavior, together with a set of control variables. We first estimate the following reduced-form equation:

$$LLP_{it} = f(DC_{it}, NDC_{it}, CV) \quad (2)$$

where LLP_{it} is the ratio of loan-loss provisions to total assets. The vector of discretionary components (DC_{it}) includes the ratio of non-performing loans to total assets (NPL), while the ratio of non-discretionary components (NDC_{it}) includes net operating income (NOI) and the ratio of capital to total assets (CAP). The vector of control variables (CV) includes the loan-to-assets ratio as a proxy for bank specialization (SPE); bank size as the log of total assets (LTA); a measure of income smoothing symmetry (ISS); the general index of the Madrid stock exchange, as a proxy for expectations regarding economic conditions (EEC); GDP growth (GDPG); and the Lerner index of bank market power (MPW). The definitions and sources of these variables are provided in Table II.

NPL, EEC and GDPG can be interpreted as measures of credit risk. Consistent with discretionary behavior in loan-loss provisions, we would expect LLP to increase in line with NPL. EEC captures expectations regarding economic conditions, which may affect provisioning decisions. A negative sign is expected for GDPG, as loan-loss provisions increase during downturns and decrease in upturns. If the magnitude of this coefficient decreases following the implementation of the dynamic provisions, these measures will therefore contribute to reducing procyclicality. In equation (2), we profit smoothing behavior will be identified if the coefficient of NOI is positive and significant. We will also determine whether evidence exists of profit signaling, by testing whether end-of-period net operating income (NOIt+1) is significantly related with LLP. Similarly, capital management behavior is proven if CAP is positively and significantly related to LLP. As in Perez et al. (2006), the income smoothing symmetry variable is included in equation (2) to test whether income smoothing behavior is symmetrical in periods of expansion and contraction and, in particular, before and during the crisis. ISS is defined as the absolute value of the difference between the net operating income of the bank in a given year and its average net operating income over the period. Finally, the Lerner index of market power (MPW) is also included as a control variable, to test whether competitive pressures may have affected the provisioning policies of banks, by broadening or narrowing managerial discretion.

On the question of loan growth and loan quality, we adopt the empirical structure proposed in most previous studies to estimate the following reduced-form equation:

$$NPL_{it} = f(LGR_{it-n}, CV) \quad (3)$$

where the ratio of non-performing loans is explained by a vector of lagged loan growth (LGR) terms and a set of control variables. As for the LGR variable we include lags of 1, 2, 4 and 8 quarters. Consistent with the expected negative impact of past of loan growth on current loan quality standards, if the high-order lags of the LGR variable are statistically significant and the low-order lags are not, this would suggest that bank managers relax credit quality as the time from the last downturn increases. In our context, banks displaying relatively high loan growth rates in the year prior to the crisis are those most likely to exhibit this type of herding behavior. The control variables in equation (3) include one lag of NOI, CAPt-1, SPE, LTA, EEC, GDPG and MPW. We further include other macroeconomic control variables which may affect the quality of credit standards, such as the growth in real house prices (RHPG) and the 1-year Euribor rate (1YE), together with other bank-level variables which may also affect non-performing loans, such as the efficiency ratio of cost-to-income (EFF), the one-year lagged branch growth rate (BGRt-4) and the return on equity (RoE).

To identify the ex-ante risk behavior of banks and the specific role of dynamic provisions in this behavior, we follow a identification strategy in two steps. First of all, we interact the different lags of the LGR variable in equation (3) with the dynamic provision variable DPR in the same year. This way we identify if dynamic provisions implied a change in ex-ante risk-taking that affected ex-post loan performance. However, one may still argue that the interaction variables are just identifying banks that have a riskier profile per se and not just the effects of the provisions. In order to check if this is the case, we perform a placebo test. We take advantage of a long-period of credit expansion from 1995 to 2007 to conduct this analysis. In particular we test if both the loans generated during 1995-2000 and 2001-2006 had an effect in NPL during the crisis. The placebo consists of assuming that the dynamic provisions made in 2001-2006 were instead made in 1995-2000. If the relationship between the placebo provisions and the ex-post NPL performance still holds the DPR would not be explaining the risk behavior as equation (3) would be just identifying riskier banks and not the effect of DPR.

