
The Spillover Effects of Prudential Regulation on Banking Competition

GIOVANNI FERRI, AND VALERIO PESIC

Giovanni Ferri, Lumsa University (Rome), g.ferri@lumsa.it
Valerio Pesic, Sapienza University (Rome), valerio.pesic@uniroma1.it

Summary: European supervisors aggressively requested more capital at large banks. That may cut credit to the economy. We confirm that especially larger banks cut loans while less-significant banks partly offset that credit drop. Moreover, we identify nasty spillovers from that interaction. Specifically, larger banks' deleveraging was associated with significant portfolio worsening for mid-sized banks. We conjecture that while small banks' loan expansion was somewhat shielded by superior soft-information-based technologies, medium-sized banks were fully exposed to lending to bad borrowers as they boosted loans by relying on credit scoring and Internal Rating Based models. That is proving tricky through the prolonged European dip.

Zusammenfassung: Die europäischen Aufsichtsbehörden forderten aggressiv mehr Kapital bei den Großbanken. Das könnte die Kreditvergabe an die Wirtschaft einschränken. Wir bestätigen, dass vor allem größere Banken ihre Kredite kürzten, während weniger bedeutende Banken diesen Kreditrückgang teilweise kompensierten. Darüber hinaus identifizieren wir unangenehme Spillovers aus dieser Interaktion. Insbesondere die Deleveraging-Aktivitäten der größeren Banken waren mit einer deutlichen Verschlechterung des Portfolios bei mittelgroßen Banken verbunden. Wir gehen davon aus, dass die Kreditausweitung der kleinen Banken zwar durch überlegene Soft-Informationstechnologien etwas abgeschirmt war, dass aber mittelgroße Banken voll und ganz der Kreditvergabe an schlechte Kreditnehmer ausgesetzt waren, da sie die Kredite durch Kredit-Scoring und interne ratingbasierte Modelle ausweiteten. Das erweist sich als problematisch durch die anhaltende europäische Krise.

→ JEL classification: G2; G21; G28.

→ Keywords: Bank Credit, bank capital requirements, prudential regulation, mid-sized banks, spillover effects, europe, business cycle.

I Introduction

Promoting individual banks' safety and soundness and stability of the whole banking system is the key objective of banking supervision. That task, in many countries assigned to a sole supervisor, can associate with other responsibilities, such as depositor protection, financial stability, consumer protection, financial inclusion, if the latter are not conflicting with the former (BCBS, 2012).

To achieve that goal supervisors can use a broad set of instruments, generally following the institutional framework characterizing their scope and mandate, which in most jurisdictions were recently expanded in response to the global financial crisis (GFC) (FSB, 2015). In different contexts supervisors' scope has been recently enlarged to make supervision more effective, especially to achieve sounder and more effective supervision of systemically important financial institutions (SIFIs), and particularly of global systemically important financial institutions (G-SIFIs). That eventually led authorities to review their supervisory approach, which has become more tailored and risk-based, with more time and resources bestowed to larger, more complex and riskier banks.

The belief arising in the aftermath of the financial crisis that safety and stability of the financial system should be achieved via more effective supervision of SIFIs, can be interpreted as a further episode of a longer series which, during the last decade, created a more sophisticated and tailored risk-based approach (BCBS, 1988, 1996 and 1999).

Key in this process was the proposition cued by the Basel II capital framework (BCBS, 2006), first authorizing banks to use alternative methods to estimate their capital requirements within the Risk Weighted Assets (RWAs) formula for credit risk. In this way, if on one side supervision aims to stimulate more sophisticated/relevant banks to adopt more advanced methods of risk evaluation (BCBS, 2005), on the other, the regulatory framework is less binding for less sophisticated banks.

That criterion of proportionality has gained importance recently also for other issues, not directly related to capital adequacy, which have gained attention within the overall prudential framework, such as organization quality, adequacy of risk management practices, effectiveness of internal governance and internal control system. To regulate those issues, supervisors generally refer to core basic principles each bank must comply to, calibrating between the objectives of regulators and the characteristics of each organization. On the opposite, when referring to any measure which can be objective of a more precise accountability, supervisors have often come to the necessity to distinguish between different requirements to be achieved by each institution (BCBS, 2011).

As mentioned, the necessity to distinguish between different needs around the whole banking system has become particularly evident in the aftermath of the crisis. At that time, supervisors moved to the belief that global financial stability of financial systems needs to encounter a more effective response to the "too-big-to-fail" concerns related to the proper supervision of SIFIs. Hence, supervisors realized that more intense supervision and greater resources, should be applied to those banks, in a commensurate way to their risk profile and systemic importance (FSB, 2015).

To achieve those objectives, substantial changes occurred in terms of both prudential regulation and supervisory structure organization. Specifically, the new Basel III capital framework paid great attention to increasing capital and liquidity especially at larger institutions. Moreover, other goals related to the effectiveness of governance mechanisms, quality of risk management practices and fitness of internal control systems were also undertaken. Likewise, in some jurisdictions the scope

of supervision was redefined, together with enlarged methods and instruments used to achieve those objectives. In Europe, that led to launching the Single Supervisory Mechanism (SSM), which from November 2014 entrusted the Eurozone's prudential supervision to the European Central Bank (ECB), throughout its direct scrutiny of more relevant banks versus the indirect approach exercised by the support of national authorities for less significant institutions.

The above framework is an effort that could contribute to the stability of the global financial system, even if the potential cons arising from that more prudent environment should also be gaged.

From this perspective, against the binding prudential framework, more relevant institutions could be induced not only to increase their levels of capital and liquidity, but also to limit their risk undertaking, especially by reducing their total assets or via a more prudent scrutiny of lending activity. Thus, the substantial increase of capital they are supposed to achieve, may lead to a potential reduction of credit available to the economy. In turn, this could cause potential adverse “spillover effects” on less significant banks. Suffering a lower intensification of regulatory requirements, less significant banks might be allowed to take more risk by replacing the lending gap left by the significant banks. The consequence of that could be particularly nasty for supervisors because some of the non-significant banks might be unprepared to the undertaking. In particular, while loan growth could be somewhat shielded by superior soft-information-based lending technologies at small banks, medium-sized banks might be hurt by the recession and by making loans to bad borrowers. Indeed, medium-sized banks could expand their loans while changing their business model, relying more and more on credit scoring and Internal Rating Based (IRB) models.

This paper aims to shed light on those potential spillover effects of prudential regulation, a phenomenon so far largely neglected in the literature. Specifically, we focus on a large sample of European banks over 2008–2013, so that we can consider the period not only encountering the euro sovereign crisis, but also the one anticipating the arrival of Basel III, with especially larger banks supposed to reinforce their position to reach the new regulatory requirements. By looking at different-size sub-groups of banks, we find that during the last two sample years especially larger banks increased their capital level while cutting loans. We also find that despite an increase of capital – though smaller than at bigger banks – non-significant banks increased notably the amount of loans to the economy. Moreover, we show how nasty the spillover effect can be, finding evidence that the more significant banks' deleveraging associates with a significant worsening of the portfolio for less significant banks. Besides, we find that loan impairment dynamics is most intense for the mid-sized banks. In line with our expectations, this seems to suggest that lending expansion by smaller-sized banks was supported by better lending technologies while mid-sized banks might have been unprepared to replace the lending gap left by the significant banks.

The remainder of the paper is structured as follows. Section 2 gives a synthetic frame of the broad literature on desired and undesired effects of prudential regulation on banking behavior, so to underline how the spillover effects arising from banking competition has been investigated only partly. Section 3 presents the dataset we created to realize our analysis, together with the segmentation we perform in line with the dimension of each bank. In section 4 we report and comment the results of our econometric estimations. Finally, Section 5 concludes summarizing our main findings and discussing policy implications.

2 The Effects of Prudential Regulation on Banking Competition in the Economics Literature

The economics literature has extensively investigated the potential – desired and undesired – effects of prudential regulation and supervision on banking activity from different perspectives (for in depth reviews, see e.g. Berger et al., 1995; Jackson et al., 1999; Santos, 2001; Stolz, 2002; Wang, 2005; Van Hoose, 2007). We can distinguish a first strand gaging the effects of prudential regulation on banks' behavior, in particular the risk-taking appetite of bank management (Avery and Berger, 1991; Hancock and Wilcox, 1994; Thakor, 1996; Estrella et al., 2000; Gambacorta and Mistruilli, 2004). Here, we can recognize a first view, such as the seminal works of Furlong and Keely (1987, 1989), and Keely and Furlong (1990), arguing for the capability of capital requirement to reduce the risk undertaking by supervised institutions. On the opposite, Kahane (1977), Koehn and Santomero (1980), Kim and Santomero (1988), Gennotte and Pyle (1991), Shrieves and Dahl (1992) and Blum (1999) suggest that capital requirements could increase risk-taking. Finally, other authors derive mixed implications according to the different characteristics of their models, Rochet (1992), Jeitschko and Jeung (2005), Demirgüç-Kunt et al. (2010), Cathcart et al. (2015). Finally, Calem and Rob (1999) argue for the existence of a U-shape link between capital and risk.

A second strand of literature focuses on the potential – undesired – effects capital requirements may generate, especially in lending contraction. In this respect, Bernanke and Lown (1991), Berger and Udell (1994), Brinkmann and Horvitz (1995), Furfine (2000) and Peek and Rosengren (1992, 1994, 1995a,b) argue for a negative impact of capital requirements on lending after the introduction of Basel I, although a more recent literature, such as Aiyar, Calomiris and Wieladek (2012), Ongena et al. (2012), Osborne et al. (2012), suggests a smoother evidence on this.

All mentioned studies generally focus on the two fundamental shocks which may potentially affect the capital requirement for banks, eventually through different perspectives, respectively the Basel I and Basel II capital accord. However, some works study the effects of raising capital requirements during financial crises (Kashyap et al., 2008; Acharya et al., 2011; Calomiris and Herring, 2011; Hart and Zingales, 2011; Berger and Bouwman, 2013). In particular, Berger and Bouwman (2013) examine how capital requirements – both during financial crises and normal periods – can raise a bank's probability of survival and market share, confirming the hypothesis that capital can play a positive influence upon banks' performance (Holmstrom and Tirole, 1997; Calomiris and Powell, 2001; Calomiris and Mason, 2003; Calomiris and Wilson, 2004; Kim et al., 2005; Acharya et al., 2011; Allen et al., 2011; Mehran and Thakor, 2011; Thakor, 2012).

Finally, more recently, increasing interest has focused on assessing the potential impacts of the whole prudential supervision on banks' behavior. This interest basically relates to the upturn of prudential supervision which took place after the GFC, so that standard-setting bodies and national authorities realized the need to estimate how their activities can contribute to a sound and stable financial system (BCBS, 2015). To achieve that goal, the BCBS set up a Task Force on Impact and Accountability (TFIA) which, coherently with other initiatives promoted by the IMF and the World Bank, aims to gage international experience on the impact and accountability of banking supervision. The BCBS (2015) report highlights how challenging the objective to come to any unique measurement of supervisory efficacy can be, because of various biases related to heterogeneity across jurisdictions, methodological challenges, variety of objectives and instruments used by different supervisors. For that reason, here we disregard how the supervision enforcement enacted by national authorities could impact differently banks' behavior across European countries (Ka-

mada and Nasu, 2000; Gilbert, 2006; Kiema and Jokivuolle, 2010; Blundell-Wignall and Atkinson, 2010). Instead, we investigate the widespread effects generated by supervision enforcement across differently sized banks (Chen and Song, 2013; Adams et al., 2014; De Haan and Kases, 2018).

By this perspective, despite this broad literature, to our knowledge, there is still scant evidence – to which we aim to contribute – on the potential biases arising from spillover effects, which we define as the – undesired and potentially disruptive – effects from applying different regulatory regimes to different banks. In this respect, we consider the recent amendments to the prudential supervision scheme and its increasing level of capital for SIFIs as a potential factor of adverse selection for smaller banks, especially if acting in close competition with the largest ones, because of the different changes in behavior determined by the different requirements they will finally undergo, potentially violating the basic principle of realizing a level playing field across the whole banking system.

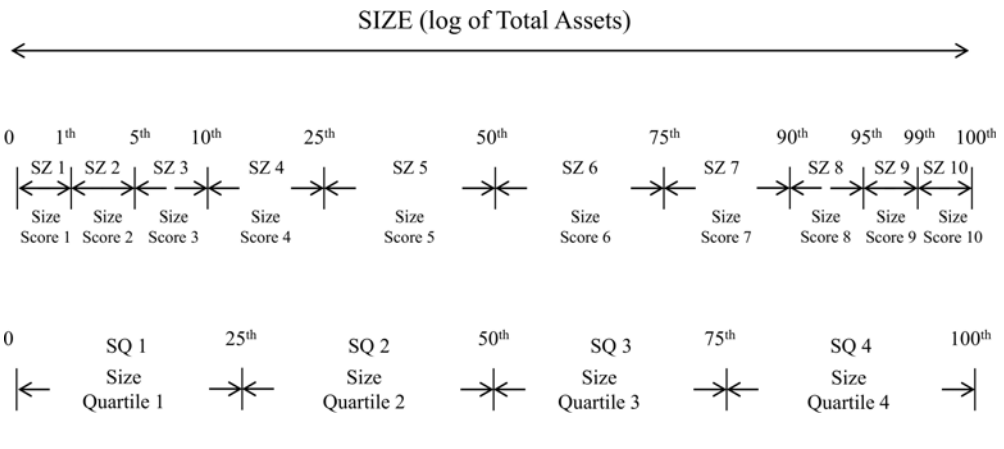
3 Description of the Database

Our database includes a large number of individual banks (4,580) and total bank-year observations (27,843) from 29 European countries, for which we collected all the data available on Bankscope (Bureau van Dijk) over the period 2008–2013. We could so analyze the banking system in Europe, an area where regulatory cross-country differences exist but are certainly smaller than in other world areas. Secondly, we managed to observe a very significant and large sample of banks, representing nearly the entirety of European banks total assets, allowing us to perform various robust checks. Finally, the period considered is of particular interest, going well into the euro sovereign crisis, as well as anticipating the arrival of Basel III, when especially larger banks should strive to save capital to meet the new regulatory requirements, possibly reducing their loans supply.

As discussed in section 1, since the aftermath of the crisis supervision focused on banks size, among other factors, as a fundamental determinant to better define a proper approach to supervised entities, so to overcome past fragilities jeopardizing the prudential supervision regime. Therefore, our anal-

Figure 1

Segmentation of the Sample by Size Percentiles



ysis considers size, measured by the logarithm of total assets, as the main feature to control for potential differences among the performance achieved by European banks encompassed in our database. In particular, we defined various alternative sub-groups of banks along different percentiles segments of the sample – which we report for simplicity in Figure 1. By this approach, we study differences in performance of different sized banks across Europe, but also investigate the possible interaction with different strategies by each individual sub-group in each country.

Our econometric estimates aim to document whether and the extent to which, controlling for a bank's business specialization, the “new” regulatory framework had produced any desired – or undesired – effects upon different categories of European banks. To that end, we consider the increase of *capital* level as the most important objective pursued by supervisors. As well, we consider the *loans* contraction and the variation of *loan impairments* as the main undesired effects which could be generated by the regulatory framework. So, we focus on the most significant variables, which can be viewed as potential predictors of the business specialization of each bank, as well as on a measure of the risk level to which each bank can be exposed. Then, we consider some macro variables able to control for the level of competition exhibited by each banking system as well as for other macroeconomic factors potentially influencing banks' behavior.

The bank level variables we consider are:

- SIZE – the logarithm of total assets. This variable controls for possible systematic differences across banks of different dimension;
- EQUITY – ratio between equity and total assets, defined similarly to the *leverage ratio* of the new Basel III capital framework, which is viewed as a more effective safeguard against model risk and measurement error than other ratios controlling for the level of bank capitalization (Haldane and Madouros, 2012) – i. e. the Total-Capital ratio, the Core-Capital ratio. We consider EQUITY both as dependent and independent variable in different model specifications;
- LOANS – ratio between net loans and total assets. We consider also this variable both as dependent and independent variable among different model specifications;
- LOAN IMPAIRMENT – cost of credit losses to economic account. We consider also this variable both as dependent and independent variable among different model specifications;
- NET INCOME – ratio between net income and total assets. We consider it to control for the level of profitability of each bank;
- ASSETS GROWTH – the variation of Total Assets from t-1 to t. We consider this variable to control for the growth realized by each bank;
- LOANS GROWTH – the variation of LOANS (Loans/Total Assets) from t-1 to t. We consider this variable as the measure of change (reduction) of credit upon the total activity of each banks;
- LOANSP GROWTH – the variation of Loans (Amount of Loans) from t-1 to t. We consider this variable as a measure of credit available to customers.

We also include some macro level variables:

- GOVERNMENT DEBT, since various years in the period under observation were affected by the euro sovereign crisis we need to control for this macro variable;
- GOVERNMENT DEFICIT, also included as a potential control for the euro sovereign crisis as markets might judge a government's sustainability not only on its debt but also on its deficit;

- GDP GROWTH, as a further macro control on debt sustainability;
- NPL SYSTEM, the country level ratio of non-performing loans to total loans;
- CAPITAL SYSTEM, the ratio of Capital to Total Assets of each country's banking system.

Table 1a reports the basic descriptive statistics for the main variables utilized in our analysis, throughout we may appreciate the quite significant heterogeneity characterizing our database.

The same breakdown is offered in Table 1b – reporting the evolution of the variables by year average – and in Table 1c – reporting the averages of the variables by country.

Table 2a reports each variable's mean value by sub-group defined by different size percentiles.

Table 2b has the same breakdown reporting the evolution of the key variables by year average.

Table 3 presents the Correlation Matrix among the variables. Because LOANS GROWTH and LOANSP GROWTH are by definition highly correlated, they are considered as alternative in different model specifications.

