

# EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT SYSTEMIC IMPORTANCE (BUT WERE AFRAID TO ASK)

Piergiorgio Alessandri<sup>\*</sup>, Sergio Masciantonio<sup>\*</sup> and Andrea Zaghini<sup>\*</sup>

*Banca d'Italia, Banca d'Italia, Banca d'Italia and CFS*

## Abstract

*We develop a methodology to identify and rank “systemically important financial institutions” (SIFIs). Our approach is consistent with that followed by the Financial Stability Board (FSB) but, unlike the latter, it is free of judgment and it is based entirely on publicly available data, thus filling the gap between the official views of the regulator and those that market participants can form with their own information set. We apply the methodology to annual data on three samples of banks (global, EU and euro area) for the years 2007-2012. We examine the evolution of the SIFIs over time and document the shifts in the relative weights of the major geographic areas. We also discuss the implication of the 2013 update of the identification methodology proposed by the FSB.*

*Key words:* G-SIFIs, Systemic risk, too-big-to-fail, financial crisis.

*JEL Classification:* G21; G01; G18.

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<sup>\*</sup> Bank of Italy, DG Economics, Statistics and Research – E-mail: piergiorgio.alessandri@bancaditalia.it, sergio.masciantonio@bancaditalia.it, andrea.zaghini@bancaditalia.it.

## 1. Introduction<sup>1</sup>

The term “systemic importance” has entered the economic jargon relatively recently. It was effectively the demise of Lehman Brothers in 2008 that showed how the collapse of a single, possibly not big, but deeply interconnected financial institution could endanger financial stability worldwide. While the *too-big-to-fail* problem had been already identified by both academics and regulators, the issue of defining, measuring and modelling systemic importance has effectively gained attention only after the eruption of the crisis.

This paper proposes a procedure to measure banks’ systemic importance which is consistent with regulatory views but based on public data, and hence transparent and easily replicable. The paper is thus mainly meant to provide regulators, practitioners and researchers with a shared, operational definition of systemic importance. The methodology is then applied to a sample of large European and global banks to investigate how the nature and geographical distribution of systemic institutions changed between 2007 and 2012.

The main motivation behind our work is that definition and measurement are crucial to policy makers. Following a formal request by the G20 group and a consultation that involved the International Monetary Fund (IMF), the Bank for International Settlements (BIS) and the Financial Stability Board (FSB), the Basel Committee on Banking Supervision proposed (BCBS 2011) a methodology to identify global systematically important financial institutions (G-SIFIs). A first important aspect is that the definition of systemic importance is different from the definition of systemic risk. In particular, systemic importance relates to the damage that the failure of a financial institution may create to the global financial stability, whereas systemic risk relates to the probability of default of an institution.

The BCBS (2011) methodology arguably represents the state of the art in the measurement of systemic importance. Furthermore, it has important practical implications, because all banks identified as G-SIFIs will be subject to capital surcharges and enhanced prudential supervision starting from 2019. This decision is aimed at applying one of the policy responses to the systemic importance issue: additional capital surcharges will make the default of a systemically important financial institution less likely. Thus a good

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understanding of the procedure is important for banks and market participants at large. As of today, however, the procedure raises concerns in terms of communication and transparency. The main potential weaknesses relate to the impossibility of replicating it due to its reliance on supervisory data, the non-negligible role played by supervisory judgement, and an incomplete disclosure of some important technical details.<sup>2</sup>

In order to overcome some of these flaws, Masciantonio (2013) implements the BCBS (2011) procedure using publicly available data only: the modified procedure replicates fairly closely the initial FSB (2011) G-SIFIs selection. Against this background, the first contribution of this paper is of a methodological nature. Building on BCBS (2011) and Masciantonio (2013) we construct a systemic importance (SI) index using a procedure which is free of judgment and is based exclusively on public data. Hence, we provide a methodology by which market participants could directly assess banks' systemic relevance in a way that is consistent with, and directly comparable to, the FSB assessment. Then, we exploit this methodology to study how systemic importance varied between 2007 and 2012 for a sample of large banks, looking separately at global, European and euro-area institutions. The comparison of pre- and post-crisis data is a useful extension of the (limited) information disclosed by the FSB, which covered only 2010, 2011 and 2012. Measuring systemic importance within specific regions, rather than at the global level only, is relevant since banks might have a significant impact on their domestic financial system even if they are not systemic from a global point of view. Our results suggest that both the nature of systemic importance (size *versus* complexity) and its geographical distribution (East vs West) changed significantly after the crisis, with important implications for regulators.

The paper is organized as follows. Section 2 describes the approach used to compute systemic importance; Section 3 deals with the issue of how to single out the banks that are "sufficiently systemic" to be labelled as SIFIs; Section 4 implements the procedure on three samples of banks covering respectively the global economy, the EU and euro area; Section 5 deals with the evolution of the global and domestic SIFIs over the years from 2007 to 2012; Section 6 concludes.

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<sup>2</sup> BCBS acknowledged the issue and announced a gradual disclosure process aimed at rendering data and method more transparent to the public (BCBS, 2013). At present, though, the information gap remains wide, and transparency concerns significant. For a broader analysis of the pros and cons of transparency of banking supervisors see Liedorp et al. (2013).

## 2. The selection procedure

The initial definition of the IMF/BIS/FSB (2009) Report is that a financial institution is to be considered systematically important if its failure or malfunction causes widespread distress either as a direct impact or as a trigger for broader contagion. Despite its generality, this definition stresses the view that global systemic importance has to be measured in terms of the impact and the consequences that a default of a bank may have on the global financial system (and the wider economy) rather than the risk that a failure can occur. Thus clearly distinguishing the concept of systemic importance (loss-given-default, LGD) from that of probability of default (PD) on which the standard systemic risk measures are based (CoVaR, DIP, SRISK).

<b>Table 2.1 Categories and indicators of systemic relevance (1)</b>	
1.	<b>Size:</b> a) Total exposures as defined for use in the Basel III leverage ratio (20%);
2.	<b>Interconnectedness:</b> a) Intra-financial system assets (6.67%); b) Intra-financial system liabilities (6.67%); c) Total marketable securities (6.67%);
3.	<b>Substitutability:</b> a) Assets under custody (6.67%); b) Payments cleared and settled through payments systems (6.67%); c) Values of underwritten transactions in debt and equity markets (6.67%);
4.	<b>Complexity:</b> a) OTC derivatives notional value (6.67%); b) Level 3 assets (6.67%); c) Held for trading and available for sale value (6.67%);
5.	<b>Cross-jurisdictional activity:</b> a) Cross-jurisdictional claims (10%); b) Cross-jurisdictional liabilities (10%).
(1) Relative weights in parentheses. <i>Source:</i> BCBS (2011).	

Relying on this tenet, the BCBS (2011) developed an assessment methodology which reflects the different sources of negative externalities which make a bank critical for the overall stability of the financial system. BCBS (2013) provides an updated version of the rules text, reflecting lessons learnt from the first applications of the methodology. All in all, the approach is based on 12 indicators grouped in five main categories of systemic importance: size, interconnectedness, substitutability, complexity, and cross-jurisdictional activity. The scores of these 5 categories are collected for the sample of the largest 75 banks

in the world, according to their size. The score for each indicator is calculated by dividing the individual bank amount by the aggregate amount summed across all banks in the sample. The scores are then simple averaged to obtain the overall SI index. Given that the score obtained for each indicator is multiplied by 10,000 in order to express it in basis points, the maximum possible total score is 10,000 (100%). Table 2.1 shows the categories employed and their relative weight.

Every year, the FSB performs the SI index calculations, ranks the banks and provides the set of systemically important banks (SIBs).<sup>3</sup> The selected SIBs are allocated to four buckets to which are associated increasing capital surcharges up to 2.5% of risk-weighted assets. An additional empty bucket of 3.5% of risk-weighted assets is proposed to discourage further increases in systemic relevance.<sup>4</sup>

The rationale for the five categories is straightforward and can be explained as follows. As concerns the size of the bank, the bankruptcy or even the distress of a financial institution is more likely to damage the global economy and to deteriorate the confidence in the financial system as a whole if its activities encompass a large share of the global activity. A bank's systemic influence is also likely to be positively associated to its interconnectedness vis-à-vis other financial institutions due to a broad network of contractual obligations. Besides, the systemic impact of a bank's distress is expected to be negatively related to its degree of substitutability (the lack of readily available substitutes or alternative infrastructure) as both a market participant and a client service provider. In addition, the systemic impact of a bank's distress or failure is expected to be positively related to its overall complexity – that is, its business, structural and operational complexity. The more complex the bank, the greater the costs and time needed to resolve it. Finally, when a large part of the bank's activities are located outside the home headquarter jurisdiction the systemic relevance is expected to be significant and the resolution process will easily become long and cumbersome.

Given the broad implications of the enhanced supervisory framework of G-SIBs, it is of the utmost importance that the selection methodology is fully understood by the financial

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<sup>3</sup> In the paper we will use the terms SIB and SIFI alike since the procedure has been currently applied to banks only.

<sup>4</sup> The additional loss absorbency requirement framework will be phased-in gradually starting on 1 January 2016 and becoming effective on 1 January 2019.

system. Yet, there are several issues of concern regarding the possibility to replicate the actual BCBS (2011) methodology, starting from the fact that the value of the SI index has not been disclosed yet. In addition, the use of supervisory authorities' data and the recourse to a not well-defined supervisory judgement in several steps of the procedure might create a gap between market agents' and regulators' information and even undermine the financial market confidence in the methodology.