In both equations (2) and (3), the lagged values of the dependent variables might affect, at least partially, the current values of these variables. In this case, a "dynamic" specification with lagged dependent variables is employed, as regressors are able to address these potential feedback effects. For the same reason, we employ a dynamic panel methodology which relies on the Generalized Method of Moments (GMM) estimator formulated by Arellano and Bover (1995) and Blundell and Bond (1998), and refined by Blundell et al. (2000). This GMM estimator is called the system estimator, since it combines, in one system, the regression in differences with the regression in levels. The instruments for the equation in differences are the lagged exogenous variables and the lagged values of the potential endogenous variables. The instruments for the equation in levels are the lagged differences of the corresponding variables. These are appropriate instruments under the following additional assumption: although correlation may exist between the levels of the right-hand side variables, there is no correlation between the differences of these variables and the firm-specific effect.

The system estimator is appropriate to estimate the following specification:

$$y_{i,t} = \alpha y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \qquad (4)$$

where y is the dependent variable, X, is the vector of regressors in equations (2) and (3), η_i is an unobserved firm-specific effect and ε is the error component. The firm-specific effect is eliminated by taking first-differences in equation (4), so that:

$$y_{i,t} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta'(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (5)$$

All variables are expressed in logs, and thus the differences can be interpreted as growth rates. Appropriate instruments must be employed to deal with the likely endogeneity of the explanatory variables, and also to take into account that the new error term $(\varepsilon_{i,t}\text{-}\varepsilon_{i,t-1})$ is correlated with the lagged dependent variable $(y_{i,t-1}\text{-}y_{i,t-2})$. In order to assess the appropriateness of our instrumental variables we conduct a Durbin-Wu-Hausman (DWH) test. The DWH is an F-test for overidentifying restrictions in each of the regressions (Davidson and McKinnon, 1993, pp. 237-242). These instruments are particularly appropriate when the DWH rejects the null hypothesis that the instruments have no effect on the estimates of the regression coefficients. If the p-value of the DWH test is under 10%, the null hypothesis is rejected and the instrumental variables are accepted.

V. Results

V.a. Main results

Table III presents our main results for the whole sample. In the first two columns of Table III we examine managerial discretion in provisions as shown in equation (3). The coefficient of non-performing loans (NPL) -the discretionary component of loan-loss provisioning (LLP)- is positive and significant, as expected. Similarly, there appears to be evidence of procyclicality in loan-loss provisioning, since the coefficient of GDP growth (GDPG) is negative and significant. With regard to managerial discretion, the positive and significant coefficient of net operating income (NOI) suggests that banks employ income smoothing. On the question of the impact of end-of-period profits on current loan-loss provisioning, the positive and significant coefficient of NOIt+1 in the second column of Table 3 suggests that Spanish banks use provisions to signal positive profit prospects. However, there is no evidence of capital management, since the coefficient of the beginning-of-period capital ratio (CAP) is not found to be statistically significant. It is worth noting that the coefficients of the discretionary components of loan-loss provisioning (NOI and CAP) are significantly lower (0.141 and -0.006) than the coefficient of the discretionary component, NPL (0.184). Concerning the control variables, those banks displaying high loans to assets ratio (ESP) increase loan-loss provisions to a significantly larger extent.[12] Additionally, income smoothing asymmetry appears to exist. In particular, the positive and significant coefficient of ISS suggests that bank income smoothing is greater in periods of relatively high profits, a finding consistent with the evidence found by Perez et al. (2006).

[12] We also included a dummy to test whether the accounting change implemented in 2004 (to make the dynamic provisions comply with the IFRS) had an impact on our results. However, the dummy was not found to be statistically significant (for the sake of simplicity it is not given here).

