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John P. Bonin & Marko Kosak

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WESLEYAN UNIVERSITY

Department of Economics
Public Affairs Center
238 Church Street
Middletown, CT 06459-007

Tel: (860) 685-2340
Fax: (860) 685-2301
http://www.wesleyan.edu/econ

Loan/Loss Provisioning in Emerging Europe: Precautionary or Pro-Cyclical?

John P. Bonin (Department of Economics, Wesleyan University, Middletown CT 06459) jbonin@wesleyan.edu

Marko Kosak (University of Ljubljana, Faculty of Economics, Ljubljana, Slovenia) marko.kosak@ef.uni-lj.si

Abstract

The recent global financial crisis has generated considerable interest in reviewing the regulatory environment surrounding the banking sectors in most countries and proposals for changes designed to avoid such a severe outcome in the future. In this paper, we consider a particular aspect relevant to bank regulation, namely, the cyclicality of loan loss provisioning, in a region of emerging market economies. All eleven of the countries in our sample are currently new members of the European Union, the first group entering 2004 and the last country joining in 2013. Our time period from 1997 to 2010 covers roughly one and a half business cycles, starting with the impact of the Russian financial crisis and followed by a rapid growth of bank credit prior to the included global financial crisis. We find that the determinants of loan loss provisioning by banks in the region are similar to those found in the literature for other countries both developed and developing ones. We find evidence on income smoothing through provisioning and capital management by substitution. Unlike the results in much of the literature, we do not find statistically significant evidence of bank-specific pro-cyclicality, i.e., a strong positive relationship between provisioning and individual bank loan growth. However, we do find strong and robust evidence of macroeconomic pro-cyclicality, i.e., a strong positive relationship between provisioning and country GDP growth. Based on the innovative policy of dynamic (statistical) provisioning instrument adopted by Spanish regulators in 2000 to smooth provisioning over the business cycle, we draw implications for regulatory design specific to this region in which financial sectors are bank-centric and financial deepening is occurring.

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I. Introduction: Loan-loss Provisioning and Bank Regulation in Emerging Europe

Loan-loss provisioning by banks plays an important role in prudent risk management and, thus, is a concern for bank regulators. As the primary regulatory tool, bank capital is required to cover unexpected losses in the loan portfolio. In actuality, loan-loss provisioning may be somewhat substitutable for capital by providing a buffer to absorb unexpected losses. Provisions take two forms: general and specific. Specific provisions are allocated against identified impaired loans to compensate for their lost value. By nature, specific provisioning is backward-looking and pro-cyclical in that these identified impaired loans increase (decrease) in downturns (booms) due to lags in recognizing problem loans. General provisions are intended to cover expected losses across the business cycle and thus should be forward-looking to be prudential. To the extent that banks misestimate the latent risk in the loan portfolio, general provisions may be pro-cyclical in the same sense as specific provisions. Hence, both forms are usually considered together as an aggregate flow.

Pro-cyclicality of loan-loss provisioning is important for macroeconomic policy because of the well-documented positive relationship between changes in bank lending and GDP growth. Bank lending exacerbates booms by growing at above-average rates and downturns by growing at below-average or even negative rates. In addition, individual banks may use loan-loss provisioning in discretionary ways to manage the volatility of earnings (income smoothing), to provide a cushion for bank capital in a downturn (capital management) and to signal financial strength (stress test). If a bank manager engages in income smoothing, any pro-cyclicality of loan-loss provisioning is mitigated. Empirical analysis of loan-loss provisioning over the business cycle identifies two types of cyclicality: macroeconomic cyclicality relating loan-loss provisioning to GDP growth directly and bank-specific cyclicality relating loan-loss provisioning to some measure of the bank's loan growth.

In July 2000, Spain's central bank introduced a rule-based dynamic provisioning requirement for banks in response to a perceived heightened credit risk in the loan portfolios of Spanish banks due to significant credit growth in the previous period. The regulator's concern was chronic under-provisioning by banks during a credit boom leading to a heightened need for provisioning during a downturn and, thus, accentuating any credit crunch. To the extent that loan-loss provisioning is backward-looking in accounting for credit risk and based on realized losses without taking account appropriately of future expected losses, such a regulatory measure is warranted.

Various hypotheses have been put forward to explain the underestimation of the latent credit risk in the loan portfolio by banks during boom periods Jimenez and Saurina (2006) focus on the thin margins that result from competition for clients leading banks to overweight type I errors (rejecting good borrowers) and to underweight type II errors (lending to a bad borrower). Rajan (1994) provides a theoretical justification for herd behavior by bank managers wishing to avoid being dismissed for poor performance during booms. Bouvatier and Lepetit (2008) identify

accounting regulations that lead to an overvaluation of collateral during asset booms. Finally, an agency relationship may lead bank managers to grow the loan portfolio during booms as an empire-building strategy. Whatever the underlying motivation, if discretionary behavior by bank managers results in pro-cyclical loan-loss provisioning, such action may exacerbate the impact on GDP through the bank lending channel.

Using U.S. data over two full business cycles from 1980 to 2000, Berger and Udell (2004) are among the first to identify the pro-cyclicality of bank lending. They explain this resulting relationship by attributing it to lack of institutional memory in that the lessons learned regarding the implicit and increasing risk in the loan book during a credit boom are forgotten by the time the next boom occurs. These authors find that lending pro-cyclicality is stronger for commercial loans than for real estate, credit card and mortgage loans. The policy implication they offer is to adjust the severity of regulations according to the lenght of time from the last bust. Using quarterly macroeconomic for the U.S. from 1993:3 to 2008:4, Beatty and Liao (2009) show that pro-cyclicality of bank lending may be magnified when loan-loss provisioning is backward looking. In addition, they find that banks with more conservative loan-loss provisioning reduce their lending less during recessionary periods relative to explansionary periods lending support to the case for prudential provisioning. These papers focusing solely on the U.S., one considering the period before the recent financial crisis and the other a period that includes some crisis data, provide at least implicit support for including some type of dynamic provisioning in regulatory reforms designed to avert severe crises in the future.

