The Spillover Effects of Prudential Regulation on Banking Competition

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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.

DOI https://doi.org/10.3790/vjh.89.1.59

1 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.

DOI https://doi.org/10.3790/vjh.89.1.59

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 Mistrulli, 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 el 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.

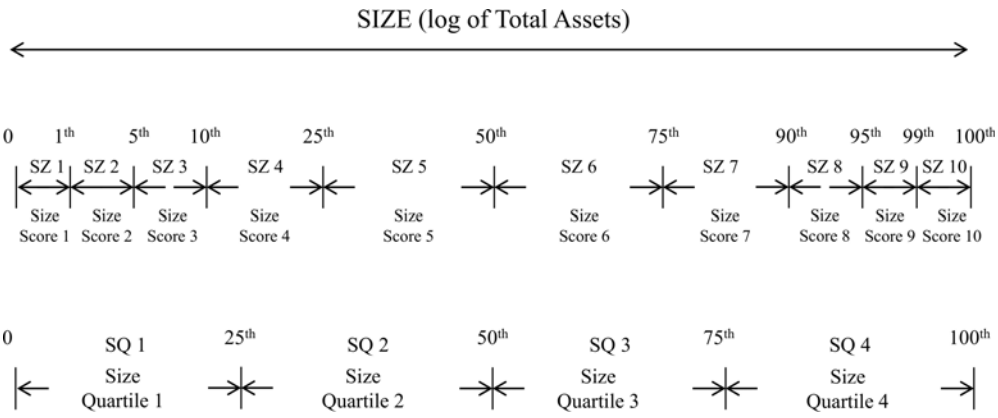
3 Description of the Database

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



DOI https://doi.org/10.3790/vjh.89.1.59

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 Impair	Assets Growth	Loans Growth	LoansP Growth
Size Score 1	2007	8.10	49.81	55.06	12.94	-38.30	40.15	31.59	32.30
	2008	8.21	49.17	56.24	-92.72	-7.60	18.91	-4.78	-0.28
	2009	8.07	61.02	59.05	-9.35	-4.73	8.89	-18.88	-7.21
	2010	8.02	72.64	58.31	952.42	12.19	-2.13	14.55	5.49
	2011	8.06	70.46	45.12	-78.20	-1.30	27.06	-11.94	-0.04
	2012	7.68	66.01	44.45	-63.22	0.86	9.24	22.40	2.43
	2013	8.35	62.94	46.35	-12.27	1.39	46.92	41.53	8.55

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Score 2	2007	10.09	30.61	42.80	-24.33	6.88	10.12	4.09	5.43
	2008	10.06	32.38	45.06	4.74	7.84	8.28	12.75	5.93
	2009	10.13	33.59	40.07	9.40	11.88	9.22	4.72	2.14
	2010	10.12	33.38	40.66	-1.54	7.12	7.50	18.37	5.06
	2011	10.07	34.21	41.16	379.36	3.58	13.51	8.62	3.01
	2012	10.15	32.85	40.01	5.18	2.01	9.98	6.45	1.74
	2013	10.27	31.00	41.39	-417.69	5.90	15.83	12.55	5.03

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Score 3	2007	10.83	21.71	51.92	9.00	2.73	10.31	11.58	4.51
	2008	10.77	23.35	51.75	5.90	4.16	6.91	3.00	2.50
	2009	10.91	21.35	51.68	13.51	5.47	7.59	4.55	3.14
	2010	10.97	21.94	50.73	-4.51	2.27	8.83	14.67	5.78
	2011	11.03	21.58	51.67	2.78	2.86	6.58	7.20	4.65
	2012	11.08	21.13	50.61	8.93	1.56	9.48	10.85	4.36
	2013	11.15	20.46	51.25	0.50	4.17	12.72	10.38	4.57

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Score 4	2007	11.64	12.70	60.32	19.94	3.26	8.68	12.89	7.02
	2008	11.66	13.28	59.51	13.53	4.35	7.68	7.06	4.47
	2009	11.71	14.25	57.32	-26.59	4.66	6.58	5.38	2.79
	2010	11.77	14.32	57.63	138.14	3.41	10.59	11.43	5.79
	2011	11.85	14.09	57.37	45.11	2.72	7.91	8.26	5.20
	2012	11.90	14.01	57.50	-64.12	2.39	7.48	7.75	4.21
	2013	11.94	13.45	58.09	7.42	2.38	6.87	7.82	4.05

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Score 5	2007	12.55	10.17	64.89	13.57	3.03	9.22	7.85	5.74
	2008	12.62	10.32	64.21	7.80	3.85	9.53	8.67	5.50
	2009	12.67	10.00	63.57	10.15	4.89	6.97	5.60	3.64
	2010	12.72	10.49	64.12	11.66	4.20	4.36	6.95	4.56
	2011	12.78	10.69	64.14	5.23	2.57	6.53	7.65	4.36
	2012	12.84	10.72	63.25	-30.18	3.48	6.72	5.98	3.69
	2013	12.88	10.70	63.44	9.70	3.71	5.21	5.28	3.55

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Score 6	2007	13.73	10.14	61.02	17.99	3.46	11.76	13.30	8.54
	2008	13.80	9.92	60.52	8.89	4.54	9.91	9.29	5.84
	2009	13.83	10.13	60.10	17.36	5.67	5.64	6.34	3.35
	2010	13.88	10.70	60.56	13.26	4.38	4.70	8.04	4.53
	2011	13.92	10.89	60.82	16.52	1.26	6.05	7.50	4.18
	2012	13.96	11.23	60.14	14.87	3.09	7.24	5.99	3.93
	2013	13.99	11.62	60.56	6.51	3.79	4.62	5.49	3.06

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Score 7	2007	15.21	9.21	58.68	22.48	3.40	15.65	16.30	9.95
	2008	15.24	8.30	58.81	37.37	5.31	11.20	10.00	6.77
	2009	15.27	8.87	58.40	19.25	6.46	2.17	5.37	3.09
	2010	15.31	9.77	58.84	15.90	5.09	5.36	4.71	3.23
	2011	15.33	10.10	59.23	-6.47	1.94	5.68	5.95	3.40
	2012	15.36	10.22	59.27	-4.60	3.71	4.13	3.18	2.09
	2013	15.35	11.05	59.51	-0.88	4.55	0.87	2.41	2.13

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Score 8	2007	16.57	8.34	60.65	29.67	2.77	19.41	29.57	16.02
	2008	16.65	7.82	59.96	-7.97	4.26	12.60	14.63	9.29
	2009	16.65	8.27	59.87	26.33	5.53	2.26	5.67	2.54
	2010	16.66	8.68	60.22	25.42	4.14	2.45	3.68	3.08
	2011	16.70	8.58	60.50	1.18	3.90	7.16	2.53	2.19
	2012	16.70	9.13	60.30	3.81	4.85	2.12	3.37	0.97
	2013	16.67	9.18	61.13	28.76	5.07	-1.32	0.17	1.25

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Score 9	2007	18.08	5.85	58.36	33.58	1.62	17.38	14.93	10.65
	2008	18.10	5.43	58.07	101.04	3.12	10.44	15.10	8.36
	2009	18.14	5.44	56.65	1.03	5.32	8.34	2.59	2.24
	2010	18.22	5.40	56.55	9.42	4.90	1.76	0.66	2.00
	2011	18.22	5.23	55.75	-17.58	4.54	2.10	3.21	0.96
	2012	18.22	5.45	54.57	-21.08	6.43	0.00	-0.67	0.76
	2013	18.15	5.91	55.41	3.27	5.91	-4.76	3.54	-1.19

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Score 10	2007	20.43	3.83	41.46	26.26	1.49	19.11	16.66	7.96
	2008	20.51	3.02	39.44	15.07	2.99	16.44	8.96	4.38
	2009	20.44	4.00	42.40	3.74	5.29	-5.64	2.06	1.66
	2010	20.50	4.29	43.40	13.57	3.61	4.02	7.86	3.66
	2011	20.57	4.28	40.82	6.70	3.07	5.41	1.95	-0.07
	2012	20.52	4.54	40.64	12.93	2.92	-2.77	-4.05	-0.76
	2013	20.43	4.94	42.50	11.69	3.10	-7.60	-4.09	-1.23

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Quartile 1	2007	11.18	17.85	56.53	11.81	2.47	9.87	11.98	6.76
	2008	11.17	18.91	56.08	8.40	4.52	7.89	6.76	4.20
	2009	11.23	19.62	53.89	-12.81	5.70	7.20	4.75	2.63
	2010	11.27	20.08	53.98	101.19	3.92	9.53	12.99	5.70
	2011	11.31	20.17	53.89	81.14	2.77	8.82	7.86	4.76
	2012	11.34	19.86	53.60	-39.44	2.12	8.31	8.39	3.91
	2013	11.43	18.97	54.41	-50.31	3.21	10.49	9.39	4.34

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Quartile 2	2007	12.55	10.17	64.89	13.57	3.03	9.22	7.85	5.74
	2008	12.62	10.32	64.21	7.80	3.85	9.53	8.67	5.50
	2009	12.67	10.00	63.57	10.15	4.89	6.97	5.60	3.64
	2010	12.72	10.49	64.12	11.66	4.20	4.36	6.95	4.56
	2011	12.78	10.69	64.14	5.23	2.57	6.53	7.65	4.36
	2012	12.84	10.72	63.25	-30.18	3.48	6.72	5.98	3.69
	2013	12.88	10.70	63.44	9.70	3.71	5.21	5.28	3.55