Although these results suggest that dynamic provisions may have been more effective in avoiding capital management than income smoothing and profit signaling, we wonder whether the intensity of earnings management decreases over time, and in particular before and during the financial crisis. We also wonder if the procyclicality of provisions has also declined. We analyze these trends for the periods 1995Q1-2007Q2 and 2007Q3-2013Q4 in Appendix 1. We find that procyclicality of provisioning declined over time as shown by the coefficient of GDPG in the second and third columns (-0.181 and -1.156) vs. the fourth and fifth columns (-0.098 and -0.087). As for earnings management, the coefficient of NOI (indicating income smoothing) decreases from 0.131 to 0.096 between the two periods. Additionally, while there is evidence of profit signaling in the pre-crisis period, there is no evidence of such behavior during the crisis (the coefficient of NOIt+1 in the second period is not statistically significant). It should also be noted that the procyclicality of loan-loss provisions also appears to decrease over time. In particular, the impact of GDPG upon NPL decreases in absolute terms between the two periods, from -0.181 to -0.098.

The third column in Table III tests the relationship between loan growth and loan quality and the extent to which banks may have gamed on dynamic provisioning ex-ante taking more risk. While the first- and fourth-order lagged loan growth variables (LGR_{t-1} and LGR_{t-4}) are not found to significantly affect current non-performing loan levels (NPL), the two-year and three-year lagged loan growth rates (LGR_{t-8} and LGR_{t-12}) are found to have a positive and significant effect on NPL. This suggests that poorly monitored loan growth eventually produced poorer credit quality, with a time span of at least two years during the period considered. As for the specific impact of dynamic provisions, the variable that interact lagged loan growth with lagged dynamic provisions is positive and significant in all cases. The magnitude of the coefficients increases with the length of the lags suggesting that accumulating these provisions also increase risk-taking on top of loan growth. Among the macroeconomic determinants of NPL, GDP growth and the one-year lagged growth in real house prices ($RHPG_{t-4}$) are found to be negatively and significantly related to credit quality. As for the bank-level determinants of non-performing loans, the one-year lagged branch growth (BGR_{t-4}) is positively and significantly related to NPL, suggesting adverse selection problems in bank expansion strategies. We also find that greater efficiency (lower EFF) generates improved credit quality. These findings are similar to those obtained by Salas and Saurina (1999) for the Spanish banking sector in the period 1988-1997.

V.b. Loan growth before the crisis and loan quality during the crisis: a placebo test

The baseline results on the relationship between loan growth before the crisis and loan quality during the crisis are shown in Table IV. In order to focus on the impact of loan growth and dynamic provisions the coefficients for other bank and macroeconomic control variables are omitted. Both the average bank loan growth during 1995-2000 and during 2001-2007 have a negative impact on loan quality during the crisis. In line with the results of Table III, the interaction between average loan growth in 2001-2007 and dynamic provisions in this period have also a positive and significant effect on non-performing loans. However, the placebo test that assumes that the dynamic provisions were made in 1995-2000 suggests that there is no impact of the dynamic provisions on that period on the NPL during the crisis. Therefore, the placebo test reinforces our main result that a larger ex-ante risk behavior is related to some significant extent to dynamic provisions and not to other specific management features of the group of banks that make the larger dynamic provisions.

VI. Conclusions

In this paper we examine the impact of the Spanish dynamic loan-loss provision system on managerial discretion and ex-ante risk behavior. We analyze a sample of 55 Spanish banks from 1995Q1 to 2013Q4. Our results suggest that the counter-cyclical system has significantly reduced the procyclicality of loan-loss provisions. We also find that dynamic provisions have not prevented Spanish banks from employing various mechanisms for earnings management, although this behavior has been less significant (in both economic and statistical sense) after the implementation of the counter-cyclical provisioning. We also find that there are ex-ante incentives for banks to take more risk when the provisions are implemented that negatively affect loan quality and loan performance during the crisis.