During a downturn, an increase in loan-loss provisioning above what would have been normal had the latent risk now being realized been anticipated and provisioned for leads to a decrease in bank lending as earnings are diverted to loan-loss provisioning so that the bust is exacerbated. On the other hand, evidence exists to indicate that banks actually use loan-loss provisioning to smooth fluctuations in reported earnings. Hence, banks may increase provisioning during boom times and decrease it during busts to achieve an income-smoothing objective. Such behavior would have a similar effect as the rule-based regulatory system in that loan-loss provisioning would be above average during expansions with its associated significant credit growth but below average during contractions with its accompanying credit crunch. In essence, banks may voluntarily act in consonance with the regulator's objective. Critics argue that income smoothing distorts the information that banks provide to the regulator and to their shareholders. They claim that managers have a strong motivation to moderate the variability of earnings to reduce the perception of risk by shareholders. Jiminez and Saurina (2006) argue that the advantage of the Spanish system of so-called statistical provisioning is that the parameters are specified by the regulator so that the inherent income-smoothing component can be undone by relatively simple calculations using available information. Hence, they claim that dynamic provisioning as a rule-based parametric system introduces both prudency and transparency to bank provisioning.

Dynamic (or statistical) provisioning has as its objective the smoothing of provisions over a business cycle so that above -average provisions accrue during boom periods and become

available to be drawn down during bust periods. Statistical provisions are calculated as the difference between expected credit loss from a loan portfolio based on experiences during previous cycles and specific provisions for loans that are recognized as impaired. Balla and McKenna (2009) analyze U.S. data from 1993 to 2008 comparing actual loan-loss provisioning, which is highly pro-cyclical in the latter half of the period, to simulated statistical provisioning over the same period using the Spanish methodology. They conclude that dynamic provisioning would have had a considerable dampening impact on loan-loss provisioning and consequently increased bank liquidity (and by supposition bank lending) during the recent financial crisis. In 2006, these authors show that Spanish banks had accumulated a considerably higher percentage of loan-loss provisioning to non-performing assets (around 250%) than US banks (around 120% as the next highest of the other countries considered, the remainder of which is in Europe) and thus could take advantage of a substantial reserve cushion as the financial crisis evolved. Fernandez de Lis and Garcia-Herrero (2010) compare the experiences of three countries with dynamic provisioning; Spain adopted the practice in 2000 while Colombia and Peru followed in 2007 and 2008, respectively. They conclude that, when the boom is large, this regulatory instrument has a limited impact on smoothing credit growth but that the policy does promote the prudent accumulation of a buffer of reserves for bust times.

The recent financial crisis has spawned considerable interest in reforming financial regulation to prevent similar such events in the future. Whether dynamic provisioning should be part of regulatory reform and, if so, how it should be designed are issues that require prior analysis of the determinants of loan-loss provisioning. The implementation of any such regulatory policy relies on historical data to set the parameters for statistical provisioning. To the extent that a bank's internal management of latent risk is prudent, the need for a rules-based parametric system is mitigated. According to Fernandez de Lis and Garcia-Herrero (2010), large Spanish banks discussed with the regulator the appropriateness of their own internal systems leading to adjustments in the design by the regulator. These authors also report that, while the system in Spain uses bank credit as a key target to measure cyclicality, the Peruvian system uses GDP. In addition, they point out that any such regulatory practice should allow for financial deepening in emerging market economies. Hence, resolving design issues for regulatory reform requires a careful consideration of country (or regional) characteristics.

Our objective is to examine the provisioning behavior of banks in a relatively homogeneous region of emerging market economies during the recent financial crisis to shed light on the advisability of considering a regulatory tool similar to that employed by the Spanish Central Bank. Our sample consists of eleven countries of emerging Europe: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. We consider the period from 1998 to 2010; it includes a mini-crisis at the beginning (echoing the Russian financial crisis) followed by a strong credit boom prior to the recent financial crisis that spawned the great recession. As such, we capture a cycle and a half of economic activity that includes both a considerable rapid increase in bank credit (due somewhat too rapid financial

deepening) and a precipitous contraction of credit and GDP at the end of the period. Eight of the countries joined the EU in 2004, two additional ones (Bulgaria and Romania) joined in 2007, and the remaining country (Croatia) was admitted in 2013 so that the institutional characteristics are relatively homogeneous across the countries.[1] In addition, the financial systems in all of these countries are bank-centric rather than market-based and, with one exception (Slovenia), the banking systems are dominated by six major European-based multinational banks. The countries share the distinction of having some of the highest percentages of bank assets owned by foreign banks anywhere in the world. Finally, each experienced a severe bank loan cycle with rapid credit growth prior to 2007 and a considerable decrease in credit growth during the great recession.

Our basic model is a dynamic one that links loan-loss provisioning (LLP) by banks to earnings before taxes and provisioning (EBP), gross bank loan growth (ΔLoans), GDP growth (ΔGDP), and a measure reflecting the bank's capital adequacy (CAP). The specification includes a one-year and a two-year lagged dependent variable to account for a period of adjustment to a desired stock of loan-loss provisions over time. We distinguish two measures of cyclicality; the relationship between loan-loss provisions and GDP growth reflecting macroeconomic cyclicality and the relationship between loan-loss provisions and loan growth representing bank-specific cyclicality. The relationship of loan-loss provisions to earnings indicates whether or not a bank is engaged in income smoothing. Some authors in the literature consider income smoothing to be commendable prudent behavior (saving for a rainy day); other authors judge it to be condemnable strategic behavior designed to hide volatility in earnings from shareholders and the regulator. When we find evidence of income smoothing behavior, we do not probe the motivation for this behavior due to data limitations. The inclusion of a capital measure controls for risk but also provides information about the use of provisions as a buffer for regulatory capital (substitution). Macroeconomic pro-cyclicality, i.e., a negative relationship between loan-loss provisions and GDP, is a policy concern in that over-provisioning in a downturn absorbs bank earnings that would have been available for lending and, thus, adds to a credit crunch exacerbating the bust. Bank-specific pro-cyclicality may be a regulatory concern in that under-provisioning during a credit boom underestimates the increasing implicit riskiness of the developing loan portfolio with the resulting adverse impact on lending once the bust arrives.

A selective review of the relevant literature is presented in the following section; the large multi-country studies corroborate the importance of taking account of regional differences. As we note, no analysis of loan-loss provisioning has been done on this region to the best of our knowledge and the multi-country studies do not include these eleven countries of emerging

[1] The period preceding accession to the EU requires a country to begin to make its institutions compatible with those in the EU (as prescribed in the Maastricht Treaty). Moreover, in Croatia (the late-joining country), the banking system relied predominantly on euro-denominated transactions from the beginning of our data period so that it was similar institutionally to its neighbor Slovenia who joined the Eurozone in 2007.