In what follows we address these shortcomings by making use exclusively of publicly available data, and relying on objective statistical procedures to select the set of SIBs. By following the new guidelines of the BSBC (2013) Rules text and the methodology proposed in Masciantonio (2013) we are able to replicate, under standard assumptions, the whole selection procedure with public data of widespread availability, strong reliability and prompt timeliness. In this way we are able to fill the gap between financial market information about large and complex financial institutions and regulators' risk assessment and perception of systemic importance. In addition, the new features of the updated Rules text provide also the scope for an assessment of their potential effect on the identification and bucket allocation of SIBs.

A distinguishing feature of our analysis is that we apply the BSBC methodology to data before the start of the FSB exercise. In particular, we run the whole exercise over the six-year period 2007-2012 in order to cover the whole time span of the global financial crisis, including the financial institutions actually active in each financial year (and thus limiting any survivorship bias).<sup>5</sup> We also replicate the analysis for three different populations of banks: the global economy, the EU and euro area. We can thus wear regulators' lenses in an ex-post assessment of the most critical moments of both the global financial crisis and the euro-area sovereign debt crisis.

The first step of the procedure is to identify the reference population of financial institutions. Each year, the FSB list of G-SIFIs is drawn from a sample made of the largest 75 (global) banks from a given set of countries plus banks that were designated as G-SIBs in

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<sup>5</sup> While it will always be possible to update the sample with future values, data before 2007 present several missing values and breaks which strongly undermine the possibility to expand the time span backwards.

previous years and possibly other banks added according to supervisory judgement.<sup>6</sup> In this paper, in order to make the criteria as objective and unbiased as possible, the sample dimension was broadened to include the largest 100 banks in the world by total exposure, regardless of their geographic location. The inclusion of the largest 100 banks most likely encompasses all the banks with potential systemic relevance as they account for broadly the 70% of the total banking assets in the world. The reference samples are allowed to change from year to year in order to avoid cliff effects in the calculation of scores.<sup>7</sup>

As concerns the EU and euro-area samples, following the BCBS (2012) document on domestic SIBs (D-SIBs), the top 100 banks are drawn from banks headquartered in the areas under review and from subsidiaries of foreign banks. While it is straightforward to consider banks headquartered in the EU (and euro area) from a consolidated perspective, since their activities outside the home jurisdiction can still have a significant negative impact on the domestic economy in case of distress or even bankruptcy, the reason for subsidiaries of foreign banks might appear less self-explaining. However, the inclusion of foreign subsidiaries in the sample accounts for the fact that the failure of a foreign banking group may impose costs to the economy hosting the subsidiary, especially when the foreign subsidiary plays an important role in the host financial system. From a technical perspective, including foreign subsidiaries in the analysis does not bring any particular drawback, because subsidiaries publish their own financial statements.

After selecting the initial samples, the data are collected from published end-of-year financial statements and, where available, from a broad set of data providers (SNL Financial, Bloomberg, Dealogic, Bankscope, BIS International Banking Statistics) for the financial years 2007-2012. Once the dataset for each year and each sample is completed, we compute the value of the 12 indicators and aggregate them to obtain the SI score for each bank. This

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<sup>6</sup> The first FSB sample of banks was made of 73 financial institutions headquartered in selected BIS countries: Australia, Belgium, Brazil, Canada, China, France, Germany, India, Italy, Japan, Korea, the Netherlands, Spain, Sweden, Switzerland, the UK and the US. However, the sample of banks has not yet been disclosed.

<sup>7</sup> Given the variability in ownership structures and the global reach of the sample, only banks on a consolidated basis were considered, thus collecting data from the ultimate parent entity. In addition, when dealing with financial conglomerates encompassing both banking and insurance activities, only the banking arm was selected.

score represents banks' actual systemic importance as defined by regulators, but measured by market data.<sup>8</sup>

Once the ranking of financial institutions by systemic relevance is obtained we have to sort out those which are to be labelled as “systemically important”. The result of this phase is a set of systemically important banks, a sub-set of the starting 100-bank sample, for each reference sample (global, EU, euro area) and for each year (from 2007 to 2012). We investigate this issue further in the following section.

The final bucketing phase is relatively straightforward: the G-SIBs set is divided into four equally-spaced buckets that corresponds to four different capital surcharges ranging from 1.0% to 2.5%.

### **3. Identifying systemically important banks**

The identification of the SIFIs is important because only a subset of the institutions, i.e. those that are deemed to be ‘systemic enough’, will be subject to additional capital requirements. There are, however, various ways to establish what ‘enough’ means in this context. This poses a robustness issue: uncertainty about the relevant threshold, or a high degree of volatility in the list of institutions that are identified as systemic, could significantly complicate the implementation of the regulatory regime. In this section we exploit the length of our dataset to gauge the relevance of this problem.

The identification problem is addressed in the initial Rules text (BCBS, 2011) via a clustering analysis, a statistical methodology that distributes the population items into different groups according to the statistical features of the initial population. The clustering methodology used by the FSB (2011 and 2012) has not been disclosed, while the 2013 Rules text takes instead a micro approach and considers of systemic relevance only banks with a total SI score above 130 basis points, value which might have been chosen with the aid of some clustering methodologies.

Faced with the choice between different statistical methodologies, we choose to rely on simple rules with a higher economic rationale. Indeed, while the average linkage method employed by Masciantonio (2013) and ECB (2006) can be viewed as a superior statistical

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<sup>8</sup> The interested reader is referred to Masciantonio (2013) for further details on the methodology and the choice of the single variables.



compromise between the single linkage and the complete linkage methods, it lacks a sufficient degree of economic rationale which in turn leads to a “supervisory judgement” amendment by regulators. Moreover, after having applied this clustering methodology on our multiple-year horizon, the SIBs sets do not appear to be sufficiently stable or robust. Often, banks with SI scores very close to the selected threshold fall in or out the SIBs sample just because of marginal changes in their scores but without changes in their ranking positions. We performed a robustness check of the average linkage method, comparing the results of the SIBs sample dimensions obtained with this methodology with others arising from different clustering methodologies as the complete linkage method, the median linkage method, the “Chebychev” maximum distance method, and the “Minkowski” maximum distance method. As Table 3.1 shows the clustering methodologies do not allow to draw robust conclusions about the banks that should be selected as SIBs. This is probably due to the fact that clustering methodologies might have a limited power, because of the small dimension of the samples. Moreover any clustering methodology fails to capture the importance of the ranking position and of the optimal level of systemic importance to be overseen by regulators. Thus we move towards a different methodology that can properly address the selection issue.

Given that the systemic relevance concept covers aspects of both micro- and macro-prudential supervision, in the identification of the SIBs we take care of both issues. From the one hand, the BCBS (2013) selection criterion is aimed at including among the systemically relevant banks all the institutions with an “above average” weight (micro-prudential approach). In fact, the 130bp threshold is very close to the banks’ average contribution to the sample systemic importance.<sup>9</sup> On the other hand, we must be sure that the selected set of SIBs represents a sufficiently large share of the global financial system (macro-prudential approach). Thus we choose to include in the SIBs set all the banks that show a SI score higher than 1% (100 bp) – the average score of our dataset – provided that a sufficiently large share of the global systemic relevance is taken into account.<sup>10</sup>

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<sup>9</sup> The overall sum of the scores is 10.000 bp, which divided by the number of banks (75) gives 133bp.

<sup>10</sup> The threshold of 100bp is lower than the BCBS’, since our reference sample is larger (100 vs 75 institutions) and thus the overall total amount of 10,000bp of systemic relevance has to be divided among more banks. Note that it is impossible to compute the share of systemic importance covered by the selected FSB set of SIBs since the scores are not available. However, our estimates suggest that it should be around 70%.

**Table 3.1: Global and domestic SIFIs by clustering methodologies**

	Clustering Method	2007	2008	2009	2010	2011	2012
G-SIBs	SI above 1%	29 (70.3%)	28 (70.3%)	28 (70.2%)	30 (73.7%)	32 (75.0%)	32 (70.9%)
	Average Linkage	26 (67.1%)	24 (66.0%)	27 (69.2%)	27 (70.5%)	27 (69.8%)	24 (62.1%)
	Complete Linkage	23 (63.2%)	28 (70.3%)	27 (69.2%)	27 (70.5%)	25 (67.4%)	21 (57.9%)
	Median Linkage	26 (67.1%)	28 (70.3%)	20 (59.2%)	27 (70.5%)	21 (61.8%)	26 (64.5%)
	Chebychev Max Distance	26 (67.1%)	28 (70.3%)	27 (69.2%)	27 (70.5%)	17 (51.4%)	21 (57.9%)
	Minkowski Max Distance	26 (67.1%)	24 (66.0%)	27 (69.2%)	27 (70.5%)	17 (51.4%)	21 (57.9%)
EU-SIBs	SI above 1%	32 (80.4%)	30 (79.6%)	29 (78.1%)	31 (80.3%)	31 (81.7%)	32 (82.3%)
	Average Linkage	23 (69.7%)	17 (63.8%)	18 (63.6%)	35 (82.2%)	33 (83.6%)	32 (82.3%)
	Complete Linkage	27 (74.8%)	29 (78.6%)	29 (78.1%)	35 (82.2%)	33 (83.6%)	32 (82.3%)
	Median Linkage	23 (69.7%)	37 (85.7%)	29 (78.1%)	25 (74.6%)	33 (83.6%)	32 (82.3%)
	Chebychev Max Distance	23 (69.7%)	17 (63.8%)	29 (78.1%)	35 (82.2%)	33 (83.6%)	32 (82.3%)
	Minkowski Max Distance	23 (69.7%)	17 (63.8%)	18 (63.6%)	25 (74.6%)	33 (83.6%)	32 (82.3%)
EA-SIBs	SI above 1%	27 (80.9%)	26 (80.7%)	25 (77.7%)	24 (77.3%)	22 (76.8%)	24 (79.6%)
	Average Linkage	27 (80.9%)	27 (81.7%)	27 (79.7%)	30 (82.5%)	22 (76.8%)	21 (76.1%)
	Complete Linkage	26 (79.6%)	27 (81.7%)	19 (70.9%)	19 (71.4%)	22 (76.8%)	24 (79.6%)
	Median Linkage	27 (80.9%)	27 (81.7%)	19 (70.9%)	19 (71.4%)	22 (76.8%)	21 (76.1%)
	Chebychev Max Distance	27 (80.9%)	26 (80.7%)	19 (70.9%)	19 (71.4%)	22 (76.8%)	20 (74.6%)
	Minkowski Max Distance	27 (80.9%)	27 (81.7%)	27 (79.7%)	19 (71.4%)	22 (76.8%)	21 (76.1%)

The dimension of each SIBs set with our methodology is also shown in Table 3.1 (first line of each panel). With this criterion, the SIBs sets are by far more stable than with any clustering methodology, with only the euro-area sample showing some variability. In addition, the share of systemic importance selected according to this criterion is satisfying also from a macro-prudential point of view. In fact, the selected G-SIBs sets encompass at

least 70% of the systemic importance of the overall sample, whereas for the two European sets the value is even higher at around 80%.