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Quartile 3	2007	13.73	10.14	61.02	17.99	3.46	11.76	13.30	8.54
	2008	13.80	9.92	60.52	8.89	4.54	9.91	9.29	5.84
	2009	13.83	10.13	60.10	17.36	5.67	5.64	6.34	3.35
	2010	13.88	10.70	60.56	13.26	4.38	4.70	8.04	4.53
	2011	13.92	10.89	60.82	16.52	1.26	6.05	7.50	4.18
	2012	13.96	11.23	60.14	14.87	3.09	7.24	5.99	3.93
	2013	13.99	11.62	60.56	6.51	3.79	4.62	5.49	3.06

	t	Size	Equity	Loans	Net Income	Loan Impair	Assets Growth	Loans Growth	LoansP Growth
Size Quartile 4	2007	16.16	8.27	58.26	25.79	2.92	16.82	18.75	11.18
	2008	16.21	7.51	58.03	37.28	4.65	11.60	11.72	7.43
	2009	16.24	7.98	57.68	17.04	6.04	2.84	4.83	2.77
	2010	16.27	8.62	58.08	16.70	4.81	4.16	4.00	3.02
	2011	16.29	8.77	58.13	-6.13	2.80	5.39	4.62	2.60
	2012	16.31	9.00	57.91	-4.68	4.34	2.77	2.27	1.51
	2013	16.32	9.53	58.37	6.57	4.82	-0.90	1.82	1.23

DOI https://doi.org/10.3790/vjh.89.1.59

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

DOI https://doi.org/10.3790/vjh.89.1.59

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 gage 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

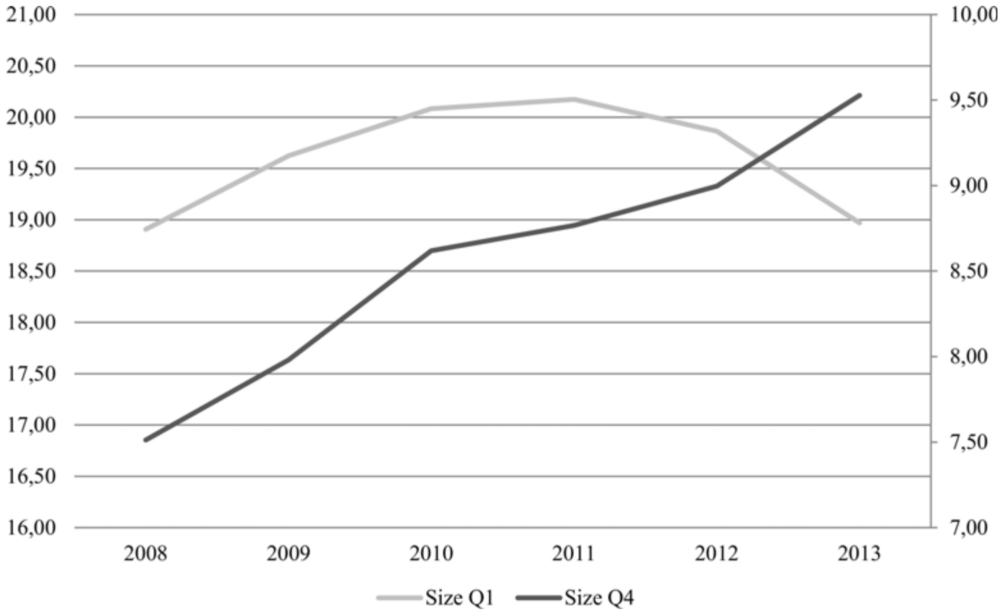
4.2.1 Evidence of Desired effects of Prudential Regulation

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

DOI https://doi.org/10.3790/vjh.89.1.59

Figure 2

Level of Capital



Level of Capital (as ratio of Total Capital to Total Assets) for Size Q1Banks (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***	0.8823***	0.9921***	1.0047***	0.9698***	0.9736***
	0.084	0.080	0.073	0.072	0.071	0.073
Total Assets	-0.2497*	-0.1821	-0.0518	-0.0277	-0.0619	-0.0546
	0.133	0.124	0.104	0.103	0.100	0.103
Loans	-0.0163	-0.0175*	0.0014	0.0075	-0.0062	-0.0066
	0.011	0.010	0.008	0.008	0.008	0.008
NPL System	-0.0162	0.0008	-0.0324	-0.0401**	-0.0169	-0.0165
	0.026	0.021	0.020	0.020	0.019	0.019
Government Debt	0.0006	-0.003	-0.0022	-0.0021	-0.002	-0.0018
	0.003	0.003	0.002	0.002	0.002	0.002
GDP Growth	0.0363	0.0396	0.0728**	0.0744**	0.0623**	0.0643**
	0.037	0.032	0.033	0.034	0.031	0.031
Capital System	-0.0356**	-0.0279**	-0.0543***	-0.0568***	-0.0320***	-0.0306***
	0.015	0.011	0.010	0.011	0.009	0.009
Dummy 2009	0.6757***	0.3423*	0.8595***	0.8370***	0.5551***	0.5705***
	0.234	0.197	0.193	0.195	0.181	0.183
Dummy 2010	0.4888***	0.1143	0.3815***	0.3521***	0.1292	0.1162
	0.126	0.111	0.113	0.117	0.111	0.112
Dummy 2011	0.5774***	0.2276*	0.4008***	0.3649***	0.182	0.1752
	0.126	0.116	0.115	0.122	0.114	0.117
Dummy 2012	0.8798***	0.4832***	0.7080***	0.6877***	0.4780***	0.4859***
	0.109	0.098	0.100	0.106	0.100	0.101
Dummy 2013	1.0012***	0.3731***	0.7526***	0.7299***	0.3830***	0.3876***
	0.110	0.103	0.106	0.112	0.107	0.107
Assets Growth		-0.0648***			-0.0586***	-0.0628***
		0.006			0.006	0.007
Loans Growth			-0.0204***		-0.0041	
			0.005		0.004	
LoansP Growth				-0.0497***		0.0031
				0.011		0.014
Constant	5.5237*	5.3176*	1.095	0.4054	2.1326	1.9758
	3.212	2.923	2.534	2.516	2.407	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***	0.7906***	0.7012***	0.8581***	0.5886**	1.1466***	0.9046***	0.9001***	0.7211***	1.0485***	0.9901***	0.7372***	1.1466***	0.9046***	0.8783***
	0.071	*0.073*	*0.196*	*0.083*	*0.248*	*0.104*	*0.090*	*0.127*	*0.088*	*0.054*	*0.129*	*0.111*	*0.104*	*0.090*	*0.130*
Total Assets	-0.0619	-1.9560**	-6.3990*	-0.5244	-1.9941	0.2219	-0.3856*	-0.5151***	-1.0424***	-0.067	0.0393	-2.2542**	0.2219	-0.3856*	-0.2078*
	0.100	*0.971*	*3.501*	*1.345*	*1.326*	*0.401*	*0.200*	*0.174*	*0.340*	*0.064*	*0.067*	*0.944*	*0.401*	*0.200*	*0.110*
Loans	-0.0062	0.0651**	-0.1131	-0.0383	-0.0797*	0.0009	-0.0109	-0.0059	-0.0034	-0.0021	0.0053	-0.0594**	0.0009	-0.0109	-0.004
	0.008	*0.030*	*0.078*	*0.024*	*0.048*	*0.012*	*0.009*	*0.004*	*0.007*	*0.003*	*0.007*	*0.025*	*0.012*	*0.009*	*0.003*
NPL System	-0.0169	0.3244	-0.1748	-0.092	0.1584	-0.0657	0.0287	0.0146	-0.0177	-0.0133	-0.0167	-0.0589	-0.0657	0.0287	0.0106
	0.019	*1.010*	*0.195*	*0.083*	*0.129*	*0.047*	*0.046*	*0.029*	*0.052*	*0.012*	*0.037*	*0.055*	*0.047*	*0.046*	*0.018*
Government Debt	-0.002	-0.0139	0.0742**	0.0142	-0.0082	-0.0029	-0.0083	-0.0026	0.0032	0.001	-0.0007	0.0200**	-0.0029	-0.0083	-0.0031
	0.002	*0.110*	*0.036*	*0.012*	*0.015*	*0.006*	*0.006*	*0.003*	*0.009*	*0.002*	*0.007*	*0.010*	*0.006*	*0.006*	*0.002*
GDP Growth	0.0623**	3.1291	-0.3964**	-0.1154	0.017	0.0075	0.1079***	0.0717**	0.0765*	0.0580*	0.0374	-0.0298	0.0075	0.1079***	0.0650***
	0.031	*2.045*	*0.197*	*0.133*	*0.170*	*0.070*	*0.041*	*0.036*	*0.042*	*0.033*	*0.060*	*0.099*	*0.070*	*0.041*	*0.022*
Capital System	-0.0320***	0.5733	0.5863*	-0.0421	0.0392	-0.0128	-0.0711***	0.0104	0.104	0.0128	0.0083	0.1346**	-0.0128	-0.0711***	0.0193
	0.009	*1.370*	*0.304*	*0.074*	*0.065*	*0.029*	*0.019*	*0.023*	*0.139*	*0.023*	*0.033*	*0.059*	*0.029*	*0.019*	*0.036*
Assets Growth	-0.0586***	-0.1913***	-0.1108**	-0.1255***	-0.0530***	-0.0540***	-0.0482***	-0.0434***	-0.0303***	-0.0186***	-0.0082*	-0.0809***	-0.0540***	-0.0482***	-0.0373***
	0.006	*0.029*	*0.047*	*0.037*	*0.015*	*0.017*	*0.008*	*0.012*	*0.006*	*0.003*	*0.005*	*0.018*	*0.017*	*0.008*	*0.008*
Loans Growth	-0.0041	0.0082	0.0042	-0.0147**	-0.0009	-0.021	0.005	-0.0039	0.0096**	0.0014*	0.0055	-0.0011	-0.021	0.005	-0.0003
	0.004	*0.028*	*0.006*	*0.007*	*0.006*	*0.021*	*0.004*	*0.003*	*0.004*	*0.001*	*0.004*	*0.004*	*0.021*	*0.004*	*0.002*
Dummy 2009	0.5551***	16.2462	-3.1043**	-0.1589	0.2803	-0.0086	0.9679***	0.9215***	0.7508***	0.9908***	1.8753***	-0.0954	-0.0086	0.9679***	0.8764***
	0.181	*12.072*	*1.423*	*1.003*	*0.913*	*0.456*	*0.284*	*0.271*	*0.261*	*0.175*	*0.359*	*0.550*	*0.456*	*0.284*	*0.185*
Dummy 2010	0.1292	-10.1833	-0.8163	0.4695	0.3365	0.266	0.1509	0.5232***	0.3402	0.2203	1.0154***	0.0259	0.266	0.1509	0.4349***
	0.111	*9.901*	*1.125*	*0.515*	*0.565*	*0.187*	*0.168*	*0.170*	*0.230*	*0.140*	*0.166*	*0.361*	*0.187*	*0.168*	*0.111*
Dummy 2011	0.182	-8.3847	-0.2588	0.3712	0.4835	0.1047	0.4653***	0.5884***	0.3074	0.0423	0.6823***	0.204	0.1047	0.4653***	0.4101***
	0.114	*8.419*	*1.145*	*0.459*	*0.535*	*0.202*	*0.169*	*0.146*	*0.224*	*0.134*	*0.126*	*0.333*	*0.202*	*0.169*	*0.106*
Dummy 2012	0.4780***	-2.8511	-0.7229	1.0967***	0.8165***	0.1562	0.8368***	0.7139***	0.6081**	0.5037***	1.1331***	0.5414**	0.1562	0.8368***	0.6156***
	0.100	*5.287*	*1.153*	*0.379*	*0.302*	*0.293*	*0.167*	*0.133*	*0.260*	*0.126*	*0.148*	*0.234*	*0.293*	*0.167*	*0.092*
Dummy 2013	0.3830***	-3.2888	-0.8837	0.8227**	0.5260*	0.1564	0.7842***	0.6110***	0.4342	0.5396***	1.1014***	0.2723	0.1564	0.7842***	0.5150***
	0.107	*7.280*	*1.305*	*0.370*	*0.315*	*0.298*	*0.185*	*0.146*	*0.300*	*0.151*	*0.173*	*0.256*	*0.298*	*0.185*	*0.117*
Constant	2.1326	23.4323*	71.4621*	9.7516	32.5455	-3.1854	7.7318*	9.0393***	18.7725***	0.7767	-1.7012	31.0366**	-3.1854	7.7318*	4.4749*
	2.407	*12.359*	*41.185*	*16.183*	*20.597*	*5.888*	*4.061*	*3.379*	*5.645*	*1.246*	*1.291*	*12.992*	*5.888*	*4.061*	*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***	0.9949***	0.9835***	0.9420***	1.0130***	0.9494***
	0.066	*0.065*	*0.058*	*0.054*	*0.051*	*0.046*
Total Assets	0.0324	0.0173	-0.007	-0.044	0.0454	-0.0014
	0.039	*0.037*	*0.036*	*0.035*	*0.033*	*0.032*
Equity	-0.1431**	-0.1906***	0.0895*	0.0940*	-0.1387***	-0.1911***
	0.059	*0.065*	*0.054*	*0.050*	*0.048*	*0.040*
L.Equity	0.1335*	0.1899**	-0.1234*	-0.1453**	0.1270**	0.1524***
	0.070	*0.081*	*0.063*	*0.059*	*0.059*	*0.046*
NPL System	-0.3302***	-0.3278***	-0.3063***	-0.2800***	-0.3003***	-0.2505***
	0.029	*0.028*	*0.027*	*0.026*	*0.025*	*0.022*
Government Debt	0.0253***	0.0237***	0.0257***	0.0284***	0.0218***	0.0260***
	0.009	*0.008*	*0.007*	*0.007*	*0.007*	*0.006*
GDP Growth	0.0382	0.0485	0.0537	0.0411	0.0751	0.0585
	0.063	*0.061*	*0.055*	*0.053*	*0.049*	*0.044*
Capital System	-0.0136	-0.0232	-0.014	0.0344	-0.0396	0.0404
	0.102	*0.101*	*0.092*	*0.086*	*0.079*	*0.072*
Dummy 2009	0.4784	0.3446	0.7695*	0.7647*	0.5961	0.5202
	0.497	*0.470*	*0.452*	*0.433*	*0.380*	*0.356*
Dummy 2010	1.2298***	0.9781***	1.1968***	1.2349***	0.7599***	0.6474***
	0.234	*0.212*	*0.201*	*0.193*	*0.170*	*0.156*
Dummy 2011	0.7846***	0.5948***	0.8670***	0.9371***	0.5171***	0.5194***
	0.225	*0.207*	*0.203*	*0.194*	*0.170*	*0.156*
Dummy 2012	0.1649	0.0142	0.3915	0.4003	0.2129	0.168
	0.318	*0.301*	*0.302*	*0.290*	*0.247*	*0.236*
Dummy 2013	1.1403**	0.8802**	1.4355***	1.3987***	1.0052***	0.7915***
	0.444	*0.418*	*0.419*	*0.388*	*0.330*	*0.304*
Assets Growth		-0.0491***			-0.1239***	-0.1711***
		0.009			*0.012*	*0.014*
Loans Growth			0.0625***		0.0909***	
			0.007		*0.011*	
LoansP Growth				0.1605***		0.2825***
				0.015		*0.017*
Constant	-0.3092	-0.4865	-0.5573	1.7663	-2.0366	1.4987
	3.713	*3.658*	*3.357*	*3.098*	*2.927*	*2.614*
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.