Europe. Moreover, we find only two country-specific papers have addressed this issue for the region, one for Slovenia and the other for Poland. By pooling the eleven countries together, we aim to make sharper comparisons with the multi-country studies that predominate in the literature. Our empirical specification follows the basic one used most commonly in the literature to afford a comparison of the results. After our empirical analysis, we conclude with policy recommendations regarding regulatory reform in the region acknowledging the possibility that some leeway may be required within the EU for further financial deepening.

II. Selective Literature Review

The relevant literature can be partitioned into multi-country studies that anaylze loan-loss provisioning during business cycles prior to the financial crisis (before 2005) and those that include data for the recent financial crisis. Laeven and Majnoni (2003) consider 1,419 banks in 45 countries (including the U.S.) from 1988 to 1999, approximately one and a half business cycles. Their results from pooling the data show pro-cyclicality of loan-loss provisioning with both GDP growth and bank loan growth; they also find strong evidence of income smoothing. By disaggregating the data, the authors corroborate the importance of considering regional differences. For Europe, they find income smoothing that is exacerbated in periods of negative earnings (asymmetry). They also find bank-specific pro-cyclicality but no statistically significant relationship between provisioning and GDP growth in European countries. For Asia, the authors find either more moderate or no income smoothing at all and macroeconomic pro-cyclicality but no statistically significant bank-specific pro-cyclicality. Hence, regional differences matter.

Fonseca and Gonzalez (2008) examine provisioning in forty countries (excluding the U.S.) with a sample of 1,213 banks from 1995 to 2002, a mini-cycle that includes the East Asian crisis. The authors find some macroeconomic pro-cyclicality but the negative coefficient on GDP growth is not always statistically significant. They find positive relationships between loan-loss provisioning and loan growth, bank earnings, and a capital adequacy measure, all mitigating the finding of weak pro-cyclicality. The authors include a vector of institutional variables to control for cross-country differences and focus their interpretation on the income-smoothing result. They find lower income smoothing in developed countries than in developing countries and offer the explanation that incentives to smooth decline with improved disclosure (as risk-taking becomes more transparent) but increase with the development of the financial system and market orientation (as the opportunity to take risk inceases). Their results indicate the need to account for financial deepening in emerging market economies when interpreting empirical work.

Bikker and Metzemakers (2005) study a full cycle from 1991 to 2001 in twenty-nine OECD countries. The authors find that provisioning is negatively related to GDP growth (macroeconomic pro-cyclicality) and positively related to earnings (income smoothing). In

addition, they find that provisioning is positively related to loan growth thus mitigating the potential impact of macroeconomic pro-cyclicality, although the coefficient loses statistical significance for a subsample of European countries only. The authors also find evidence of capital substitution as the coefficient measuring the impact of the capital ratio on loan-loss provisioning is negative and significant. When they separate the U.S. from the other OECD countries, the authors find no evidence of macroeconomic pro-cyclicality for the U.S. but continuing evidence for it in Europe. Hence, their results for macroeconomic pro-cyclicality in Europe are at odds with those of Laeven and Majnoni indicating the potential importance of the choice of time periods. In addition, their results indicate the importance of isolating a large country that may have a disproportionate impact on the pooled data.

Bouvatier and Lepetit (2008) consider 186 banks in fifteen European countries from 1992 to 2004, a cycle and a half. The authors find that provisioning is negatively related to GDP growth (macroeconomic pro-cyclicality) but they find no statistically significant coefficient for loan growth or the loan-to-asset ratio. In addition, the authors find a negative and significant coefficient for their earnings variable indicating behavior opposite to income smoothing. They do find the substitutability result of loan-loss provisioning for capital but in for poorly capitalized banks only. Their specification includes both a stock and a flow measure for non-performing loans (NPL); each has a positive and significant coefficient indicating the expected impact of specific provisioning for recognized impaired loans. These findings for fifteen European countries are not completely consistent with those in the above papers and, thus, indicative of the importance of country selection even within a region.

In summary, the literature on loan-loss provisioning considering periods prior to the recent financial crisis yields somewhat conflicting evidence regarding macroeconomic pro-cyclicality in Europe and inconclusive evidence for bank-specific pro-cyclicality. The evidence of income smoothing is strong with one exception, the fifteen European countries examined by Bouvatier and Lepetit (2008). Some evidence of provisions being used as a buffer for capital is found but it is not conclusive. What is clear from this literature is that country and regional differences matter in discerning the determinants and cyclicality of loan-loss provisioning .

Two studies of loan-loss provisioning incorporate the recent financial crisis but both restrict their analysis to Asian countries. Packer and Zhu (2012) consider 240 banks in twelve Asian countries from 2000 to 2009. The authors find that loan-loss provisioning is negatively related to GDP growth but that the coefficient is not statistically significant (weak macroeconomic pro-cyclicality). They find the coefficient for loan growth to be negative and statistically significant (bank-specific pro-cyclicality). These authors also find both income smoothing (positive and significant coefficient for the earnings variable) and capital substitutability (negative and significant coefficient for the capital ratio). When non-performing loans is included as an explanatory variable, they find its coefficient to be positive and significant. When they disaggregation the countries, they find significant differences for Japan compared with the other subsets. Japan exhibits strong macroeconomic and bank-specific pro-cyclicality but no evidence

of income smoothing. Hence, their work reinforces the conclusion that country specifics may have undue influence over the coefficients in the pooled data when one country is large and more developed compared to the others.

Wong, Fong, and Choi (2011) consider 192 banks in eleven Asian "countries" (although they focus on Hong Kong in their interpretations) from 1996 to 2009. Interestingly, these authors only considered the 25 largest banks in Japan to mitigate any undue impact of this country on the results. The authors find strong evidence of both macroeconomic and bank-specific pro-cyclicality of loan-loss provisioning. Since their objective is to compare banks in Hong Kong to those in other neighboring countries, they do not consider income smoothing or capital management directly. However, they conclude that the coefficients on both GDP growth and bank loan growth do differ across the countries.