Besides the higher concentration within the two European samples, the two D-SIBs sets are characterised by a two-tiered shape, with a smaller group of larger banks – most of which already included in the G-SIBs set – distinct from a second group of systemic banks which often are smaller in size and have a simpler business model.<sup>11</sup> From the perspective of the BCBS categories of systemic importance, these tier-two banks are less complex and interconnected, with a large part of their SI explained by size.

Moreover it can be seen that while the banks in the G-SIBs set gradually increased and those in the EU remained almost unchanged, the banks in the euro-area set sharply decreased to reach a minimum in 2011. This result is an effect of the increased concentration within euro area, also due to the sovereign debt crisis which spilled-over to the banking system. At the same time, the G-SIBs set slightly increased its size because of two different effects. On the one hand, we have a robust decrease in the SI score of the banks severely affected by the crisis, which however remained within the G-SIBs set in the years under review (e.g. Royal Bank of Scotland, Citigroup, ING). On the other hand, we note an increase in the SI score of other banks that gradually acquired the critical SI weight necessary to be included within the G-SIBs set.

#### **4. The geography of systemic importance between 2007 and 2012**

##### *4.1 The global sample*

A first striking feature of the banking system evolution over time is that even the initial population of the largest banks in the world has been reshaped by the financial crisis. Over the 6-year period from 2007 to 2012, 131 banks were selected from 25 countries, suggesting a significant turnover. Out of the first 100 banks selected in 2007 only 77 are still present in 2012. While the 23 missing institutions are all from US and Europe, only seven of the new entries are from those countries (three and four, respectively). With the exception of one bank from Brazil and one from Canada, the remaining institutions are all headquartered

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<sup>11</sup> According to Masciantonio and Tiseno (2013), while the tier-one European SIBs are truly universal banks, usually strongly oriented towards the finance-related business, the tier-two European SIBs are banks usually more retail oriented and their business is often based on fewer jurisdictions.

in Asian countries, with a robust increase recorded by China and South Korea, which added five and four banks, respectively.<sup>12</sup>

**Table 4.1 Selected indicators by geographic area**

	share of banks					
	2007	2008	2009	2010	2011	2012
US	15.0	12.0	13.0	11.0	11.0	11.0
EA	38.0	39.0	38.0	34.0	30.0	29.0
UK	9.0	8.0	6.0	6.0	6.0	6.0
Ad-AS	8.0	8.0	9.0	13.0	14.0	15.0
BRIC	12.0	15.0	16.0	17.0	21.0	20.0
Ad-RW	18.0	18.0	18.0	19.0	18.0	19.0
	Size score					
	2007	2008	2009	2010	2011	2012
US	17.7	15.3	15.0	14.7	13.9	13.8
EA	39.3	38.4	37.3	33.5	30.2	29.2
UK	15.6	15.4	13.1	12.3	12.0	11.2
Ad-AS	7.6	8.8	9.5	10.5	12.1	12.0
BRIC	7.0	9.7	12.6	15.2	18.2	19.6
Ad-RW	12.9	12.4	12.5	13.7	13.6	14.1
	SI score					
	2007	2008	2009	2010	2011	2012
US	23.2	22.1	22.6	22.8	23.5	22.7
EA	38.5	37.4	35.9	33.5	31.5	29.0
UK	15.9	16.0	14.7	13.5	13.7	13.0
Ad-AS	5.6	7.1	8.0	9.0	9.0	10.8
BRIC	3.2	4.5	6.0	7.6	8.5	10.2
Ad-RW	13.6	13.0	12.8	13.6	13.9	14.3
	SI/Size					
	2007	2008	2009	2010	2011	2012
US	1.31	1.45	1.51	1.55	1.69	1.64
EA	0.98	0.97	0.96	1.00	1.04	0.99
UK	1.02	1.04	1.12	1.09	1.14	1.16
Ad-AS	0.74	0.80	0.84	0.85	0.74	0.90
BRIC	0.45	0.46	0.48	0.50	0.47	0.52
Ad-RW	1.05	1.04	1.03	1.00	1.02	1.01

Table 4.1 reports the development of the relative contribution of 6 geographic areas to: 1) the share in the top 100 banks, 2) the overall balance sheet size, 3) the estimated systemic relevance. While the share of banks in the sample shrinks significantly for the US, euro area and the UK, the reduction as a share of total assets is more muted for the US and the UK,

<sup>12</sup> With respect to the BCBS (2011) sample we have ten banks from six additional countries (Austria, Denmark, Ireland, Norvegia, Russia and Singapore) which provide a systemic relevance contribution of 3.6% in 2012. At the same time, banks from the 76<sup>th</sup> to the 100<sup>th</sup> are worth 6% of the total systemic relevance.

and even smaller is the decline in the overall systemic relevance. At the same time, for the BRIC countries (Brazil, Russia, India and China) the increase in size is much larger than the increase in the share of banks, suggesting a fast balance sheet expansion. Also their contribution to the systemic relevance increases more than proportionately reaching 10.2 per cent in 2012 from just 3.2 per cent in 2007. A similar pattern characterizes the rise of Asian advanced countries (Singapore, South Korea and Japan), even though in a less significant way. The contribution from the Rest of the World is instead stable over the sample period.

The last panel of Table 4.1 shows the ratio between the SI score and size, which can be interpreted as a measure of ‘systemic contribution per unit of asset’. Two facts stand out. First, the indicator has increased in all geographic areas except the Rest of the World. Second, the 2012 data show significant heterogeneity among regions: the ratio is as low as 0.5 for the BRICs, approximately 1 for the Euro Area, and about 1.6 for the US. This in turn suggests that size cannot be taken as a sufficient statistic of systemic importance, since there are deep differences among the underlying business models. In particular, banks headquartered in the fast developing economies seem to be engaged in more traditional banking activities.<sup>13</sup>

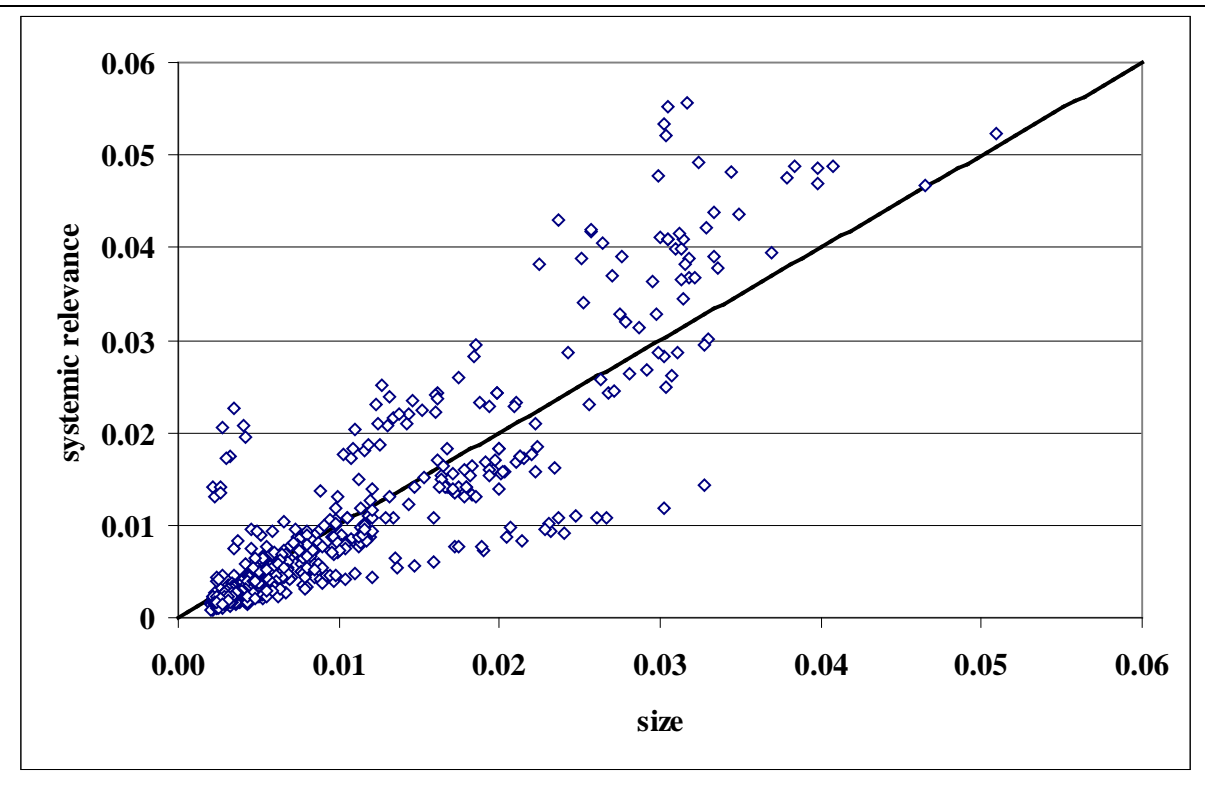
In order to provide more evidence on the size-SI nexus, Figure 4.1 plots the relationship between the two for the whole set of bank-year entries. While it is evident a strong positive correlation (89.6%), the distribution with respect to the diagonal suggest that when the size of the bank is relatively small the driver of the SI score is indeed the balance sheet dimension, but after a given threshold is breached (around 0.025 on the X-axis of Figure 4.1) the contribution of size is less than proportionate, suggesting that other factors of the business model determine the overall systemic relevance. One likely interpretation for this finding is that many relatively complex activities, such as trading or cross-border lending, can be efficiently handled only by institutions that are sufficiently big. In addition, the annual correlation coefficient between size and the SI score shows a significant downward trend: from 92.7% in 2007 to 85.4% in 2012. Over the same horizon, the correlation increased for substitutability (from 73.1% to 76.5%), was stable for complexity