DOI https://doi.org/10.3790/vjh.89.1.59

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***	0.9597***	0.3815	1.1937***	0.9255***	1.0291***	1.0925***	1.1024***	0.9683***	0.9943***	0.8730***	1.0084***	1.0291***	1.0925***	1.0437***
	0.065	*0.120*	*0.448*	*0.125*	*0.188*	*0.112*	*0.105*	*0.187*	*0.079*	*0.095*	*0.075*	*0.137*	*0.112*	*0.105*	*0.114*
Total Assets	0.0173	1.109	2.8555	0.1561	-0.084	-0.341	-0.1152	-0.2115	-0.6131	-0.4031	-0.6991	-0.1497	-0.341	-0.1152	-0.0056
	0.037	*0.949*	*3.745*	*1.842*	*0.824*	*0.446*	*0.301*	*0.326*	*0.503*	*0.540*	*0.534*	*0.226*	*0.446*	*0.301*	*0.227*
Equity	-0.1906***	0.1843*	-0.2553**	-0.2874	-0.1044	-0.3216**	-0.0575	-0.1551*	0.3238*	0.5436**	3.0182***	-0.1360*	-0.3216**	-0.0575	-0.017
	0.065	*0.095*	*0.104*	*0.349*	*0.101*	*0.157*	*0.110*	*0.093*	*0.183*	*0.240*	*0.939*	*0.080*	*0.157*	*0.110*	*0.081*
L.Equity	0.1899**	-0.1195	-0.0289	0.4102	0.0401	0.3371	0.1178	0.1953*	-0.3619**	-0.5151**	-2.3402***	0.1298	0.3371	0.1178	0.0246
	0.081	*0.099*	*0.151*	*0.396*	*0.143*	*0.206*	*0.116*	*0.106*	*0.166*	*0.232*	*0.861*	*0.110*	*0.206*	*0.116*	*0.082*
NPL System	-0.3278***	1.0034	0.3868	-0.4476**	-0.3747**	-0.6784***	-0.4740***	-0.0705	-0.1124	-0.1341	-0.2162	-0.4375***	-0.6784***	-0.4740***	-0.1051
	0.028	*1.040*	*0.809*	*0.203*	*0.167*	*0.133*	*0.087*	*0.159*	*0.105*	*0.089*	*0.277*	*0.114*	*0.133*	*0.087*	*0.065*
Government Debt	0.0237***	-0.0365	-0.0948	0.0431	0.0425**	0.0577***	0.0165	-0.027	0.019	0.0086	0.0226	0.0501***	0.0577***	0.0165	-0.004
	0.008	*0.103*	*0.151*	*0.029*	*0.018*	*0.009*	*0.016*	*0.062*	*0.026*	*0.010*	*0.061*	*0.016*	*0.009*	*0.016*	*0.027*
GDP Growth	0.0485	-0.0632	-1.3306***	0.1538	-0.0575	-0.0684	0.0887	0.2507**	-0.0935	-0.1038	-0.0138	-0.1257	-0.0684	0.0887	0.1253
	0.061	*1.213*	*0.482*	*0.384*	*0.155*	*0.118*	*0.119*	*0.117*	*0.174*	*0.194*	*0.221*	*0.151*	*0.118*	*0.119*	*0.090*
Capital System	-0.0232	1.2078	-0.7753	0.0592	0.1232	-0.0547	-0.157	-0.0833	0.1259	0.02	-0.1705	0.0212	-0.0547	-0.157	0.0029
	0.101	*1.455*	*0.687*	*0.174*	*0.214*	*0.208*	*0.130*	*0.164*	*0.095*	*0.084*	*0.226*	*0.122*	*0.208*	*0.130*	*0.060*
Assets Growth	-0.0491***	0.0399	-0.0274	-0.0813	-0.0128	-0.0364**	-0.0549***	-0.0972***	-0.1114***	-0.0337	-0.0466	-0.0199	-0.0364**	-0.0549***	-0.0889***
	0.009	*0.053*	*0.028*	*0.095*	*0.016*	*0.017*	*0.013*	*0.016*	*0.028*	*0.022*	*0.030*	*0.017*	*0.017*	*0.013*	*0.013*
Dummy 2009	0.3446	2.8716	-8.7470***	0.7974	-0.4285	-0.0891	0.8695	1.9283	-2.3520**	-2.8159***	-3.9849**	-0.9885	-0.0891	0.8695	0.2263
	0.470	*6.463*	*2.577*	*2.535*	*0.991*	*0.920*	*0.913*	*1.187*	*0.931*	*0.990*	*1.943*	*0.928*	*0.920*	*0.913*	*0.694*
Dummy 2010	0.9781***	4.9296	2.2007	1.4472	1.1748**	1.6749***	1.3332***	0.4456	-1.0818	-1.6063**	-2.2890**	1.5734***	1.6749***	1.3332***	-0.2483
	0.212	*7.175*	*1.801*	*1.088*	*0.537*	*0.330*	*0.429*	*0.719*	*0.733*	*0.744*	*1.146*	*0.503*	*0.330*	*0.429*	*0.364*
Dummy 2011	0.5948***	-0.5504	1.9403	0.721	0.9028	1.3955***	0.7653**	0.3767	-1.6642**	-1.7131**	-4.2069***	1.1656***	1.3955***	0.7653**	-0.5751
	0.207	*7.707*	*1.543*	*1.045*	*0.596*	*0.309*	*0.380*	*0.816*	*0.773*	*0.718*	*1.009*	*0.435*	*0.309*	*0.380*	*0.427*
Dummy 2012	0.0142	2.6038	-2.5829*	0.663	0.0521	0.0764	0.482	0.4475	-2.0101**	-2.4492***	-4.3061***	0.0509	0.0764	0.482	-0.5985
	0.301	*6.312*	*1.554*	*1.241*	*0.851*	*0.443*	*0.550*	*0.809*	*0.801*	*0.636*	*1.284*	*0.566*	*0.443*	*0.550*	*0.445*
Dummy 2013	0.8802**	-4.4128	-2.3072	1.4503	0.742	1.3466*	1.3091**	1.1649	-1.6022**	-1.2909*	-2.3063**	0.9697	1.3466*	1.3091**	0.1012
	0.418	*5.712*	*2.475*	*0.941*	*1.206*	*0.739*	*0.665*	*1.284*	*0.775*	*0.752*	*1.170*	*0.780*	*0.739*	*0.665*	*0.655*
Constant	-0.4865	-18.9360**	15.5794	-16.0142	3.1387	0.5294	-3.5198	-0.5613	12.7308	8.8718	19.5783	-1.2177	0.5294	-3.5198	-1.2024
	3.658	*9.225*	*25.932*	*26.993*	*9.447*	*10.373*	*5.293*	*7.403*	*9.013*	*15.066*	*12.394*	*7.815*	*10.373*	*5.293*	*8.628*