Overall, the empirical findings of this paper suggest that some of the primary and defining objective of reducing procyclicality have been achieved, via a system of dynamic provisions. However, these provisions do not appear, by themselves, to have effectively control excessive loan growth and, to some extent, can also be exacerbated if they are not accompanied by other risk-prevention measures such as countercyclical capital. This evidence is consistent with some preliminary assessments of the effectiveness of Spanish dynamic provisions, suggesting that while dynamic provisions may effectively reduce procyclicality and act as a buffer for loan losses over the business cycle, they cannot prevent credit booms (Brunnermeier et al.,, 2009; Balla and McKenna, 2009; Sacasa, 2010). These results may also be related to theories that justify bank capital regulation and loan-loss provisioning build on the need to "control" bank risk of failure. In this sense, further research should be done in order to clarify to what extent one instrument (capital and provisioning rules) can be used to achieve two objectives such as the control of both the risk of failure and procyclicality.

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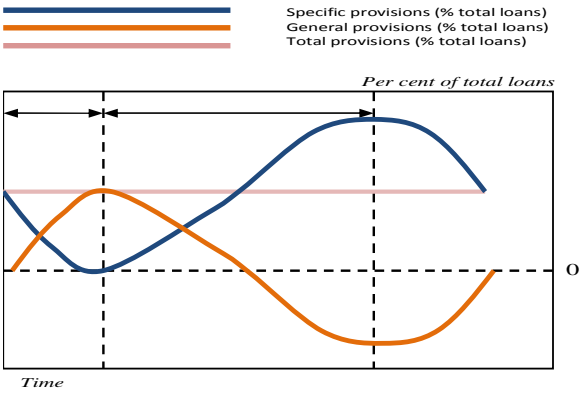
Figure I. Dynamic provisioning: an illustration



Source: Bank of England and authors' elaboration

Table I. Risk Categories Under Standard Approach to Statistical Provisioning

Category	Description
Negligible Risk ($\alpha = 0\%$, $\beta = 0\%$)	Cash and public sector exposures (both loans and securities)
Low Risk ($\alpha = 0.6\%$, $\beta = 0.11\%$)	Mortgages with a loan-to-value ratio below 80 percent and exposure to corporations with a rating of "A" or higher
Medium-Low Risk ($\alpha = 1.5\%$, $\beta = 0.44\%$)	Mortgages with a loan-to-value ratio above 80 percent and other collateralized loans not previously mentioned
Medium Risk ($\alpha = 1.8\%$, $\beta = 0.65\%$)	Other loans, including corporate exposures which are non-rated or have a rating below "A" and exposures to small- and medium-size firms
Medium-High Risk ($\alpha = 2.0\%$, $\beta = 1.1\%$)	Consumer durables financing
High Risk ($\alpha = 2.5\%$, $\beta = 1.64\%$)	Credit card exposures and overdrafts