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<sup>13</sup> Note that a recent strand of the literature is already trying to empirically distinguish between the issue of size *per se* and systemic importance in the market monitoring activity. For instance Völz and Wedow (2011), Bertay et al. (2013) and Zaghini (2014) find evidence of enhanced market discipline for banks of systemic relevance.

(95%) and cross-border activity (92%) and decreased for interconnectedness (from 94.8% to 90.6%).

**Figure 4.1 Systemic relevance and size in the dataset**



Focusing on the single 23 countries for which at least one bank was sampled within the top 100 in 2012, only five (France, Japan, Switzerland, UK and US) have the SI score for the selected domestic banks larger than the share of banks in the sample (Table 4.2). With the exception of Japan, they all show values well above the sample share in each of the five categories. In particular, banks from US present the maximum aggregate value in four categories. The five economies, which have 32 banks in the top 100, represent almost 50% of the sample total assets and over 60% of the aggregate systemic importance, suggesting that the systemic relevance is geographically concentrated in few countries.

By looking at other countries for which the value of the index is larger than the sample share in at least one category, China shows the maximum value for “size” with a share of 16.2% attributable to 13 banks. Just the four largest Chinese banks account for the striking share of almost 11% of the sample total assets. On the other hand, apart from the interconnectedness category for which the computed value is relatively high at 12.2% – but

still below the sample share of 13% – the value in the remaining categories (complexity, cross-jurisdictional activity and substitutability) is extremely low for China at around 2%, which contribute to lessen the overall SI score to just 7.5%. A possibly directly opposed case to China is Germany, which presents a relatively narrow range of values, with two categories above the sample share of 8% (interconnectedness and complexity) and three below.

	<b>Share</b>	<b>SI</b>	<b>Size</b>	<b>Inter</b>	<b>Sub</b>	<b>Comp</b>	<b>Cross</b>
<b>Australia</b>	4.0	2.3	3.5	2.7	1.1	1.7	2.0
<b>Austria</b>	1.0	0.2	0.3	0.2	0.1	0.2	0.4
<b>Belgium</b>	2.0	1.1	0.9	0.9	0.5	1.8	1.3
<b>Brazil</b>	4.0	1.9	2.1	3.1	0.4	1.3	2.1
<b>Canada</b>	6.0	3.8	4.1	3.9	3.7	3.5	4.0
<b>China</b>	13.0	7.5	16.2	12.2	2.0	2.6	2.6
<b>Denmark</b>	2.0	1.1	1.0	1.2	0.3	0.7	2.1
<b>France</b>	5.0	11.1	10.8	13.1	10.0	12.3	9.0
<b>Germany</b>	8.0	7.7	6.6	8.5	5.6	9.5	7.7
<b>India</b>	1.0	0.2	0.5	0.2	0.1	0.0	0.2
<b>Ireland</b>	1.0	0.2	0.2	0.2	0.0	0.1	0.3
<b>Italy</b>	3.0	2.3	2.8	2.5	1.0	2.5	2.2
<b>Japan</b>	8.0	9.1	9.9	9.7	5.5	10.8	8.3
<b>Korea</b>	4.0	0.9	1.3	0.9	0.3	0.8	1.1
<b>Netherlands</b>	3.0	2.5	3.1	2.5	0.4	1.8	4.0
<b>Norway</b>	1.0	0.6	0.5	0.5	0.1	1.1	0.8
<b>Russia</b>	2.0	0.6	0.9	0.7	0.3	0.3	0.8
<b>Singapore</b>	3.0	0.9	0.9	0.5	0.2	0.4	2.1
<b>Spain</b>	6.0	3.9	4.5	3.8	1.5	3.6	5.2
<b>Sweden</b>	4.0	2.2	2.3	2.5	0.8	1.6	3.4
<b>Switzerland</b>	2.0	4.2	2.8	4.4	5.7	4.7	3.9
<b>UK</b>	6.0	13.0	11.2	11.6	10.3	14.0	17.0
<b>US</b>	11.0	22.7	13.8	14.3	49.9	24.7	19.6

#### *4.2 Europe*

The global financial crisis severely hit the European banking system, with many banks which experienced serious problems being acquired (in several cases almost for free) by other sounder financial institutions (as Dresdner Bank by Commerzbank), nationalised (as RBS, Bank of Ireland, ABN Amro) or dismembered (as Fortis). In addition, new banking groups were created to better cope with the new financial environment (as Bankia in Spain and BPCE Group in France). Thus the geography of the European samples was significantly re-shaped by the financial and sovereign debt crises.

**Table 4.3 EU and euro area top 100 banks by country (1)**

	2007		2008		2009		2010		2011		2012	
	EU	EA	EU	EA	EU	EA	EU	EA	EU	EA	EU	EA
<b>Austria</b>	5	5	5	5	6	6	4	7	4	6	3	5
<b>Belgium</b>	3	4	2	3	2	5 (1)	3 (1)	5 (1)	4 (1)	5 (1)	4	6 (1)
<b>Cyprus</b>			2	2	2	2	2	2		3		
<b>Finland</b>	1	3 (1)	1	3 (2)	1	3 (1)	1	3 (1)	1	3 (1)	1	3 (2)
<b>France</b>	6	8 (1)	7	8 (1)	6	7 (1)	6	8 (1)	6	9 (1)	5	6 (1)
<b>Germany</b>	22 (1)	23 (2)	21	23 (2)	19	22 (2)	18	22 (1)	16	21	16	22
<b>Greece</b>	4	5	4	5	4	5	4	5	4	5	4	4
<b>Ireland</b>	5 (1)	6 (2)	4 (1)	4 (1)	5 (1)	5 (1)	4 (1)	5 (1)	4 (1)	5 (1)	4 (1)	6 (2)
<b>Italy</b>	8	11	8	12	9	12	8	12	10	14	12	16
<b>Lux</b>	1	2 (1)	1	2 (1)	1	2 (1)		1	1	2	1	1
<b>Netherlands</b>	3	7 (2)	3	5 (1)	3	5 (1)	4	5	4	5	4	6
<b>Portugal</b>	4	4	4	4	4	4	4	4	4	4	4	5
<b>Spain</b>	12	22 (1)	14	23 (1)	14	22 (1)	16	21 (1)	15	18 (1)	16	20 (1)
<b>Denmark</b>	2		2		2		2		2		2	
<b>Poland</b>							1		1		1	
<b>Sweden</b>	4		4		4		4		4		4	
<b>UK</b>	20 (9)		18 (8)		18 (9)		19 (10)		20 (10)		19 (9)	
<b>Total</b>	100 (11)	100 (10)	100 (9)	100 (9)	100 (10)	100 (9)	100 (12)	100 (6)	100 (12)	100 (5)	100 (10)	100 (7)

(1) Subsidiaries of extra-sample banks in parentheses

The EU top 100-bank sample shows a turnaround very similar to that of the global economy. By considering the new institutions stemmed from the merger or acquisition of previously existing banks as single different institutions, we have that in the six-year period under analysis 129 banks from 17 countries were selected.<sup>14</sup> Out of the initial 2007 sample 79 banks are still active in 2012: Germany lost six banks while Italy and Spain added four banks each to reach 12 and 16, respectively (Table 4.3). Only one bank is headquartered in one of the Central and Eastern newly accessed countries: PKO Bank Polski from Poland, which is in the top 100 EU banks since 2010. The UK has the largest share in the sample with 19 banks; however nine banks are subsidiaries from US (5), Japan (2) and Switzerland (2). Note that in 2012 France shows only five banks in the EU sample, exactly those belonging to the global sample, a consequence of the high concentration of its banking sector.

By looking at the SI index and the five categories it is clear that, in the EU sample, the UK is by far the top player. In fact, UK shows the highest value in the overall SI index and

<sup>14</sup> Note that there are also subsidiaries from 3 countries US, Japan and Switzerland.



in each category every single year. In 2012 it accounts for 36.2% of the overall EU systemic importance (Table 4.4); together with France it has a value in each category larger than its share in the sample, and together with Belgium and Ireland shows a value above one for the ratio of systemic importance over size. However, the paramount role played by UK's financial institutions, in terms of EU systemic importance, is largely due to the concentration on its jurisdiction of several subsidiaries of non-EU banks. For instance, considering the global sample, which includes only banks at the consolidated level, the SI score for UK and France is rather close (13.0 % and 11.1%, respectively, in 2012); instead, in the EU sample the difference is significantly larger (36.2% and 18.7%), but much of it is due to a 15.1% contribution of foreign subsidiaries in the UK.