DOI https://doi.org/10.3790/vjh.89.1.59

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	0.699	0.7073	0.1713	0.5156	0.0123	0.5589	0.4203	0.699	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.

DOI https://doi.org/10.3790/vjh.89.1.59

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***	0.7953***	0.8039***	0.8030***	0.7939***	0.7945***
	0.149	*0.151*	*0.147*	*0.146*	*0.150*	*0.150*
Loans	0.014	0.0115	0.0163*	0.0206***	0.0145	0.0164*
	0.009	*0.010*	*0.009*	*0.008*	*0.009*	*0.009*
Total Assets	-0.0209	-0.0124	-0.0076	-0.002	0.002	0.0033
	0.098	*0.094*	*0.095*	*0.094*	*0.093*	*0.093*
Equity	0.0135	0.009	0.0214	0.022	0.0173	0.0177
	0.039	*0.041*	*0.042*	*0.042*	*0.044*	*0.044*
Net Income	-0.0012*	-0.0012*	-0.0013*	-0.0013*	-0.0013*	-0.0013*
	0.001	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
NPL System	-0.2417	-0.1163	-0.1062	-0.1058	-0.0027	-0.014
	0.710	*0.677*	*0.694*	*0.694*	*0.662*	*0.665*
Government Debt	-0.01	-0.0143	-0.0142	-0.0141	-0.0176	-0.0172
	0.018	*0.017*	*0.017*	*0.017*	*0.017*	*0.017*
GDP Growth	-3.7644	-3.0583	-2.9102	-2.8768	-2.3451	-2.3973
	4.573	*4.342*	*4.448*	*4.437*	*4.239*	*4.260*
Dummy 2009	-29.5562	-24.1177	-22.89	-22.6695	-18.562	-18.9778
	35.720	*33.916*	*34.733*	*34.666*	*33.138*	*33.303*
Dummy 2010	-0.6038	-0.9239	-0.8111	-0.8589	-1.1334	-1.1192
	1.780	*1.716*	*1.791*	*1.773*	*1.663*	*1.673*
Dummy 2011	-3.0804***	-3.2164***	-3.1787***	-3.2239***	-3.3350***	-3.3379***
	0.682	*0.665*	*0.679*	*0.663*	*0.620*	*0.622*
Dummy 2012	-8.3409	-6.9567	-6.5851	-6.5628	-5.5078	-5.6256
	9.484	*8.993*	*9.209*	*9.206*	*8.799*	*8.848*
Dummy 2013	-8.6055	-7.3534	-6.9199	-6.9076	-5.9412	-6.0521
	9.104	*8.658*	*8.837*	*8.840*	*8.469*	*8.515*
Assets Growth		-0.0328**			-0.0312**	-0.0289**
		0.014			*0.014*	*0.013*
Loans Growth			-0.0152**		-0.0068*	
			0.006		*0.004*	
LoansP Growth				-0.0444**		-0.0185
				0.019		*0.013*
Constant	11.267	9.9392	8.9016	8.5923	7.7765	7.7892
	13.531	*13.036*	*13.192*	*13.099*	*12.793*	*12.804*
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***	1.6447***	0.3418**	1.7735**	0.4941***	0.3618*	0.7913	0.5003***	0.161	0.5737***	0.5759***	0.2422	0.3618*	0.7913	0.3691***
	0.147	*0.251*	*0.144*	*0.773*	*0.111*	*0.188*	*0.494*	*0.130*	*0.144*	*0.127*	*0.056*	*0.327*	*0.188*	*0.494*	*0.127*
Loans	0.0163*	0.0278	-0.0231	0.0406	0.004	0.0111	0.0382***	0.0429***	0.0451***	0.0480***	0.0735**	0.0184	0.0111	0.0382***	0.0434***
	0.009	*0.024*	*0.145*	*0.075*	*0.019*	*0.017*	*0.015*	*0.014*	*0.011*	*0.017*	*0.032*	*0.026*	*0.017*	*0.015*	*0.011*
Total Assets	-0.0076	0.0339	-0.7889	-12.4264	3.7930**	-0.5866	-1.3771	0.2102	0.0323	-0.1357	0.4052	-0.387	-0.5866	-1.3771	0.1567
	0.095	*1.478*	*2.843*	*10.388*	*1.887*	*0.808*	*1.054*	*0.392*	*0.802*	*0.334*	*0.358*	*1.470*	*0.808*	*1.054*	*0.175*
Equity	0.0214	0.0248	0.1936	-0.0184	0.0224	-0.0663	0.0205	-0.0171	0.0169	0.003	-0.4187	0.1590**	-0.0663	0.0205	0.0159
	0.042	*0.070*	*0.126*	*0.207*	*0.072*	*0.086*	*0.028*	*0.043*	*0.071*	*0.056*	*0.264*	*0.080*	*0.086*	*0.028*	*0.047*
Net Income	-0.0013*	-0.1093***	-0.0246	-0.1181	-0.0003*	-0.0007	-0.0089	-0.0006	-0.0027*	-0.0012	-0.0050*	-0.0015	-0.0007	-0.0089	-0.0011
	0.001	*0.006*	*0.031*	*0.080*	*0.000*	*0.001*	*0.007*	*0.001*	*0.002*	*0.001*	*0.003*	*0.002*	*0.001*	*0.007*	*0.001*
NPL System	-0.1062	-0.725	-1.0434	0.5796	-0.8764	-0.025	1.1860*	0.9133**	0.7525***	0.3628	0.8231***	0.5355	-0.025	1.1860*	0.7350***
	0.694	*1.185*	*3.089*	*2.977*	*0.811*	*0.616*	*0.700*	*0.365*	*0.247*	*0.292*	*0.239*	*2.112*	*0.616*	*0.700*	*0.222*
Government Debt	-0.0142	0.0086	0.0313	0.0635	-0.0166	-0.0670***	-0.0718**	-0.0507**	-0.0348*	0.0009	-0.0617**	-0.0669	-0.0670***	-0.0718**	-0.0393***
	0.017	*0.099*	*0.246*	*0.246*	*0.024*	*0.025*	*0.029*	*0.020*	*0.020*	*0.017*	*0.024*	*0.094*	*0.025*	*0.029*	*0.012*
GDP Growth	-2.9102	-1.9748	-5.6899	3.7345	-7.6675*	-4.4192	4.0365	2.539	1.1463	0.7663	1.1668	-1.037	-4.4192	4.0365	0.5794
	4.448	*1.391*	*14.265*	*10.988*	*4.370*	*2.991*	*5.403*	*3.283*	*2.395*	*0.479*	*0.840*	*9.559*	*2.991*	*5.403*	*2.514*
Loans Growth	-0.0152**	-0.0139	-0.0209	0.0278	-0.0147*	-0.0165	-0.0065	-0.0106*	-0.0096	0.0005	0.0152*	-0.0144**	-0.0165	-0.0065	-0.01
	0.006	*0.020*	*0.025*	*0.054*	*0.009*	*0.010*	*0.010*	*0.006*	*0.015*	*0.005*	*0.008*	*0.007*	*0.010*	*0.010*	*0.008*
Dummy 2009	-22.89	-11.8106*	-44.3174	29.3694	-57.1064*	-31.4004	31.2958	21.7567	10.3226	8.1452**	9.0437*	-9.0834	-31.4004	31.2958	5.2093
	34.733	*6.644*	*107.524*	*91.347*	*32.370*	*21.998*	*41.339*	*29.869*	*17.411*	*3.820*	*5.086*	*72.339*	*21.998*	*41.339*	*21.796*
Dummy 2010	-0.8111	11.0425*	-2.9557	-6.7351	6.1286	3.6456	-4.0918	-0.9143	0.538	0.3843	-1.7271***	-1.3951	3.6456	-4.0918	-1.0737
	1.791	*6.509*	*8.985*	*4.215*	*4.128*	*2.419*	*4.272*	*2.787*	*1.169*	*0.742*	*0.641*	*7.200*	*2.419*	*4.272*	*2.049*
Dummy 2011	-3.1787***	6.7966	-7.3086	-4.0311	2.3113	0.1846	-5.4145**	-3.5905	-0.2045	0.5073	-0.9944**	-3.2511	0.1846	-5.4145**	-2.9774
	0.679	*5.871*	*6.155*	*4.404*	*2.702*	*1.447*	*2.251*	*3.042*	*1.128*	*0.636*	*0.480*	*4.201*	*1.447*	*2.251*	*2.280*
Dummy 2012	-6.5851	0.7848	-15.4068	7.3263	-15.5391*	-7.8818	8.3842	5.7352	2.7928	3.6827***	1.5884	-5.1338	-7.8818	8.3842	0.6017
	9.209	*2.430*	*28.726*	*28.306*	*8.031*	*5.172*	*11.727*	*9.799*	*5.295*	*1.409*	*1.390*	*17.750*	*5.172*	*11.727*	*7.519*
Dummy 2013	-6.9199	1.2275	-14.2363	12.9037	-15.2242**	-7.7626	7.2415	4.7048	2.506	0.2014	1.2673	-4.5174	-7.7626	7.2415	-0.2895
	8.837	*3.289*	*28.604*	*28.612*	*7.664*	*4.983*	*10.865*	*9.599*	*4.759*	*1.326*	*1.473*	*17.272*	*4.983*	*10.865*	*7.050*
Constant	8.9016	-0.3979	26.6429	119.0371	-23.2619	23.5236***	10.9654	-8.5565	-2.9981	-1.5403	-8.1428	11.2804	23.5236***	10.9654	-2.724
	13.192	*12.812*	*37.902*	*96.115*	*14.898*	*8.758*	*7.071*	*14.686*	*17.276*	*5.748*	*7.833*	*8.950*	*8.758*	*7.071*	*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, 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.