Table 1a

Dispersion Among Variables of Analysis – Description Over the Total Sample

| stats | Size | Equity | Loans | Net Income | Loan Impairment | NPL System | Government Debt | GDP Growth | Capital System | Assets Growth | Loans Growth | LoansP Growth |
|-------|--------|---------|---------|------------|-----------------|------------|-----------------|------------|----------------|---------------|--------------|---------------|
| mean | 13.588 | 12.076 | 59.481 | 11.227 | 3.819 | 4.187 | 70.871 | 0.641 | 6.173 | 7.125 | 7.517 | 4.465 |
| max | 21.674 | 100.000 | 100.000 | 65833.400 | 605.600 | 33.680 | 174.900 | 10.680 | 17.900 | 902.800 | 900.000 | 851.258 |
| p90 | 16.272 | 19.600 | 87.200 | 35.800 | 9.200 | 9.810 | 104.000 | 3.620 | 8.200 | 17.630 | 18.200 | 10.983 |
| p75 | 14.638 | 11.100 | 76.390 | 21.000 | 4.900 | 4.290 | 81.700 | 2.610 | 6.200 | 8.520 | 8.900 | 5.534 |
| p50 | 13.317 | 7.800 | 62.590 | 10.300 | 2.100 | 2.870 | 76.400 | 1.050 | 5.000 | 3.660 | 3.790 | 2.208 |
| p25 | 12.280 | 5.600 | 47.790 | 4.700 | 0.000 | 2.650 | 53.600 | -0.330 | 4.500 | -0.020 | -0.390 | -0.136 |
| p10 | 11.377 | 3.600 | 25.130 | 0.000 | -0.300 | 0.810 | 36.700 | -3.800 | 4.270 | -6.030 | -6.290 | -2.664 |
| min | 2.329 | 0.000 | 0.000 | -51700.000 | -1071.100 | 0.080 | 4.340 | -17.950 | 3.220 | -79.910 | -100.000 | -84.403 |
| sd | 2.036 | 15.834 | 23.272 | 775.691 | 15.409 | 3.949 | 25.538 | 2.877 | 3.270 | 31.313 | 37.823 | 18.121 |
| N | 30406 | 30406 | 29055 | 29983 | 30406 | 36462 | 36511 | 37015 | 34831 | 29216 | 27895 | 27843 |

Table 1b

Evolution for Variables of Analysis – Breakdown by Time Over the Total Sample

| t | Size | Equity | Loans | Net Income | Loan Impairment | NPL System | Government Debt | GDP Growth | Capital System | Assets Growth | Loans Growth | LoansP Growth |
|-------|--------|--------|--------|------------|-----------------|------------|-----------------|------------|----------------|---------------|--------------|---------------|
| 2007 | 13.476 | 11.371 | 60.386 | 17.448 | 2.993 | 2.402 | 58.726 | 3.256 | 6.113 | 11.951 | 12.934 | 8.084 |
| 2008 | 13.518 | 11.411 | 59.903 | 15.658 | 4.384 | 2.758 | 61.489 | 0.736 | 5.799 | 9.799 | 9.218 | 5.811 |
| 2009 | 13.537 | 11.755 | 59.006 | 8.501 | 5.573 | 4.071 | 70.095 | -4.591 | 6.199 | 5.608 | 5.429 | 3.129 |
| 2010 | 13.589 | 12.308 | 59.371 | 33.968 | 4.338 | 4.345 | 74.166 | 2.656 | 6.209 | 5.570 | 7.783 | 4.403 |
| 2011 | 13.606 | 12.507 | 59.436 | 22.951 | 2.341 | 4.710 | 74.616 | 2.244 | 6.233 | 6.649 | 6.884 | 3.951 |
| 2012 | 13.656 | 12.553 | 58.928 | -14.238 | 3.277 | 5.211 | 77.497 | 0.010 | 6.539 | 6.217 | 5.566 | 3.250 |
| 2013 | 13.725 | 12.509 | 59.422 | -5.358 | 3.902 | 5.931 | 78.871 | 0.170 | 6.130 | 4.668 | 5.324 | 2.988 |
| Total | 13.588 | 12.076 | 59.481 | 11.227 | 3.819 | 4.187 | 70.871 | 0.641 | 6.173 | 7.125 | 7.517 | 4.465 |

Table 1c

Dispersion Among Variables of Analysis – Breakdown by Country

| Country | Size | Equity | Loans | Net Income | Loan Impairment | NPL System | Government Debt | GDP Growth | Capital System | Assets Growth | Loans Growth | LoansP Growth |
|----------------|--------|--------|--------|------------|-----------------|------------|-----------------|------------|----------------|---------------|--------------|---------------|
| AUSTRIA | 13.166 | 12.564 | 54.378 | 8.508 | 5.113 | 2.516 | 77.200 | 1.061 | 7.177 | 5.504 | 7.386 | 3.418 |
| BELGIUM | 14.666 | 19.530 | 47.903 | 41.818 | -1.695 | 2.894 | 98.362 | 0.821 | 4.837 | 6.603 | 10.393 | 3.677 |
| CZECH REPUBLIC | 13.963 | 13.839 | 60.626 | 46.878 | -3.080 | 4.401 | 37.286 | 0.879 | 6.286 | 14.358 | 13.994 | 8.192 |
| DENMARK | 13.531 | 13.210 | 59.511 | -82.468 | 11.979 | 3.343 | 40.143 | -0.480 | 5.643 | 5.226 | 4.028 | 3.618 |
| ESTONIA | 12.976 | 17.988 | 50.770 | -14.154 | 13.795 | 3.023 | 7.711 | 0.696 | 9.271 | 19.825 | 32.911 | 16.333 |
| FINLAND | 14.154 | 19.512 | 64.492 | 21.361 | 2.490 | 0.483 | 44.714 | 0.074 | 5.686 | 11.165 | 13.785 | 9.708 |
| FRANCE | 14.869 | 14.238 | 60.936 | 13.696 | 3.692 | 3.769 | 79.820 | 0.613 | 4.689 | 7.171 | 8.493 | 4.788 |
| GERMANY | 13.251 | 8.876 | 56.175 | 9.977 | 2.304 | 2.941 | 73.513 | 0.979 | 4.639 | 4.633 | 5.096 | 2.899 |
| GREECE | 14.802 | 15.614 | 74.708 | -18.064 | 11.861 | 13.036 | 139.444 | -3.329 | 7.300 | 10.792 | 9.108 | 8.210 |
| HUNGARY | 13.590 | 12.518 | 60.582 | 286.292 | 11.385 | 9.671 | 76.243 | -0.359 | 8.220 | 15.292 | 15.703 | 7.046 |
| IRELAND | 16.169 | 12.319 | 41.656 | -19.671 | 7.064 | 13.008 | 81.863 | -0.236 | 5.864 | 4.820 | 7.311 | 4.707 |
| ITALY | 13.298 | 12.453 | 64.782 | 4.784 | 6.372 | 10.509 | 113.755 | -0.994 | 4.971 | 9.344 | 8.544 | 5.308 |
| LUXEMBOURG | 14.747 | 11.663 | 28.760 | 41.464 | 1.259 | 0.380 | 17.172 | 1.609 | 5.458 | 15.251 | 17.043 | 5.852 |
| NETHERLANDS | 15.664 | 14.243 | 57.027 | 9.562 | 5.284 | 2.790 | 58.459 | 0.504 | 4.144 | 4.872 | 8.954 | 4.696 |
| NORWAY | 13.321 | 11.183 | 81.373 | 19.472 | 2.256 | 1.221 | 32.026 | 0.925 | 6.360 | 11.965 | 10.512 | 9.011 |
| POLAND | 14.338 | 11.226 | 69.352 | -4.759 | 8.044 | 4.580 | 51.293 | 3.667 | 8.184 | 18.075 | 19.498 | 14.208 |
| PORTUGAL | 14.473 | 15.075 | 57.076 | 4.467 | 9.008 | 6.353 | 97.728 | -0.697 | 6.353 | 5.966 | 6.460 | 3.564 |
| SLOVAKIA | 14.067 | 10.840 | 60.285 | 11.321 | 11.334 | 4.577 | 40.738 | 3.058 | 10.002 | 5.680 | 10.475 | 5.560 |
| SLOVENIA | 14.098 | 7.411 | 69.804 | -47.362 | 19.392 | 8.575 | 40.772 | 0.093 | 8.325 | 4.320 | 7.230 | 5.182 |
| SPAIN | 14.129 | 13.107 | 61.372 | 13.268 | 4.954 | 5.042 | 61.826 | -0.362 | 6.160 | 7.307 | 6.141 | 3.186 |
| SWEDEN | 13.459 | 13.088 | 70.305 | 19.605 | 2.564 | 0.587 | 37.585 | 1.076 | 4.834 | 8.429 | 9.309 | 6.338 |
| SWITZERLAND | 13.051 | 8.356 | 72.101 | 12.095 | 2.545 | 0.774 | 37.584 | 1.725 | 17.334 | 8.786 | 9.720 | 6.056 |
| UNITED KINGDOM | 14.000 | 26.339 | 50.013 | 17.628 | 3.770 | 2.916 | 70.220 | 0.553 | 5.134 | 9.983 | 9.512 | 6.243 |
| Total | 13.588 | 12.076 | 59.481 | 11.227 | 3.819 | 4.187 | 70.871 | 0.641 | 6.173 | 7.125 | 7.517 | 4.465 |

Table 2a

Dispersion Among Variables of Analysis – Breakdown by Sub-Group of Banks

| Size Score | Size | Equity | Loans | Net Income | Loan Impairment | NPL System | Government Debt | GDP Growth | Capital System | Assets Growth | Loans Growth | LoansP Growth |
|------------|--------|--------|--------|------------|-----------------|------------|-----------------|------------|----------------|---------------|--------------|---------------|
| 1 | 8.061 | 62.186 | 52.017 | 72.460 | -4.892 | 4.219 | 73.491 | 0.517 | 5.400 | 22.058 | 10.638 | 60.953 |
| 2 | 10.127 | 32.694 | 41.499 | 4.234 | 6.379 | 4.095 | 73.500 | 0.498 | 5.692 | 10.729 | 9.765 | 39.293 |
| 3 | 10.971 | 21.621 | 51.347 | 4.982 | 3.279 | 4.062 | 74.385 | 0.548 | 5.684 | 8.940 | 9.025 | 42.749 |
| 4 | 11.786 | 13.754 | 58.204 | 19.156 | 3.292 | 3.859 | 72.017 | 0.673 | 6.371 | 7.973 | 8.635 | 47.799 |
| 5 | 12.725 | 10.447 | 63.939 | 3.704 | 3.670 | 3.736 | 70.762 | 0.719 | 6.863 | 6.897 | 6.835 | 44.145 |
| 6 | 13.872 | 10.668 | 60.528 | 13.649 | 3.726 | 3.879 | 72.654 | 0.656 | 5.728 | 7.089 | 7.947 | 47.433 |
| 7 | 15.297 | 9.659 | 58.963 | 11.503 | 4.336 | 4.166 | 71.110 | 0.645 | 5.614 | 6.262 | 6.715 | 42.954 |
| 8 | 16.661 | 8.591 | 60.379 | 15.219 | 4.374 | 4.426 | 71.075 | 0.530 | 5.863 | 6.071 | 8.056 | 47.892 |
| 9 | 18.165 | 5.526 | 56.421 | 14.177 | 4.618 | 4.328 | 71.297 | 0.412 | 5.761 | 4.633 | 5.340 | 31.705 |
| 10 | 20.488 | 4.136 | 41.533 | 12.703 | 3.231 | 7.112 | 59.270 | 0.608 | 7.121 | 3.763 | 3.909 | 21.054 |
| Total | 13.588 | 12.076 | 59.481 | 11.227 | 3.819 | 4.187 | 70.871 | 0.641 | 6.173 | 7.125 | 7.517 | 44.650 |

Table 2b

Evolution of Variables of Analysis – Breakdown by Sub-Group of Banks

| t | Size | Equity | Loans | Net Income | Loan Assets | Loans | LoansP | t | Size | Equity | Loans | Net Income | Loan Assets | Loans | LoansP | |
|--------------|-------|--------|-------|------------|-------------|--------|--------|---------------|-------|--------|-------|------------|-------------|--------|--------|-------|
| | | | | | Impair | Growth | Growth | | | | | | Impair | Growth | Growth | |
| 2007 | 8.10 | 49.81 | 55.06 | 12.94 | -38.30 | 40.15 | 31.59 | 2007 | 13.73 | 10.14 | 61.02 | 17.99 | 3.46 | 11.76 | 13.30 | 8.54 |
| 2008 | 8.21 | 49.17 | 56.24 | -9.27 | -7.60 | 18.91 | -4.78 | 2008 | 13.80 | 9.92 | 60.52 | 8.89 | 4.54 | 9.91 | 9.29 | 3.85 |
| 2009 | 8.07 | 61.02 | 59.05 | -9.35 | -4.73 | 8.89 | -18.88 | 2009 | 13.83 | 10.13 | 60.10 | 17.36 | 5.64 | 6.34 | 5.35 | 3.34 |
| 2010 | 8.02 | 74.64 | 58.31 | 952.42 | 12.19 | -2.13 | 14.55 | 2010 | 13.88 | 10.70 | 60.56 | 13.26 | 4.70 | 8.04 | 4.53 | 4.18 |
| 2011 | 8.06 | 70.46 | 45.12 | -78.20 | -1.30 | 27.06 | -11.94 | 2011 | 13.92 | 10.89 | 60.82 | 16.52 | 1.26 | 6.05 | 7.77 | 8.82 |
| 2012 | 7.68 | 66.01 | 44.45 | -63.22 | 0.86 | 9.24 | 22.40 | 2012 | 13.96 | 11.23 | 60.14 | 14.87 | 3.09 | 7.24 | 5.99 | 3.93 |
| 2013 | 8.35 | 62.94 | 46.35 | -12.27 | 1.39 | 46.92 | 41.53 | 2013 | 13.99 | 11.62 | 60.56 | 6.51 | 3.79 | 4.62 | 5.49 | 3.06 |
| Size Score 1 | | | | | | | | Size Score 6 | | | | | | | | |
| 2007 | 10.09 | 30.61 | 42.80 | -24.33 | 6.88 | 10.12 | 4.09 | 2007 | 15.21 | 9.21 | 58.68 | 22.48 | 3.40 | 15.65 | 16.30 | 9.95 |
| 2008 | 10.06 | 32.38 | 45.06 | 4.74 | 7.84 | 8.28 | 12.75 | 2008 | 15.24 | 8.30 | 58.81 | 37.37 | 5.31 | 11.20 | 10.00 | 6.77 |
| 2009 | 10.13 | 33.59 | 40.67 | 9.40 | 11.88 | 9.22 | 4.72 | 2009 | 15.27 | 8.87 | 58.40 | 19.25 | 6.46 | 2.17 | 5.37 | 3.03 |
| 2010 | 10.12 | 33.38 | 40.66 | -1.54 | 7.12 | 7.50 | 18.37 | 2010 | 15.31 | 9.77 | 58.84 | 15.90 | 5.09 | 5.36 | 4.71 | 3.23 |
| 2011 | 10.07 | 34.21 | 41.16 | 379.36 | 3.58 | 13.51 | 8.62 | 2011 | 15.33 | 10.10 | 59.23 | -6.47 | 1.94 | 5.68 | 5.95 | 3.40 |
| 2012 | 10.15 | 32.85 | 40.01 | 5.18 | 2.01 | 9.98 | 6.45 | 2012 | 15.36 | 10.22 | 59.27 | -4.60 | 3.71 | 4.13 | 3.18 | 2.09 |
| 2013 | 10.27 | 31.00 | 41.39 | -417.69 | 5.90 | 15.83 | 12.55 | 2013 | 15.35 | 11.05 | 59.51 | -0.88 | 4.55 | 0.87 | 2.41 | 2.13 |
| Size Score 2 | | | | | | | | Size Score 7 | | | | | | | | |
| 2007 | 10.83 | 21.71 | 51.92 | 9.00 | 2.73 | 10.31 | 11.58 | 2007 | 16.57 | 8.34 | 60.65 | 29.67 | 2.77 | 19.41 | 29.57 | 16.02 |
| 2008 | 10.77 | 23.35 | 51.75 | 5.90 | 4.16 | 6.91 | 3.00 | 2008 | 16.65 | 7.82 | 59.96 | -7.97 | 4.26 | 12.60 | 14.63 | 9.29 |
| 2009 | 10.91 | 21.35 | 51.68 | 13.51 | 5.47 | 7.59 | 4.55 | 2009 | 16.65 | 8.27 | 59.87 | 26.33 | 5.53 | 2.26 | 5.67 | 2.54 |
| 2010 | 10.97 | 21.94 | 50.73 | -4.51 | 2.27 | 8.83 | 14.67 | 2010 | 16.66 | 8.68 | 60.22 | 25.42 | 4.14 | 2.45 | 3.68 | 3.08 |
| 2011 | 11.03 | 21.58 | 51.67 | 2.78 | 2.86 | 6.58 | 7.20 | 2011 | 16.70 | 8.58 | 60.50 | 1.18 | 3.90 | 7.16 | 2.53 | 2.19 |
| 2012 | 11.08 | 21.13 | 50.61 | 8.93 | 1.56 | 9.48 | 10.85 | 2012 | 16.70 | 9.13 | 60.30 | 3.81 | 4.85 | 2.12 | 3.37 | 0.97 |
| 2013 | 11.15 | 20.46 | 51.25 | 0.50 | 4.17 | 12.72 | 10.38 | 2013 | 16.67 | 9.18 | 61.13 | 28.76 | 5.07 | -1.32 | 0.17 | 1.25 |
| Size Score 3 | | | | | | | | Size Score 8 | | | | | | | | |
| 2007 | 13.73 | 10.14 | 61.02 | 17.99 | 3.46 | 11.76 | 13.30 | 2007 | 18.08 | 5.85 | 58.36 | 33.58 | 1.62 | 17.38 | 14.93 | 10.65 |
| 2008 | 13.80 | 9.92 | 60.52 | 8.89 | 4.54 | 9.91 | 9.29 | 2008 | 18.10 | 5.43 | 58.07 | 11.04 | 3.12 | 10.44 | 15.10 | 8.36 |
| 2009 | 13.83 | 10.13 | 60.10 | 17.36 | 5.64 | 6.34 | 3.35 | 2009 | 18.14 | 5.44 | 56.65 | 10.33 | 3.32 | 8.34 | 2.59 | 2.24 |
| 2010 | 13.88 | 10.70 | 60.56 | 13.26 | 4.70 | 8.04 | 4.53 | 2010 | 18.22 | 5.40 | 56.55 | 9.42 | 4.90 | 1.76 | 0.66 | 2.00 |
| 2011 | 13.92 | 10.89 | 60.82 | 16.52 | 1.26 | 6.05 | 7.77 | 2011 | 18.22 | 5.23 | 55.75 | -17.58 | 4.54 | 2.10 | 3.21 | 0.96 |
| 2012 | 13.96 | 11.23 | 60.14 | 14.87 | 3.09 | 7.24 | 5.99 | 2012 | 18.22 | 5.45 | 54.57 | -21.08 | 4.00 | -0.67 | 0.76 | 0.76 |
| 2013 | 13.99 | 11.62 | 60.56 | 6.51 | 3.79 | 4.62 | 5.49 | 2013 | 18.15 | 5.91 | 55.41 | 3.27 | 5.91 | -4.76 | 3.54 | -1.19 |
| Size Score 4 | | | | | | | | Size Score 9 | | | | | | | | |
| 2007 | 16.16 | 8.27 | 58.26 | 25.79 | 2.92 | 16.82 | 18.75 | 2007 | 20.43 | 3.83 | 41.46 | 26.26 | 1.49 | 19.11 | 16.66 | 7.96 |
| 2008 | 16.21 | 7.51 | 58.03 | 37.28 | 4.65 | 11.60 | 11.72 | 2008 | 20.51 | 3.02 | 39.44 | 15.07 | 2.99 | 16.44 | 8.96 | 4.38 |
| 2009 | 16.24 | 7.98 | 57.68 | 17.04 | 6.04 | 2.84 | 4.83 | 2009 | 20.44 | 4.00 | 42.40 | 3.74 | 5.29 | -5.64 | 2.06 | 1.66 |
| 2010 | 16.27 | 8.62 | 58.08 | 16.70 | 4.81 | 4.16 | 4.00 | 2010 | 20.50 | 4.29 | 43.40 | 13.57 | 3.61 | -6.02 | 3.86 | 3.66 |
| 2011 | 16.29 | 8.77 | 58.13 | -6.13 | 2.80 | 5.39 | 4.62 | 2011 | 20.57 | 4.28 | 40.82 | 6.70 | 3.07 | 5.41 | 1.95 | -0.07 |
| 2012 | 16.31 | 9.00 | 57.91 | -4.68 | 4.34 | 2.77 | 1.51 | 2012 | 20.52 | 4.54 | 40.64 | 12.93 | 2.92 | -2.77 | -4.05 | -0.76 |
| 2013 | 16.32 | 9.53 | 58.37 | 6.57 | 4.82 | -0.90 | 1.82 | 2013 | 20.43 | 4.94 | 42.50 | 11.69 | 3.10 | -7.60 | -4.09 | -1.23 |
| Size Score 5 | | | | | | | | Size Score 10 | | | | | | | | |
| 2007 | 12.55 | 10.17 | 64.89 | 13.57 | 3.03 | 9.22 | 7.85 | 2007 | 20.43 | 3.83 | 41.46 | 26.26 | 1.49 | 19.11 | 16.66 | 7.96 |
| 2008 | 12.62 | 10.32 | 64.21 | 7.80 | 3.85 | 9.53 | 8.67 | 2008 | 20.51 | 3.02 | 39.44 | 15.07 | 2.99 | 16.44 | 8.96 | 4.38 |
| 2009 | 12.67 | 10.00 | 63.57 | 10.15 | 4.89 | 6.97 | 5.60 | 2009 | 20.44 | 4.00 | 42.40 | 3.74 | 5.29 | -5.64 | 2.06 | 1.66 |
| 2010 | 12.72 | 10.49 | 64.12 | 11.66 | 4.20 | 4.36 | 6.95 | 2010 | 20.50 | 4.29 | 43.40 | 13.57 | 3.61 | -6.02 | 3.86 | 3.66 |
| 2011 | 12.78 | 10.69 | 64.14 | 5.23 | 2.57 | 6.53 | 7.65 | 2011 | 20.57 | 4.28 | 40.82 | 6.70 | 3.07 | 5.41 | 1.95 | -0.07 |
| 2012 | 12.84 | 10.72 | 63.25 | -30.18 | 3.48 | 6.72 | 5.98 | 2012 | 20.52 | 4.54 | 40.64 | 12.93 | 2.92 | -2.77 | -4.05 | -0.76 |
| 2013 | 12.88 | 10.70 | 63.44 | 9.70 | 3.71 | 5.21 | 5.28 | 2013 | 20.43 | 4.94 | 42.50 | 11.69 | 3.10 | -7.60 | -4.09 | -1.23 |