**Table 4.4 Categories of systemic relevance in the EU by group of countries**

	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
<b>SI Index</b>						
<b>EA</b>	62.3	61.5	63.2	66.6	57.9	58.2
<b>non EA</b>	37.7	38.5	36.8	33.4	42.1	41.8
<b>UK</b>	33.3	34.8	32.5	27.6	36.4	36.2
<b>other</b>	4.4	3.7	4.3	5.8	5.7	5.6
<b>Size</b>						
<b>EA</b>	65.3	64.3	67.0	66.4	64.0	64.7
<b>non EA</b>	34.7	35.7	33.0	33.6	36.0	35.3
<b>UK</b>	30.0	31.0	27.7	28.1	29.9	29.1
<b>other</b>	4.6	4.7	5.2	5.5	6.0	6.2
<b>Interconnectedness</b>						
<b>EA</b>	65.7	60.0	64.9	66.9	62.5	60.5
<b>non EA</b>	34.3	40.0	35.1	33.1	37.5	39.5
<b>UK</b>	30.3	36.1	30.3	27.6	32.0	33.8
<b>other</b>	4.0	3.9	4.8	5.5	5.5	5.8
<b>Substitutability</b>						
<b>EA</b>	46.3	48.8	46.6	71.2	53.5	52.1
<b>non EA</b>	53.7	51.2	53.4	28.8	46.5	47.9
<b>UK</b>	51.5	48.3	50.8	22.4	43.4	45.1
<b>other</b>	2.2	2.9	2.6	6.4	3.1	2.8
<b>Complexity</b>						
<b>EA</b>	58.5	58.7	62.0	65.9	58.7	56.7
<b>non EA</b>	41.5	41.3	38.0	34.1	41.3	43.3
<b>UK</b>	35.6	39.5	35.3	28.5	38.0	39.8
<b>other</b>	5.9	1.8	2.7	5.6	3.3	3.5
<b>Cross-Jurisdictional</b>						
<b>EA</b>	70.4	71.6	69.9	64.2	49.4	55.1
<b>non EA</b>	29.6	28.4	30.1	35.8	50.6	44.9
<b>UK</b>	25.3	23.5	24.6	29.7	41.2	36.4
<b>other</b>	4.3	4.9	5.4	6.0	9.4	8.5

From a policy perspective the euro-area sample should be more interesting. The starting of the SSM will most likely lead to a more integrated banking system. In fact, the creation of a common supervisory approach will ensure that the overall euro-area system plays by a single set of rules. In addition, the introduction of the SSM, based on uniform data reporting requirements, will reduce compliance costs for banks and encourage greater cross-border banking activity.

**Table 4.5 Systemic relevance of euro-area countries in 2012 across samples**

	Global sample			EU sample			EA sample		
	Share	SI	size	Share	SI	size	Share	SI	size
<b>Austria</b>	1.0	0.2	0.3	3.0	0.8	1.2	5.0	1.4	1.9
<b>Belgium</b>	2.0	1.1	0.9	4.0	3.6	1.9	6.0	5.5	3.1
<b>Finland</b>	--	--	--	1.0	0.2	0.3	3.0	1.9	2.0
<b>France</b>	5.0	11.1	10.8	5.0	18.7	20.0	6.0	31.6	30.1
<b>Germany</b>	8.0	7.7	6.6	16.0	14.2	14.4	22.0	23.8	21.9
<b>Greece</b>	--	--	--	4.0	0.5	0.9	4.0	0.9	1.3
<b>Ireland</b>	1.0	0.2	0.2	4.0	2.2	2.0	6.0	4.5	3.1
<b>Italy</b>	3.0	2.3	2.8	12.0	5.2	7.0	16.0	8.7	10.8
<b>Lux</b>	--	--	--	1.0	0.1	0.1	1.0	0.1	0.2
<b>Netherlands</b>	3.0	2.5	3.1	4.0	4.4	6.1	6.0	8.0	9.3
<b>Portugal</b>	--	--	--	4.0	0.7	1.0	5.0	1.2	1.5
<b>Spain</b>	6.0	3.9	4.5	16.0	7.5	9.9	20.0	12.4	14.8
<b>Total EA</b>	29.0	29.0	29.2	74.0	58.2	64.7	100	100	100

Actually, the euro-area sample shows more muted dynamics: over the period 2007-2012 Germany loses only one bank in the top 100 sample and Spain does not increase its relative weight, France has again the five global banks in the ranking plus the HSCB subsidiary. The only marked change is recorded by Italy which increases its banks by five units: from 11 in 2007 to 16 in 2012. Even though the subsidiaries are more widespread across countries, there are no representatives from Japan and Switzerland: in addition to US there are only subsidiaries from other EU countries (Denmark, Sweden and UK), depicting a somewhat less “global” sample.

In addition, out of the 12 countries which in 2012 provide banks to euro-area sample only eight are also listed in the global sample. Table 4.5 shows the overall country contribution in each sample. Maintaining the financial stability perspective there are two

opposite cases which are worth signalling. The first is the French banking system, which shows in 2012 a value of around 30% of the overall euro area sample as concern both size and systemic relevance with only 6 banks, thus suggesting both an extremely concentrated banking system and the adoption of a “universal banking” business model. The second is the case of Spain and Italy, which although having respectively 20 and 16 banks in the sample they add up to an aggregated systemic importance of just around the half (12.4% for Spain and 8.7% for Italy), thus hinting to a less concentrated banking system with a more traditional business model.

## **5. Bank-level analysis: how did the SIBs fare during the crisis?**

### *5.1 Global SIBs*

In spite of the crisis, the G-SIBs sample shows a relatively high degree of stability over time in the top-ranked institutions, due to a considerable persistency of SI scores (Table A1 in Appendix): the same eight banks are ranked within the 10 most-systemic in each year in the 2007-2012 period. However, out of the 34 G-SIBs listed 2012, 10 banks are not ranked as systemically important in 2007. A relevant part of this variability can be attributed to the effects of the financial crisis. In 2007 the systemic importance attached to banks from Europe and the US accounts for 96% of the whole G-SIBs set of 29 financial institutions (the remaining 4% being due to two Japanese banks), afterward, the share gradually decreases to reach 83% in 2012. This large reduction is offset by banks from countries that have been less affected by the global financial crisis: the share of Japanese G-SIBs increases to 9% in 2012 and, even more strikingly, Chinese G-SIBs – which grows from none in 2007, to one in 2010, and to four in 2012 – increase their systemic importance from 1.4% in 2010 to 6.5% in 2012. Also Nordea Bank and Royal Bank of Canada, from two other countries almost spared by the financial turmoil (Sweden and Canada, respectively), find their place in the G-SIB set only after the eruption of the crisis (from 2009 and 2012, respectively). Other banks which became systemic after the crisis– which were not included in the 2007 G-SIB set – are State Street Corporation, Lloyds Banking Group and, in particular, Wells Fargo which has been able to expand its activities in sectors where its peers were in retreat.

The crisis hampered the stability of the global financial system with several banks facing financial distress or even straightforward bankruptcy. In the two years after the

eruption of the crisis five G-SIBs (Lehman Brothers, Merrill Lynch, Fortis Bank, Halifax Bank of Scotland, Dresdner Bank) were forced to file for bankruptcy or to be acquired by supposedly stronger competitors following their inability to continue business on their own.<sup>15</sup> Other six G-SIBs (Royal Bank of Scotland, Citigroup, UBS, ING Bank, Lloyds Banking Group, Commerzbank) needed capital injections by their sovereigns. Afterwards, the only G-SIBs facing financial distress is Dexia in 2011. These widespread difficulties experienced by banks in the G-SIBs set can be considered as an ex-post rationale for a closer supervision of systemically important banks.

In this section we want to assess whether there are ex-ante differences between failed and safe banks, in particular among G-SIFIs, which can serve as fragility indicators or at least provide some early warnings.<sup>16</sup> As a preliminary step we refer to the top 100 institutions selected in 2007: Table 5.1 compares some basic profitability and solvability indicators for the banks which experienced serious financial distress (failed, acquired, or bailed-in) and those which dealt better with the crisis. In addition, it also reports some business-model indicators and the values of the SI score and the two categories size and cross-jurisdictional activity.<sup>17</sup>

The first indication suggests that size *per sé* is not an indicator of fragility of a financial institution: while crisis banks are on average slightly larger than safe banks, the difference is not statistically significant. In addition, also from the overall SI index does not emerge any sizable difference among the two sets, hinting that the assessed level of systemic relevance of the top 100 banks cannot be used as an early warning indicator of a crisis (and it was not intended for such a scope). At the same time, the component cross-jurisdictional activity is higher for crisis banks suggesting a broader set of international connections, but at

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<sup>15</sup> Also two banks immediately after the G-SIBs set (Wachovia Corporation and Bear Stearns Companies) were acquired for the same reason.

<sup>16</sup> While Laeven et al. (2014) provide a recent analysis of the factors that may render a large bank more fragile than a small bank, the identification of the differences among the activities undertaken (and the business model) of large banks which may lead to a different degree of (systemic) riskiness is still an open question. For the heated debate on the optimal size, organizational complexity, and range of activities of banks see Viñals et al. (2013).