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.

DOI https://doi.org/10.3790/vjh.89.1.59

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***	1.0884***	1.0800***	1.0831***	1.0951***	1.0804***	1.0851***	1.0870***	1.0789***	1.0853***	1.0853***	1.0933***
	0.103	*0.106*	*0.104*	*0.103*	*0.106*	*0.102*	*0.103*	*0.106*	*0.103*	*0.103*	*0.105*	*0.105*
Size	-0.1099	-0.1093	-0.1126	-0.1111	-0.0964	-0.1056	-0.1033	-0.098	-0.0995	-0.0763	-0.0712	-0.0305
	0.296	*0.296*	*0.292*	*0.293*	*0.301*	*0.292*	*0.296*	*0.294*	*0.290*	*0.294*	*0.289*	*0.295*
Equity	-0.0591	-0.0577	-0.0634	-0.0601	-0.0565	-0.0655	-0.0615	-0.0619	-0.0645	-0.0601	-0.0694	-0.0628
	0.110	*0.111*	*0.110*	*0.110*	*0.110*	*0.110*	*0.110*	*0.108*	*0.110*	*0.110*	*0.108*	*0.107*
L.Equity	0.1159	0.1165	0.1176	0.1156	0.1197	0.1188	0.1162	0.1198	0.1169	0.115	0.1249	0.121
	0.115	*0.115*	*0.115*	*0.115*	*0.115*	*0.115*	*0.115*	*0.113*	*0.115*	*0.115*	*0.113*	*0.112*
NPL System	-0.4697***	-0.4691***	-0.4617***	-0.4644***	-0.4403***	-0.4520***	-0.4474***	-0.4332***	-0.4518***	-0.4538***	-0.3813***	-0.3624***
	0.085	*0.084*	*0.086*	*0.090*	*0.084*	*0.084*	*0.089*	*0.085*	*0.083*	*0.090*	*0.080*	*0.090*
Government Debt	0.0174	0.0171	0.0179	0.0176	0.0127	0.0183	0.017	0.0114	0.0186	0.0173	0.0102	0.007
	0.016	*0.016*	*0.015*	*0.015*	*0.017*	*0.015*	*0.015*	*0.016*	*0.015*	*0.015*	*0.016*	*0.016*
GDP Growth	0.0862	0.0884	0.0752	0.0864	0.0519	0.123	0.1307	0.0265	0.138	0.1729	0.0987	0.1429
	0.118	*0.120*	*0.121*	*0.117*	*0.113*	*0.115*	*0.109*	*0.118*	*0.123*	*0.111*	*0.120*	*0.113*
Capital System	-0.1484	-0.154	-0.1465	-0.148	-0.1344	-0.1601	-0.1736	-0.1036	-0.1594	-0.1889	-0.1187	-0.1616
	0.128	*0.134*	*0.126*	*0.124*	*0.127*	*0.125*	*0.120*	*0.136*	*0.127*	*0.123*	*0.134*	*0.132*
Assets Growth	-0.0548***	-0.0546***	-0.0552***	-0.0550***	-0.0523***	-0.0561***	-0.0564***	-0.0521***	-0.0560***	-0.0564***	-0.0526***	-0.0530***
	0.013	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	*0.013*	*0.012*	*0.012*
Dummy 2009	0.8401	0.7598	0.9474	0.9192	0.2173	1.3076	1.4278*	0.4206	1.3155	1.4379*	0.8525	1.0083
	0.906	*0.778*	*0.868*	*0.832*	*0.823*	*0.866*	*0.779*	*0.764*	*0.873*	*0.782*	*0.763*	*0.732*
Dummy 2010	1.3121***	1.2364***	1.5028***	1.3785***	0.9939**	1.3010***	1.3767***	1.2918***	1.1400***	0.9182**	0.7532*	0.4561
	0.427	*0.418*	*0.409*	*0.383*	*0.427*	*0.424*	*0.417*	*0.411*	*0.402*	*0.397*	*0.421*	*0.418*
Dummy 2011	0.7534**	0.6806*	0.8868**	0.8201**	0.4818	0.8274**	0.8787**	0.7837**	0.7350**	0.4964	0.5521	0.2267
	0.380	*0.361*	*0.360*	*0.341*	*0.386*	*0.375*	*0.362*	*0.356*	*0.356*	*0.357*	*0.358*	*0.369*
Dummy 2012	0.4564	0.3781	0.6086	0.5425	0.0542	0.7343	0.8189*	0.3418	0.6667	0.5317	0.4418	0.2752
	0.547	*0.425*	*0.492*	*0.444*	*0.505*	*0.524*	*0.458*	*0.423*	*0.493*	*0.446*	*0.417*	*0.413*
Dummy 2013	1.2717*	1.1420**	1.4835**	1.3772***	0.6455	1.5906**	1.6892***	1.1309**	1.4819**	1.3014**	1.0661**	0.7905*
	0.663	*0.465*	*0.592*	*0.528*	*0.600*	*0.640*	*0.556*	*0.464*	*0.589*	*0.533*	*0.459*	*0.472*
AGMS Size Q4		-0.0152						0.0872			0.0806	0.0757
		0.044						*0.056*			*0.058*	*0.057*

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						-0.0253		-0.0439	
			0.024						*0.033*		*0.032*	
LPGMS Size Q4				0.0266						-0.2024**		-0.2671***
				0.059						*0.079*		*0.085*
AGMS Total					-0.1094***			-0.1609***			-0.2332***	-0.2644***
					0.038			*0.049*			*0.055*	*0.057*
LGMS Total						0.0786***			0.0987***		0.1801***	
						0.023			*0.032*		*0.038*	
LPGMS Total							0.1459**			0.3194***		0.5435***
							0.063			*0.076*		*0.085*
Constant	-3.2276	-3.2766	-3.2175	-3.2564	-2.9227	-3.7199	-4.0054	-2.7526	-3.6813	-4.1296	-3.4643	-4.0931
	5.204	*5.177*	*5.115*	*5.066*	*5.280*	*5.094*	*5.025*	*5.202*	*5.124*	*5.059*	*5.144*	*5.173*
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 *Loans* 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.