Table 3

Correlation Matrix

| | Size | Total Assets | Equity | Loans | Net Income | Loan Impairment | NPL System | Government Debt | GDP Growth | Capital System | Assets Growth | Loans Growth | LoansP Growth |
|-----------------|--------|--------------|--------|--------|------------|-----------------|------------|-----------------|------------|----------------|---------------|--------------|---------------|
| Size | 1.000 | | | | | | | | | | | | |
| Total Assets | 0.441 | 1.000 | | | | | | | | | | | |
| Equity | -0.252 | -0.071 | 1.000 | | | | | | | | | | |
| Loans | -0.002 | -0.088 | -0.251 | 1.000 | | | | | | | | | |
| Net Income | 0.002 | 0.000 | -0.027 | 0.012 | 1.000 | | | | | | | | |
| Loan Impairment | 0.012 | -0.002 | 0.095 | 0.059 | -0.035 | 1.000 | | | | | | | |
| NPL System | 0.027 | -0.012 | 0.075 | 0.026 | -0.018 | 0.149 | 1.000 | | | | | | |
| Government Debt | -0.012 | -0.008 | 0.062 | 0.013 | -0.013 | 0.044 | 0.765 | 1.000 | | | | | |
| GDP Growth | -0.026 | -0.008 | -0.032 | -0.008 | 0.007 | -0.095 | -0.290 | -0.221 | 1.000 | | | | |
| Capital System | -0.076 | -0.019 | -0.033 | 0.170 | 0.001 | -0.004 | -0.215 | -0.443 | 0.086 | 1.000 | | | |
| Assets Growth | -0.003 | -0.005 | -0.021 | -0.031 | 0.014 | -0.049 | -0.012 | -0.048 | 0.035 | 0.038 | 1.000 | | |
| Loans Growth | -0.010 | -0.008 | 0.029 | -0.022 | 0.007 | -0.047 | -0.028 | -0.042 | 0.040 | 0.025 | 0.463 | 1.000 | |
| LoansP Growth | 0.004 | -0.013 | -0.003 | 0.108 | 0.001 | -0.045 | -0.040 | -0.056 | 0.050 | 0.038 | 0.570 | 0.716 | 1.000 |

4 Empirical Analysis

4.1 Methodology of Analysis

Several studies similar to ours have experimented that bank's asset portfolio shows high persistence in time, so that changes from one period to the next tend to be small relative to the variable's levels. This is a noteworthy property of our dataset we must consider to adopt an econometric approach able to address the issues arising from high persistence and autocorrelation of the series, with the potential endogeneity problems coming from reciprocal causality links among different variables. In these situations, the literature generally points to the dynamic regression model as the most effective approach, using a time lag of the dependent variable as an additional regressor on the right-hand-side of the regression. In particular, that approach becomes nearly a compelled when a database, like the ours, as stated by Arellano & Bond (1991), Arellano & Bover (1995), and Blundell & Bond (1998) is characterized as a "small T, large N" panel.

After some initial tests of alternative models, we chose Sys-GMM specifications, as most appropriate for our analysis. For all the specifications, we included time dummies and applied the Windmeijer correction to reported standard errors, reporting the results for the Sargan/Hansen test of overidentifying restrictions and for the Arellano-Bond test for second-order autocorrelation.

Our analysis consists of two parts. A first one, devoted to assess the existence of desired and undesired effects of regulation on the whole sample and on different banks' sub-groups. The second part, studying the potential "spillover effects" arising from the market interaction between different banks' sub-groups. In the first analysis, for each dependent variable we report the results obtained by using alternative model specifications, to test for robustness of the significance of the independent variables. Then, we apply the same analysis to all relevant sub-groups of banks defined above (see section 2), to gauge any difference across them. Finally, the second analysis, focuses on two sub-groups of banks, on which we study the potential "spillover effects" generated by other banks. Our conjecture runs as follows. First, through the sample period, there is an increasing aggravation – in relative terms – of capital requirements for larger sized banks. One can see that from Figure 2 representing the in-sample evolution of total capital level for the 1st vs the 4th quartile of banks ranked by asset size. We consider that ratio as representative of the level of capital to total assets, in order to better control for model risk arising from different assets composition. Second, larger sized banks have complied by raising their capitalization levels but they have then cut their lending. Third, the small and mid-sized banks have to some extent replaced the loan gap produced by the retrenchment in the loan supply by the large sized banks. Fourth and finally, the loan impairment ratios at medium-sized banks have surged. While we provide no systematic structural test of it, this conjecture appears to be confirmed if one collects the piece-wise evidence from the various regressions providing support to our four-step hypothesis.

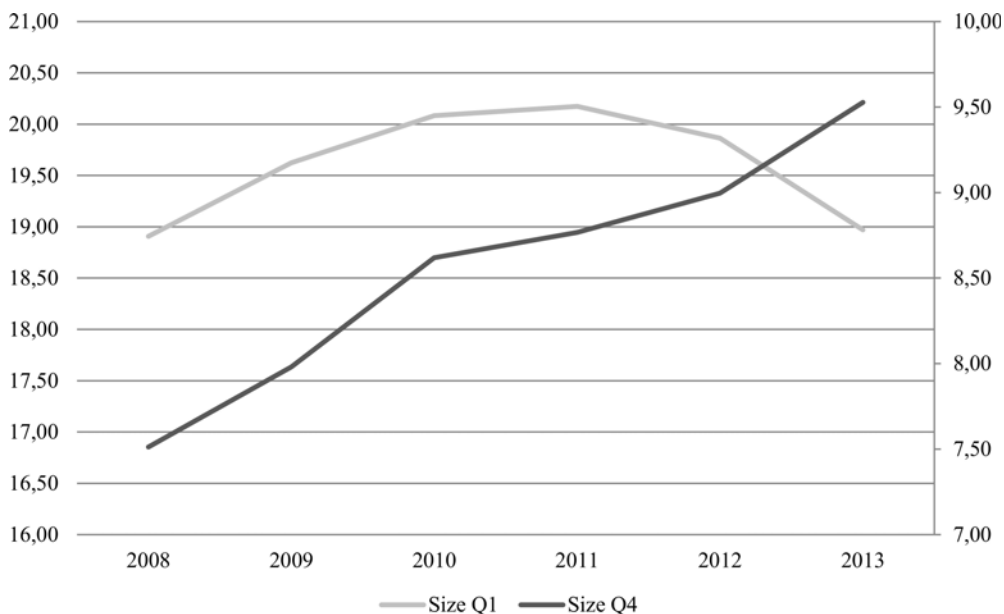
4.2 Results of the Econometric Analysis

4.2.1 Evidence of Desired effects of Prudential Regulation

The key desired effect of prudential regulation is increasing each bank's capitalization level. This is the main objective sought by supervisors, especially at most significant banks (Figure 2). In this paper we consider how European supervisors – EBA and ECB – pushed larger banks to increase notably their level of capital in the years included in our analysis, as a result of the various Stress

Figure 2

Level of Capital



Level of Capital (as ratio of Total Capital to Total Assets) for Size Q1 Banks (left hand scale) and for Size Q4 Banks (right hand scale). Source: data drawn from our sample. Our leverage ratio – Total Capital/Total Assets – differs from other works using instead Tangible Common Equity/Tangible Assets (e.g., International Monetary Fund, 2012).

Tests and Capital Exercises conducted upon the period 2010–2013. Table 4a reports the results obtained by alternative model specifications on a bank’s capitalization determinants. We may see a notable stability of the estimates, with a general rise of capital levels in the last years where the specific year dummies turn out positive and generally significant.

Table 4b reports a more comprehensive analysis of the effects of switching across different size, by presenting the regression results for different sub-samples of banks. This allows us to speculate on the potential effects of the new regulatory framework on the whole sample and on different banks’ sub-groups. To that end, for each sub-group we present the regression encapsulating the most enriched model, which we view as best explicative of our dependent variable. Among other factors, Table 4b shows a significant difference between larger banks – sub-groups from SZ6 to SZ10 and SQ3 and SQ4 – and the others, especially for the last time dummy variables. That seems to confirm the efficacy of regulatory actions to stimulate most significant banks to raise their capital level.

Table 4a

Desired Effects on Equity (Different Estimates of Dynamic Panel Model Upon the Total Sample)

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 |
|-----------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| L.Equity | 0.8534*** 0.084 | 0.8823*** 0.080 | 0.9921*** 0.073 | 1.0047*** 0.072 | 0.9698*** 0.071 | 0.9736*** 0.073 |
| Total Assets | -0.2497* 0.133 | -0.1821 0.124 | -0.0518 0.104 | -0.0277 0.103 | -0.0619 0.100 | -0.0546 0.103 |
| Loans | -0.0163 0.011 | -0.0175* 0.010 | 0.0014 0.008 | 0.0075 0.008 | -0.0062 0.008 | -0.0066 0.008 |
| NPL System | -0.0162 0.026 | 0.0008 0.021 | -0.0324 0.020 | -0.0401** 0.020 | -0.0169 0.019 | -0.0165 0.019 |
| Government Debt | 0.0006 0.003 | -0.003 0.003 | -0.0022 0.002 | -0.0021 0.002 | -0.002 0.002 | -0.0018 0.002 |
| GDP Growth | 0.0363 0.037 | 0.0396 0.032 | 0.0728** 0.033 | 0.0744** 0.034 | 0.0623** 0.031 | 0.0643** 0.031 |
| Capital System | -0.0356** 0.015 | -0.0279** 0.011 | -0.0543*** 0.010 | -0.0568*** 0.011 | -0.0320*** 0.009 | -0.0306*** 0.009 |
| Dummy 2009 | 0.6757*** 0.234 | 0.3423* 0.197 | 0.8595*** 0.193 | 0.8370*** 0.195 | 0.5551*** 0.181 | 0.5705*** 0.183 |
| Dummy 2010 | 0.4888*** 0.126 | 0.1143 0.111 | 0.3815*** 0.113 | 0.3521*** 0.117 | 0.1292 0.111 | 0.1162 0.112 |
| Dummy 2011 | 0.5774*** 0.126 | 0.2276* 0.116 | 0.4008*** 0.115 | 0.3649*** 0.122 | 0.182 0.114 | 0.1752 0.117 |
| Dummy 2012 | 0.8798*** 0.109 | 0.4832*** 0.098 | 0.7080*** 0.100 | 0.6877*** 0.106 | 0.4780*** 0.100 | 0.4859*** 0.101 |
| Dummy 2013 | 1.0012*** 0.110 | 0.3731*** 0.103 | 0.7526*** 0.106 | 0.7299*** 0.112 | 0.3830*** 0.107 | 0.3876*** 0.107 |
| Assets Growth | | -0.0648*** 0.006 | | | -0.0586*** 0.006 | -0.0628*** 0.007 |
| Loans Growth | | | -0.0204*** 0.005 | | -0.0041 0.004 | |
| LoansP Growth | | | | -0.0497*** 0.011 | | 0.0031 0.014 |
| Constant | 5.5237* 3.212 | 5.3176* 2.923 | 1.095 2.534 | 0.4054 2.516 | 2.1326 2.407 | 1.9758 2.488 |
| N | 22707 | 22652 | 22471 | 22471 | 22468 | 22468 |
| N(g) | 4581 | 4576 | 4545 | 4545 | 4545 | 4545 |
| AR2-p | 0.8897 | 0.534 | 0.7938 | 0.6631 | 0.2116 | 0.1988 |
| J | 23 | 24 | 24 | 24 | 25 | 25 |
| Hansen-df | 10 | 10 | 10 | 10 | 10 | 10 |
| Hansen-p | 0.1288 | 0.6186 | 0.3122 | 0.4418 | 0.6662 | 0.6996 |

The table presents different Sys-GMM model estimations with dependent variable *Equity*. All regressions include time dummies. N is the number of observations available, N(g) is the number of banks available, AR2-p is the p-value of Arellano-Bond test for autocorrelation of second order; J represents the number of instruments; Hansen-df represents the degree of freedom for the Hansen statistic; Hansen-p represents the p-value of the Hansen statistic. Windmeijer-corrected, bank-clustered standard errors are given in italics. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. L.Equity = *Equity* lagged one year.

Table 4b

Desired Effects on Equity (Estimates Upon Different Sub-Group of Banks)

| Variable | ALL | SZ 1 | SZ 2 | SZ 3 | SZ 4 | SZ 5 | SZ 6 | SZ 7 | SZ 8 | SZ 9 | SZ 10 | SQ 1 | SQ 2 | SQ 3 | SQ 4 | |
|-----------------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| L:Equity | 0.9698*** 0.071 | 0.7906*** 0.073 | 0.7012*** 0.196 | 0.8581*** 0.083 | 0.5886** 0.248 | 1.1466*** 0.104 | 0.9046*** 0.090 | 0.9001*** 0.127 | 0.7211*** 0.088 | 1.0485*** 0.054 | 0.9901*** 0.129 | 0.7377*** 0.111 | 1.1466*** 0.104 | 0.9046*** 0.090 | 0.9046*** 0.090 | 0.8783*** 0.130 |
| Total Assets | -0.0619 0.100 | -1.9560** 0.071 | -6.3990** 3.501 | -0.5244 1.345 | -1.9941 1.326 | 0.2219 0.401 | -0.3956* 0.200 | -0.5151*** 0.174 | -1.0424*** 0.340 | -0.067 0.064 | 0.0393 0.067 | -2.2542** 0.944 | 0.2219 0.401 | -0.3856* 0.200 | -0.3856* 0.200 | -0.2078* 0.110 |
| Loans | -0.0062 0.008 | 0.0651** 0.030 | -0.1131 0.078 | -0.0383 0.024 | -0.0797* 0.048 | 0.0009 0.012 | -0.0109 0.009 | -0.0059 0.004 | -0.0034 0.007 | -0.0021 0.003 | 0.0053 0.007 | -0.0594** 0.025 | 0.0009 0.012 | -0.0109 0.009 | -0.0109 0.009 | -0.004 0.003 |
| NPL System | -0.0169 0.019 | 0.3244 1.010 | -0.1748 3.501 | -0.092 1.083 | 0.1584 1.129 | -0.0657 0.047 | 0.0287 0.046 | 0.0146 0.029 | -0.0177 0.052 | -0.0133 0.012 | -0.0167 0.037 | -0.0589 0.055 | -0.0657 0.047 | -0.0589 0.047 | 0.0287 0.046 | 0.0106 0.018 |
| Government Debt | -0.002 0.002 | -0.0139 0.110 | 0.0742** 0.036 | 0.0142 0.012 | -0.0082 0.015 | -0.0029 0.006 | -0.0083 0.006 | -0.0026 0.003 | 0.0032 0.009 | 0.001 0.002 | -0.0007 0.007 | 0.0200** 0.010 | -0.0029 0.006 | -0.0083 0.006 | -0.0083 0.006 | -0.0031 0.002 |
| GDP Growth | 0.0623** 0.031 | 3.1291 2.045 | -0.3964** 0.197 | -0.1154 0.133 | 0.017 0.170 | 0.0075 0.070 | 0.1079*** 0.041 | 0.0717** 0.036 | 0.0765* 0.042 | 0.0580* 0.033 | 0.0374 0.060 | -0.0298 0.099 | 0.0075 0.070 | 0.1079*** 0.041 | 0.1079*** 0.041 | 0.0650*** 0.022 |
| Capital System | -0.0320*** 0.009 | 0.5733 1.370 | 0.5863* 0.304 | -0.0421 0.074 | 0.0392 0.065 | -0.0128 0.029 | -0.0711*** 0.019 | 0.0104 0.023 | 0.104 0.139 | 0.0128 0.023 | 0.0083 0.033 | 0.1346** 0.059 | -0.0128 0.029 | -0.0711*** 0.019 | -0.0711*** 0.019 | 0.0193 0.036 |
| Assets Growth | -0.0586*** 0.006 | -0.1913*** 0.029 | -0.1108** 0.047 | -0.1255*** 0.037 | -0.0530*** 0.015 | -0.0540*** 0.017 | -0.0482*** 0.008 | -0.0434*** 0.012 | -0.0303*** 0.006 | -0.0186*** 0.003 | -0.0082* 0.005 | -0.0809*** 0.018 | -0.0540*** 0.017 | -0.0482*** 0.008 | -0.0482*** 0.008 | -0.0373*** 0.008 |
| Loans Growth | -0.0041 0.004 | 0.0082 0.028 | 0.0042 0.006 | -0.0147** 0.007 | -0.0009 0.006 | -0.021 0.021 | 0.005 0.004 | -0.0039 0.003 | 0.0096** 0.004 | 0.0014* 0.001 | 0.0055 0.004 | -0.0011 0.004 | -0.021 0.021 | 0.005 0.004 | 0.005 0.004 | -0.0003 0.002 |
| Dummy 2009 | 0.5551*** 0.181 | 16.2462 12.072 | -3.1043** 1.423 | -0.1589 1.003 | 0.2803 0.913 | -0.0086 0.456 | 0.9679*** 0.284 | 0.9215*** 0.271 | 0.7508*** 0.261 | 0.9908*** 0.175 | 1.8753*** 0.359 | -0.0954 0.550 | -0.0086 0.456 | 0.9679*** 0.284 | 0.9679*** 0.284 | 0.8764*** 0.185 |
| Dummy 2010 | 0.1292 0.111 | -10.1833 9.901 | -0.8163 1.125 | 0.4695 0.515 | 0.3365 0.565 | 0.266 0.187 | 0.1509 0.168 | 0.5232*** 0.170 | 0.3402 0.230 | 0.2203 0.140 | 1.0154*** 0.166 | 0.0259 0.361 | 0.266 0.187 | 0.1509 0.168 | 0.1509 0.168 | 0.4349*** 0.111 |
| Dummy 2011 | 0.182 0.114 | -8.3847 8.419 | -0.2588 1.145 | 0.3712 0.459 | 0.4835 0.535 | 0.1047 0.202 | 0.4653*** 0.169 | 0.5884*** 0.146 | 0.3074 0.224 | 0.0423 0.134 | 0.6823*** 0.126 | 0.204 0.333 | 0.1047 0.202 | 0.4653*** 0.169 | 0.4653*** 0.169 | 0.4101*** 0.106 |
| Dummy 2012 | 0.4780*** 0.100 | -2.8511 5.287 | -0.7229 1.153 | 1.0967*** 0.379 | 0.8165*** 0.302 | 0.1562 0.293 | 0.8368*** 0.167 | 0.7139*** 0.133 | 0.6081** 0.260 | 0.5037*** 0.126 | 1.1331*** 0.148 | 0.5414** 0.234 | 0.1562 0.293 | 0.8368*** 0.167 | 0.8368*** 0.167 | 0.6156*** 0.092 |
| Dummy 2013 | 0.3830*** 0.107 | -3.2888 7.280 | -0.8837 1.305 | 0.8227** 0.370 | 0.5260* 0.315 | 0.1564 0.298 | 0.7842*** 0.185 | 0.6110*** 0.146 | 0.4342 0.300 | 0.5396*** 0.151 | 1.1014*** 0.173 | 0.2723 0.256 | 0.1564 0.298 | 0.7842*** 0.185 | 0.7842*** 0.185 | 0.5150*** 0.117 |
| Constant | 2.1326 2.407 | 23.4323* 12.359 | 71.4621* 41.185 | 9.7516 16.183 | 32.5455 20.597 | -3.1854 5.888 | 7.7318* 4.061 | 9.0393*** 3.379 | 18.7725*** 5.645 | 0.7767 1.246 | -1.7012 1.291 | 31.0366** 12.992 | -3.1854 5.888 | 7.7318* 4.061 | 7.7318* 4.061 | 4.4749* 2.581 |

| Variable | ALL | SZ 1 | SZ 2 | SZ 3 | SZ 4 | SZ 5 | SZ 6 | SZ 7 | SZ 8 | SZ 9 | SZ 10 | SQ 1 | SQ 2 | SQ 3 | SQ 4 |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|--------|
| N | 22468 | 57 | 606 | 968 | 3179 | 5817 | 6094 | 3372 | 1198 | 920 | 257 | 4810 | 5817 | 6094 | 5747 |
| N(g) | 4545 | 23 | 148 | 213 | 677 | 1160 | 1172 | 678 | 236 | 190 | 48 | 1061 | 1160 | 1172 | 1152 |
| AR2-p | 0.2116 | 0.6166 | 0.6295 | 0.1611 | 0.9263 | 0.0571 | 0.3824 | 0.1082 | 0.4536 | 0.8964 | 0.918 | 0.727 | 0.0571 | 0.3824 | 0.2925 |
| J | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Hansen-df | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Hansen-p | 0.6662 | 0.967 | 0.5009 | 0.4386 | 0.3331 | 0.6364 | 0.0443 | 0.3637 | 0.0203 | 0.3902 | 0.2035 | 0.257 | 0.6364 | 0.0443 | 0.0544 |