<sup>17</sup> Data are collected for all the 100 banks in the 2007 sample, but, due to data availability, their number restricts to 97 for the first set of indicators. The number of banks restricts even further for MTBV since several banks are not listed on any stock exchange.

same time a likely fragility due to possibly hampered free flows of cross-border liquidity during period of financial stress.

**Table 5.1 Balance sheet indicator for the global samples in 2007**

	<b>Size</b>	<b>Cross</b>	<b>SI</b>	<b>ROA</b>	<b>ROE</b>	<b>Leverage</b>
<b>All banks</b>	0.0102	0.0102	0.0479	0.0075	0.1554	25.240
<b>Safe banks (a)</b>	0.0099	0.0090	0.0450	0.0084	0.1654	22.486
<b>Crisis Banks (b)</b>	0.0108	0.0131	0.0545	0.0054	0.1319	31.697
<b>Delta (b) - (a)</b>	0.0009	0.0041 **	0.0094	-0.0030 ***	-0.0335 **	9.2111 ***
<b>Observations</b>	97 (29)	97 (29)	97 (29)	97 (29)	97 (29)	97 (29)
	<b>NIIS</b>	<b>LDR</b>	<b>LAR</b>	<b>DAR</b>	<b>T1</b>	<b>MTBV</b>
<b>All banks</b>	0.3139	0.9657	0.4839	0.5616	8.4654	9.4896
<b>Safe banks (a)</b>	0.3311	0.9691	0.4847	0.5777	8.6252	10.885
<b>Crisis Banks (b)</b>	0.2736	0.9574	0.4819	0.5216	8.0394	6.2916
<b>Delta (b) - (a)</b>	-0.0575	-0.0117	-0.0028	-0.0561 *	-0.5858 *	-4.5935 ***
<b>Observations</b>	97 (29)	94 (27)	94 (27)	94 (27)	88 (24)	79 (24)

Number of distressed banks in parentheses. NIIS is the ratio of non-interest income to total income; LDR is the loans to deposits ratio; LAR is the loans to assets ratio; DAR is the deposits to assets ratio; T1 is tier-1 capital ratio; MTBV is the market-to-book-value

Both ROA and ROE are larger for safe banks pointing to a less profitable management by crisis banks already in the years preceding the global financial crisis. The higher leverage of crisis banks suggests instead that the latter were more prone to indebtedness. At the same time, the ratio of non-interest income to total income (NIIS) does not signal any difference between safe and crisis banks in their business model. In addition, balance sheet differences emerge only on the liability side: the deposit to asset ratio (DAR) is significantly smaller for crisis banks, while the loan to asset (LAR) and loan to deposit (LDR) ratios do not display different values.

Tier 1 Capital Ratio (T1) is only marginally larger for safe banks (the difference being significantly different from zero at the 10% level), but distressed banks remain overall well capitalized (8%). Thus, raising the capital base for systemic banks may well be a good solution to improve the resilience of these institutions, but the reported capital shortfall may not be enough to explain the failures in the sample. In fact, as highlighted by Kuritzkes and Scott (2009) and Flannery (2014), book capital measures during the crisis did not assure solvency even when the regulatory capital ratios were significantly above market average.

Finally the market-to-book-value (MTBV) denotes a considerably lower value for crisis banks than safe banks. The statistically significant difference of the average MTBV values between the two groups points to a high correlation between market perceptions of banks' resilience and future banking crises. Yet, this correlation might not be interpreted as causality. Indeed, either market agents have been aware of the potential troubles faced by some banks of the sample (correctly assessing the true equity value), or the coordination of market agents on a bad (self-fulfilling) equilibrium outcome have led to the future distress of the banks. Further investigation on this specific topic may be a profitable research path.

Summing up, crisis banks highlighted lower profitability (as measured by ROA and ROE), although positive on average; higher leverage; a lower reliance on stable sources of funding and a higher share of cross-jurisdictional activity. While these indications together could be straightforwardly considered as a sign of weakness, the actual distress of each bank may have well been triggered by exogenous causes, like the spikes in risk-aversion or the collapse of cross-border interbank markets, which interplayed with existing weaknesses.

Further insights is gained by restricting the analysis to the sole G-SIBs and focusing on the systemic importance categories. In particular, complexity is the category which contributes the most in the SI scores of the G-SIBs, regardless whether they faced distress or not. Thus it can be considered a distinctive feature of systemic banks, but still not an indicator of fragility. The second most important category for the 11 failed or distressed G-SIBs is cross-jurisdictional activity, and the sum of the two adds up to 45% of the SI score in 2007, indeed suggesting that some of these financial institutions were already becoming too-complex-to-manage (Haldane, 2012). For the remaining G-SIBs, the second most-important category is instead interconnectedness, which together with complexity represent 41% of the SI score, pointing to a potentially more balanced business model. Perhaps surprisingly, the category that contribute the least in 2007 to the SI score of G-SIBs is substitutability.

The different weight of interconnectedness (most relevant for the safe G-SIBs) and cross-jurisdictional activity (most relevant for the distressed G-SIBs) could be interpreted as follows. In times of market turmoil, a high interconnectedness score could represent the main contagion channel for non-distressed banks, thus providing distorted incentives for banks' risk-taking decisions and creating the potential to capture regulators. At the same time, a high score in cross-jurisdictional activity could harm a bank's performance and resilience and make it more prone to systemic liquidity risk, especially when regulators try to

hamper the free flow of cross-border liquidity through the internal capital markets of banks (Cetorelli and Goldberg, 2012).

By looking at Lehman Brothers – the only bank in the sample allowed to file for bankruptcy – it turns out that its SI score is mainly driven by high levels of complexity and substitutability, adding up to 54% in 2007. This in turn suggests that Lehman Brothers' business model was even less balanced than the rest of distressed G-SIBs, potentially being one of the causes for its bankruptcy. Moreover the failure of a highly-complex, but hardly-substitutable, institution could be at the root of the wide-spread market disruptions that followed Lehman Brothers' demise and the main cause of the difficulty faced by regulators in handling it (Brunnermeier, 2009). The combination of complexity and substitutability as the top-contributing categories to systemic importance should thus be considered particularly harmful for financial stability.

Note that during the financial crisis, the acknowledged difficulties faced by several banks, now labelled as systemic, prompted the intervention of governments, through capital injections and resolution/restructuring plans, and supervisory authorities at the national and supranational level, through tighter and more updated prudential regulations (Panetta et al., 2009). These developments had three main effects on systemically important banks. First, out of the group of failed or distressed banks, those which survived the crisis saw their SI score steadily decreasing in the following years. This reduction happened mainly through deleveraging, via the selling of non-core assets, which reduced the contribution of the size category to the overall systemic importance. Second, most of dismembered or taken-over banks were acquired by other systemically important institutions, especially in the US. This development led to a rise in the acquirers' SI score and to an increase in the concentration of the systemic importance within the hardest-hit countries (US, UK, Germany). Third, the increase in the SI score of several banks within the G-SIB set was mainly due to an increase in the contribution of complexity. This is also true for banks that had quite a low contribution from this category at the onset of the crisis, but had greater contributions from substitutability. Then, a distinctive consequence of the crisis is an increase of the high-complexity and low-substitutability combination, much more rare at the onset of the crisis. Given the Lehman Brothers experience, this consequence potentially increases the threats to the stability of the post-crisis financial system.

Thus, from a financial stability perspective, such kind of merger and acquisitions between systemically important banks should be considered with increased care in the future, especially in crisis times. Actually, the recent evolution is not fully in line with a less-risky financial framework: the threats posed to financial stability by these behemoths are potentially higher than those faced in 2007. Besides strengthening the capital bases, G-SIBs should not be allowed to become more complex or less substitutable and in particular to grow in both categories at the same time. In the future a rule similar to that in force in the US which poses a limit to the increase in a bank's market share if already above 10% might be applied to merger and acquisition activities involving banks with a SI score above a given threshold.

## *5.2 Domestic European SIBs*

The two European sets of systemically important banks (EU-SIBs and EA-SIBs) appear even more stable than the global set through the crisis years. The lists of EU- and EA-SIBs for the whole 2007-2012 period show a high persistency of the SI scores: eight banks are always present among the top 10 SIBs for both the EU and EA set (Tables A.2 and A.3 in Annex, respectively).<sup>18</sup> Moreover, also the ranking is quite stable: in the euro area the first seven SIBs have the same rank since 2009 with the exception of the switch at the top in 2011 from BNP Paribas to Deutsche Bank.

However, the SI score of European SIBs appears to be more concentrated than the global sample. As can be seen from Table 5.2, the average SI score for the first 10 banks increases steadily when moving from the global to the euro-area sample. At the same time the range of the SI scores shows a remarkable value in the euro area, suggesting that even within the first 10 banks there is a significant difference in the systemic relevance. Interestingly enough, the samples show similar average scores and ranges for the SIBs in the rest of the sample. These results suggests that the distribution of systemically important banks is skewed towards the top in terms of SI weight. The skewness is larger in the smaller EU and EA samples, showing that European supervisors should consider the supervision of

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<sup>18</sup> For the euro-area set this is true considering that the BPCE group was created in 2009 from the merger between Groupe Banques Populaires and Groupe Caisse d'Épargne.



the largest banks with particular care, given their higher weight with respect to the rest of the sample.