In summary, the literature on loan-loss provisioning in Asian countries, which includes the recent financial crisis, yields evidence of macroeconomic pro-cyclicality (especially strong in Japan) and strong evidence for bank-specific pro-cyclicality throughout Asia. The former result is consistent with the findings of Laeven and Majnoni for the previous period in Asia but the latter contrasts with their results for the earlier period. Strong evidence of income smoothing and substitutability for capital is found in the paper in which these are considered. The former result again contrasts with the findings of Laeven and Majnoni for the earlier period in Asia. Hence, the meager literature considering Asian countries during the financial crisis indicates that provisioning behavior may be different during extremely severe cycles than during more moderate cycles.

We know of only two papers that consider any of the countries in our sample. Kosak and Kosak (2009) study the period from 1996 to 2008 in Slovenia consisting of a cycle plus the recent financial crisis. Using approximately 700 bank/year observations for Slovenia, they find a positive but not statistically significant coefficent on earnings and thus inconclusive results for income smoothing. However, the authors do find strong evidence of both macroeconomic and bank-specific pro-cyclicality in Slovenia. The coefficient on the capital ratio is positive and weakly significant and, thus, is suggestive of substitutability between provisions and regulatory capital. Olszak (2012) studies aggregate quarterly data for Poland from 1998 to 2009 (a cycle plus the financial crisis). For the banking sector as a whole, the results support income smoothing and macroeconomic pro-cyclicality in Poland. In addition, the author finds strong evidence of a positive relationship between loan-loss provisioning and both aggregate loan growth and non-performing loans. No statistically significant relationship is found between loan-loss provisioning and a capital adequacy measure. .

In summary, the research that we found in which the recent financial crisis is included presents reasonably strong evidence of both macroeconomic and bank-specific pro-cyclicality of loan-loss provisioning and, when examined, a tendency of banks to use provisioning as a buffer for regulatory capital in Asia and emerging market economies. Evidence of mitigating income

smoothing is found but the result is sensitive to differences across countries and regions. Our objective in this paper is to analyze empirically the provisioning behavior of banks in the larger region of emerging Europe using pooled data that includes three years of the recent financial crisis. We compare the determinants of provisioning in this region to those found in the literature for other countries with an eye toward drawing regulatory policy conclusions.

III. The Empirical Specification: the Data and the Model

Our sample includes eight countries that joined the EU together in 2004, namely, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia. Slovenia (2007), Slovakia (2009), and Estonia (2011) belong to the Eurozone with their year of entry recorded in parentheses. Two more countries in our sample, Bulgaria and Romania joined the EU in 2007; the final country, Croatia, was welcomed into the EU in 2013. The accession process required each country to adopt institutions and regulation compatible with the EU during the preparation for becoming a member. [2] Hence, we consider this region to be relatively homogeneous regarding banking institutions. The financial systems of all eleven countries are bank-centric; in 2011, bank credit to GDP ratios range from 57.5% (Lithuania) to 94.7% (Slovenia) and market capitalization to GDP ratios range from 3.8% (Latvia) to 34.9% (Croatia). [3] In addition, in virtually all but one country (Slovenia), foreign banks have taken over the banking sector; in 2008, the foreign asset share of the banking system ranges from 76.5% (Poland) to 99.2% (Slovakia) in the other ten countries.[4] All eleven countries experienced rapid growth of bank credit in the period preceding 2007 followed by a considerable decrease in credit growth in the subsequent years of the financial crisis. All bank-level data come from BankScope for the period 1997 to 2010. Macroeconomic data are taken from the Eurostat database.

Our sample consists of 318 banks (coded as either commercial or savings banks in BankScope) and 2,175 bank/year observations after we eliminate observations that are missing any variable that we use in the empirical specification. Further trimming of the data at the first and 99th percentile for the dependent variable and for gross loan growth, an explanatory variable, yields a sample of 2,147 bank/year observations. We also estimate our model on a subsample containing a core of the top ten banks in each country as a robustness exercise.

[2] Croatia officially applied for the EU membership on February 21, 2003 and the Council confirmed it as a candidate country on June 1, 2004. The negotiations formally opened on October 4, 2005.
[3] Data are from the World Bank database. The ratio of bank credit to market capitalization ranges from 2.5 to 20.9 for these countries with all but two (Poland and Croatia) higher than 3.8 compared to the equivalent ratios of 1.8 in the UK, 2.2 in the US, 2.4 in France and 3.8 in Germany (the stereotypical bank-centric Continental European system).
[4] Data are from EBRD Transition Report. The foreign asset share of the banking system in Slovenia in 2008 is 31.1%.

In Table 1, we present a brief description of the variables included in the empirical model along with the expected signs of their estimated parameters.

Table 1: Information About Variables

Variable	Sign	Description
$\left(LLP_t / LOANS_{t-1} \right)$	Dependent variable	Loan impairment charge in each year for each bank compared to lagged total loans
$\left(EBT_t / TA_{t-1} \right)$	(+) income smoothing	Earnings before provisions and taxes
$\Delta Loans$	(-) procyclical effect	Gross loan growth rate (annual rates for each individual bank)
ΔGDP	(-) procyclical effect	GDP growth rate (annual rates for each country from the Eurostat database)
CAR	(-) substitution effect	Capital adequacy ratio (capital ratio required by regulators reflecting riskyness of the credit portfolio)
$\left(CLOANS_t / TA_{t-1} \right)$	(-) procyclical effect	Annual change in gross loans compared to total assets
$\left(EQ_t / TA_{t-1} \right)$	(-) substitution effect	Equity-to-total-assets ratio, reflecting the leverage of the individual bank

The baseline specification of our dynamic panel model is given by:

$$\left(\frac{LLP_{i,t}}{Loans_{t-1}} \right) = \beta_0 + \beta_1 \left(\frac{LLP_{i,t-1}}{Loans_{i,t-2}} \right) + \beta_2 \left(\frac{LLP_{i,t-2}}{Loans_{i,t-3}} \right) + \beta_3 \left(\frac{EBT_{it}}{TA_{i,t-1}} \right) +$$

$$+ \beta_4 \Delta Loans_{i,t} + \beta_5 \Delta GDP_t + \beta_6 CAR_{it} + v_i + \varepsilon_{it}$$

where $LLP_{i,t}$ denotes loan loss provisions of bank i in year t. Most studies use the level of total assets lagged one period to normalize loan loss provisions in the dependent variable. In our specification, we use the lagged level of loans ($Loans_{t-1}$) as a normalization. Hence, by

comparing the flow of loan loss provisions in year t to the stock of loans at the end of year t-1, we capture more realistically the actual provisioning process in which bankers base their decisions about provisioning on the known level and quality of loans. As explanatory variables, we include the first and second lags of the dependent variable, i.e., $LLP_{i,t-1}$ and $LLP_{i,t-2}$ indicating the amount of loan loss provision in years t-1 and t-2 allowing us to examine the adjustment of loan loss provisions over a two-year period. Some studies find an adjustment period extending beyond the first year (e.g. Fonseca and Gonzalez, 2008), while other studies conclude that the adjustment effect is concentrated predominantly in the first year (e.g. Laeven and Majnoni, 2003; Bikker and Metzemakers, 2005). Hence, we allow for a two-period adjustment period. The estimated coefficients of the two lagged terms are expected to be positive and between 0 and 1, with the second lagged coefficient expected to be smaller in magnitude than the first to indicate a decelerating dynamic effect.