The table represents different Sys-GMM model estimations for the dependent variable *Equity* upon different groups of banks. All regressions include time dummies. N represents the number of observations available, N(g) represents the number of banks available, AR2-p represents the p-value of Arellano-Bond test for autocorrelation of second order, J represents the number of instruments; Hansen-df represents the degree of freedom for the Hansen statistic; Hansen-p represents the p-value of the Hansen statistic. Windmeijer-corrected, bank-clustered standard errors are given in italics. ***, **, * and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. L.Equity = Equity lagged one year.

4.2.2 Evidence of Undesired Effects of Prudential Regulation

We consider the variation of Loans and the level of Loan impairments as two undesired effects of the prudential regulation. As above, we first test alternative specifications on the whole sample and then study differences across banks' sub-groups. In particular, Table 5a reports the results of alternative model specifications on the determinants of changes in Loans. Results are notably stable across model specifications, with a general increase of the level of loans available during last years.

Still, similar analyses on different banks' sub-groups (Table 5b) uncover strong effects of prudential regulation on credit available to the economy. In particular, we find that larger banks (sub-groups from SZ8 to SZ10) cut their loans to total assets ratios notably, probably to save capital and achieve the higher capital ratio requested by supervisors. On the opposite, medium banks (SZ5 and SZ6) enjoy a slight increase in their loan/asset ratios. We may presume that prudential regulation, via its different requirements for different size banks, could have started to distort banking competition.

As with the above variables, Table 5c reports the results by alternative model specifications, searching for the determinants of changes of the Level of Impairments. Here, it seems more difficult to capture the determinants of this variable, even if all model specifications lead to similar results.

Even if considering the different sub-groups of banks (Table 5d), the results seem to be less evident, without significant differences between different sub-groups of banks, except for the sub-group SQ2, which exhibits a very high level for its constant. Also, the evidence from this part of analysis has been considered as predictive of any potential spillover effects against the medium and smaller banks in our sample. For that reasons, in the next section we focus on sub-groups SQ2 and SQ3 to investigate any potential adverse effect caused by the strategy achieved by larger banks.

Table 5a

Undesired Effects on Loans (Different Estimates of Dynamic Panel Model Upon the Total Sample)

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 |
|-----------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| N.Loans | 0.9799*** <i>0.066</i> | 0.9949*** <i>0.065</i> | 0.9835*** <i>0.058</i> | 0.9420*** <i>0.054</i> | 1.0130*** <i>0.051</i> | 0.9494*** <i>0.046</i> |
| Total Assets | 0.0324 <i>0.039</i> | 0.0173 <i>0.037</i> | -0.007 <i>0.036</i> | -0.044 <i>0.035</i> | 0.0454 <i>0.033</i> | -0.0014 <i>0.032</i> |
| Equity | -0.1431** <i>0.059</i> | -0.1906*** <i>0.065</i> | 0.0895* <i>0.054</i> | 0.0940* <i>0.050</i> | -0.1387*** <i>0.048</i> | -0.1911*** <i>0.040</i> |
| L.Equity | 0.1335* <i>0.070</i> | 0.1899** <i>0.081</i> | -0.1234* <i>0.063</i> | -0.1453** <i>0.059</i> | 0.1270** <i>0.059</i> | 0.1524*** <i>0.046</i> |
| NPL System | -0.3302*** <i>0.029</i> | -0.3278*** <i>0.028</i> | -0.3063*** <i>0.027</i> | -0.2800*** <i>0.026</i> | -0.3003*** <i>0.025</i> | -0.2505*** <i>0.022</i> |
| Government Debt | 0.0253*** <i>0.009</i> | 0.0237*** <i>0.008</i> | 0.0257*** <i>0.007</i> | 0.0284*** <i>0.007</i> | 0.0218*** <i>0.007</i> | 0.0260*** <i>0.006</i> |
| GDP Growth | 0.0382 <i>0.063</i> | 0.0485 <i>0.061</i> | 0.0537 <i>0.055</i> | 0.0411 <i>0.053</i> | 0.0751 <i>0.049</i> | 0.0585 <i>0.044</i> |
| Capital System | -0.0136 <i>0.102</i> | -0.0232 <i>0.101</i> | -0.014 <i>0.092</i> | 0.0344 <i>0.086</i> | -0.0396 <i>0.079</i> | 0.0404 <i>0.072</i> |
| Dummy 2009 | 0.4784 <i>0.497</i> | 0.3446 <i>0.470</i> | 0.7695* <i>0.452</i> | 0.7647* <i>0.433</i> | 0.5961 <i>0.380</i> | 0.5202 <i>0.356</i> |
| Dummy 2010 | 1.2298*** <i>0.234</i> | 0.9781*** <i>0.212</i> | 1.1968*** <i>0.201</i> | 1.2349*** <i>0.193</i> | 0.7599*** <i>0.170</i> | 0.6474*** <i>0.156</i> |
| Dummy 2011 | 0.7846*** <i>0.225</i> | 0.5948*** <i>0.207</i> | 0.8670*** <i>0.203</i> | 0.9371*** <i>0.194</i> | 0.5171*** <i>0.170</i> | 0.5194*** <i>0.156</i> |
| Dummy 2012 | 0.1649 <i>0.318</i> | 0.0142 <i>0.301</i> | 0.3915 <i>0.302</i> | 0.4003 <i>0.290</i> | 0.2129 <i>0.247</i> | 0.168 <i>0.236</i> |
| Dummy 2013 | 1.1403** <i>0.444</i> | 0.8802** <i>0.418</i> | 1.4355*** <i>0.419</i> | 1.3987*** <i>0.388</i> | 1.0052*** <i>0.330</i> | 0.7915*** <i>0.304</i> |
| Assets Growth | | -0.0491*** <i>0.009</i> | | | -0.1239*** <i>0.012</i> | -0.1711*** <i>0.014</i> |
| Loans Growth | | | 0.0625*** <i>0.007</i> | | 0.0909*** <i>0.011</i> | |
| LoansP Growth | | | | 0.1605*** <i>0.015</i> | | 0.2825*** <i>0.017</i> |
| Constant | -0.3092 <i>3.713</i> | -0.4865 <i>3.658</i> | -0.5573 <i>3.357</i> | 1.7663 <i>3.098</i> | -2.0366 <i>2.927</i> | 1.4987 <i>2.614</i> |
| N | 22643 | 22603 | 22471 | 22471 | 22468 | 22468 |
| N(g) | 4566 | 4564 | 4545 | 4545 | 4545 | 4545 |
| AR2-p | 0.2632 | 0.2171 | 0.2466 | 0.1697 | 0.1928 | 0.264 |
| J | 21 | 22 | 22 | 22 | 23 | 23 |
| Hansen-df | 7 | 7 | 7 | 7 | 7 | 7 |
| Hansen-p | 0.5293 | 0.1519 | 0.1314 | 0.209 | 0.0009 | 0.0098 |

The table represents different Sys-GMM model estimations for the dependent variable *Loans*. All regressions include time dummies. N represents the number of observations available, N(g) represents the number of banks available, AR2-p represents the p-value of Arellano–Bond test for autocorrelation of second order; J represents the number of instruments; Hansen-df represents the degree of freedom for the Hansen statistic; Hansen-p represents the p-value of the Hansen statistic. Windmeijer-corrected, bank-clustered standard errors are given in italics. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. L.Equity = Equity lagged one year.

Table 5b

Undesired Effects on Loans (Estimates Upon Different Sub-Group of Banks)

| Variable | ALL | SZ 1 | SZ 2 | SZ 3 | SZ 4 | SZ 5 | SZ 6 | SZ 7 | SZ 8 | SZ 9 | SZ 10 | SQ 1 | SQ 2 | SQ 3 | SQ 4 |
|-----------------|---------------------|---------------------|---------------------|--------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| L.Loans | 0.9949*** 0.065 | 0.9597*** 0.120 | 0.3815 0.448 | 1.1937*** 0.125 | 0.9255*** 0.188 | 1.0291*** 0.112 | 1.0925*** 0.105 | 1.1024*** 0.187 | 0.9683*** 0.079 | 0.9943*** 0.095 | 0.8730*** 0.075 | 1.0084*** 0.137 | 1.0291*** 0.112 | 1.0925*** 0.105 | 1.0437*** 0.114 |
| Total Assets | 0.0173 0.037 | 1.109 0.949 | 2.8555 3.745 | 0.1561 1.842 | -0.084 0.824 | -0.341 0.446 | -0.1152 0.301 | -0.2215 0.326 | -0.6131 0.503 | -0.4031 0.534 | -0.6991 0.524 | -0.1497 0.226 | -0.341 0.446 | -0.1152 0.301 | -0.0056 0.227 |
| Equity | -0.1906*** 0.065 | 0.1843* 0.095 | -0.2553** 0.104 | -0.2874 0.349 | -0.1044 0.101 | -0.3216** 0.157 | -0.0575 0.110 | -0.1551* 0.093 | 0.3238* 0.183 | 0.5436** 0.240 | 0.30182*** 0.939 | -0.1360* 0.080 | -0.3216** 0.157 | -0.0575 0.110 | -0.017 0.087 |
| L.Equity | 0.1899** 0.081 | -0.1195 0.099 | -0.0289 0.151 | 0.4102 0.396 | 0.0401 0.143 | 0.3371 0.206 | 0.1178 0.116 | 0.1953* 0.106 | -0.3619** 0.166 | -0.5151** 0.232 | -2.3402*** 0.861 | 0.1298 0.110 | 0.3371 0.206 | 0.1178 0.116 | 0.0246 0.082 |
| NPL System | -0.3278*** 0.028 | 1.0034 1.040 | 0.3868 0.809 | -0.4476** 0.203 | -0.3747** 0.167 | -0.6784*** 0.133 | -0.4740*** 0.087 | -0.0705 0.159 | -0.1124 0.105 | -0.1341 0.089 | 0.2162 0.277 | -0.4375*** 0.114 | -0.6784*** 0.133 | -0.4740*** 0.087 | -0.1051 0.065 |
| Government Debt | 0.0237*** 0.008 | -0.0365 0.103 | -0.0948 0.151 | 0.0431 0.029 | 0.0425** 0.018 | 0.0577*** 0.009 | 0.0165 0.016 | -0.027 0.062 | 0.019 0.026 | 0.0086 0.010 | 0.0226 0.061 | 0.0501*** 0.016 | 0.0577*** 0.009 | 0.0165 0.016 | -0.004 0.027 |
| GDP Growth | 0.0485 0.061 | -0.0632 1.213 | -1.3306*** 0.482 | 0.1538 0.384 | -0.0575 0.155 | -0.0684 0.118 | 0.0887 0.119 | 0.2507** 0.117 | -0.0935 0.174 | -0.1038 0.194 | -0.0138 0.221 | -0.0138 0.151 | -0.1257 0.118 | -0.0684 0.119 | 0.1253 0.090 |
| Capital System | -0.0232 0.101 | 1.2078 1.455 | -0.7753 0.687 | 0.0592 0.174 | 0.1232 0.214 | -0.0547 0.208 | -0.157 0.130 | -0.0833 0.164 | 0.1259 0.095 | 0.02 0.084 | -0.1705 0.226 | 0.0212 0.122 | -0.0547 0.208 | -0.157 0.130 | 0.0029 0.060 |
| Assets Growth | -0.0491*** 0.009 | 0.0399 0.053 | -0.0274 0.028 | -0.0813 0.095 | -0.0128 0.016 | -0.0364** 0.017 | -0.0549*** 0.013 | -0.0972*** 0.016 | -0.1114*** 0.028 | -0.0337 0.022 | -0.0466 0.030 | -0.0199 0.017 | -0.0364** 0.017 | -0.0549*** 0.013 | -0.0889*** 0.013 |
| Dummy 2009 | 0.3446 0.470 | 2.8716 6.463 | -8.7470*** 2.577 | 0.7974 2.535 | -0.4285 0.991 | -0.0891 0.920 | 0.8695 0.913 | 1.9283 1.187 | -2.3520** 0.931 | -2.8159*** 0.990 | -3.9849** 1.943 | -0.9885 0.928 | -0.0891 0.920 | 0.8695 0.913 | 0.2263 0.694 |
| Dummy 2010 | 0.9781*** 0.212 | 4.9296 7.175 | 2.2007 1.801 | 1.4472 1.088 | 1.1748** 0.537 | 1.3332*** 0.330 | 0.4456 0.429 | 0.4456 0.719 | -1.0818 0.733 | -1.6063** 0.744 | -2.2890** 1.146 | 1.5734*** 0.503 | 1.6749*** 0.330 | 1.3332*** 0.429 | -0.2483 0.364 |
| Dummy 2011 | 0.5948*** 0.207 | -0.5504 7.707 | 1.9403 1.543 | 0.721 1.045 | 0.9028 0.596 | 1.3955*** 0.309 | 0.7653** 0.380 | 0.3767 0.816 | -1.6642** 0.773 | -1.7131** 0.718 | -4.2069*** 1.009 | 1.1656*** 0.435 | 1.3955*** 0.309 | 0.7653** 0.380 | -0.5751 0.427 |
| Dummy 2012 | 0.0142 0.301 | 2.6038 6.312 | -2.5829* 1.554 | 0.663 1.241 | 0.0521 0.851 | 0.0764 0.443 | 0.482 0.550 | 0.4475 0.809 | -2.0101** 0.801 | -2.4492*** 0.636 | -4.3061*** 1.284 | 0.0509 0.566 | 0.0764 0.443 | 0.482 0.550 | -0.5985 0.445 |
| Dummy 2013 | 0.8802** 0.418 | -4.4128 5.712 | -2.3072 2.475 | 1.4503 0.941 | 0.742 1.206 | 1.3466* 0.739 | 1.3091** 0.665 | 1.1649 1.284 | -1.6022** 0.775 | -1.2909* 1.170 | -2.3063** 1.170 | 0.9697 0.780 | 1.3466* 0.739 | 1.3091** 0.665 | 0.1012 0.655 |
| Constant | -0.4865 3.658 | -18.9360** 9.225 | 15.5794 25.932 | -16.0142 26.993 | 3.1387 9.447 | 0.5294 10.373 | -3.5198 5.293 | -0.5613 7.403 | 12.7308 9.013 | 8.8718 15.066 | 19.5783 12.394 | -1.2177 7.815 | 0.5294 10.373 | -3.5198 5.293 | -1.2024 8.628 |

| Variable | ALL | SZ 1 | SZ 2 | SZ 3 | SZ 4 | SZ 5 | SZ 6 | SZ 7 | SZ 8 | SZ 9 | SZ 10 | SQ 1 | SQ 2 | SQ 3 | SQ 4 |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| N | 22603 | 61 | 638 | 995 | 3208 | 5823 | 6112 | 3387 | 1201 | 921 | 257 | 4902 | 5823 | 6112 | 5766 |
| N(g) | 4564 | 25 | 155 | 216 | 679 | 1161 | 1175 | 679 | 236 | 190 | 48 | 1075 | 1161 | 1175 | 1153 |
| AR2-p | 0.2171 | 0.2847 | 0.6984 | 0.3259 | 0.6966 | 0.3206 | 0.1903 | 0.9917 | 0.5614 | 0.8742 | 0.6775 | 0.6056 | 0.3206 | 0.1903 | 0.9331 |
| J | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| Hansen-df | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| Hansen-p | 0.1519 | 0.5588 | 0.2217 | 0.1561 | 0.3263 | 0.4203 | 0.6999 | 0.7073 | 0.1713 | 0.5156 | 0.0123 | 0.5589 | 0.4203 | 0.6999 | 0.4637 |

The table represents different Sys-GMM model estimations for the dependent variable *Loans* upon different groups of banks. All regressions include time dummies. N represents the number of observations available, N(g) represents the number of banks available, AR2-p represents the p-value of Arellano-Bond test for autocorrelation of second order, J represents the number of instruments; Hansen-df represents the degree of freedom for the Hansen statistic; Hansen-p represents the p-value of the Hansen statistic. Windmeijer-corrected, bank-clustered standard errors are given in italics. ***, **, * and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. L.Equity = Equity lagged one year; L.Loans = *Loans* lagged one year.