Table II. Descriptive statistics and definition of the posited variables

	Mean	*Std dev.*	*Definition*	*Source*
SPR	0.37	0.19	Specific loan-loss provisions over total assets	Information of Prudential Relevance Reports for data from 2007 to 2013. For the remaining periods the information has been gathered from quarterly bank reports and publicly available information provided by the banks to the Spanish Securities Exchange Commission (CNMV), as well as from occasional reports and memos provided by the banks.
DPR	0.19	0.14	Dynamic loan-loss provisions over total assets	Same as above
PLL	0.55	0.27	Total net specific and dynamic loan-loss provisions over total assets	Same as above
LGR	10.47	7.18	Loan growth (yearly)	Quarterly accounting statements published by the Spanish Banking Association (AEB) and the Spanish Confederation of Savings Banks (CECA).
NPL	2.78	1.89	Non-performing loans	Information of Prudential Relevance Reports for data from 2007 to 2012. For the remaining periods the information has been gathered from quarterly bank reports and publicly available information provided by the banks to the Spanish Securities Exchange Commission (CNMV), as well as from occasional reports and memos provided by the banks.
NOI	1.70	0.98	Net operating income	Quarterly accounting statements published by the Spanish Banking Association (AEB) and the Spanish Confederation of Savings Banks (CECA)
CAP	8.03	3.65	Capitalization (total capital/assets)	Same as above
SPE	66.15	14.22	Specialization (loan-to-assets ratio)	Same as above
LTA	17.27	2.91	Log (total assets)	Same as above
ISS	0.45	0.24	Income smoothing symmetry: absolute value of the difference between the net operating income of bank i in period t and the average net operating income of bank i over the period	Same as above
EEC	887	223	Expectations of economic conditions (general index of Madrid stock exchange)	Bank of Spain
GDPG	2.19	1.72	GDP growth	Spanish Statistical Office (INE)
MPW	20.54	7.18	Market power (Lerner index): (average price of earning assets-marginal costs)/average price of earning assets. Note: marginal costs are computed from a translog function with two outputs (loan and deposits) and three inputs (deposits, labor and physical capital)	Quarterly accounting statements published by the Spanish Banking Association (AEB) and the Spanish Confederation of Savings Banks (CECA)
RHPG	7.24	3.16	Real house prices (growth)	Spanish Statistical Office (INE)
1YE	3.29	2.18	1-year Euribor rate	Bank of Spain
EFF	0.57	0.44	Operating efficiency (cost-to-income ratio)	Quarterly accounting statements published by the Spanish Banking Association (AEB) and the Spanish Confederation of Savings Banks (CECA)
BGR	3.36	3.82	Branch growth rate	Same as above
RoE	9.75	6.88	Return on equity	Same as above

Table III. Test of discretionary bank management, loan growth and gaming on provisions (1995Q1-2013Q4)

Dynamic panel data (system estimator)
In equations (3) and (4), NOI, CAPt-1, SPE, LTA, EEC, GDPG and MPW enter with one lag.
*,** : statistically significant at 5% and 1% levels, respectively
p-values in parentheses

	(1)	(2)	(3)	(4)
Dependent variable	**PLL**	**PLL**	**NPL**	**NPL**
Hypotheses tested	Procyclicality of provisions, income smoothing and capital management	Signaling behavior	Impact of loan growth on NPL	Impact of loan growth and dynamic provisions on NPL
PLLt-1	0.184**	0.168**	-	-
	(0.000)	(0.000)		
NPL	0.190**	0.199**	-	-
	(0.000)	(0.000)		
NPLt-1	-	-	0.228**	0.219**
			(0.000)	(0.000)
NOI	0.141**	0.137**	0.125**	0.120**
	(0.005)	(0.003)	(0.006)	(0.005)
CAPt-1	-0.006	-0.007	-0.005	-0.007
	(0.328)	(0.329)	(0.317)	(0.344)
SPE	0.013**	0.015**	0.016**	0.012**
	(0.004)	(0.005)	(0.005)	(0.003)
LTA	0.029	0.033	0.025	0.029
	(0.280)	(0.276)	(0.271)	(0.250)
ISS	0.023**	0.018*	-	-
	(0.009)	(0.017)		
EEC	0.008	0.007	0.005	0.008
	(0.126)	(0.135)	(0.129)	(0.143)
GDPG	-0.111**	-0.116*	-0.108**	-0.117**
	(0.016)	(0.019)	(0.014)	(0.013)
MPW	0.007	0.006	0.014	0.018
	(0.116)	(0.122)	(0.179)	(0.156)
NOIt+1	-	0.099*	-	-
		(0.025)		
RHPG	-	-	-0.331**	-0.326**
			(0.003)	(0.004)
1YE	-	-	0.218**	0.203**
			(0.002)	(0.004)
EFF	-	-	0.049*	0.042*
			(0.030)	(0.025)
BGRt-4	-	-	0.018*	0.013*
			(0.016)	(0.014)
RoE	-	-	-0.202*	-0.209*
			(0.034)	(0.038)
LGRt-1	-	-	0.004	0.006
			(0.168)	(0.144)
LGRt-4	-	-	0.007	0.011
			(0.269)	(0.271)
LGRt-8	-	-	0.076**	0.073**
			(0.000)	(0.000)
LGRt-12	-	-	0.088**	0.086**
			(0.000)	(0.000)
LGRt-1 X DPRt-1	-	-	-	0.035*
				(0.038)
LGRt-4 X DPRt-4	-	-	-	0.049*
				(0.026)
LGRt-8 X DPRt-8	-	-	-	0.062*
				(0.018)
LGRt-12 X DPRt-12	-	-	-	0.077*
				(0.021)
Number of observations	3040	2728	2104	2104
Durbin-Wu-Hausman test (p-value)	0.042	0.030	0.023	0.019
F-test for overall significance (p-value)	0.011	0.018	0.013	0.008