The second explanatory variable in the specification is earnings before provisions and taxes (EBT) normalized by the lagged level of total assets ($TA_{i,t-1}$). The coefficient of this variable is commonly used to investigate the presence of income smoothing by banks. A positive regression coefficient confirms the presence of income smoothing behavior because it indicates an increase of loan loss provisions in times of higher earnings (booms) and a decrease of loan loss provisions in times of lower earnings (busts).

The next explanatory variable is the annual growth rate of gross loans for bank i at time t, i.e., ($\Delta Loans_{i,t}$), used to capture the presence of a pro-cyclical effect of provisioning at the bank level. This variable is constructed using log differences as follows: $\Delta Loans_{i,t} = (\log GROSSLOANS_{i,t} - \log GROSSLOANS_{i,t-1})$. The growth rate of loans is expected to be positively associated with the riskiness of the bank's credit portfolio. In times of accelerated credit growth, screening and monitoring efforts become lax leading to an accumulation of problem loans. In a recent study, Foos, Norden and Weber (2010) find empirical evidence of a positive association between loan growth rates and the riskiness of loan portfolios. They conclude that abnormal loan growth in the past has a positive and highly significant influence on subsequent loan losses with a lag from two to four years. Based on these findings, prudent bank behavior would involve provisioning more in times of accelerated credit growth so that the sign of the estimated coefficient would be positive. On the contrary, a negative sign would be an indication of pro-cyclical provisioning behavior suggesting that the bank is likely to find itself having to provision more than average in economic downturns due to its lower-than-average provisioning during boom times. Fonseca and Gonzalez (2008) use the annual change in total loan volume relatively to the stock of total assets ($CLOANS / TA$) rather than annual loan growth to measure this variable. Hence, we replace ($\Delta Loans_{i,t}$) with ($CLOANS / TA$) in one of the robustness tests of our baseline specification.

Capital adequacy ratio ($CAR_{i,t}$) is the ratio of regulatory bank capital to risk-weighted assets; it is included as a control variable to reflect leveraging of banks and the riskiness of their credit portfolios. In addition, such a variable allows us to test for the presence of capital management behavior. According to the capital management hypothesis, bank managers may increase loan loss provisions in order to compensate for weak capitalization and, conversely, banks may provision less if they are well-capitalized and can rely on covering not only unexpected losses but also a portion of expected losses from bank capital. A purely mechanical connection exists between loan loss provisions and bank capital because the volume of loans loss provisions impacts a bank's retained earnings on the P&L account and, consequently, bank capital on the balance sheet. In our robustness check, we employ an alternative measure of capital, i.e., the equity-to-total-assets ratio (EQ_t / TA_{t-1}), which normalizes capital by the size of the bank. Although this ratio does not account for the riskiness of the loan portfolio, it offers better coverage in our sample because it is available for a larger number of banks and, thus, yields almost twice as many observations as we have when we use CAR.

Finally, we include the traditional standard error term $\varepsilon_{i,t}$ and a term for unobservable bank specific effects v_i that varies across banks but is constant over time.

Since two lagged dependent variables $(LLP / Loans)_{t-1}$ and $(LLP / Loans)_{t-2}$ are included as explanatory variables in the dynamic panel data model, we employ the Arellano-Bond (1991) two step GMM difference estimator with the Windmeijer biased-corrected robust VCE (Windmeijer, 2005). In all the models estimated, we consider two specification tests. First, we compute the Hansen J statistic, which enables us to test for the absence of correlation between the instruments and the error term. Second, we test for the presence of the first and second order autocorrelation in the first-differenced residuals. While first-order autocorrelation is expected to be present, we expect to find no second-order autocorrelation.

Descriptive statistics for the aforementioned variables are given in Table 2. The chosen explanatory variables allow us to examine the income smoothing hypothesis (EBT), the presence of pro-cyclical effects at both the bank level, where we consider two alternative measure of loan growth ($\Delta Loans$ and $CLOANS/TA$), and at the aggregate macroeconomic level (ΔGDP), along with the capital management hypothesis regarding the substitution of loan loss provisioning for bank capital using two alternative measures for bank capital (CAR and EQ/TA).

Table 2: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
$LLP_t/Loans_{t-1}$	2147	0.0157	0.0230	-0.0480	0.1495
LLP_t/TA_{t-1}	2175	0.0097	0.0178	-0.0963	0.2280
EBT_t/TA_{t-1}	2175	0.0190	0.0266	-0.4183	0.2102
$CLOANS_t/TA_{t-1}$	2359	0.0987	0.2048	-0.5492	2.3788
$\Delta Loans$	2335	0.1467	0.2860	-0.8747	1.6033
ΔGDP	2360	0.0327	0.0429	-0.1770	0.1120
CAR	1448	0.1815	0.1610	0.0099	2.7030
EQ_t/TA_{t-1}	2360	0.1374	0.1105	-0.2125	1.8297

Notes: The dependent variable $LLP/Loans$ is trimmed at the 1% and the 99% level, respectively. In addition, the explanatory variable $\Delta Loans$ represents the annual growth of gross loans expressed as $\Delta Loans_{i,t} = (\log GROSSLOANS_{i,t} - \log GROSSLOANS_{i,t-1})$. This variable is also trimmed at the 1% and the 99% level, respectively. The variable ΔGDP represents the annual growth of GDP as reported in the Eurostat database.