Table 5c

Undesired Effects on Loan Impairments (Different Estimates of Dynamic Panel Model Upon the Total Sample)

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 |
|-------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| L.Loan Impairment | 0.8070*** <i>0.149</i> | 0.7953*** <i>0.151</i> | 0.8039*** <i>0.147</i> | 0.8030*** <i>0.146</i> | 0.7939*** <i>0.150</i> | 0.7945*** <i>0.150</i> |
| Loans | 0.014 <i>0.009</i> | 0.0115 <i>0.010</i> | 0.0163* <i>0.009</i> | 0.0206*** <i>0.008</i> | 0.0145 <i>0.009</i> | 0.0164* <i>0.009</i> |
| Total Assets | -0.0209 <i>0.098</i> | -0.0124 <i>0.094</i> | -0.0076 <i>0.095</i> | -0.002 <i>0.094</i> | 0.002 <i>0.093</i> | 0.0033 <i>0.093</i> |
| Equity | 0.0135 <i>0.039</i> | 0.009 <i>0.041</i> | 0.0214 <i>0.042</i> | 0.022 <i>0.042</i> | 0.0173 <i>0.044</i> | 0.0177 <i>0.044</i> |
| Net Income | -0.0012* <i>0.001</i> | -0.0012* <i>0.001</i> | -0.0013* <i>0.001</i> | -0.0013* <i>0.001</i> | -0.0013* <i>0.001</i> | -0.0013* <i>0.001</i> |
| NPL System | -0.2417 <i>0.710</i> | -0.1163 <i>0.677</i> | -0.1062 <i>0.694</i> | -0.1058 <i>0.694</i> | -0.0027 <i>0.662</i> | -0.014 <i>0.665</i> |
| Government Debt | -0.01 <i>0.018</i> | -0.0143 <i>0.017</i> | -0.0142 <i>0.017</i> | -0.0141 <i>0.017</i> | -0.0176 <i>0.017</i> | -0.0172 <i>0.017</i> |
| GDP Growth | -3.7644 <i>4.573</i> | -3.0583 <i>4.342</i> | -2.9102 <i>4.448</i> | -2.8768 <i>4.437</i> | -2.3451 <i>4.239</i> | -2.3973 <i>4.260</i> |
| Dummy 2009 | -29.5562 <i>35.720</i> | -24.1177 <i>33.916</i> | -22.89 <i>34.733</i> | -22.6695 <i>34.666</i> | -18.562 <i>33.138</i> | -18.9778 <i>33.303</i> |
| Dummy 2010 | -0.6038 <i>1.780</i> | -0.9239 <i>1.716</i> | -0.8111 <i>1.791</i> | -0.8589 <i>1.773</i> | -1.1334 <i>1.663</i> | -1.1192 <i>1.673</i> |
| Dummy 2011 | -3.0804*** <i>0.682</i> | -3.2164*** <i>0.665</i> | -3.1787*** <i>0.679</i> | -3.2239*** <i>0.663</i> | -3.3350*** <i>0.620</i> | -3.3379*** <i>0.622</i> |
| Dummy 2012 | -8.3409 <i>9.484</i> | -6.9567 <i>8.993</i> | -6.5851 <i>9.209</i> | -6.5628 <i>9.206</i> | -5.5078 <i>8.799</i> | -5.6256 <i>8.848</i> |
| Dummy 2013 | -8.6055 <i>9.104</i> | -7.3534 <i>8.658</i> | -6.9199 <i>8.837</i> | -6.9076 <i>8.840</i> | -5.9412 <i>8.469</i> | -6.0521 <i>8.515</i> |
| Assets Growth | | -0.0328** <i>0.014</i> | | | -0.0312** <i>0.014</i> | -0.0289** <i>0.013</i> |
| Loans Growth | | | -0.0152** <i>0.006</i> | | -0.0068* <i>0.004</i> | |
| LoansP Growth | | | | -0.0444** <i>0.019</i> | | -0.0185 <i>0.013</i> |
| Constant | 11.267 <i>13.531</i> | 9.9392 <i>13.036</i> | 8.9016 <i>13.192</i> | 8.5923 <i>13.099</i> | 7.7765 <i>12.793</i> | 7.7892 <i>12.804</i> |
| N | 23602 | 23549 | 23379 | 23379 | 23376 | 23376 |
| N(g) | 4585 | 4581 | 4552 | 4552 | 4552 | 4552 |
| AR2-p | 0.2326 | 0.1564 | 0.1567 | 0.1511 | 0.1143 | 0.1167 |
| J | 23 | 24 | 24 | 24 | 25 | 25 |
| Hansen-df | 9 | 9 | 9 | 9 | 9 | 9 |
| Hansen-p | 0.4792 | 0.4738 | 0.4748 | 0.4641 | 0.468 | 0.4641 |

The table presents various Sys-GMM model estimations with dependent variable *Loan Impairment*. All regressions include time dummies. N is the number of observations available, N(g) is the number of banks available, AR2-p is the p-value of Arellano–Bond test for autocorrelation of second order; J is the number of instruments; Hansen-df is the degree of freedom for the Hansen statistic; Hansen-p is the p-value of the Hansen statistic. Windmeijer-corrected, bank-clustered standard errors are given in italics. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. L.Loan Impairment=Loan Impairment lagged one year.

Table 5d

Undesired Effects on Loan Impairments (Estimates Upon Different Sub-Group of Banks)

| Variable | ALL | SZ 1 | SZ 2 | SZ 3 | SZ 4 | SZ 5 | SZ 6 | SZ 7 | SZ 8 | SZ 9 | SZ 10 | SQ 1 | SQ 2 | SQ 3 | SQ 4 |
|-------------------|---------------------|---------------------|---------------------|--------------------|---------------------|---------------------|--------------------|--------------------|--------------------|--------------------|---------------------|--------------------|---------------------|--------------------|---------------------|
| L.Loan Impairment | 0.8039*** 0.147 | 1.6447*** 0.251 | 0.3418** 0.144 | 1.7735** 0.773 | 0.4941*** 0.111 | 0.3618* 0.188 | 0.7913 0.494 | 0.5003*** 0.130 | 0.161 0.144 | 0.5737*** 0.127 | 0.5759*** 0.056 | 0.2422 0.327 | 0.3618* 0.188 | 0.7913 0.494 | 0.3691*** 0.127 |
| Loans | 0.0163* 0.009 | 0.0278 0.024 | -0.0231 0.145 | 0.0406 0.075 | 0.004 0.019 | 0.0111 0.017 | 0.0382*** 0.015 | 0.0429*** 0.014 | 0.0451*** 0.011 | 0.0480*** 0.017 | 0.0735** 0.032 | 0.0184 0.026 | 0.0111 0.017 | 0.0382*** 0.015 | 0.0434*** 0.011 |
| Total Assets | -0.0076 0.095 | 0.0339 1.478 | -0.7889 2.843 | -12.4264 10.388 | 3.7930** 1.887 | -0.5866 0.808 | -1.3771 1.054 | 0.2102 0.392 | 0.0323 0.802 | -0.1357 0.334 | 0.4052 0.358 | -0.387 1.470 | -0.5866 0.808 | -1.3771 1.054 | 0.1567 0.175 |
| Equity | 0.0214 0.042 | 0.0248 0.070 | 0.1936 0.126 | -0.0184 0.207 | 0.0224 0.072 | -0.0663 0.086 | 0.0205 0.028 | -0.0171 0.043 | 0.0169 0.071 | 0.003 0.056 | -0.4187 0.264 | 0.1590** 0.080 | -0.0663 0.086 | 0.0205 0.028 | 0.0159 0.047 |
| Net Income | -0.0013* 0.001 | -0.1093*** 0.006 | -0.0246 0.037 | -0.1181 0.080 | -0.0003* 0.000 | -0.0007 0.001 | -0.0089 0.001 | -0.0006 0.001 | -0.0027* 0.002 | -0.0012 0.001 | -0.0050* 0.003 | -0.0015 0.002 | -0.0007 0.001 | -0.0089 0.007 | -0.0011 0.001 |
| NPL System | -0.1062 0.694 | -0.725 1.185 | -1.0434 3.089 | 0.5796 2.977 | -0.8764 0.871 | -0.025 0.616 | 1.1860* 0.700 | 0.9133** 0.365 | 0.7525*** 0.247 | 0.3628 0.292 | 0.8231*** 0.239 | 0.5355 2.112 | -0.025 0.616 | 1.1860* 0.700 | 0.7350*** 0.222 |
| Government Debt | -0.0142 0.017 | 0.0086 0.099 | 0.0313 0.246 | 0.0635 0.246 | -0.0166 0.024 | -0.0670*** 0.025 | -0.0718** 0.029 | -0.0507** 0.020 | -0.0348* 0.020 | 0.0009 0.017 | -0.0617** 0.024 | -0.0669 0.094 | -0.0670*** 0.025 | -0.0718** 0.029 | -0.0393*** 0.012 |
| GDP Growth | -2.9102 4.448 | -1.9748 1.397 | -5.6899 14.265 | 3.7345 10.988 | -7.6675* 4.370 | -4.4192 2.991 | 4.0365 5.403 | 2.539 3.283 | 1.1463 2.395 | 0.7663 0.479 | 1.1668 0.840 | -1.037 9.559 | -4.4192 2.991 | 4.0365 5.403 | 0.5794 2.514 |
| Loans Growth | -0.0152** 0.006 | -0.0139 0.020 | -0.0209 0.025 | 0.0278 0.054 | -0.0147* 0.009 | -0.0165 0.010 | -0.0065 0.010 | -0.0106* 0.006 | -0.0096 0.015 | 0.0005 0.005 | 0.0152* 0.008 | -0.0144** 0.007 | -0.0165 0.010 | -0.0065 0.010 | -0.01 0.008 |
| Dummy 2009 | -2.89 34.733 | -11.8106* 6.644 | -44.3174 107.524 | 29.3694 91.347 | -57.1064* 32.370 | -31.4004 21.998 | 31.2958 41.339 | 21.7567 29.869 | 10.3226 17.411 | 8.1452** 3.820 | 9.0437* 5.086 | -9.0834 72.339 | -31.4004 21.998 | 31.2958 41.339 | 5.2093 21.796 |
| Dummy 2010 | -0.8111 1.791 | 1.10425* 6.509 | -2.9557 8.985 | -6.7351 4.215 | 6.1286 4.128 | 3.6456 2.419 | -4.0918 4.272 | -0.9143 2.787 | 0.538 1.169 | 0.3843 0.742 | -1.7271*** 0.641 | -1.3951 7.200 | 3.6456 2.419 | -4.0918 4.272 | -1.0737 2.049 |
| Dummy 2011 | -3.1787*** 0.679 | 6.7966 5.871 | -7.3086 6.155 | -4.0311 4.404 | 2.3113 2.702 | 0.1846 1.447 | -5.4145** 1.447 | -3.5905 3.042 | -0.2045 1.128 | 0.5073 0.636 | -0.9944** 0.480 | -3.2511 4.201 | 0.1846 1.447 | -5.4145** 1.447 | -2.9774 2.280 |
| Dummy 2012 | -6.5851 9.209 | 0.7848 2.430 | -15.4068 28.726 | 7.3263 28.306 | -15.5391* 8.031 | -7.8818 5.172 | 8.3842 11.727 | 5.7352 9.799 | 2.7928 5.295 | 3.6827*** 1.409 | 1.5884 1.390 | -5.1338 17.750 | -7.8818 5.172 | 8.3842 11.727 | 0.6017 7.519 |
| Dummy 2013 | -6.9199 8.837 | 1.2275 3.289 | -14.2363 28.604 | 12.9037 28.612 | -15.2242** 7.664 | -7.7626 4.983 | 7.2415 10.865 | 4.7048 9.599 | 2.506 4.759 | 0.2014 1.326 | 1.2673 1.473 | -4.5174 17.272 | -7.7626 4.983 | 7.2415 10.865 | -0.2895 7.050 |
| Constant | 8.9016 13.192 | -0.3979 12.812 | 26.6429 37.902 | 119.0371 96.115 | -23.2619 14.898 | 23.5236*** 8.758 | 10.9654 7.071 | -8.5565 14.686 | -2.9981 17.276 | -1.5403 5.748 | -8.1428 7.853 | 11.2804 8.950 | 23.5236*** 8.758 | 10.9654 7.071 | -2.724 10.550 |

| Variable | ALL | SZ 1 | SZ 2 | SZ 3 | SZ 4 | SZ 5 | SZ 6 | SZ 7 | SZ 8 | SZ 9 | SZ 10 | SQ 1 | SQ 2 | SQ 3 | SQ 4 |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| N | 23379 | 48 | 595 | 1003 | 3336 | 6191 | 6293 | 3478 | 1221 | 950 | 264 | 4982 | 6191 | 6293 | 5913 |
| N(g) | 4552 | 19 | 145 | 213 | 677 | 1167 | 1181 | 678 | 236 | 188 | 48 | 1054 | 1167 | 1181 | 1150 |
| AR2-p | 0.1567 | 0.4965 | 0.3711 | 0.6004 | 0.2992 | 0.8594 | 0.8154 | 0.8225 | 0.73 | 0.0695 | 0.8517 | 0.8582 | 0.8594 | 0.8154 | 0.6777 |
| J | 24 | 23 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| Hansen-df | 9 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Hansen-p | 0.4748 | 0.9343 | 0.2733 | 0.7731 | 0.2006 | 0.2899 | 0.1382 | 0.1698 | 0.0044 | 0.0386 | 0.0371 | 0.6286 | 0.2899 | 0.1382 | 0.0043 |

The table represents different Sys-GMM model estimations for the dependent variable *Loan Impairment* upon different groups of banks. All regressions include time dummies. N represents the number of observations available, N(g) represents the number of banks available, AR2-p represents the p-value of Arellano-Bond test for autocorrelation of second order; J represents the number of instruments; Hansen-df represents the degree of freedom for the Hansen statistic; Hansen-p represents the p-value of the Hansen statistic. Windmeijer-corrected, bankclustered standard errors are given in italics. ***, **, * and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. L Loan Impairment=Loan Impairment lagged one year.

4.2.3 Evidence of Spillover Effects of Prudential Regulation

Previous evidence suggests that a potential “adverse” interaction could be at play across European banks, because of the different behavior highlighted at various banks’ sub-groups. In particular, we hypothesize that a more pronounced effect could be discovered if considering the performance of banks operating with similar categories of customers. Lacking any data on the effective market segmentation in each country, we use the market share of each bank and of each banks’ sub-group as a proxy of their market power, supposing that size is a quite logical reason for common behavior.

In particular, here we consider the effects that sub-groups SQ3 and SQ2 may have suffered because of bigger banks’ strategy, which generally cut their customer loans. We view market share of the biggest banks as a proxy for their ability to affect the other banks (Goddard et al., 2007), so that we hypothesize – at least at this stage of the analysis – a causal direction from larger to smaller banks.

Table 6a and 6b report the evidence on the spillover effects on respectively SQ3 and SQ2 banks in terms on variation of loans. In particular, for SQ3 banks we notice a potential spillover effect, especially when considering the reduction in terms of total assets of the whole banking system in each country. On the opposite, the performance achieved by SQ4 banks doesn’t seem to generate specific effects – except in some specifications when considering the reduction of Loans of larger banks (Table 6a). Similarly, even considering the performance of SQ2 banks, we detect no particular effect deriving from SQ4 banks, whilst we may see a common feature – instead of a spillover effect – if considering the performance of SQ3 banks. Against this, for the whole banking system we detect a little spillover effect when considering the reduction in term of total assets, even if mitigated by the increase of loans. The overall results from these two tables suggest that the hypothesized spillover effects in terms of transferring of market share don’t seem noticeable.

Tables 6c and 6d report the evidence on the deterioration of asset quality for SQ3 and SQ2 banks respectively. To perform this analysis, we consider that a potential deterioration of credit quality which could be ascribed to the reduction of loans from larger banks needs a proper temporal lag to materialize. In particular, here we consider a two-year lag as an adequate compromise between the period that a potential bad loan in average needs to deteriorate and the length of our dataset.

Table 6c reports the estimates for loan impairments of SQ3 banks, for which we may consider the effect that both SQ4 banks and the whole sample can determine on the asset quality of SQ3 banks. In particular, by considering the lag-2 variation of credit available from larger banks and the whole system, we can argue that medium sized banks suffer a worsening of their assets quality. In other words, it should be argued that smaller banks, not pressed by supervision to increase their level of capital, ultimately resulted chastened from that regulatory asymmetry, with larger banks more prone to reduce loans exposure because of the necessity to save capital absorption, whilst the former indulged in more relaxed credit policies determining a deterioration of their portfolio of loans.

Similarly, SQ2 banks highlight strong evidence confirming our hypothesis (Table 6d). In particular, SQ2 banks suffer a deterioration of loans quality, when bigger banks – SQ4, SQ3, but also the whole sample – reduce customer loans. As this evidence seems to be significant when considering the reduction in term of loans, rather than of total assets, we consider it as a possible confirmation of our hypothesis about the adverse selection generated by bigger banks on smaller banks.

Table 6a

Spillover Effects on Loans (Different Estimates of Dynamic Panel Model Upon Size Q3 Banks)

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 |
|-----------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| L.Loans | 1.0850*** 0.103 | 1.0884*** 0.106 | 1.0800*** 0.104 | 1.0831*** 0.103 | 1.0951*** 0.106 | 1.0804*** 0.102 | 1.0851*** 0.103 | 1.0870*** 0.106 | 1.0789*** 0.103 | 1.0853*** 0.103 | 1.0853*** 0.105 | 1.0933*** 0.105 |
| Size | -0.1099 0.296 | -0.1093 0.296 | -0.1126 0.292 | -0.1111 0.292 | -0.0964 0.301 | -0.1056 0.292 | -0.1033 0.296 | -0.098 0.294 | -0.0995 0.290 | -0.0763 0.294 | -0.0712 0.289 | -0.0305 0.295 |
| Equity | -0.0591 0.110 | -0.0577 0.111 | -0.0634 0.110 | -0.0601 0.110 | -0.0565 0.110 | -0.0655 0.110 | -0.0615 0.110 | -0.0619 0.108 | -0.0645 0.110 | -0.0601 0.110 | -0.0694 0.108 | -0.0628 0.107 |
| L.Equity | 0.1159 0.115 | 0.1165 0.115 | 0.1176 0.115 | 0.1156 0.115 | 0.1197 0.115 | 0.1188 0.115 | 0.1162 0.115 | 0.1198 0.113 | 0.1169 0.115 | 0.115 0.115 | 0.1249 0.113 | 0.121 0.112 |
| NPL System | -0.4697*** 0.085 | -0.4691*** 0.084 | -0.4617*** 0.086 | -0.4644*** 0.090 | -0.4403*** 0.084 | -0.4520*** 0.084 | -0.4474*** 0.089 | -0.4332*** 0.085 | -0.4518*** 0.083 | -0.4538*** 0.090 | -0.3813*** 0.080 | -0.3624*** 0.090 |
| Government Debt | 0.0174 0.016 | 0.0171 0.016 | 0.0179 0.015 | 0.0176 0.015 | 0.0127 0.017 | 0.0183 0.015 | 0.017 0.015 | 0.0114 0.016 | 0.0186 0.015 | 0.0173 0.015 | 0.0102 0.016 | 0.007 0.016 |
| GDP Growth | 0.0862 0.118 | 0.0884 0.120 | 0.0752 0.121 | 0.0864 0.117 | 0.0519 0.113 | 0.123 0.115 | 0.1307 0.109 | 0.0265 0.118 | 0.138 0.123 | 0.1729 0.111 | 0.0987 0.120 | 0.1429 0.113 |
| Capital System | -0.1484 0.128 | -0.154 0.134 | -0.1465 0.126 | -0.148 0.124 | -0.1344 0.127 | -0.1601 0.125 | -0.1736 0.120 | -0.1036 0.136 | -0.1594 0.127 | -0.1889 0.123 | -0.1187 0.134 | -0.1616 0.132 |
| Assets Growth | -0.0548*** 0.013 | -0.0546*** 0.013 | -0.0552*** 0.013 | -0.0550*** 0.013 | -0.0523*** 0.013 | -0.0561*** 0.013 | -0.0564*** 0.013 | -0.0521*** 0.013 | -0.0560*** 0.013 | -0.0564*** 0.013 | -0.0526*** 0.012 | -0.0530*** 0.012 |
| Dummy 2009 | 0.8401 0.906 | 0.7598 0.778 | 0.9474 0.868 | 0.9192 0.832 | 0.2173 0.823 | 1.3076 0.866 | 1.4278* 0.779 | 0.4206 0.764 | 1.3155 0.873 | 1.4379* 0.782 | 0.8525 0.763 | 1.0083 0.732 |
| Dummy 2010 | 1.3121*** 0.427 | 1.2364*** 0.418 | 1.5028*** 0.409 | 1.3785*** 0.383 | 0.9939*** 0.427 | 1.3010*** 0.424 | 1.3767*** 0.417 | 1.2918*** 0.411 | 1.1400*** 0.402 | 0.9182*** 0.397 | 0.7532* 0.421 | 0.4561 0.418 |
| Dummy 2011 | 0.7534** 0.380 | 0.6806* 0.361 | 0.8868** 0.360 | 0.8201** 0.341 | 0.4818 0.386 | 0.8274** 0.375 | 0.8787** 0.362 | 0.7837** 0.356 | 0.7350** 0.356 | 0.4964 0.357 | 0.5521 0.358 | 0.2267 0.369 |
| Dummy 2012 | 0.4564 0.547 | 0.3781 0.425 | 0.6086 0.492 | 0.5425 0.444 | 0.0542 0.505 | 0.7343 0.524 | 0.8189* 0.458 | 0.3418 0.423 | 0.6667 0.493 | 0.5317 0.446 | 0.4418 0.417 | 0.2752 0.413 |
| Dummy 2013 | 1.2717* 0.663 | 1.1420** 0.465 | 1.4835** 0.592 | 1.3772*** 0.528 | 0.6455 0.600 | 1.5906** 0.640 | 1.6892*** 0.556 | 1.1309** 0.464 | 1.4819** 0.589 | 1.3014** 0.533 | 1.0661** 0.459 | 0.7905* 0.472 |
| AGMS Size Q4 | | -0.0152 0.044 | | | | | | 0.0872 0.056 | | | 0.0806 0.058 | |