DOI https://doi.org/10.3790/vjh.89.1.59

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***	1.0281***	1.0277***	1.0259***	1.0284***	1.0294***	1.0313***	1.0579***	1.0190***	1.0249***	1.0282***	1.0215***	1.0283***	1.0252***	1.0376***
	0.112	*0.111*	*0.112*	*0.112*	*0.112*	*0.111*	*0.111*	*0.106*	*0.113*	*0.114*	*0.110*	*0.112*	*0.111*	*0.111*	*0.113*
Size	-0.341	-0.3476	-0.3695	-0.3768	-0.3396	-0.324	-0.3208	-0.2896	-0.3323	-0.318	-0.3434	-0.2962	-0.2733	-0.2514	-0.211
	0.446	*0.459*	*0.451*	*0.453*	*0.445*	*0.447*	*0.441*	*0.446*	*0.440*	*0.441*	*0.460*	*0.451*	*0.450*	*0.457*	*0.457*
Equity	-0.3216**	-0.3221**	-0.3237**	-0.3250**	-0.3219**	-0.3273**	-0.3277**	-0.3172**	-0.3321**	-0.3315**	-0.3220**	-0.3302**	-0.3306**	-0.3264**	-0.3243**
	0.157	*0.157*	*0.157*	*0.156*	*0.157*	*0.158*	*0.157*	*0.161*	*0.156*	*0.155*	*0.158*	*0.156*	*0.155*	*0.158*	*0.157*
L.Equity	0.3371	0.3368*	0.3375*	0.3359	0.3368	0.3401*	0.3401*	0.3484*	0.3380*	0.3382*	0.3365	0.3381*	0.3402*	0.3366	0.3394
	0.206	*0.204*	*0.205*	*0.205*	*0.206*	*0.206*	*0.205*	*0.206*	*0.204*	*0.205*	*0.205*	*0.204*	*0.204*	*0.206*	*0.207*
NPL System	-0.6784***	-0.6789***	-0.6725***	-0.6550***	-0.6822***	-0.6764***	-0.6740***	-0.7091***	-0.6528***	-0.6555***	-0.6808***	-0.6583***	-0.6752***	-0.6086***	-0.6101***
	0.133	*0.123*	*0.135*	*0.145*	*0.131*	*0.133*	*0.134*	*0.124*	*0.134*	*0.138*	*0.127*	*0.134*	*0.142*	*0.128*	*0.145*
Government Debt	0.0577***	0.0578***	0.0574***	0.0563***	0.0582***	0.0600***	0.0602***	0.0588***	0.0582***	0.0593***	0.0580***	0.0584***	0.0613***	0.0540***	0.0554***
	0.009	*0.009*	*0.009*	*0.009*	*0.009*	*0.009*	*0.009*	*0.009*	*0.008*	*0.008*	*0.009*	*0.008*	*0.009*	*0.009*	*0.009*
GDP Growth	-0.0684	-0.0688	-0.0799	-0.0658	-0.0696	-0.0423	-0.0233	-0.0421	-0.0239	-0.0077	-0.0729	-0.0049	0.008	-0.0202	-0.0112
	0.118	*0.117*	*0.124*	*0.117*	*0.119*	*0.115*	*0.110*	*0.114*	*0.113*	*0.110*	*0.124*	*0.118*	*0.109*	*0.116*	*0.116*
Capital System	-0.0547	-0.0519	-0.0548	-0.0537	-0.055	-0.063	-0.0629	-0.1061	-0.0557	-0.0741	-0.0519	-0.0591	-0.0806	-0.0446	-0.0761
	0.208	*0.213*	*0.207*	*0.206*	*0.207*	*0.205*	*0.205*	*0.196*	*0.208*	*0.206*	*0.216*	*0.205*	*0.204*	*0.220*	*0.218*
Assets Growth	-0.0364**	-0.0364**	-0.0365**	-0.0367**	-0.0365**	-0.0373**	-0.0372**	-0.0366**	-0.0384**	-0.0386**	-0.0364**	-0.0385**	-0.0388**	-0.0374**	-0.0373**
	0.017	*0.017*	*0.017*	*0.017*	*0.017*	*0.017*	*0.017*	*0.017*	*0.017*	*0.017*	*0.017*	*0.017*	*0.017*	*0.017*	*0.017*
Dummy 2009	-0.0891	-0.0656	-0.0561	0.1317	-0.0855	0.1158	0.3221	0.1121	0.426	0.5722	-0.087	0.4604	0.5299	0.2694	0.2517
	0.920	*0.791*	*0.906*	*0.834*	*0.914*	*0.882*	*0.818*	*0.853*	*0.867*	*0.821*	*0.831*	*0.868*	*0.781*	*0.777*	*0.782*
Dummy 2010	1.6749***	1.6966***	1.8107***	1.8649***	1.7070***	1.6039***	1.6536***	1.6772***	1.5784***	1.6330***	1.7253***	1.4177***	1.4263***	1.2093***	1.1382***
	0.330	*0.331*	*0.332*	*0.322*	*0.343*	*0.336*	*0.334*	*0.342*	*0.332*	*0.334*	*0.347*	*0.330*	*0.326*	*0.352*	*0.381*
Dummy 2011	1.3955***	1.4154***	1.4776***	1.5895***	1.4211***	1.4344***	1.5001***	1.3974***	1.4572***	1.4900***	1.4365***	1.3674***	1.3228***	1.2406***	1.0929***
	0.309	*0.282*	*0.286*	*0.277*	*0.308*	*0.303*	*0.288*	*0.308*	*0.301*	*0.296*	*0.289*	*0.285*	*0.276*	*0.291*	*0.308*
Dummy 2012	0.0764	0.0957	0.1141	0.284	0.0904	0.1809	0.2883	0.177	0.3557	0.4761	0.0929	0.3516	0.3679	0.1576	0.0877
	0.443	*0.351*	*0.424*	*0.367*	*0.429*	*0.419*	*0.380*	*0.401*	*0.409*	*0.376*	*0.376*	*0.402*	*0.348*	*0.350*	*0.367*
Dummy 2013	1.3466*	1.3892***	1.4624**	1.6627***	1.3778*	1.5592**	1.7274***	1.4977**	1.7648**	1.9216***	1.3990***	1.6829**	1.7602***	1.4172***	1.3400**
	0.739	*0.516*	*0.683*	*0.603*	*0.715*	*0.699*	*0.621*	*0.671*	*0.703*	*0.649*	*0.540*	*0.666*	*0.569*	*0.520*	*0.543*
AGMS Size Q4		0.0057									0.0082			0.0433	0.0417
		0.049									*0.056*			*0.069*	*0.062*

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 *0.026*									-0.0264 *0.022*		-0.0376 *0.028*	
LPGMS Size Q4				0.0831 *0.079*									-0.0855 *0.067*		-0.1075 *0.077*
AGMS Size Q3					0.0057 *0.025*						0.0098 *0.041*			0.0602 *0.046*	0.0653 *0.049*
LGMS Size Q3						0.0477* *0.025*						-0.0077 *0.032*		-0.006 *0.032*	
LPGMS Size Q3							0.1232** *0.056*						0.0181 *0.061*		0.0014 *0.066*
AGMS Total								0.0004 *0.050*			-0.0124 *0.087*			-0.2005** *0.101*	-0.2463** *0.105*
LGMS Total									0.1095*** *0.036*			0.1279*** *0.044*		0.1717*** *0.047*	
LPGMS Total										0.2119*** *0.074*			0.2506*** *0.076*		0.3696*** *0.091*
Constant	0.5294 *10.373*	0.6206 *10.350*	0.8241 *10.440*	0.8023 *10.370*	0.4853 *10.309*	-0.2246 *10.315*	-0.7053 *10.029*	-1.7678 *9.830*	0.0821 *10.328*	-0.6247 *10.252*	0.5475 *10.411*	-0.4164 *10.413*	-1.3299 *10.180*	-0.608 *10.380*	-1.751 *10.383*
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 LGMS Size Q4/Size Q3/Total represents the average growth of Loans 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/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.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	0.7680*	0.7584*	0.7651*	0.7651*	0.7644*	0.7663*	0.7638*	0.7587*	0.8097**	0.7533	0.7598*
	0.494	*0.456*	*0.460*	*0.458*	*0.458*	*0.458*	*0.458*	*0.457*	*0.461*	*0.405*	*0.464*	*0.458*
Loans	0.0382***	0.0302	0.0319	0.0335	0.0307	0.0315	0.0328	0.0301	0.0318	0.0245	0.0309	0.0322
	0.015	*0.022*	*0.022*	*0.022*	*0.022*	*0.022*	*0.022*	*0.022*	*0.023*	*0.018*	*0.022*	*0.022*
Total Assets	-1.3771	-0.9484	-0.943	-0.9456	-0.938	-0.9296	-0.9317	-0.9274	-0.927	-1.1760*	-0.9133	-0.9201
	1.054	*0.611*	*0.610*	*0.610*	*0.608*	*0.607*	*0.606*	*0.604*	*0.603*	*0.694*	*0.602*	*0.602*
Equity	0.0205	-0.0036	0.0007	0.0043	-0.0021	0.0019	0.0026	-0.0035	0.0024	-0.0148	0.0001	0.0001
	0.028	*0.038*	*0.039*	*0.038*	*0.038*	*0.037*	*0.038*	*0.038*	*0.038*	*0.033*	*0.038*	*0.038*
Net Income	-0.0089	-0.0086	-0.0086	-0.0086	-0.0086	-0.0086	-0.0086	-0.0085	-0.0086	-0.0087	-0.0086	-0.0086
	0.007	*0.008*	*0.008*	*0.008*	*0.008*	*0.008*	*0.008*	*0.008*	*0.008*	*0.008*	*0.008*	*0.008*
NPL System	1.1860*	0.4304	0.4365	0.4613	0.4483	0.4726	0.4832	0.4533	0.4757	-0.0198	0.4692	0.4576
	0.700	*0.377*	*0.376*	*0.378*	*0.381*	*0.377*	*0.381*	*0.379*	*0.357*	*0.294*	*0.361*	*0.378*
Government Debt	-0.0718**	-0.0335	-0.035	-0.0383	-0.0367	-0.0407	-0.0428	-0.0387	-0.0409	0.0484	-0.0426	-0.0426
	0.029	*0.035*	*0.035*	*0.035*	*0.036*	*0.035*	*0.036*	*0.035*	*0.032*	*0.055*	*0.034*	*0.035*
GDP Growth	4.0365	-0.1673	-0.1854	-0.184	-0.1474	-0.1326	-0.1326	-0.128	-0.1352	-0.7981	-0.1286	-0.1769
	5.403	*0.137*	*0.136*	*0.135*	*0.147*	*0.143*	*0.145*	*0.147*	*0.158*	*0.515*	*0.158*	*0.149*
Loans Growth	-0.0065	-0.0114**	-0.0116**	-0.0116**	-0.0116**	-0.0119**	-0.0118**	-0.0117**	-0.0119**	-0.007	-0.0120**	-0.0115**
	0.010	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.006*	*0.005*	*0.005*
Dummy 2009	31.2958	0.0616	0.4507	0.7754	0.2726	0.536	0.611	0.1634	0.5549	-0.5134	0.3136	0.2846
	41.339	*1.018*	*0.995*	*0.992*	*0.991*	*0.926*	*0.962*	*1.029*	*0.973*	*1.296*	*1.036*	*1.006*
Dummy 2010	-4.0918	-0.2386	0.0389	0.2734	-0.1968	-0.1952	-0.1391	-0.3612	-0.1612	3.2439	-0.3929	-0.0774
	4.272	*1.335*	*1.379*	*1.322*	*1.311*	*1.305*	*1.301*	*1.347*	*1.496*	*3.154*	*1.481*	*1.395*
Dummy 2011	-5.4145**	-2.9613***	-2.9941***	-2.9501***	-3.0146***	-3.1318***	-3.1310***	-3.0293***	-3.1195***	-0.5937	-3.1102***	-2.7893***
	2.251	*0.890*	*0.885*	*0.890*	*0.901*	*0.914*	*0.913*	*0.902*	*0.946*	*2.259*	*0.945*	*0.949*
Dummy 2012	8.3842	1.0225	0.9018	1.027	1.0071	1.0751	1.0788	0.997	1.0557	0.3814	0.9792	1.0017
	11.727	*0.941*	*0.997*	*0.942*	*0.947*	*0.942*	*0.939*	*0.943*	*1.097*	*1.309*	*1.144*	*0.951*
Dummy 2013	7.2415											
	10.865											
L2.AGMS Size Q4		-0.0068						0.0362			0.0736	0.1674***
		0.034						*0.039*			*0.045*	*0.055*