The matrix of bivariate correlations calculated for the entire sample is presented in Table 3. A positive and statistically significant relationship exists between loan loss provisions and earnings, which suggests the existence of income smoothing by banks in the sample. In addition, negative and highly significant correlations between loan loss provisions and both bank loan growth and GDP growth suggest the presence of bank-specific and macroeconomic pro-cyclicality. Finally, the correlation between loan loss provisioning and the ratio of equity to total assets is positive and statistically significant while the correlation with the capital adequacy ratio is negative and statistically insignificant. Hence, simple correlations do not give clear evidence in support of capital management. Regarding the correlations between the explanatory variables, we find positive and statistically significant correlation coefficients between bank earnings and loan growth (both measures), GDP, and one measure of bank capital. We find the expected strong correlations between the two different measures of loan growth and the two relating to bank capital. Finally we find positive correlations between loan growth and GDP, as expected, and also between loan growth and bank capital.

The statistically significant simple correlation coefficients between the explanatory variables lead us to consider the possibility of multicollinearity in our estimations. To test for the presence of multicollinearity, we calculate the variance inflation factor (VIF), a typically used indicator. In Table 4, we present the VIF factors calculated for the variables used in our core empirical model. As the table indicates, no one of the variables has a VIF exceeding 1.29. Following the

commonly accepted rule of thumb that a value of $VIF < 10$ indicates that multicollinearity does not present a significant problem, we are confident in proceeding to our estimations.

Table 3: Matrix of Correlation Coefficients

	$\frac{LLP_t}{Loans_{t-1}}$	$\frac{EBT_t}{TA_{t-1}}$	$\frac{CLOANS_t}{TA_{t-1}}$	$\Delta Loans$	ΔGDP	CAR	$\frac{EQ_t}{TA_{t-1}}$
$LLP_t / Loans_{t-1}$	1						
EBT_t / TA_{t-1}	0.1200 *0.0000*	1					
$CLOANS_t / TA_{t-1}$	-0.0366 *0.0903*	0.2298 *0.0000*	1				
$\Delta Loans$	-0.0458 *0.0347*	0.0823 *0.0001*	0.8452 *0.0000*	1			
ΔGDP	-0.2991 *0.0000*	0.0508 *0.0175*	0.1701 *0.0000*	0.2806 *0.0000*	1		
CAR	-0.0252 *0.3476*	0.0294 *0.2703*	-0.0288 *0.2720*	0.0522 *0.0483*	-0.0040 *0.8738*	1	
EQ_t / TA_{t-1}	0.0919 *0.0000*	0.1430 *0.0000*	0.6446 *0.0000*	0.2682 *0.0000*	0.0392 *0.0549*	0.5378 *0.0000*	1

Note: Significance levels for the correlation coefficients are given in italics.

Table 4: Variance Inflation Factors

Variable	VIF	1 / VIF
$\Delta Loans$	1.29	0.775331
ΔGDP	1.27	0.788574
$L1(LLP_t / Loans_{t-1})$	1.25	0.801483
$L2(LLP_t / Loans_{t-1})$	1.25	0.802334
EBT_t / TA_{t-1}	1.03	0.968657
CAR	1.01	0.991589
Mean VIF	1.18	

IV. Estimation Results

In Table 5, we construct the core specification of the dynamic model starting with the two autoregressive terms that capture the dynamic adjustment and the earnings measure as explanatory variables. As Table 5 indicates, the first-order autoregressive term in all five model specifications has the expected positive sign and is highly statistically significant. In addition, its value is relatively consistent across specifications and, according to expectations, the coefficient always lies between 0 and 1. In fact, the coefficient never exceeds 0.50, which means that the dynamic adjustment of loan loss provisions in year t never exceeds 50% of the stock of loan loss provisions in year t-1. The coefficient on the second autoregressive term is never statistically significant in any specification and, when positive, it is substantially smaller than the coefficient for the first autoregressive term. Hence, we conclude that the dynamic adjustment effect fades out relatively quickly so we do not consider any autoregressive terms beyond the second lag as these are not likely to have any significant explanatory power.

Table 5: Determinants of Loan Loss Provisioning

	(1)	(2)	(3)	(4)	(5)
L1(LLP/Loans)	0.482***	0.442***	0.387***	0.384***	0.313***
	(4.74)	(4.31)	(3.90)	(3.86)	(2.65)
L2(LLP/Loans)	-0.0173	-0.00561	0.000490	0.00163	0.0193
	(-0.40)	(-0.13)	(0.01)	(0.04)	(0.49)
EBT/TA	0.434**	0.458***	0.419***	0.428***	0.328**
	(2.56)	(2.76)	(2.67)	(2.68)	(2.29)
△Loans		-0.00865**		-0.000819	-0.000998
		(-2.55)		(-0.27)	(-0.21)
△GDP			-0.132***	-0.127***	-0.132***
			(-7.80)	(-7.17)	(-6.79)
CAR					-0.0279*
					(-1.69)
hansen	62.66	63.06	48.47	47.82	56.06
hansenp	0.196	0.187	0.687	0.710	0.398
ar1p	0.000	0.000	0.000	0.000	0.002
ar2p	0.850	0.852	0.588	0.490	0.973
j	57	58	58	59	60
N_g	209	209	209	209	170
N	1253	1242	1253	1242	834

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Notes: The statistics reported below each model are as follows: “hansen” is the value of the Hansen J test, “hansenp” is the p value of the Hansen J test, “ar1p” and “ar2p” stand for the p values of the AR1 and AR2 test respectively, “j” denotes the number of instruments used in the estimation of each model, “N_g” stands for the number of banks and “N” stands for the total number of observations. .

The coefficient on the earnings variable is positive and highly significant in all five specifications; it is relatively stable across specifications. Hence, we find strong evidence of income smoothing behavior by the banks in our sample. On average, banks tend to increase their loan loss provisioning in periods of higher earnings and decrease loan loss provisioning when their earnings are lower. We add the loan growth variable $\Delta Loans$ in model specification (2) and retain it in specifications (4) and (5) to test for bank-specific pro-cyclicality [5]. In all three specifications, the coefficient of this variable is negative but it is not statistically significant in specifications (4) and (5). Hence, we find only weak support for bank-specific pro-cyclicality. In specification (3), we add to the explanatory variables in specification (1), the variable intended to test for macroeconomic (country-specific) pro-cyclicality. The coefficient on annual GDP growth (ΔGDP) is negative and highly significant in all three specifications. Hence, we find strong evidence that, on average, banks tend to under-provision in an economic expansion and intensify loan loss provisioning during recession periods when GDP growth rates are low or even negative. In the last specification (5), we add to the explanatory variables in specification (4) the capital adequacy variable (CAR). We find the coefficient to be negative and statistically significant indicating that banks in the sample are substituting provisions for bank capital and, thus, we find support for the capital management hypothesis in the banks in this region.