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 |
|---------------|-------------------------|-------------------------|-------------------------|----------------------------|---------------------------|--------------------------|-------------------------|----------------------------|---------------------------|---------------------------|----------------------------|----------------------------|
| LGMS Size Q4 | | | 0.0321 <i>0.024</i> | | | | | | -0.0253 <i>0.033</i> | | -0.0439 <i>0.032</i> | |
| LPGMS Size Q4 | | | | 0.0266 <i>0.059</i> | | | | | | -0.2024** <i>0.079</i> | | -0.2671*** <i>0.085</i> |
| AGMS Total | | | | -0.1094*** <i>0.038</i> | | | | -0.1609*** <i>0.049</i> | | | -0.2332*** <i>0.055</i> | -0.2644*** <i>0.057</i> |
| LGMS Total | | | | | 0.0786*** <i>0.023</i> | | | | 0.0987*** <i>0.032</i> | | 0.1801*** <i>0.038</i> | |
| LPGMS Total | | | | | | 0.1459** <i>0.063</i> | | | | 0.3194*** <i>0.076</i> | | 0.5435*** <i>0.085</i> |
| Constant | -3.2276 <i>5.204</i> | -3.2766 <i>5.177</i> | -3.2175 <i>5.715</i> | -3.2564 <i>5.066</i> | -2.9227 <i>5.280</i> | -3.7199 <i>5.094</i> | -4.0054 <i>5.025</i> | -2.7526 <i>5.202</i> | -3.6813 <i>5.124</i> | -4.1296 <i>5.059</i> | -3.4643 <i>5.144</i> | -4.0931 <i>5.173</i> |
| N | 6112 | 6112 | 6112 | 6112 | 6112 | 6112 | 6112 | 6112 | 6112 | 6112 | 6112 | 6112 |
| N(g) | 1175 | 1175 | 1175 | 1175 | 1175 | 1175 | 1175 | 1175 | 1175 | 1175 | 1175 | 1175 |
| AR2-p | 0.1894 | 0.1938 | 0.1956 | 0.1897 | 0.191 | 0.1697 | 0.1677 | 0.2121 | 0.1704 | 0.1622 | 0.1794 | 0.1753 |
| J | 25 | 26 | 26 | 26 | 26 | 26 | 26 | 27 | 27 | 27 | 29 | 29 |
| Hansen-df | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Hansen-p | 0.827 | 0.8513 | 0.7983 | 0.8251 | 0.8995 | 0.7833 | 0.7933 | 0.8809 | 0.7954 | 0.7299 | 0.9004 | 0.9047 |

The table presents different Sys-GMM model estimations for the dependent variable $L_{2022,t}$ upon Size Q3 Banks. All regressions include time dummies. The variables AGMS Size Q4/Total is the average growth of Total Assets achieved by the Size Q4 Banks/Total Sample. The variables LGMS Size Q4/Total is the average growth of Loans achieved by the Size Q4 Banks/Total Sample. The variables LPGMS Size Q4/Total represents the average growth of Loans/Total Assets achieved by the Size Q4 Banks/Total Sample. N represents the number of observations available, N(g) represents the number of banks available, AR2-p represents the p-value of Arellano-Bond test for autocorrelation of second order, J represents the number of instruments; Hansen-df represents the degree of freedom for the Hansen statistic; Hansen-p represents the p-value of the Hansen statistic. Windmeijer-corrected, bank-clustered standard errors are given in italics. ***, **, * and * indicate statistical significance at the 1 %, 5%, and 10% levels respectively. L:Equity = Equity lagged one year; L:Loans = Loans lagged one year.

Table 6b

Spillover Effects on Loans (Different Estimates of Dynamic Panel Model Upon Size Q2 Banks)

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 | Mod 13 | Mod 14 | Mod 15 | |
|-----------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-----------------|
| L.Loans | 1.0291*** 0.112 | 1.0281*** 0.111 | 1.0277*** 0.112 | 1.0259*** 0.112 | 1.0284*** 0.112 | 1.0294*** 0.111 | 1.0313*** 0.111 | 1.0579*** 0.106 | 1.0190*** 0.113 | 1.0249*** 0.114 | 1.0282*** 0.110 | 1.0215*** 0.112 | 1.0283*** 0.111 | 1.0252*** 0.111 | 1.0376*** 0.113 | |
| Size | -0.341 0.446 | -0.3476 0.459 | -0.3695 0.451 | -0.3768 0.453 | -0.3396 0.445 | -0.324 0.447 | -0.3208 0.441 | -0.2896 0.446 | -0.3323 0.440 | -0.318 0.441 | -0.3434 0.460 | -0.2962 0.451 | -0.2733 0.450 | -0.2514 0.457 | -0.2514 0.457 | -0.211 0.457 |
| Equity | -0.3216** 0.157 | -0.3221** 0.157 | -0.3237** 0.157 | -0.3250** 0.156 | -0.3219** 0.157 | -0.3273** 0.158 | -0.3277** 0.157 | -0.3172** 0.161 | -0.3321** 0.156 | -0.3315** 0.155 | -0.3220** 0.158 | -0.3302** 0.156 | -0.3306** 0.155 | -0.3264** 0.158 | -0.3243** 0.157 | |
| L.Equity | 0.3371 0.206 | 0.3368* 0.204 | 0.3375* 0.205 | 0.3359 0.205 | 0.3368 0.206 | 0.3401* 0.206 | 0.3401* 0.205 | 0.3484* 0.206 | 0.3380* 0.204 | 0.3382* 0.205 | 0.3365 0.205 | 0.3381* 0.204 | 0.3402* 0.204 | 0.3366 0.206 | 0.3394 0.207 | |
| NPL System | -0.6784*** 0.133 | -0.6789*** 0.123 | -0.6725*** 0.135 | -0.6550*** 0.145 | -0.6822*** 0.131 | -0.6764*** 0.133 | -0.6740*** 0.134 | -0.7091*** 0.124 | -0.6528*** 0.134 | -0.6555*** 0.138 | -0.6808*** 0.127 | -0.6583*** 0.134 | -0.6752*** 0.142 | -0.6086*** 0.128 | -0.6101*** 0.145 | |
| Government Debt | 0.0577*** 0.009 | 0.0578*** 0.009 | 0.0574*** 0.009 | 0.0563*** 0.009 | 0.0582*** 0.009 | 0.0600*** 0.009 | 0.0602*** 0.009 | 0.0588*** 0.009 | 0.0582*** 0.008 | 0.0593*** 0.008 | 0.0580*** 0.009 | 0.0584*** 0.008 | 0.0613*** 0.009 | 0.0540*** 0.009 | 0.0554*** 0.009 | |
| GDP Growth | -0.0684 0.118 | -0.0688 0.117 | -0.0799 0.124 | -0.0658 0.117 | -0.0696 0.119 | -0.0423 0.115 | -0.0233 0.110 | -0.0421 0.114 | -0.0239 0.113 | -0.0077 0.110 | -0.0729 0.124 | -0.0049 0.118 | 0.008 0.109 | -0.0202 0.116 | -0.0112 0.116 | |
| Capital System | -0.0547 0.208 | -0.0519 0.213 | -0.0548 0.207 | -0.0537 0.206 | -0.055 0.207 | -0.063 0.205 | -0.0629 0.205 | -0.1061 0.196 | -0.0557 0.208 | -0.0741 0.206 | -0.0519 0.216 | -0.0591 0.205 | -0.0806 0.204 | -0.0446 0.220 | -0.0761 0.218 | |
| Assets Growth | -0.0364** 0.017 | -0.0364** 0.017 | -0.0365** 0.017 | -0.0367** 0.017 | -0.0365** 0.017 | -0.0373** 0.017 | -0.0372** 0.017 | -0.0366** 0.017 | -0.0384** 0.017 | -0.0386** 0.017 | -0.0364** 0.017 | -0.0385** 0.017 | -0.0388** 0.017 | -0.0374** 0.017 | -0.0373** 0.017 | |
| Dummy 2009 | -0.0891 0.920 | -0.0656 0.791 | -0.0561 0.906 | 0.1317 0.834 | -0.0855 0.914 | 0.1158 0.882 | 0.3221 0.818 | 0.1121 0.853 | 0.426 0.867 | 0.5722 0.821 | -0.087 0.831 | 0.4604 0.868 | 0.5299 0.781 | 0.2694 0.777 | 0.2517 0.782 | |
| Dummy 2010 | 1.6749*** 0.330 | 1.6966*** 0.331 | 1.8107*** 0.332 | 1.8649*** 0.322 | 1.7070*** 0.343 | 1.6039*** 0.336 | 1.6536*** 0.334 | 1.6772*** 0.342 | 1.5784*** 0.332 | 1.6330*** 0.334 | 1.7253*** 0.347 | 1.4177*** 0.330 | 1.4263*** 0.326 | 1.2093*** 0.352 | 1.1382*** 0.381 | |
| Dummy 2011 | 1.3955*** 0.309 | 1.4154*** 0.282 | 1.4776*** 0.286 | 1.5895*** 0.277 | 1.4211*** 0.308 | 1.4344*** 0.303 | 1.5001*** 0.288 | 1.3974*** 0.308 | 1.4572*** 0.301 | 1.4900*** 0.296 | 1.4365*** 0.289 | 1.3674*** 0.285 | 1.3228*** 0.276 | 1.2406*** 0.291 | 1.0929*** 0.308 | |
| Dummy 2012 | 0.0764 0.443 | 0.0957 0.351 | 0.1141 0.424 | 0.284 0.367 | 0.0904 0.429 | 0.1809 0.419 | 0.2883 0.380 | 0.177 0.401 | 0.3557 0.409 | 0.4761 0.376 | 0.0929 0.376 | 0.3516 0.402 | 0.3679 0.348 | 0.1576 0.350 | 0.0877 0.367 | |
| Dummy 2013 | 1.3466** 0.739 | 1.3892*** 0.516 | 1.4624** 0.683 | 1.6627*** 0.603 | 1.3778** 0.715 | 1.5592*** 0.699 | 1.7274*** 0.621 | 1.4977** 0.671 | 1.7648*** 0.703 | 1.9216*** 0.649 | 1.3990*** 0.540 | 1.6829** 0.666 | 1.7602*** 0.569 | 1.4172*** 0.520 | 1.3400** 0.543 | |
| AGMS Size Q4 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | 0.0057 0.049 | |

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 | Mod 13 | Mod 14 | Mod 15 |
|------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------|--------------------------|---------------------------|---------------------------|--------------------------|-------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| LGMS Size Q4 | | 0.023 <i>0.026</i> | | | | | | | | | | -0.0264 <i>0.022</i> | | -0.0376 <i>0.028</i> | |
| LPGMS Size Q4 | | | 0.0831 <i>0.079</i> | | | | | | | | | | -0.0855 <i>0.067</i> | | -0.1075 <i>0.077</i> |
| AGMS Size Q3 | | | | 0.0057 <i>0.025</i> | | | | | | | 0.0098 <i>0.041</i> | | | 0.0602 <i>0.046</i> | 0.0653 <i>0.049</i> |
| LGMS Size Q3 | | | | | 0.0477* <i>0.025</i> | | | | | | | -0.0077 <i>0.032</i> | | -0.006 <i>0.032</i> | |
| LPGMS Size Q3 | | | | | | 0.1232** <i>0.056</i> | | | | | | | 0.0181 <i>0.061</i> | | 0.0014 <i>0.066</i> |
| AGMS Total | | | | | | | 0.0004 <i>0.050</i> | | | | -0.0124 <i>0.087</i> | | | -0.2005** <i>0.101</i> | -0.2463** <i>0.105</i> |
| LGMS Total | | | | | | | | 0.1095*** <i>0.036</i> | | | | 0.1279*** <i>0.044</i> | | 0.1171*** <i>0.047</i> | |
| LPGMS Total | | | | | | | | | 0.2119*** <i>0.074</i> | | | | 0.2506*** <i>0.076</i> | | 0.3696*** <i>0.091</i> |
| Constant | 0.5294 <i>10.373</i> | 0.6206 <i>10.350</i> | 0.8241 <i>10.440</i> | 0.8023 <i>10.370</i> | 0.4853 <i>10.309</i> | -0.2246 <i>10.315</i> | -0.7053 <i>10.029</i> | -1.7678 <i>9.830</i> | 0.0821 <i>10.328</i> | -0.6247 <i>10.252</i> | 0.5475 <i>10.411</i> | -0.4164 <i>10.413</i> | -1.3299 <i>10.180</i> | -0.608 <i>10.380</i> | -1.751 <i>10.383</i> |
| N | 5823 | 5823 | 5823 | 5823 | 5823 | 5823 | 5823 | 5823 | 5823 | 5823 | 5823 | 5823 | 5823 | 5823 | 5823 |
| N(g) | 1161 | 1161 | 1161 | 1161 | 1161 | 1161 | 1161 | 1161 | 1161 | 1161 | 1161 | 1161 | 1161 | 1161 | 1161 |
| AR2-p | 0.3206 | 0.3272 | 0.3282 | 0.3303 | 0.3257 | 0.3091 | 0.3009 | 0.3322 | 0.3262 | 0.3187 | 0.3261 | 0.3242 | 0.3136 | 0.2889 | 0.2648 |
| J | 22 | 23 | 23 | 23 | 23 | 23 | 23 | 24 | 23 | 23 | 25 | 25 | 25 | 28 | 28 |
| Hansen df | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| Hansen p | 0.4203 | 0.4133 | 0.3556 | 0.3934 | 0.4079 | 0.5309 | 0.6887 | 0.307 | 0.5235 | 0.6119 | 0.4126 | 0.4862 | 0.6408 | 0.3682 | 0.5044 |

The table represents different Sys-GMM model estimations for the dependent variable *Loans* upon Size Q2 Banks. All regressions include time dummies. The variables AGMS Size Q4/Size Q3/Total represents the average growth of Total Assets achieved by the Size Q4 Banks/Size Q3 Banks/Total Sample. The variables LPGMS Size Q4/Size Q3/Total represents the average growth of Loans achieved by the Size Q4 Banks/Size Q3 Banks/Total Sample. The variables LGMS Size Q4/Size Q3/Total represents the average growth of Loans achieved by the Size Q4 Banks/Size Q3 Banks/Total Sample. N represents the number of observations available, N(g) represents the number of banks available, AR2-p represents the p-value of Arellano-Bond test for autocorrelation of second order; J represents the number of instruments; Hansen df represents the degree of freedom for the Hansen statistic; Hansen-p represents the p-value of the Hansen statistic. Windmeijer-corrected, bank-clustered standard errors are given in italics. ***, **, * and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. L.Equity = Equity lagged one year; L.Loans = Loans lagged one year.

Table 6c

Spillover Effects on Loan Impairments (Different Estimates of Dynamic Panel Model Upon Size Q3 Banks)