<b>Table 5.2 Average SI scores and ranges (1)</b>			
	<b>G-SIBs</b>	<b>EU-SIBs</b>	<b>EA-SIBs</b>
<b>(1st -10th) average score</b>	365.0	466.4	542.3
<b>(1st -10th) score range</b>	264.3	362.1	771.6
<b>Rest of the sample average</b>	156.2	162.3	181.3
<b>Rest of the sample range</b>	135.0	164.9	148.8

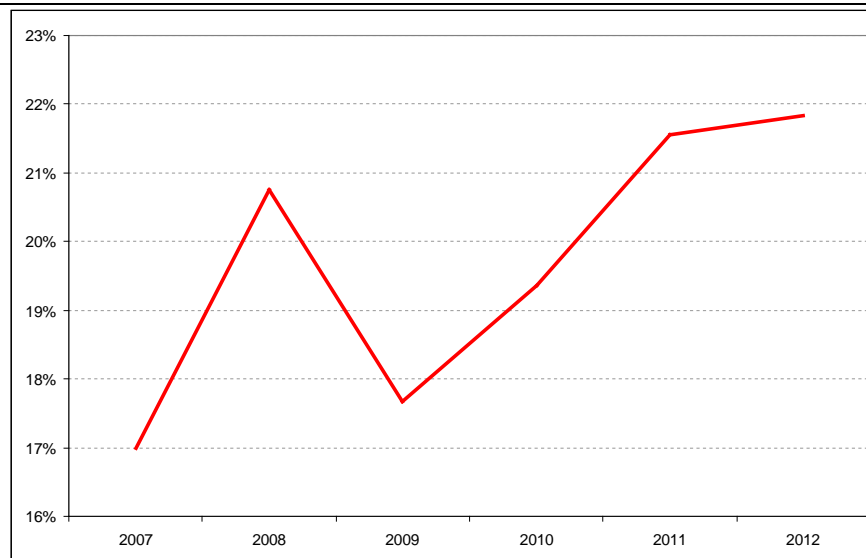
(1) Basis Points, 2012 data.

A significant dynamism is found in the sub-set of foreign subsidiaries SIBs, especially in the EU sample. The share of systemic importance attributed to foreign subsidiaries among the EU-SIBs, after a significant drop in 2009, started rising, reaching a maximum in 2012 (Figure 5.1). This increase reflects the growing role played by foreign banks in European wholesale markets. Most of the foreign subsidiaries SIBs played this role from London, despite the UK is one of the countries most severely hit by the global financial crisis. Note that the share of EU-SIBs headquartered in the UK, irrespective of their ultimate parent nation, grew during the years 2007-2012 from 37.8% to 42.1%, but most of it is due to foreign subsidiaries, the share of SI explained by domestic (UK) SIBs remaining stable at around 23%. As for the euro-area foreign subsidiaries, their role is much more limited: in 2012 they account for only 10.5% of the overall systemic importance of the EA-SIBs sample. Moreover, if we do not consider foreign subsidiaries of banks headquartered in other non-euro EU countries, the role of foreign SIBs is even further diminished to 6.1%.

All in all, it is worth noting that several national champions (e.g. Commerzbank, Rabobank, BBVA and Intesa SanPaolo) turn out to be less systemically important than several subsidiaries of global and investment banks for most of the time. This fact can depend on the more conservative and less complex business model of these banks, but it might also reflect a bias of the methodology towards the riskiest activities operated by investment banks. While the approach of giving a greater weight to riskier and more complex activities is in no doubt correct, the reported evidence suggests that the “systemic importance” notion could also include, at least for smaller economic areas, some variables

like the share of deposits-to-GDP of each bank, in order to measure the potential disruptions caused to the wider domestic economy (including households, investors and governments) by the distress of a financial institution.<sup>19</sup>

**Figure 5.1 SI weight of systemically important foreign subsidiaries**



The EA-SIBs samples provide an interesting view on the impact of the sovereign debt crisis on euro-area banks. Considering the countries most affected by the crisis (Greece, Ireland, Italy, Portugal and Spain), it is worth noting that only a small set of Spanish and Italian banks are included in the SIBs set for most of the years (Banco Santander, BBVA, Unicredit and Intesa SanPaolo). The sample share of the total systemic importance of Italy and Spain, albeit quite low if compared to the countries' GDP, increased from 12.9% in 2007 to 18.1% in 2012.<sup>20</sup> The increase was mainly due to the consolidation of the Spanish banking sector – that led to the inclusion of two other banks within the SIBs sample in 2012 (Banco de Sabadell and La Caixa) – and the lower involvement in the type of activities that were hardest hit during the 2007-2009 financial crisis (e.g. securitization, derivatives dealing, etc.). However, the severity of the sovereign debt crisis suggests that also non-

<sup>19</sup> A similar approach is for instance followed by the ECB in the selection of the sample of banks to be more closely supervised within the SSM: banks with a ratio of total asset to domestic GDP above 20% are included in this sample (ECB, 2013).

<sup>20</sup> The euro-area GDP share of these countries is around 32% (IMF, World Economic Outlook 2013).

systemically important banks can cause, through the vicious bank-sovereign link, wide market disruptions (Black et al., 2013).

By looking at the SIBs which faced significant distress or even reached bankruptcy during the crisis, three main facts emerge. First, EU- and EA-SIBs sets include several German banks that faced financial distress in 2007-2008 (Hypo Real Estate, WestLB AG, Helaba, NordLB). As a consequence, the SI score of these banks decreased steadily during the following years and the overall weight of German banks in the EU- and EA-SIBs samples somewhat decreased. Many of the distressed German SIBs relied heavily on ABCP securitization in the run-up to the crisis (Acharya and Schnabl, 2010). Second, as a response to financial distress and capital shortage, banks were mostly bailed-out with government capital injections. Third, none of the banks that underwent financial distress during the euro-area sovereign debt crisis were identified as systemically important. The bank that came closest to the EA-SIBs sample was the Spanish Bankia, which ranked 25<sup>th</sup> in 2010 and 2011 (slightly below the SIBs-identification threshold). Thus, even though this bank was not systemically important when assessed in a euro-area wide context, its financial distress in May 2012, due to the vicious bank-sovereign link, caused a confidence crisis in Spain. In this light the creation of a banking union, with its necessary complement of a common sovereign resolution mechanism, should be considered of paramount importance (Cœuré, 2013).

### *5.3 The 2013 Rules text*

As already mentioned in Section 2, the BCBS (2013) Rules text introduces some changes in the SIBs identification methodology. While many of them only have marginal consequences, the introduction of a cap on the role of substitutability has an impact for both the absolute score and the relative ranking of the institutions, especially for US banks. In addition, it introduces additional room for supervisory judgement.

The substitutability category is made of three sub-categories: assets under custody (AUC), value of underwritten transactions and payments cleared and settled through payment systems (see Table 2.1). Considering the first two sub-categories, US banks are represented with very high scores. In fact, AUC is an extremely concentrated activity, operated by a very limited set of banks, mostly US banks. Similar conclusions arise for the underwriting activity, where economies of scale led to an ever-increasing concentration

within the sector during the last decade. US banks have traditionally been more oriented towards this kind of broker-dealer activity (Adrian and Shin, 2010). This is in agreement with the view that the US financial system is at the core of the global financial system (Rey, 2013; Bruno and Shin, 2013). Thus US banks' high score in the substitutability category may capture also the importance of the broader US financial system, rather than the simple SI of each bank. Ranking the 2012 global sample according to the banks' substitutability scores, the first four banks are from the US and account for 39.6% of the total amount. Moreover, as already shown in Table 4.1, all US banks in the sample account for half of the total substitutability. This share of the global market is certainly relevant and, according to the quoted literature, should not be underestimated from a financial stability perspective. In this light, capping the substitutability category might not be advisable, because it might undervalue the aggregate systemic importance of the US banking system.

**Table 5.3 Ranking of 2012 G-SIBs with and without substitutability**

Bank Name	Rank with Subst.	Rank without Subst.	Difference	Bank Name	Rank with Subst.	Rank without Subst.	Difference
JP Morgan	1	1	=	Morgan Stanley	17	19	-2
Deutsche Bank	2	2	=	Wells Fargo	18	15	3
Barclays	3	3	=	Banco Santander	19	16	3
HSBC	4	4	=	BPCE Groupe	20	18	2
Citigroup	5	10	-5	Sumitomo Mitsui	21	20	1
BNP Paribas	6	5	1	Lloyds Banking Gr.	22	21	1
Bank of America	7	6	1	ICBC	23	22	1
RBS	8	7	1	State Street	24	77	-53
Crédit Agricole	9	8	1	Unicredit	25	23	2
Mitsubishi UFJ	10	9	1	Royal Bank of Canada	26	31	-5
UBS	11	14	-3	Bank of China Ltd.	27	25	2
Goldman Sachs	12	13	-1	ING Bank	28	26	2
Société Générale	13	12	1	Nordea Bank	29	27	2
Mizuho FG	14	11	3	Agric. Bank of China	30	24	6
BNY Mellon	15	60	-45	China Constr. Bank	31	28	3
Credit Suisse	16	17	-1	Commerzbank	32	30	2

In order to more carefully assess the impact of substitutability on the systemic relevance computation, we compare the SI scores with and without the contribution of this category in 2012 (Table 5.3). While the first four G-SIBs would not change their relative position, showing their primacy in the global financial system regardless of this category, other banks would be significantly affected. For instance BNY Mellon and State Street would both fall out of the G-SIB sample (losing 45 and 53 position, respectively), given their

prime role in the AUC business. More generally, US and Swiss universal and investment banks and Royal Bank of Canada would be “penalised” coming down in the global ranking, while several European, Japanese and Chinese would be pushed up, even having a more conservative business model (Maddaloni and Peydrò, 2011).<sup>21</sup>

Replicating the same exercise also for the 2012 EU-SIBs sample, we record a decrease in the SI scores and the rankings of foreign subsidiaries (mostly US banks) mainly involved in the AUC and investment bank business; conversely there is a rise in the SI scores and rankings of EU banks with a more traditional retail focus.