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			-0.0536						-0.0035		-0.0368	
			0.040						*0.075*		*0.086*	
L2.LPGMS Size Q4				-0.1488***						-1.5165		-0.3242***
				0.050						*1.144*		*0.118*
L2.AGMS Total					-0.034			-0.0605			-0.0143	-0.0336
					0.037			*0.044*			*0.056*	*0.045*
L2.LGMS Total						-0.0672**			-0.0647		-0.0668	
						0.029			*0.061*		*0.073*	
L2.LPGMS Total							-0.1227**			1.6842		0.038
							0.057			*1.389*		*0.108*
Constant	10.9654	13.5822	13.7554	13.9030*	13.7367	13.9867*	14.0604*	13.8005	13.9505*	10.6068	14.0133*	13.9527
	7.071	*8.409*	*8.397*	*8.416*	*8.446*	*8.441*	*8.456*	*8.453*	*8.437*	*8.723*	*8.450*	*8.518*
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
L.Impairment Loans	0.3710* *0.191*	0.3292* *0.195*	0.3268* *0.197*	0.3266* *0.196*	0.3299* *0.195*	0.3215* *0.195*	0.3232* *0.196*	0.3309* *0.196*	0.3250* *0.197*	0.3247 *0.197*	0.3326* *0.196*	0.3246* *0.197*	0.3282* *0.197*	0.5365 *0.364*	0.3255* *0.195*
Loans	0.0082 *0.015*	0.0243 *0.022*	0.0251 *0.023*	0.0266 *0.023*	0.0228 *0.021*	0.0256 *0.022*	0.0265 *0.022*	0.0227 *0.022*	0.0251 *0.022*	0.0254 *0.024*	0.0234 *0.022*	0.0243 *0.023*	0.0249 *0.024*	-0.0237 *0.052*	0.0262 *0.024*
Total Assets	-0.3816 *0.912*	-1.0178 *0.668*	-1.036 *0.679*	-1.0054 *0.667*	-1.0474 *0.665*	-0.9943 *0.667*	-0.99 *0.666*	-1.0401 *0.664*	-1.0138 *0.667*	-1.007 *0.662*	-1.0574 *0.667*	-1.0269 *0.684*	-1.0667 *0.658*	-1.8693 *1.338*	-1.0641 *0.661*
Equity	-0.0972 *0.097*	-0.0101 *0.057*	-0.0075 *0.057*	-0.0034 *0.059*	-0.0135 *0.054*	-0.0022 *0.057*	-0.0023 *0.056*	-0.014 *0.055*	-0.0076 *0.057*	-0.0074 *0.059*	-0.0108 *0.057*	-0.0032 *0.058*	0.0013 *0.057*	-0.0601 *0.084*	0.0069 *0.059*
Net Income	-0.0008 *0.001*	-0.0007 *0.001*	-0.0007 *0.001*	-0.0007 *0.001*	-0.0007 *0.001*	-0.0006 *0.001*	-0.0007 *0.001*	-0.0007 *0.001*	-0.0007 *0.001*	-0.0007 *0.001*	-0.0007 *0.001*	-0.0006 *0.001*	-0.0006 *0.001*	-0.0008 *0.001*	-0.0006 *0.001*
NPL System	-0.3393 *0.720*	0.7215*** *0.217*	0.7190*** *0.211*	0.7273*** *0.218*	0.6950*** *0.216*	0.7831*** *0.220*	0.7685*** *0.225*	0.7018*** *0.224*	0.7402*** *0.229*	0.7407*** *0.242*	0.6862*** *0.218*	0.7559*** *0.212*	0.6875*** *0.236*	0.3083 *0.510*	0.6717*** *0.231*
Government Debt	-0.0664** *0.027*	-0.0690*** *0.024*	-0.0688*** *0.024*	-0.0697*** *0.025*	-0.0646*** *0.025*	-0.0795*** *0.026*	-0.0763*** *0.026*	-0.0668*** *0.026*	-0.0721*** *0.027*	-0.0724** *0.029*	-0.0612** *0.024*	-0.0759*** *0.025*	-0.0610** *0.028*	0.0683 *0.137*	-0.0593** *0.027*
GDP Growth	-6.1732 *3.891*	-0.37 *0.236*	-0.3748 *0.241*	-0.3865 *0.246*	-0.3934 *0.243*	-0.2953 *0.245*	-0.3027 *0.233*	-0.3825 *0.234*	-0.3595 *0.230*	-0.3612 *0.227*	-0.4065* *0.240*	-0.2812 *0.268*	-0.3398 *0.258*	-1.3308 *1.205*	-0.3309 *0.256*
Loans Growth	-0.0191* *0.011*	-0.0099 *0.007*	-0.0097 *0.007*	-0.0097 *0.007*	-0.0102 *0.007*	-0.0092 *0.007*	-0.0099 *0.007*	-0.01 *0.007*	-0.0096 *0.007*	-0.0099 *0.007*	-0.0102 *0.007*	-0.0094 *0.007*	-0.0094 *0.007*	-0.0019 *0.015*	-0.0101 *0.007*
Dummy 2009	-44.3656 *28.627*	-0.2824 *1.039*	-0.1348 *0.924*	-0.0255 *0.920*	-0.6862 *1.132*	0.3526 *1.163*	0.3214 *1.078*	-0.5902 *1.039*	-0.2076 *0.967*	-0.2096 *0.929*	-0.4789 *1.111*	0.6441 *1.160*	0.903 *1.145*	-2.2366 *4.258*	0.6881 *1.200*
Dummy 2010	5.0588 *3.259*	1.596 *1.281*	1.6555 *1.328*	1.8311 *1.422*	1.4596 *1.200*	1.5462 *1.217*	1.5445 *1.215*	1.467 *1.246*	1.5919 *1.254*	1.6003 *1.288*	1.5949 *1.256*	1.5356 *1.357*	2.0209 *1.367*	4.4013 *4.126*	1.7767 *1.298*
Dummy 2011	0.9701 *1.868*	-0.4496 *0.982*	-0.4641 *0.973*	-0.3962 *1.018*	-0.454 *0.986*	-0.5629 *1.005*	-0.5674 *0.981*	-0.4259 *0.989*	-0.4865 *0.961*	-0.4703 *0.951*	-0.4731 *0.957*	-0.5348 *0.982*	-0.289 *0.989*	0.7397 *2.219*	-0.3416 *0.951*
Dummy 2012	-10.8783 *6.766*	0.1649 *0.406*	0.1113 *0.383*	0.1749 *0.411*	0.2098 *0.416*	0.3117 *0.409*	0.2531 *0.420*	0.1786 *0.403*	0.1997 *0.431*	0.1892 *0.436*	0.2147 *0.425*	0.2089 *0.421*	0.1708 *0.421*	4.0788 *4.510*	0.4004 *0.485*
Dummy 2013	-10.5877 *6.595*														
L2.AGMS Size Q4		-0.0101 *0.031*									-0.0409 *0.039*			-3.3362 *3.636*	0.1146** *0.056*

DOI https://doi.org/10.3790/vjh.89.1.59

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 *0.044*									-0.0374 *0.052*		1.6194 *1.989*	
L2.LPGMS Size Q4				-0.0711 *0.076*									-0.2416*** *0.067*		-0.3745*** *0.093*
L2.AGMS Size Q3					0.0331 *0.034*						0.0256 *0.063*			-2.9731 *3.311*	0.1235* *0.065*
L2.LGMS Size Q3						-0.0648** *0.032*						-0.1024* *0.055*		0.5063 *0.842*	
L2.LPGMS Size Q3							-0.0784* *0.042*						-0.1782* *0.092*		-0.2838*** *0.083*
L2.AGMS Total								0.03 *0.039*			0.0362 *0.088*			7.3181 *7.832*	-0.0939 *0.079*
L2.LGMS Total									-0.0271 *0.042*			0.0895 *0.070*		-1.9713 *2.500*	
L2.LPGMS Total										-0.038 *0.087*			0.3590** *0.170*		0.4159** *0.184*
Constant	25.8817*** *9.359*	16.1698* *9.499*	16.4281* *9.643*	15.9927* *9.503*	16.2313* *9.535*	16.6193* *9.593*	16.2118* *9.518*	16.2935* *9.504*	16.3451* *9.556*	16.2317* *9.504*	16.0517* *9.511*	16.7983* *9.702*	16.0648* *9.407*	8.6354 *17.257*	15.8200* *9.458*
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	26	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	0.116

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 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. The variables LPGMS 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.