Table IV. Loan growth before the crisis and credit quality during the crisis (2007Q3-2012Q4)

The bank control variables NOI, CAPt-1, SPE, LTA, EEC, GDPG and MPW enter with one lag.
*,** : statistically significant at 5% and 1% levels, respectively
p-values in parentheses

	(1)	(2)	(3)
Dependent variable	**NPL**	**NPL**	**NPL**
Hypotheses tested	Impact of loan growth on NPL	Impact of loan growth and dynamic provisions on NPL	Impact of loan growth and dynamic provisions on NPL - PLACEBO TEST
Average LGR (1995-2000)	0.288**	0.274**	0.270**
	(0.003)	(0.004)	(0.003)
Average LGR (2001-2007)	0.196**	0.192**	0.188**
	(0.007)	(0.007)	(0.005)
Average LGR (2001-2007) X Average DPR (2001-2007)	-	0.097**	0.094**
		(0.009)	(0.007)
Average LGR (1995-2000) X Average PLACEBO DPR (1995-2000)	-	-	0.016
			(0.398)
Bank and macroeconomic control variables	Yes	Yes	Yes
Number of observations	792	792	792
Durbin-Wu-Hausman test (p-value)	0.031	0.039	0.034
F-test for overall significance (p-value)	0.034	0.032	0.029

Appendix 1. Test of discretionary bank management before (2000Q1-2007Q2) and during the crisis (2007Q3-2012Q4)

Dynamic panel data (system estimator)
*,** : statistically significant at 5% and 1% levels, respectively
p-values in parentheses

	(1)	(2)	(3)	(4)
Dependent variable	**PLL**	**PLL**	**PLL**	**PLL**
Hypotheses tested	Procyclicality of provisions, income smoothing and capital management	Signaling behavior	Procyclicality of provisions, income smoothing and capital management	Signaling behavior
PERIOD	**1995Q1-2007Q2**		**2007Q3-2013Q4**	
PLLt-1	0.134**	0.136**	0.203**	0.207**
	(0.000)	(0.000)	(0.000)	(0.000)
NPL	0.162**	0.168**	0.225**	0.228**
	(0.000)	(0.000)	(0.000)	(0.000)
NOI	0.131**	0.139**	0.096**	0.097**
	(0.005)	(0.003)	(0.005)	(0.004)
CAPt-1	-0.004	-0.005	-0.003	-0.005
	(0.269)	(0.361)	(0.263)	(0.229)
SPE	0.014**	0.016**	0.007**	0.009**
	(0.007)	(0.008)	(0.004)	(0.005)
LTA	0.022	0.024	0.014	0.018
	(0.336)	(0.332)	(0.306)	(0.297)
ISS	0.028*	0.024*	0.016	0.012
	(0.012)	(0.013)	(0.123)	(0.135)
EEC	0.004	0.006	0.009	0.007
	(0.163)	(0.172)	(0.187)	(0.172)
GDPG	-0.181*	-0.156*	-0.098**	-0.087**
	(0.023)	(0.021)	(0.012)	(0.010)
MPW	0.006	0.005	-0.009*	-0.006*
	(0.139)	(0.142)	(0.055)	(0.045)
ΔNOIt+1	-	0.101*	-	0.072
		(0.023)		(0.99)
Number of observations	2028	1934	1012	918
Durbin-Wu-Hausman test (p-value)	0.043	0.041	0.033	0.035
F-test for overall significance (p-value)	0.017	0.020	0.026	0.028