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 |
|--------------------|---------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|--------------------------|----------------------------|----------------------------|
| L.Impairment Loans | 0.7913 <i>0.494</i> | 0.7680* <i>0.456</i> | 0.7584* <i>0.460</i> | 0.7651* <i>0.458</i> | 0.7651* <i>0.458</i> | 0.7644* <i>0.458</i> | 0.7663* <i>0.458</i> | 0.7638* <i>0.457</i> | 0.7587* <i>0.461</i> | 0.8097** <i>0.405</i> | 0.7533 <i>0.464</i> | 0.7598* <i>0.458</i> |
| Loans | 0.0382*** <i>0.015</i> | 0.0302 <i>0.022</i> | 0.0319 <i>0.022</i> | 0.0335 <i>0.022</i> | 0.0307 <i>0.022</i> | 0.0315 <i>0.022</i> | 0.0328 <i>0.022</i> | 0.0301 <i>0.022</i> | 0.0318 <i>0.023</i> | 0.0245 <i>0.018</i> | 0.0309 <i>0.022</i> | 0.0322 <i>0.022</i> |
| Total Assets | -1.3771 <i>1.054</i> | -0.9484 <i>0.611</i> | -0.943 <i>0.610</i> | -0.9456 <i>0.610</i> | -0.938 <i>0.608</i> | -0.9296 <i>0.607</i> | -0.9317 <i>0.606</i> | -0.9274 <i>0.604</i> | -0.927 <i>0.603</i> | -1.1760* <i>0.694</i> | -0.9133 <i>0.602</i> | -0.9201 <i>0.602</i> |
| Equity | 0.0205 <i>0.028</i> | -0.0036 <i>0.038</i> | 0.0007 <i>0.039</i> | 0.0043 <i>0.038</i> | -0.0021 <i>0.038</i> | 0.0019 <i>0.037</i> | 0.0026 <i>0.038</i> | -0.0035 <i>0.038</i> | 0.0024 <i>0.038</i> | -0.0148 <i>0.033</i> | 0.0001 <i>0.038</i> | 0.0001 <i>0.038</i> |
| Net Income | -0.0089 <i>0.007</i> | -0.0086 <i>0.008</i> | -0.0086 <i>0.008</i> | -0.0086 <i>0.008</i> | -0.0086 <i>0.008</i> | -0.0086 <i>0.008</i> | -0.0086 <i>0.008</i> | -0.0086 <i>0.008</i> | -0.0086 <i>0.008</i> | -0.0087 <i>0.008</i> | -0.0086 <i>0.008</i> | -0.0086 <i>0.008</i> |
| NPL System | 1.1860* <i>0.700</i> | 0.4304 <i>0.377</i> | 0.4365 <i>0.376</i> | 0.4613 <i>0.378</i> | 0.4483 <i>0.381</i> | 0.4726 <i>0.377</i> | 0.4832 <i>0.381</i> | 0.4533 <i>0.379</i> | 0.4757 <i>0.357</i> | -0.0198 <i>0.294</i> | 0.4692 <i>0.367</i> | 0.4576 <i>0.378</i> |
| Government Debt | -0.0718** <i>0.029</i> | -0.0335 <i>0.035</i> | -0.035 <i>0.035</i> | -0.0383 <i>0.035</i> | -0.0367 <i>0.036</i> | -0.0407 <i>0.035</i> | -0.0428 <i>0.036</i> | -0.0387 <i>0.035</i> | -0.0409 <i>0.032</i> | 0.0484 <i>0.055</i> | -0.0426 <i>0.034</i> | -0.0426 <i>0.035</i> |
| GDP Growth | 4.0365 <i>5.403</i> | -0.1673 <i>0.137</i> | -0.1854 <i>0.136</i> | -0.184 <i>0.135</i> | -0.1474 <i>0.147</i> | -0.1326 <i>0.143</i> | -0.1326 <i>0.145</i> | -0.128 <i>0.147</i> | -0.1352 <i>0.158</i> | -0.7981 <i>0.515</i> | -0.1286 <i>0.158</i> | -0.1769 <i>0.149</i> |
| Loans Growth | -0.0065 <i>0.010</i> | -0.0114** <i>0.005</i> | -0.0116** <i>0.005</i> | -0.0116** <i>0.005</i> | -0.0116** <i>0.005</i> | -0.0119** <i>0.005</i> | -0.0118** <i>0.005</i> | -0.0117** <i>0.005</i> | -0.0119** <i>0.005</i> | -0.007 <i>0.006</i> | -0.0120** <i>0.005</i> | -0.0115** <i>0.005</i> |
| Dummy 2009 | 31.2958 <i>41.339</i> | 0.0616 <i>1.018</i> | 0.4507 <i>0.995</i> | 0.7754 <i>0.992</i> | 0.2726 <i>0.997</i> | 0.536 <i>0.926</i> | 0.611 <i>0.962</i> | 0.1634 <i>1.029</i> | 0.5549 <i>0.973</i> | -0.5134 <i>1.296</i> | 0.3136 <i>1.036</i> | 0.2846 <i>1.006</i> |
| Dummy 2010 | -4.0918 <i>4.272</i> | -0.2386 <i>1.335</i> | 0.0389 <i>1.379</i> | 0.2734 <i>1.322</i> | -0.1968 <i>1.371</i> | -0.1952 <i>1.305</i> | -0.1391 <i>1.301</i> | -0.3612 <i>1.347</i> | -0.1612 <i>1.496</i> | 3.2439 <i>3.154</i> | -0.3929 <i>1.481</i> | -0.0774 <i>1.395</i> |
| Dummy 2011 | -5.4145** <i>2.257</i> | -2.9613*** <i>0.890</i> | -2.9941*** <i>0.885</i> | -2.9501*** <i>0.890</i> | -3.0146*** <i>0.901</i> | -3.1318*** <i>0.914</i> | -3.1310*** <i>0.913</i> | -3.0293*** <i>0.902</i> | -3.1195*** <i>0.946</i> | -0.5937 <i>2.259</i> | -3.1102*** <i>0.945</i> | -2.7893*** <i>0.949</i> |
| Dummy 2012 | 8.3842 <i>11.727</i> | 1.0225 <i>0.941</i> | 0.9018 <i>0.997</i> | 1.027 <i>0.942</i> | 1.0071 <i>0.947</i> | 1.0751 <i>0.942</i> | 1.0788 <i>0.939</i> | 0.997 <i>0.943</i> | 1.0557 <i>1.087</i> | 0.3814 <i>1.309</i> | 0.9792 <i>1.144</i> | 1.0017 <i>0.957</i> |
| Dummy 2013 | 7.2415 <i>10.865</i> | | | | | | | | | | | |
| L2.AGMS Size Q4 | | -0.0068 <i>0.034</i> | | | | | | 0.0362 <i>0.039</i> | | | 0.0736 <i>0.045</i> | 0.1674*** <i>0.055</i> |

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 |
|------------------|-------------------------|-------------------------|-------------------------|----------------------------|-------------------------|---------------------------|---------------------------|-------------------------|--------------------------|-------------------------|--------------------------|----------------------------|
| L2.LGMS Size Q4 | 10.9654 <i>7.071</i> | 13.5822 <i>8.409</i> | 13.7554 <i>8.397</i> | 13.9030* <i>8.416</i> | 13.7367 <i>8.446</i> | 13.9867* <i>8.441</i> | 14.0604* <i>8.456</i> | 13.8005 <i>8.453</i> | 13.9505* <i>8.437</i> | 10.6068 <i>8.723</i> | 14.0133* <i>8.450</i> | 13.9527 <i>8.518</i> |
| L2.LPGMS Size Q4 | | | -0.0536 <i>0.040</i> | -0.1488*** <i>0.050</i> | -0.034 <i>0.037</i> | -0.0672** <i>0.029</i> | -0.1227** <i>0.057</i> | -0.0605 <i>0.044</i> | -0.0035 <i>0.075</i> | -1.5165 <i>1.144</i> | -0.0143 <i>0.056</i> | -0.3242*** <i>0.118</i> |
| L2.AGMS Total | | | | | | | | | | | | -0.0336 <i>0.045</i> |
| L2.LGMS Total | | | | | | | | | -0.0647 <i>0.067</i> | | -0.0668 <i>0.073</i> | |
| L2.LPGMS Total | | | | | | | | | | 1.6842 <i>1.389</i> | | 0.038 <i>0.108</i> |
| Constant | 10.9654 <i>7.071</i> | 13.5822 <i>8.409</i> | 13.7554 <i>8.397</i> | 13.9030* <i>8.416</i> | 13.7367 <i>8.446</i> | 13.9867* <i>8.441</i> | 14.0604* <i>8.456</i> | 13.8005 <i>8.453</i> | 13.9505* <i>8.437</i> | 10.6068 <i>8.723</i> | 14.0133* <i>8.450</i> | 13.9527 <i>8.518</i> |
| N | 6293 | 5273 | 5273 | 5273 | 5273 | 5273 | 5273 | 5273 | 5273 | 5273 | 5273 | 5273 |
| N(g) | 1181 | 1167 | 1167 | 1167 | 1167 | 1167 | 1167 | 1167 | 1167 | 1167 | 1167 | 1167 |
| AR2-p | 0.8154 | 0.0491 | 0.0546 | 0.0523 | 0.0513 | 0.0521 | 0.0526 | 0.0517 | 0.0558 | 0.0208 | 0.0612 | 0.0562 |
| J | 24 | 25 | 25 | 25 | 25 | 25 | 25 | 26 | 26 | 26 | 28 | 28 |
| Hansen-df | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Hansen-p | 0.1382 | 0.0381 | 0.057 | 0.0573 | 0.0412 | 0.0568 | 0.0618 | 0.0426 | 0.0598 | 0.0102 | 0.065 | 0.0673 |

The table represents different Sys-GMM model estimations for the dependent variable *Impairment Loans* upon Size Q3 Banks. All regressions include time dummies. The variables AGMS Size Q4/Total represents the average growth of Total Assets achieved by the Size Q4 Banks/Total Sample. The variables LGMS Size Q4/Total represents the average growth of Loans achieved by the Size Q4 Banks/Total Sample. The variables LPGMS Size Q4/Total represents the average growth of Loans/Total Assets achieved by the Size Q4 Banks/Total Sample. N represents the number of observations available, N(g) represents the number of banks available, AR2-p represents the p-value of Arellano-Bond test for autocorrelation of second order, J represents the number of instruments; Hansen-df represents the degree of freedom for the Hansen statistic; Hansen-p represents the p-value of the Hansen statistic. Windmeijer-corrected, bank-clustered standard errors are given in italics. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. L.Loan Impairment=Loan Impairment lagged one year.

Table 6d

Spillover Effects on Loan Impairments (Different Estimates of Dynamic Panel Model Upon Size Q2 Banks)

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 | Mod 13 | Mod 14 | Mod 15 |
|-----------------|-----------|------------|------------|------------|------------|------------|------------|------------|------------|-----------|-----------|------------|-----------|---------|-----------|
| LImpairment | 0.3710* | 0.3292* | 0.3268* | 0.3266* | 0.3299* | 0.3215* | 0.3232* | 0.3309* | 0.3250* | 0.3247 | 0.3326* | 0.3246* | 0.3282* | 0.5365 | 0.3255* |
| Loans | 0.0082 | 0.0243 | 0.0251 | 0.0266 | 0.0228 | 0.0256 | 0.0265 | 0.0227 | 0.0251 | 0.0254 | 0.0234 | 0.0243 | 0.0249 | -0.0237 | 0.0262 |
| | 0.015 | 0.022 | 0.023 | 0.023 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.024 | 0.022 | 0.023 | 0.024 | 0.052 | 0.024 |
| Total | -0.3816 | -1.0178 | -1.036 | -1.0054 | -1.0474 | -0.9943 | -0.99 | -1.0401 | -1.0138 | -1.007 | -1.0574 | -1.0269 | -1.0667 | -1.8693 | -1.0641 |
| Assets | 0.912 | 0.668 | 0.679 | 0.667 | 0.665 | 0.667 | 0.666 | 0.664 | 0.667 | 0.662 | 0.667 | 0.684 | 0.658 | 1.338 | 0.667 |
| Equity | -0.0972 | -0.0101 | -0.0075 | -0.0034 | -0.0135 | -0.0022 | -0.0023 | -0.014 | -0.0076 | -0.0074 | -0.0108 | -0.0032 | 0.0013 | -0.0601 | 0.0069 |
| | 0.097 | 0.057 | 0.057 | 0.059 | 0.054 | 0.057 | 0.056 | 0.055 | 0.057 | 0.059 | 0.057 | 0.058 | 0.057 | 0.084 | 0.059 |
| Net Income | -0.0008 | -0.0007 | -0.0007 | -0.0007 | -0.0007 | -0.0006 | -0.0007 | -0.0007 | -0.0007 | -0.0007 | -0.0007 | -0.0006 | -0.0006 | -0.0008 | -0.0006 |
| | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| NPL | -0.3393 | 0.7215*** | 0.7190*** | 0.7273*** | 0.6950*** | 0.7831*** | 0.7685*** | 0.7018*** | 0.7402*** | 0.7407*** | 0.6862*** | 0.7559*** | 0.6875*** | 0.3083 | 0.6717*** |
| System | 0.720 | 0.217 | 0.211 | 0.218 | 0.216 | 0.220 | 0.225 | 0.224 | 0.229 | 0.242 | 0.218 | 0.212 | 0.236 | 0.510 | 0.231 |
| Government Debt | -0.0664** | -0.0690*** | -0.0688*** | -0.0697*** | -0.0646*** | -0.0795*** | -0.0763*** | -0.0668*** | -0.0721*** | -0.0724** | -0.0612** | -0.0759*** | -0.0610** | 0.0683 | -0.0593** |
| | 0.027 | 0.024 | 0.024 | 0.025 | 0.025 | 0.026 | 0.026 | 0.026 | 0.027 | 0.029 | 0.024 | 0.025 | 0.028 | 0.137 | 0.027 |
| GDP | -6.1732 | -0.37 | -0.3748 | -0.3865 | -0.3934 | -0.2953 | -0.3027 | -0.3825 | -0.3595 | -0.3612 | -0.4065* | -0.2812 | -0.3398 | -1.3308 | -0.3309 |
| Growth | 3.897 | 0.236 | 0.241 | 0.246 | 0.243 | 0.245 | 0.233 | 0.234 | 0.230 | 0.227 | 0.240 | 0.268 | 0.258 | 1.205 | 0.256 |
| Loans | -0.0191* | -0.0099 | -0.0097 | -0.0097 | -0.0102 | -0.0092 | -0.0099 | -0.01 | -0.0096 | -0.0099 | -0.0102 | -0.0094 | -0.0094 | -0.0019 | -0.0101 |
| | 0.011 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.015 | 0.007 |
| Dummy 2009 | -44.3656 | -0.2824 | -0.1348 | -0.0255 | -0.6862 | 0.3526 | 0.3214 | -0.5902 | -0.2076 | -0.2096 | -0.4789 | 0.6441 | 0.903 | -2.2366 | 0.6881 |
| | 28.627 | 1.039 | 0.924 | 0.920 | 1.132 | 1.163 | 1.078 | 1.039 | 0.967 | 0.929 | 1.111 | 1.160 | 1.145 | 4.258 | 1.200 |
| Dummy 2010 | 5.0588 | 1.596 | 1.6555 | 1.8311 | 1.4596 | 1.5462 | 1.5445 | 1.467 | 1.5919 | 1.6003 | 1.5949 | 1.5356 | 2.0709 | 4.4013 | 1.7767 |
| | 3.259 | 1.281 | 1.328 | 1.422 | 1.200 | 1.217 | 1.215 | 1.246 | 1.254 | 1.288 | 1.256 | 1.357 | 1.367 | 4.126 | 1.298 |
| Dummy 2011 | 0.9701 | -0.4496 | -0.4641 | -0.3962 | -0.454 | -0.5629 | -0.5674 | -0.4259 | -0.4865 | -0.4703 | -0.4731 | -0.5348 | -0.289 | 0.7397 | -0.3416 |
| | 1.868 | 0.982 | 0.973 | 1.018 | 0.986 | 1.005 | 0.981 | 0.989 | 0.981 | 0.951 | 0.957 | 0.982 | 0.989 | 2.219 | 0.951 |
| Dummy 2012 | -10.8783 | 0.1649 | 0.1113 | 0.1749 | 0.2098 | 0.3117 | 0.2531 | 0.1786 | 0.1997 | 0.1892 | 0.2147 | 0.2089 | 0.1708 | 4.0788 | 0.4004 |
| | 6.766 | 0.406 | 0.383 | 0.411 | 0.416 | 0.409 | 0.420 | 0.403 | 0.431 | 0.436 | 0.425 | 0.421 | 0.421 | 4.510 | 0.485 |
| Dummy 2013 | -10.5877 | | | | | | | | | | | | | | |
| | 6.595 | | | | | | | | | | | | | | |
| L2AGMS Size Q4 | -0.0101 | | | | | | | | | | -0.0409 | | | -3.3362 | 0.1146** |
| | 0.037 | | | | | | | | | | 0.039 | | | 3.636 | 0.056 |

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 | Mod 13 | Mod 14 | Mod 15 |
|------------------|----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|----------------------------|-------------------------|----------------------------|
| L2.LGMS Size Q4 | | | -0.0251 <i>0.044</i> | | | | | | | | | -0.0374 <i>0.052</i> | | 1.6194 <i>7.989</i> | |
| L2.LPGMS Size Q4 | | | | -0.0711 <i>0.076</i> | | | | | | | | | -0.2416*** <i>0.067</i> | | -0.3745*** <i>0.093</i> |
| L2.AGMS Size Q3 | | | | | 0.0331 <i>0.034</i> | | | | | | 0.0256 <i>0.063</i> | | | -2.9731 <i>3.311</i> | 0.1235* <i>0.065</i> |
| L2.LGMS Size Q3 | | | | | | -0.0648** <i>0.032</i> | | | | | | -0.1024* <i>0.055</i> | | 0.5063 <i>0.842</i> | |
| L2.LPGMS Size Q3 | | | | | | | -0.0784* <i>0.042</i> | | | | | | -0.1782* <i>0.092</i> | | -0.2838*** <i>0.083</i> |
| L2.AGMS Total | | | | | | | | 0.03 <i>0.039</i> | | | 0.0362 <i>0.088</i> | | | 7.3181 <i>7.832</i> | -0.0939 <i>0.079</i> |
| L2.LGMS Total | | | | | | | | | -0.0271 <i>0.042</i> | | | 0.0895 <i>0.070</i> | | -1.9713 <i>2.500</i> | |
| L2.LPGMS Total | | | | | | | | | | -0.038 <i>0.087</i> | | | 0.3590** <i>0.170</i> | | 0.4159** <i>0.184</i> |
| Constant | 25.8817*** <i>9.359</i> | 16.1698* <i>9.499</i> | 16.4281* <i>9.643</i> | 15.9927* <i>9.503</i> | 16.2313* <i>9.535</i> | 16.6193* <i>9.593</i> | 16.2118* <i>9.518</i> | 16.2935* <i>9.504</i> | 16.3451* <i>9.556</i> | 16.2317* <i>9.504</i> | 16.0517* <i>9.511</i> | 16.7983* <i>9.702</i> | 16.0648* <i>9.407</i> | 8.6354 <i>17.257</i> | 15.8200* <i>9.458</i> |
| N | 6191 | 5229 | 5229 | 5229 | 5229 | 5229 | 5229 | 5229 | 5229 | 5229 | 5229 | 5229 | 5229 | 5229 | 5229 |
| N(g) | 1167 | 1155 | 1155 | 1155 | 1155 | 1155 | 1155 | 1155 | 1155 | 1155 | 1155 | 1155 | 1155 | 1155 | 1155 |
| AR2-p | 0.6429 | 0.836 | 0.8352 | 0.8358 | 0.8358 | 0.821 | 0.8289 | 0.8421 | 0.8298 | 0.8336 | 0.8377 | 0.8338 | 0.8368 | 0.4395 | 0.828 |
| J | 21 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 24 | 24 | 24 | 24 | 27 |
| Hansen df | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 7 |
| Hansen p | 0.5654 | 0.1437 | 0.1464 | 0.1463 | 0.1386 | 0.145 | 0.1552 | 0.1375 | 0.1464 | 0.142 | 0.1468 | 0.1377 | 0.1503 | 0.9902 | 0.1116 |

The table represents different Sys-GMM model estimations for the dependent variable *Impairment Loans* upon Size Q2 Banks. All regressions include time dummies. The variables AGMS Size Q4/Size Q3/Total represents the average growth of Total Assets achieved by the Size Q4 Banks/Size Q3/Total Sample. The variables LGMS Size Q4/Size Q3/Total represents the average growth of Loans/Total Assets achieved by the Size Q4 Banks/Size Q3 Banks/Total Sample. N represents the number of observations available. N(g) represents the number of banks available, AR2-p represents the p-value of Arellano-Bond test for autocorrelation of second order, J represents the number of instruments; Hansen-*df* represents the degree of freedom for the Hansen statistic; Hansen-p represents the p-value of the Hansen statistic. Windmeijer-corrected, bank-clustered standard errors are given in italics. ***, **, * and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. L.Loan Impairment=Loan Impairment lagged one year.

Indeed, many of the mid-sized banks were found to belong to the mutant business model class labeled 'Diversified Retail type 2' (Ayadi et al., 2016a), where banks in this class were also found more likely indulging in regulatory arbitrage (Ayadi et al., 2016b). Matching the business model classification of Ayadi et al. (2016a) and the data from Ferri and Pesic (2017), we calculated loan portfolio shares shifted to IRB models and found that, between 2010 and 2013, while the average share was stable at 34 % for the other models it increased from 35 to 43 % for Diversified Retail type 2 banks. Hence our conjecture is that many mid-sized banks ventured into expanding their loan supply while relying on credit scoring and IRB models possibly underestimating true credit risks.

4.3 Robustness Checks

We perform some alternative robustness checks to confirm the reliability of our main estimates, by the following alternative controls. We introduce further alternative specifications considering different measures of competition in each financial system, which we differently control for the market share of each bank and sub-group. The overall evidence confirms our hypothesis that medium banks are exposed to those "spillover effects", because of the reduction of total assets and loans by larger banks. This becomes particularly significant when considering the deterioration of loans. Moreover, we considered performance of different sub-group of banks defined by alternative classification of our sample, both taking into account size and/or other meaningful variables.

Particularly interesting is the analysis of the above-mentioned spillover effects on a specific group of banks – the Medium Sized Banks – obtained as the sum of SQ3 and SQ2 Banks. This confirms the hypothesized effects that the behavior of larger banks can determine in terms of undesired spillover effects (Tab. 7a and Table 7b), respectively on Loans and Loan Impairments.