DOI https://doi.org/10.3790/vjh.89.1.59

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***	1.0305***	1.0269***	1.0272***	1.0367***	1.0227***	1.0266***	1.0351***	1.0251***	1.0293***	1.0342***	1.0438***
	0.086	*0.087*	*0.087*	*0.087*	*0.088*	*0.087*	*0.087*	*0.088*	*0.086*	*0.087*	*0.087*	*0.088*
Size	-0.0183	-0.0182	-0.0219	-0.0208	-0.019	-0.0029	0.0091	-0.0243	0.0036	0.0257	0.0066	0.0398
	0.105	*0.105*	*0.104*	*0.104*	*0.106*	*0.103*	*0.102*	*0.106*	*0.104*	*0.104*	*0.105*	*0.106*
Equity	-0.2350**	-0.2349**	-0.2377**	-0.2370**	-0.2321*	-0.2431**	-0.2414**	-0.2339*	-0.2419**	-0.2404**	-0.2412**	-0.2379**
	0.120	*0.120*	*0.119*	*0.119*	*0.120*	*0.119*	*0.119*	*0.120*	*0.119*	*0.119*	*0.119*	*0.119*
L.Equity	0.2635*	0.2635*	0.2640*	0.2626*	0.2650*	0.2653*	0.2640*	0.2650*	0.2653*	0.2652*	0.2697*	0.2700*
	0.146	*0.146*	*0.145*	*0.146*	*0.147*	*0.145*	*0.146*	*0.146*	*0.145*	*0.145*	*0.145*	*0.146*
NPL System	-0.5507***	-0.5502***	-0.5434***	-0.5366***	-0.5288***	-0.5297***	-0.5251***	-0.5259***	-0.5331***	-0.5408***	-0.4664***	-0.4589***
	0.075	*0.071*	*0.077*	*0.082*	*0.072*	*0.075*	*0.079*	*0.073*	*0.075*	*0.082*	*0.071*	*0.081*
Government Debt	0.0382***	0.0382***	0.0382***	0.0379***	0.0351***	0.0392***	0.0388***	0.0343***	0.0393***	0.0399***	0.0318***	0.0308***
	0.008	*0.008*	*0.008*	*0.008*	*0.009*	*0.008*	*0.008*	*0.008*	*0.008*	*0.008*	*0.008*	*0.008*
GDP Growth	0.0182	0.0182	0.0064	0.0194	0.0039	0.0597	0.073	-0.0053	0.0795	0.0948	0.0632	0.085
	0.089	*0.090*	*0.092*	*0.088*	*0.086*	*0.086*	*0.082*	*0.090*	*0.091*	*0.084*	*0.089*	*0.086*
Capital System	-0.0866	-0.0869	-0.0835	-0.0843	-0.0842	-0.0908	-0.1071	-0.0686	-0.0953	-0.1171	-0.0775	-0.1112
	0.153	*0.158*	*0.152*	*0.151*	*0.152*	*0.151*	*0.148*	*0.159*	*0.151*	*0.149*	*0.159*	*0.158*
Assets Growth	-0.0467***	-0.0467***	-0.0470***	-0.0471***	-0.0454***	-0.0484***	-0.0487***	-0.0453***	-0.0484***	-0.0488***	-0.0461***	-0.0463***
	0.012	*0.012*	*0.012*	*0.012*	*0.012*	*0.012*	*0.012*	*0.012*	*0.012*	*0.012*	*0.012*	*0.012*
Dummy 2009	0.3983	0.3851	0.4619	0.5674	0.1211	0.902	1.0621*	0.2392	0.9378	1.0051	0.676	0.7465
	0.722	*0.607*	*0.698*	*0.647*	*0.663*	*0.687*	*0.624*	*0.607*	*0.692*	*0.621*	*0.601*	*0.586*
Dummy 2010	1.3821***	1.3716***	1.5434***	1.5249***	1.2016***	1.3303***	1.3993***	1.3284***	1.1624***	1.1039***	0.7951***	0.6639**
	0.274	*0.258*	*0.263*	*0.247*	*0.272*	*0.274*	*0.271*	*0.260*	*0.260*	*0.256*	*0.268*	*0.279*
Dummy 2011	0.9949***	0.9850***	1.0983***	1.1389***	0.8382***	1.0632***	1.1121***	0.9633***	0.9747***	0.8619***	0.7427***	0.5637**
	0.261	*0.232*	*0.244*	*0.228*	*0.258*	*0.256*	*0.247*	*0.234*	*0.243*	*0.236*	*0.236*	*0.249*
Dummy 2012	0.1735	0.1622	0.2566	0.344	-0.0301	0.4581	0.5741*	0.0902	0.4317	0.3946	0.2145	0.1573
	0.404	*0.304*	*0.375*	*0.324*	*0.369*	*0.384*	*0.340*	*0.309*	*0.372*	*0.321*	*0.305*	*0.300*
Dummy 2013	1.1521**	1.1316***	1.3043**	1.3813***	0.8171	1.5173***	1.6582***	1.0574***	1.4391***	1.4007***	1.0587***	0.9510**
	0.577	*0.390*	*0.527*	*0.464*	*0.520*	*0.555*	*0.495*	*0.397*	*0.525*	*0.464*	*0.393*	*0.402*
AGMS Size Q4		-0.0023						0.047			0.0448	0.0434
		0.036						*0.041*			*0.044*	*0.041*

DOI https://doi.org/10.3790/vjh.89.1.59

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						-0.0272		-0.0315*	
			0.018						*0.018*		*0.018*	
LPGMS SizeQ4				0.0601						-0.1261**		-0.1434***
				0.051						*0.049*		*0.055*
AGMS Total					-0.0619*			-0.0909**			-0.1758***	-0.2080***
					0.032			*0.035*			*0.039*	*0.043*
LGMS Total						0.0948***			0.1127***		0.1688***	
						0.021			*0.022*		*0.026*	
LPGMS Total							0.1879***			0.2761***		0.4154***
							0.053			*0.051*		*0.067*
Constant	-2.5178	-2.4997	-2.4952	-2.6097	-2.2444	-3.1188	-3.6083	-2.2192	-3.274	-3.7798	-2.9482	-3.7289
	5.088	*4.926*	*5.030*	*4.935*	*5.017*	*5.022*	*4.885*	*4.962*	*5.013*	*4.892*	*4.947*	*4.927*
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
Hansen-df	10	10	10	10	10	10	10	10	10	10	10	10
Hansen-p	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 Sys-GMM 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; 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 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***	0.6463**	0.6423**	0.6429**	0.6464**	0.6415**	0.6420**	0.6472**	0.6449**	0.7168***	0.6468**	0.6416**
	0.233	*0.259*	*0.260*	*0.259*	*0.259*	*0.260*	*0.260*	*0.258*	*0.261*	*0.231*	*0.262*	*0.258*
Loans	0.0240**	0.0312**	0.0321**	0.0337**	0.0310**	0.0328**	0.0332**	0.0311**	0.0325**	0.0229**	0.0317**	0.0331**
	0.011	*0.015*	*0.015*	*0.015*	*0.015*	*0.015*	*0.015*	*0.015*	*0.015*	*0.009*	*0.015*	*0.015*
Total Assets	-0.1587	-0.1808	-0.1822	-0.1801	-0.1823	-0.1734	-0.1777	-0.1827	-0.1684	-0.2382	-0.1696	-0.1868
	0.156	*0.149*	*0.149*	*0.150*	*0.148*	*0.150*	*0.149*	*0.148*	*0.149*	*0.156*	*0.149*	*0.148*
Equity	-0.0204	-0.0236	-0.0206	-0.0168	-0.0239	-0.0183	-0.0188	-0.0236	-0.0193	-0.0334	-0.02	-0.0186
	0.050	*0.031*	*0.032*	*0.031*	*0.030*	*0.031*	*0.031*	*0.031*	*0.032*	*0.027*	*0.032*	*0.031*
Net Income	-0.0014	-0.0012	-0.0012	-0.0012	-0.0013	-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	-0.0013	-0.0013
	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 System	0.1399	0.4252*	0.4294*	0.4411*	0.4190*	0.4574*	0.4548*	0.4171*	0.4664**	0.0185	0.4479**	0.4156*
	0.768	*0.235*	*0.232*	*0.237*	*0.241*	*0.240*	*0.248*	*0.238*	*0.218*	*0.331*	*0.221*	*0.241*
Government Debt	-0.0331	-0.0352	-0.0353	-0.0367	-0.0339	-0.0396	-0.0394	-0.0333	-0.0412**	0.0339	-0.0379*	-0.035
	0.022	*0.023*	*0.023*	*0.024*	*0.024*	*0.024*	*0.025*	*0.023*	*0.021*	*0.061*	*0.022*	*0.024*
GDP Growth	-1.9005	-0.2981*	-0.3037*	-0.3129*	-0.3053*	-0.2803*	-0.2852*	-0.3083*	-0.266	-0.732	-0.2908	-0.3520**
	4.437	*0.161*	*0.164*	*0.163*	*0.168*	*0.163*	*0.163*	*0.170*	*0.175*	*0.549*	*0.179*	*0.179*
Loans Growth	-0.0139*	-0.0106**	-0.0106**	-0.0105**	-0.0106**	-0.0106**	-0.0107**	-0.0106**	-0.0106**	-0.008	-0.0105**	-0.0104**
	0.008	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.006*	*0.005*	*0.005*
Dummy 2009	-13.6814	-0.2899	-0.0551	0.159	-0.3391	0.0714	0.0254	-0.3161	-0.02	-0.7339	-0.286	-0.2455
	33.356	*0.765*	*0.750*	*0.698*	*0.755*	*0.699*	*0.708*	*0.778*	*0.750*	*1.133*	*0.812*	*0.771*
Dummy 2010	0.4498	0.5449	0.6825	0.8848	0.5445	0.6447	0.6522	0.5673	0.542	2.679	0.4352	0.8351
	3.529	*1.089*	*1.151*	*1.144*	*1.057*	*1.066*	*1.077*	*1.100*	*1.202*	*2.979*	*1.177*	*1.159*
Dummy 2011	-2.3259	-1.6858**	-1.7062**	-1.6621**	-1.6742**	-1.7836**	-1.7524**	-1.6756**	-1.8060**	-0.1807	-1.8072**	-1.4909*
	2.048	*0.787*	*0.777*	*0.792*	*0.796*	*0.789*	*0.782*	*0.794*	*0.807*	*2.225*	*0.811*	*0.833*
Dummy 2012	-3.6267	0.5246	0.4807	0.5293	0.5302	0.5668	0.552	0.5326	0.6387	0.0613	0.7167	0.5526
	8.101	*0.387*	*0.433*	*0.386*	*0.393*	*0.383*	*0.378*	*0.391*	*0.498*	*0.759*	*0.543*	*0.391*
Dummy 2013	-4.0954											
	7.799											
L2.AGMS Size Q4		0.0056						-0.0066			-0.0054	0.0686*
		0.026						*0.029*			*0.040*	*0.038*

DOI https://doi.org/10.3790/vjh.89.1.59

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						0.0239		0.0239	
			0.037						*0.060*		*0.072*	
L2.LPGMS Size Q4				-0.0778*						-0.93		-0.1967**
				0.047						*0.954*		*0.085*
L2.AGMS Total					0.0139			0.0191			0.0824	0.0433
					0.031			*0.036*			*0.053*	*0.040*
L2.LGMS Total						-0.0434*			-0.0619		-0.1046*	
						0.025			*0.045*		*0.059*	
L2.LPGMS Total							-0.056			1.1068		0.0138
							0.050			*1.203*		*0.072*
Constant	8.601	3.1138	3.175	3.178	3.018	3.3791	3.3507	2.9717	3.4071	-0.8946	3.1241	3.0768
	10.995	*2.584*	*2.644*	*2.618*	*2.677*	*2.656*	*2.677*	*2.682*	*2.644*	*4.940*	*2.740*	*2.713*
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.

DOI https://doi.org/10.3790/vjh.89.1.59

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