For all five specifications, the Hansen J test of over-identifying restrictions is calculated. The Hansen J statistic is consistent whenever heteroskedasticity is suspected in the error terms and, thus, is superior to the Sargan test, which is inconsistent for robust GMM. Since we are testing the null hypothesis that the over-identification restrictions are valid, rejection of the null hypothesis would lead us to question our assumption of the independence of the instruments and the disturbance process. As is indicated by the Hansen p-values at the bottom of Table 5, all specifications pass the Hansen test of not rejecting the null hypothesis and, thus, we are confident about the validity of our instruments. We include another diagnostic test to test for autocorrelation of the residuals. We expect the residuals of the differenced equations to exhibit AR(1) serial correlation but not the AR(2) serial correlation. The test statistics report at the bottom of Table 5 validate our expectations as the p-values for the AR(1) terms are virtually zero across all specifications whereas they are 0.49 or above in all specifications for the AR(2) terms.

Having constructed our baseline core empirical specification in column 5, we present some robustness checks in Table 6. For ease of comparison, we reproduce our baseline specification in column 1 of Table 6. In column 2 of Table 6, we examine the impact of dropping the second-period lagged dependent variable, which is statistically insignificant in the baseline model. The only change is that the capital adequacy variable (CAR) becomes statistically insignificant (although the coefficient is still negative). In column 3, we replace two of the explanatory variables, i.e., ΔLoans and CAR, with their alternative measures. Specifically, we include $CLOANS/TA$, which expresses the annual change in total loans volume relatively to the stock of total assets and is consistent with the measure used by Fonseca and Gonzalez (2008), and

[5] As we stated above, to remove outliers, we trimmed this variable at the 1st and 99th percentiles.

Table 6: Robustness Tests

	(1)	(2)	(3)	(4)	(5)	(6)
L1.DPEN	0.313***	0.345***	0.422***	§ 0.414***	0.439***	# -0.926**
	(2.65)	(2.65)	(3.75)	§ (3.19)	(3.71)	#(-2.47)
L2.DPEN	0.0193		0.0326	§ 0.0195	0.0126	#-0.0471*
	(0.49)		(0.65)	§ (0.37)	(0.18)	#(-1.78)
EBT/TA	0.328**	0.317**	0.502***	0.143*	0.379**	-0.358***
	(2.29)	(2.32)	(2.96)	(1.76)	(2.30)	(-5.10)
△LOANS	-0.000998	-0.00373		-0.00340	0.00168	# 0.0317**
	(-0.21)	(-0.84)		(-1.42)	(0.28)	# (2.25)
△GDP	-0.132***	-0.122***	-0.131***	-0.0795***	-0.149***	-0.150***
	(-6.79)	(-6.31)	(-7.60)	(-5.73)	(-4.06)	(-4.46)
CAR	-0.0279*	-0.0189		-0.0207***	-0.0312	0.0272
	(-1.69)	(-1.25)		(-2.76)	(-1.19)	(0.84)
CLOANS/TA			0.00761			
			(1.28)			
EQ/TA			-0.0958***			
			(-2.89)			
hansen	56.06	53.31	46.85	59.01	55.63	76.46
hansenp	0.398	0.348	0.744	0.297	0.413	0.0238
ar1p	0.00197	0.00128	0.000448	0.00156	0.0259	0.966
ar2p	0.973	0.675	0.763	0.938	0.983	0.342
j	60	55	60	60	60	60
N_g	170	185	209	169	64	172
N	834	959	1252	826	384	864

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Notes: In specifications (1), (2), (3), and (5), the variable $LLP_t / Loans_{t-1}$ is used as the dependent variable (DPEN) with our trimmed data as described above. In specification (4), an alternative dependent variable LLP_t / TA_{t-1} is used. In specification (6), untrimmed data for the dependent variable $LLP_t / Loans_{t-1}$ and the loan growth variable ($\Delta Loans$) are employed. Model (5) is estimated for a subsample of the top 10 banks in each country included in this study.

The symbol # denotes estimates and their standard errors when untrimmed data are used. The symbol § denotes parameters and their standard errors when the alternative specification for the dependent variable $LLPL_t / TA_{t-1}$ is used.

EQ/TA, which is the ratio of bank capital to total assets. The coefficient for the new measure of loan growth becomes positive but remains statistically insignificant. However, the coefficient on the new bank capital measure retains both its negative sign and its statistical significance providing more support for the capital substitution hypothesis.

In specification (4), we employ an alternative definition of the dependent variable and use by using total assets lagged one period as the normalization for loan loss provisions (LLP_t / TA_{t-1}). This specification for the dependent variable is the one used most commonly in the literature. Similarly, the lagged values of this dependent variable are also changed as noted at the bottom of Table 6. Regarding the two dynamic terms, the coefficient for the one-period lag remains positive and highly significant; its magnitude is somewhat higher than in the baseline specification. The coefficient for the two-period lag is virtually identical in columns (1) and (4). The two coefficients that change to some degree are those associated with the earnings variable and the loan growth measure. In column (4), the positive coefficient on earnings drops considerably in magnitude and it is significant at only the 10% level versus the 5% level in column (1). In column (4), the negative coefficient on loan growth remains statistically insignificant but its magnitude and t-stat increase considerably. Hence, income smoothing appears to be mitigated somewhat in this specification whereas some weak evidence for bank-specific pro-cyclicality may be present.

In column 5 of Table 6, we test our baseline model on a subsample of core banks in the region consisting of the top 10 banks in each individual country. Most of the banks in this group are associated with six large banking groups from Western Europe that dominate the banking sectors in the region. Hence, we wish to examine whether provisioning behavior is different for these banks with West-European parents form that in other banks in the region. Two differences are discernible. First, the core banks do not appear to be engaging as much in capital substitution because the coefficient on CAR becomes statistically insignificant. Second, the coefficient on loan growth becomes positive but, since it remains statistically insignificant, this is not conclusive evidence of different behavior. Even though the number of observations is considerably lower when only the core banks are used (384 versus 834), the results from the baseline specification are pretty robust to a consideration of this subsample of the largest banks in each country. For all specifications in the first five columns of Table 6, the diagnostic tests are consistent with those reported above for the core specification so we have no evidence of structural problems in these four robustness examples.