Table 7a

Robustness Check Upon Spillover Effects on Loans (Different Estimates of Dynamic Panel Model Upon Medium Sized Banks)

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 |
|-----------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| L.Loans | 1.0306*** 0.086 | 1.0305*** 0.087 | 1.0269*** 0.087 | 1.0277*** 0.087 | 1.0367*** 0.088 | 1.0227*** 0.087 | 1.0266*** 0.087 | 1.0351*** 0.088 | 1.0251*** 0.086 | 1.0293*** 0.087 | 1.0342*** 0.087 | 1.0438*** 0.088 |
| Size | -0.0183 0.105 | -0.0182 0.105 | -0.0219 0.104 | -0.0208 0.104 | -0.019 0.106 | -0.0029 0.106 | 0.0091 0.102 | -0.0243 0.105 | 0.0036 0.104 | 0.0257 0.104 | 0.0066 0.106 | 0.0398 0.106 |
| Equity | -0.2350** 0.120 | -0.2349** 0.120 | -0.2377** 0.119 | -0.2370** 0.119 | -0.2321** 0.120 | -0.2431** 0.119 | -0.2414** 0.119 | -0.2339** 0.120 | -0.2419** 0.119 | -0.2404** 0.119 | -0.2412** 0.119 | -0.2379** 0.119 |
| L.Equity | 0.2635* 0.146 | 0.2635* 0.146 | 0.2640* 0.145 | 0.2626* 0.146 | 0.2650* 0.147 | 0.2653* 0.145 | 0.2640* 0.146 | 0.2650* 0.146 | 0.2653* 0.145 | 0.2652* 0.145 | 0.2697* 0.145 | 0.2700* 0.146 |
| NPL System | -0.5507*** 0.075 | -0.5502*** 0.071 | -0.5434*** 0.077 | -0.5366*** 0.082 | -0.5288*** 0.072 | -0.5297*** 0.075 | -0.5251*** 0.079 | -0.5259*** 0.073 | -0.5331*** 0.075 | -0.5408*** 0.082 | -0.4664*** 0.071 | -0.4589*** 0.081 |
| Government Debt | 0.0382*** 0.008 | 0.0387*** 0.008 | 0.0382*** 0.008 | 0.0379*** 0.008 | 0.0351*** 0.009 | 0.0392*** 0.008 | 0.0388*** 0.008 | 0.0343*** 0.008 | 0.0393*** 0.008 | 0.0399*** 0.008 | 0.0318*** 0.008 | 0.0308*** 0.008 |
| GDP Growth | 0.0182 0.089 | 0.0182 0.090 | 0.0064 0.092 | 0.0194 0.088 | 0.0039 0.086 | 0.0597 0.086 | 0.073 0.082 | -0.0053 0.090 | 0.0795 0.091 | 0.0948 0.084 | 0.0632 0.089 | 0.085 0.086 |
| Capital System | -0.0866 0.153 | -0.0869 0.158 | -0.0835 0.152 | -0.0843 0.151 | -0.0842 0.152 | -0.0908 0.151 | -0.1071 0.148 | -0.0686 0.159 | -0.0953 0.151 | -0.1171 0.149 | -0.0775 0.159 | -0.1112 0.158 |
| Assets Growth | -0.0467*** 0.012 | -0.0467*** 0.012 | -0.0470*** 0.012 | -0.0471*** 0.012 | -0.0454*** 0.012 | -0.0484*** 0.012 | -0.0487*** 0.012 | -0.0453*** 0.012 | -0.0484*** 0.012 | -0.0488*** 0.012 | -0.0461*** 0.012 | -0.0463*** 0.012 |
| Dummy 2009 | 0.3983 0.722 | 0.3851 0.607 | 0.4619 0.698 | 0.5674 0.647 | 0.1211 0.663 | 0.902 0.687 | 1.0621* 0.624 | 0.2392 0.607 | 0.9378 0.692 | 1.0051 0.621 | 0.676 0.601 | 0.7465 0.586 |
| Dummy 2010 | 1.3821*** 0.274 | 1.3716*** 0.258 | 1.5434*** 0.263 | 1.5249*** 0.247 | 1.2016*** 0.272 | 1.3303*** 0.274 | 1.3993*** 0.271 | 1.3784*** 0.260 | 1.1624*** 0.260 | 1.1039*** 0.256 | 0.7951*** 0.268 | 0.6639** 0.279 |
| Dummy 2011 | 0.9949*** 0.267 | 0.9850*** 0.232 | 1.0983*** 0.244 | 1.1389*** 0.228 | 0.8382*** 0.258 | 1.0632*** 0.256 | 1.1121*** 0.247 | 0.9633*** 0.234 | 0.9747*** 0.243 | 0.8619*** 0.236 | 0.7427*** 0.236 | 0.5637** 0.249 |
| Dummy 2012 | 0.1735 0.404 | 0.1622 0.304 | 0.2566 0.375 | 0.344 0.324 | -0.301 0.369 | 0.4581 0.384 | 0.5741* 0.340 | 0.0902 0.309 | 0.4317 0.372 | 0.3946 0.321 | 0.2145 0.305 | 0.1573 0.300 |
| Dummy 2013 | 1.1521** 0.577 | 1.1316*** 0.390 | 1.3043** 0.527 | 1.3813*** 0.464 | 0.8171 0.520 | 1.5173*** 0.555 | 1.6582*** 0.495 | 1.0574*** 0.397 | 1.4391*** 0.525 | 1.4007*** 0.464 | 1.0587*** 0.393 | 0.9510** 0.402 |
| AGMS Size Q4 | | -0.0023 0.036 | | | | | | 0.047 0.041 | | | 0.0448 0.044 | 0.0434 0.041 |

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 |
|--------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------------------------|----------------------------|
| LGMS Size Q4 | | | 0.0278 <i>0.018</i> | | | | | | -0.0272 <i>0.018</i> | | -0.0315* <i>0.018</i> | |
| LPGMS SizeQ4 | | | | 0.0601 <i>0.057</i> | | | | | | -0.1261** <i>0.049</i> | | -0.1434*** <i>0.055</i> |
| AGMS Total | | | | | -0.0619* <i>0.032</i> | | | -0.0909** <i>0.035</i> | | | -0.1758*** <i>0.039</i> | -0.2080*** <i>0.043</i> |
| LGMS Total | | | | | | 0.0948*** <i>0.027</i> | | | 0.1127*** <i>0.022</i> | | 0.1688*** <i>0.026</i> | |
| LPGMS Total | | | | | | | 0.1879*** <i>0.053</i> | | | 0.2761*** <i>0.051</i> | | 0.4154*** <i>0.067</i> |
| Constant | -2.5178 <i>5.088</i> | -2.4997 <i>4.926</i> | -2.4952 <i>5.030</i> | -2.6097 <i>4.935</i> | -2.2444 <i>5.017</i> | -3.1188 <i>5.022</i> | -3.6083 <i>4.885</i> | -2.2192 <i>4.962</i> | -3.2714 <i>5.013</i> | -3.7798 <i>4.892</i> | -2.9482 <i>4.947</i> | -3.7289 <i>4.927</i> |
| N | 11935 | 11935 | 11935 | 11935 | 11935 | 11935 | 11935 | 11935 | 11935 | 11935 | 11935 | 11935 |
| N(g) | 2336 | 2336 | 2336 | 2336 | 2336 | 2336 | 2336 | 2336 | 2336 | 2336 | 2336 | 2336 |
| AR2-p | 0.1066 | 0.1121 | 0.1125 | 0.1089 | 0.1021 | 0.0998 | 0.0965 | 0.1082 | 0.0984 | 0.0954 | 0.0903 | 0.0843 |
| J | 25 | 26 | 26 | 26 | 26 | 26 | 26 | 27 | 27 | 27 | 29 | 29 |
| Hansenf | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Hansenp | 0.1651 | 0.1823 | 0.1099 | 0.1405 | 0.1169 | 0.1853 | 0.2137 | 0.0797 | 0.2710 | 0.2815 | 0.1179 | 0.1570 |

The table represents different SysGMM model estimations for the dependent variable *Loans* upon Medium Sized Banks. All regressions include time dummies. The variables AGMS Size Q4/Total represents the average growth of Total Assets achieved by the Size Q4 Banks/Total Sample. The variables LGMS Size Q4/Total represents the average growth of Loans achieved by the Size Q4 Banks/Total Sample. The variables LPGMS Size Q4/Total represents the average growth of Loans/Total Assets achieved by the Size Q4 Banks/Total Sample. N represents the number of observations available, N(g) represents the number of banks available, AR2-p represents the p-value of Arellano-Bond test for autocorrelation of second order, J represents the number of instruments; Hansenf represents the degree of freedom for the Hansen statistic; Hansenp represents the p-value of the Hansen statistic. Windmeijer-corrected, bank-clustered standard errors are given in italics. ***, **, * and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. L Equity = Equity lagged one year, L Loans = Loans lagged one year.

Table 7b

Robustness Check Upon Spillover Effects on Loan Impairments (Different Estimates of Dynamic Panel Model Upon Medium Sized Banks)

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| L.Impairment Loans | 0.6604*** 0.233 | 0.6463** 0.259 | 0.6423** 0.259 | 0.6429** 0.259 | 0.6464** 0.259 | 0.6415** 0.260 | 0.6420** 0.260 | 0.6472** 0.258 | 0.6449** 0.261 | 0.7168*** 0.237 | 0.6468** 0.262 | 0.6416** 0.258 |
| Loans | 0.0240** 0.011 | 0.0312** 0.015 | 0.0321** 0.015 | 0.0337** 0.015 | 0.0310** 0.015 | 0.0328** 0.015 | 0.0332** 0.015 | 0.0311** 0.015 | 0.0325** 0.015 | 0.0229** 0.009 | 0.0317** 0.015 | 0.0331** 0.015 |
| Total Assets | -0.1587 0.156 | -0.1808 0.149 | -0.1822 0.149 | -0.1801 0.150 | -0.1823 0.148 | -0.1734 0.150 | -0.1777 0.149 | -0.1827 0.148 | -0.1684 0.149 | -0.2382 0.156 | -0.1696 0.149 | -0.1868 0.148 |
| Equity | -0.0204 0.050 | -0.0236 0.031 | -0.0206 0.032 | -0.0168 0.031 | -0.0239 0.030 | -0.0183 0.031 | -0.0188 0.031 | -0.0236 0.031 | -0.0193 0.032 | -0.0334 0.027 | -0.02 0.032 | -0.0186 0.031 |
| Net Income | -0.0014 0.001 | -0.0012 0.001 | -0.0012 0.001 | -0.0012 0.001 | -0.0013 0.001 | -0.0012 0.001 | -0.0012 0.001 | -0.0012 0.001 | -0.0012 0.001 | -0.0012 0.001 | -0.0013 0.001 | -0.0013 0.001 |
| NPL System | 0.1399 0.768 | 0.4252* 0.235 | 0.4294* 0.232 | 0.4411* 0.237 | 0.4190* 0.241 | 0.4574* 0.240 | 0.4548* 0.248 | 0.4171* 0.238 | 0.4664** 0.278 | 0.0185 0.337 | 0.4479** 0.227 | 0.4156* 0.247 |
| Government Debt | -0.0331 0.022 | -0.0352 0.023 | -0.0353 0.023 | -0.0367 0.024 | -0.0339 0.024 | -0.0396 0.024 | -0.0394 0.025 | -0.0333 0.023 | -0.0412** 0.021 | 0.0339 0.067 | -0.0379* 0.022 | -0.035 0.024 |
| GDP Growth | -1.9005 4.437 | -0.2981* 0.167 | -0.3037* 0.164 | -0.3129* 0.163 | -0.3053* 0.168 | -0.2803* 0.163 | -0.2852* 0.163 | -0.3083* 0.170 | -0.266 0.175 | -0.732 0.549 | -0.2908 0.179 | -0.3520** 0.179 |
| Loans Growth | -0.0139* 0.008 | -0.0106** 0.005 | -0.0106** 0.005 | -0.0105** 0.005 | -0.0106** 0.005 | -0.0106** 0.005 | -0.0107** 0.005 | -0.0106** 0.005 | -0.0106** 0.005 | -0.008 0.006 | -0.0105** 0.005 | -0.0104** 0.005 |
| Dummy 2009 | -13.6814 33.356 | -0.2899 0.765 | -0.0551 0.750 | 0.159 0.698 | -0.3391 0.755 | 0.0714 0.699 | 0.0254 0.708 | -0.3161 0.778 | -0.02 0.750 | -0.7339 1.133 | -0.286 0.812 | -0.2455 0.771 |
| Dummy 2010 | 0.4498 3.529 | 0.5449 7.089 | 0.6825 1.757 | 0.8848 1.144 | 0.5445 1.057 | 0.6447 1.066 | 0.6522 1.077 | 0.5673 1.100 | 0.542 1.202 | 2.679 2.979 | 0.4352 1.177 | 0.8351 1.159 |
| Dummy 2011 | -2.3259 2.048 | -1.6858** 0.787 | -1.7062** 0.777 | -1.6621** 0.792 | -1.6742** 0.796 | -1.7836** 0.789 | -1.7524** 0.782 | -1.6756** 0.794 | -1.8060** 0.807 | -0.1807 2.225 | -1.8072** 0.811 | -1.4909* 0.833 |
| Dummy 2012 | -3.6267 8.107 | 0.5246 0.387 | 0.4807 0.433 | 0.5293 0.386 | 0.5302 0.393 | 0.5668 0.383 | 0.552 0.378 | 0.5326 0.391 | 0.6387 0.498 | 0.0613 0.759 | 0.7167 0.543 | 0.5526 0.391 |
| Dummy 2013 | -4.0954 7.799 | | | | | | | | | | | |
| L2.AGMS Size Q4 | | 0.0056 0.026 | | | | | | -0.0066 0.029 | | | -0.0054 0.040 | 0.0686* 0.038 |

| Variable | Mod 1 | Mod 2 | Mod 3 | Mod 4 | Mod 5 | Mod 6 | Mod 7 | Mod 8 | Mod 9 | Mod 10 | Mod 11 | Mod 12 |
|------------------|------------------------|------------------------|-------------------------|--------------------------|------------------------|--------------------------|------------------------|------------------------|-------------------------|-------------------------|--------------------------|---------------------------|
| L2.LGMS Size Q4 | | | -0.0196 <i>0.037</i> | | | | | | 0.0239 <i>0.060</i> | | 0.0239 <i>0.072</i> | |
| L2.LPGMS Size Q4 | | | | -0.0778* <i>0.047</i> | | | | | | -0.93 <i>0.954</i> | | -0.1967** <i>0.085</i> |
| L2.AGMS Total | | | | | 0.0139 <i>0.031</i> | | | 0.0191 <i>0.036</i> | | | 0.0824 <i>0.053</i> | 0.0433 <i>0.040</i> |
| L2.LGMS Total | | | | | | -0.0434* <i>0.025</i> | | | -0.0619 <i>0.045</i> | | -0.1046* <i>0.059</i> | |
| L2.LPGMS Total | | | | | | | -0.056 <i>0.050</i> | | | 1.1068 <i>1.203</i> | | 0.0138 <i>0.072</i> |
| Constant | 8.601 <i>10.995</i> | 3.1138 <i>2.584</i> | 3.175 <i>2.644</i> | 3.178 <i>2.618</i> | 3.018 <i>2.677</i> | 3.3791 <i>2.656</i> | 3.3507 <i>2.677</i> | 2.9717 <i>2.682</i> | 3.4071 <i>2.644</i> | -0.8946 <i>4.940</i> | 3.1241 <i>2.740</i> | 3.0768 <i>2.713</i> |
| N | 12484 | 10502 | 10502 | 10502 | 10502 | 10502 | 10502 | 10502 | 10502 | 10502 | 10502 | 10502 |
| N(g) | 2348 | 2322 | 2322 | 2322 | 2322 | 2322 | 2322 | 2322 | 2322 | 2322 | 2322 | 2322 |
| AR2-p | 0.3096 | 0.4002 | 0.4051 | 0.4032 | 0.3988 | 0.4092 | 0.4054 | 0.3972 | 0.4095 | 0.3296 | 0.4027 | 0.3939 |
| J | 24 | 25 | 25 | 25 | 25 | 25 | 25 | 26 | 26 | 26 | 28 | 28 |
| Hansen-df | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Hansen-p | 0.215 | 0.1892 | 0.226 | 0.2339 | 0.1934 | 0.2368 | 0.238 | 0.1909 | 0.2406 | 0.0264 | 0.2464 | 0.2142 |

The table presents various Sys-GMM model estimations for the dependent variable *Impairment Loans* upon Medium Sized Banks. All regressions include time dummies. The variables AGMS Size Q4/Total is the average growth of Total Assets achieved by the Size Q4 Banks/Total Sample. The variables LGMS Size Q4/Total is the average growth of Loans achieved by the Size Q4 Banks/Total Sample. The variables LPGMS Size Q4/Total is the average growth of Loans/Total Assets achieved by the Size Q4 Banks/Total Sample. N is the number of observations available, N(g) represents the number of banks available, AR2-p represents the p-value of Arellano-Bond test for autocorrelation of second order, J represents the number of instruments; Hansen-df represents the degree of freedom for the Hansen statistic; Hansen-p represents the p-value of the Hansen statistic. Windmeijer-corrected, bank-clustered standard errors are given in italics. ***, **, * and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. L.Loan Impairment=Loan Impairment lagged one year.

5 Conclusions

In the aftermath of the crisis, different jurisdictions enlarged the mandate and powers of supervisors to make supervision more effective, especially by achieving sounder and more effective supervision of systemically important financial institutions (SIFIs), and even more so of global systemically important financial institutions (G-SIFIs). That led authorities to review their supervisory approach, by making it more tailored and risk-based, with more time and resources bestowed to larger, more complex and riskier banks, eventually leading to a “jeopardized” capital regulation framework.

Along this, despite a general consensus on the need to provide more effective supervision for more sophisticated and relevant banks, a concern could arise from the incoming new framework. When considering the potential effects that the more binding prudential framework may determine for the more relevant institutions, one could argue that the significant increase of capital they are supposed to achieve may lead them to cut credit to the economy. We hypothesized that this could cause a potential adverse effect (“spillover effect”) on less significant banks, which – subject to less capital requirements stiffening – might be enticed to step up lending and, then, suffer loan quality deterioration. The potential consequences of that could be particularly nasty for supervisors, not only because of the high level of capital that biggest banks are supposed to achieve when Basel III capital will become completely effective, but also because of the generally significant market share held by more relevant banks versus the smaller ones.

Looking at sub-groups of banks differing by size, we found that during the last two sample years especially larger banks raised their capital level and cut customer loans. On the opposite, despite a milder increase in capital, smaller banks notably increased their customer loans. Moreover, when looking for the potential spillover effects which may arise from the interaction of different banks’ sub-groups, we showed how nasty that phenomenon can be, finding evidence that the deleveraging originated at more significant banks already started to generate, among other factors, a significant loan worsening at less significant banks. Finally, we showed that the most notable loan worsening materialized at mid-sized banks. We conjectured that while the loan expansion was somewhat shielded by superior soft-information-based lending technologies at small banks, medium-sized banks were fully exposed to the economic recession and to making loans to bad borrowers. Indeed, mid-sized banks boosted their loans while relying more and more on credit scoring and IRB models. That proved a problematic choice given the prolonged unfavorable European business cycle.

We consider this evidence full of policy implications. More analyses should be devoted in the future to this issue. Alternative measures to mitigate the undesired effects of regulatory stiffening should be evaluated. An attempt should be made trying to ameliorate the application of proportionality on less significant banks. In particular, it would be crucial to distinguish relationship lending oriented small banks from mid-sized banks. These latter banks might, in fact, be caught in the middle of the transition from having abandoned lending technologies based on soft information into adopting transactional lending technologies they don’t fully command yet. All of these prescriptions seem to be needed to mitigate the potential spillover effects of stiffening bank regulation.

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