In column 6 of Table 6, we use the untrimmed data for all banks in our sample so that we add back omitted values for the dependent variable $LLP / Loans$ and the explanatory variable $\Delta Loans$. In this way, we seek to examine the impact of our trimming exercise on our core results. As Table 6 indicates, using the untrimmed data yields an improperly specified model. The Hansen null hypothesis that the over-identification restrictions are valid is rejected. In addition, the coefficients on both dynamic terms are negative and statistically significant. The

earnings variable has a negative and significant coefficient whereas the loan growth variable has a positive and significant coefficient. The only surviving result is the negative and statistically significant coefficient on GDP growth. Hence, we conclude that either errors in the data or extreme values for loan growth and/or provisioning reflect anomalies that should be eliminated such as bank start-ups and closings during a given year.

V. Conclusion

We consider a region of emerging market economies and a time period that begins with a small crisis and ends with a large one sandwiched in between is a period of dramatic retail credit growth in all thirteen countries. As each country is currently a member of the European Union, we are confident that institutional characteristics in the financial sectors are similar enough to pool the bank-level data for our empirical specification. Moreover, the financial sector of each country is bank-centric with the banking industry dominated by large European multinational banks in all but one country. Our objective is to analyze the determinants of loan loss provisioning by banks in the region so that we may first, compare these with the determinants found in the literature for other countries and regions and second, draw policy implications regarding the advisability of adopting some type of dynamic provisioning modeled on the Spanish policy initiated in 2000. Our empirical methodology follows that used in the literature. We estimate a dynamic panel model using the Arellano-Bond two-step GMM difference estimator with the Windmeijer biased-corrected robust VCE. Following the lead of many papers that use these bank-level data for this region, we trim the dependent variable and the growth rate of loans to avoid extreme outliers having undue influence on the estimation results. Relative to the literature, our innovations are: first, considering a relatively homogeneous but developing region so that we consider countries involved in financial deepening; second, incorporating the recent global financial crisis to capture any differences that might be attributable to the severity of the downturn and third, using the lagged loans rather than lagged total assets to normalize the dependent variable, i.e., loan-loss provisions. We consider this last difference from the literature to correspond better to the way in which banks make decisions about provisioning.

Broadly speaking, for periods prior to the global financial crisis, the multi-country studies in the literature find strong evidence of banks using provisioning to smooth fluctuations in earnings, somewhat mixed evidence regarding the macroeconomic pro-cyclicality in Europe of provisioning, inclusive results regarding bank-specific pro-cyclicality, and reasonably good evidence of capital management, i.e., a substitutability of provisions for regulatory bank capital. The studies that include the recent crisis period focusing on Asia find strong evidence of both macroeconomic and bank-centric pro-cyclicality even though previous studies had found evidence (weaker) of only the former in the earlier period. The literature also finds income smoothing to be more prevalent in developing countries. With regard to the model specification, we follow the literature that uses mainly two-period lags of the dependent variable to allow for

adjustment over time to a desired stock of provisions, hence the dynamic panel approach adopted.

Our results confirm the findings in the literature of a strong and robust presence of income smoothing by banks in the region. We also find some weaker evidence of capital management as the sign of the coefficient on the capital adequacy ratio is always negative but sometimes insignificant. We find that close to half of the autoregressive adjustment in provisioning occurs in the first year and that the second year lag is not statistically significance. Hence, one of our robustness checks drops this explanatory variable with the only resulting change being that the coefficient on the capital adequacy variable loses its significance but retains its negative sign. In another robustness check, we use alternative measures for bank capital and bank loan growth. Using the ratio of equity to total assets, we find a strong negative coefficient suggesting the presence of capital management. However, no matter which measure we use for bank loan growth, the coefficient is never statistically significant in a well-specified model. Hence, we find no statistically significant evidence of bank-specific pro-cyclicality of provisioning even in a robustness test in which we use an alternative dependent variable that is used commonly in the literature, i.e., the ratio of loan loss provisioning to lagged total bank assets. The strongest (statistically) and most persistent result is macroeconomic pro-cyclicality. The coefficient of GDP growth is always strongly negative, a result that we did not necessarily expect based on the literature.

Due to the dominance of six large multinational European banks in the region, we estimated our baseline model on a subsample consisting of only the ten largest banks in each country. Our strong results concerning income smoothing and macroeconomic pro-cyclicality are confirmed as our inability to discern any bank-specific pro-cyclicality. Compared to the base specification, we do not find any statistically significant evidence of capital management among these large banks, which might have been anticipated due to the nature of the parent bank relationship for many of them. Our final robustness test involves estimating our baseline model on untrimmed data for our sample. The diagnostic tests results indicate that the model is not specified correctly in this case so we are comfortable with our strategy of trimming the data.

What policy implications can be drawn regarding bank regulation in the region? The strong income smoothing result indicates that banks mitigate to some extent any pro-cyclicality of loan loss provisioning internally and are, thus, acting in consonant with regulatory objectives of putting away funds for a rainy day during boom periods. However, the strong result on macroeconomic pro-cyclicality tampers such enthusiasm. In addition, weaker evidence suggests that banks view provisions and regulatory capital as substitutes so that the effectiveness of instruments based solely on capital adequacy may not be sufficient. Hence, dynamic provisioning may have a place in the regulator's toolbox.

If such a program were instituted in the region, the Spanish model is not likely to be the appropriate one to follow in that the parameters used by Spanish regulators are keyed to bank loan growth. Interestingly, when Peru adopted a Spanish-type regulatory program in 2008, the Peruvian regulators used GDP growth to set the parameters for smoothing provisions. Our results indicate that the Peruvian instrument would be a better one to use if dynamic provisioning is introduced. In addition, we find virtually no discernible difference between the determinants of provisioning when we restrict our sample to only the largest banks in the region. Hence, no special regulatory tool regarding the smoothing of provision is needed due to the foreign dominance of the banking sectors of these countries by large multinational banks. Perhaps, our results also provide some guidance to countries with similar banking characteristics outside the region in contemplating the introduction of dynamic provisioning.

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