## 6. Conclusions

In this paper we develop a methodology to evaluate the systemic importance (SI) of financial institutions and to identify those that can be considered “systemically relevant”. Our aim is to fill the gap between the official assessment by the FSB, which is based on expert judgment and confidential supervisory data, and the evaluation that market can form based on publicly available data. To achieve our goal, we follow the guidelines of the Basel Committee on Banking Supervision (BSBC 2011, 2013), but rely on objective statistical procedures and make use exclusively of public data. We apply our procedure to annual data from 2007 to 2012, covering a period which goes from the US sub-prime mortgage crisis to the euro-area sovereign debt market turmoil, and distinguish between global and European (‘domestic’) banks.

We find that size is not a sufficient statistics for systemic relevance at either the global or the domestic level. Size and SI tend to overlap in the case of small and medium banks, but the correlation breaks down for larger institutions that typically engage in complex activities (derivatives origination, prime brokering, trading or cross-border lending). This suggests that systemic relevance should be treated differently from the well-known too-big-to-fail issue.

We also document that the crisis led to significant changes in the international landscape. The concentration and complexity of G-SIBs increased. Systemic importance migrated from Europe towards emerging economies, most notably China. The number of US banks in the global top-100 sample decreased somewhat but their aggregate share of

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<sup>21</sup> As a matter of fact, the average share of revenues of large US banks coming from trading activities is significantly higher than their European peers (Masciantonio and Tiseno, 2013).

systemic importance was fairly stable, suggesting an increased concentration of systemic importance in relatively fewer institutions within the country. The new BCBS (2013) proposal to cap the contribution of the “substitutability” evaluation criterion appears problematic in this sense, as it might bias downwards the degree of systemic importance associated to the US banking sector.

At the domestic European level, we report an increasing weight for extra-EU foreign subsidiaries, whose share of systemic importance has been rising steadily since 2010. This increase reflects the growing role played by foreign (notably UK) banks in European wholesale markets and a relatively more pronounced deleveraging process by domestic SIFIs compared to their foreign peers. A number of national champions (e.g. Commerzbank, Rabobank, BBVA and Intesa San Paolo) appear to be consistently downweighted by the methodology. This result might reflect a methodological bias towards the riskiest activities operated by investment banks. While the idea of giving a greater weight to risky, complex activities is no doubt sensible in a global context, our evidence suggests that the notion of systemic importance should also include, at least for smaller “domestic” areas, some measure of the size of a bank relative to its national banking system or its domestic economy as a whole.

Several banks identified as systemic by our procedure faced serious financial distress during the global financial crisis. In principle, this provides an *ex-post* case for tighter supervision of complex institutions at the global level. When looking at balance sheets, however, we find no evidence that basic profitability and solvency ratios could have served as early warning indicators: distressed banks appeared *ex ante* similar to their peers. Thus, while our (admittedly basic) analysis offers no practical clues to supervisors tasked with disciplining SIFIs as to what they should closely monitor, it suggests that some indicators devised to the goal might not serve the scope and further research is warranted.

## Annex

**Table A.1 G-SIBs sets and bank scores (end-of-year data)**

Rank	2007		2008		2009		2010		2011		2012	
	Name	SI Score	Name	SI Score	Name	SI Score	Name	SI Score	Name	SI Score	Name	SI Score
1	Royal Bank of Scotland	522.7	JP Morgan	491.2	JP Morgan	521.7	JP Morgan	537.1	JP Morgan	559.6	JP Morgan	534.7
2	Citigroup	476.8	BNP Paribas	488.8	BNP Paribas	469.2	Deutsche Bank	477.1	Deutsche Bank	489.2	Deutsche Bank	418.3
3	Deutsche Bank	475.1	Deutsche Bank	487.7	Citigroup	416.6	BNP Paribas	456.8	Citigroup	435.6	Barclays	392.1
4	Barclays	420.4	Barclays	485.6	Barclays	411.2	Barclays	436.9	HSBC	415.6	HSBC	382.4
5	BNP Paribas	391.1	Royal Bank of Scotland	466.6	Deutsche Bank	397.9	Citigroup	426.9	Barclays	413.9	Citigroup	382.3
6	JP Morgan	389.2	Citigroup	403.8	Royal Bank of Scotland	394.8	HSBC	409.5	BNP Paribas	405.1	BNP Paribas	364.2
7	UBS	370.0	HSBC	377.1	HSBC	389.1	Bank of America	335.7	Bank of America	324.3	Bank of America	328.0
8	HSBC	344.9	UBS	340.0	Bank of America	367.3	Royal Bank of Scotland	329.3	Royal Bank of Scotland	318.0	Royal Bank of Scotland	289.9
9	Crédit Agricole	248.3	Crédit Agricole	301.2	Crédit Agricole	295.3	UBS AG	304.5	UBS	299.4	Crédit Agricole	287.5
10	Credit Suisse	242.2	Bank of America	256.5	Mitsubishi UFJ	263.1	Crédit Agricole	290.6	Crédit Agricole	290.7	Mitsubishi UFJ	270.5
11	Goldman Sachs	241.1	Mitsubishi UFJ	242.7	UBS	259.4	Société Générale	247.0	Mitsubishi UFJ	265.6	UBS	236.2
12	Société Générale	232.5	Credit Suisse	234.3	Société Générale	242.4	Goldman Sachs	245.5	Goldman Sachs	253.5	Goldman Sachs	230.6
13	Bank of America	231.2	Société Générale	229.0	Credit Suisse	215.2	Credit Suisse	241.9	Société Générale	235.2	Société Générale	229.4
14	Merrill Lynch	224.4	Goldman Sachs	209.0	Goldman Sachs	207.8	Mitsubishi UFJ	237.3	Credit Suisse	223.6	Mizuho Financial Group	212.1
15	Morgan Stanley	221.4	Morgan Stanley	180.7	Morgan Stanley	187.1	Morgan Stanley	209.3	Bank of New York Mellon	211.6	Bank of New York Mellon	195.6
16	Bank of New York Mellon	205.0	Bank of New York Mellon	174.1	Lloyds Banking Group	183.8	Bank of New York Mellon	202.4	Morgan Stanley	206.2	Credit Suisse	187.0
17	Lehman Brothers	177.1	Merrill Lynch	172.4	BPCE Group	183.2	Banco Santander	194.2	Banco Santander	187.0	Morgan Stanley	182.3
18	ING Bank	159.4	ING Bank	168.8	Mizuho Financial Group	176.5	Mizuho FG	168.6	Wells Fargo	172.2	Wells Fargo	182.3
19	Mitsubishi UFJ	157.5	Mizuho Financial Group	168.7	Banco Santander	171.8	ING Bank NV	162.8	Mizuho Financial Group	163.9	Banco Santander	169.8
20	Fortis	156.6	Unicredit	159.0	Bank of New York Mellon	171.4	Unicredit	154.3	BPCE Group	155.6	BPCE Groupe	159.3
21	Unicredit	155.7	Banco Santander	152.7	Commerzbank	153.7	BPCE Group	154.2	ING Bank	155.1	Sumitomo Mitsui	158.1
22	Banco Santander	141.1	Wells Fargo	140.2	Dexia	149.3	Wells Fargo	148.2	Unicredit	144.1	Lloyds Banking Group	140.2
23	Danske Bank	137.0	Dexia	139.6	UniCredit	141.2	Dexia	144.9	State Street Corporation	143.9	ICBC	139.6
24	Mizuho Financial Group	132.4	State Street	130.4	Wells Fargo	141.1	Lloyds Banking Group	140.4	Sumitomo Mitsui	140.1	State Street Corporation	135.0
25	HBOS	130.8	Groupe Caisse d'Epargne	116.3	State Street	140.7	State Street Corporation	136.0	Lloyds Banking Group	132.5	Unicredit	122.5
26	Dexia	126.2	Sumitomo Mitsui	107.5	ING Bank	138.0	Sumitomo Mitsui FG	133.5	ICBC	121.2	Royal Bank of Canada	118.0
27	Groupe Caisse d'Epargne	109.4	HBOS	107.5	Sumitomo Mitsui	135.1	Commerzbank	131.8	Nordea Bank	119.7	Bank of China Limited	108.7
28	Commerzbank	107.2	Commerzbank	102.7	Nordea Bank	100.5	Royal Bank of Canada	107.2	Commerzbank	109.6	ING Bank	107.9
29	Dresdner Bank	105.8					ICBC	103.7	Dexia	106.2	Nordea Bank	107.8
30							Nordea Bank	101.2	Bank of China Ltd	102.4	Agricultural Bank of China	107.1
31									Royal Bank of Canada	101.8	China Construction Bank	105.6
32									Rabobank	100.7	Commerzbank	101.2

**Table A.2 EU-SIBs sets and bank scores (end-of-year data)**

Rank	2007		2008		2009		2010		2011		2012	
	Name	SI Score	Name	SI Score	Name	SI Score	Name	SI Score	Name	SI Score	Name	SI Score
1	Royal Bank of Scotland	690.5	BNP Paribas	751.5	BNP Paribas	780.2	BNP Paribas	729.1	Deutsche Bank	701.0	HSBC	639.2
2	Deutsche Bank	673.3	Deutsche Bank	632.0	HSBC	561.5	Deutsche Bank	633.6	HSBC	659.2	Deutsche Bank	627.4
3	BNP Paribas	623.6	Barclays	565.1	Deutsche Bank	529.2	HSBC	620.5	Barclays	631.1	BNP Paribas	604.3
4	Barclays	531.5	Royal Bank of Scotland	560.5	Barclays	511.8	Barclays	574.3	BNP Paribas	610.7	Barclays	589.8
5	HSBC	494.5	HSBC	507.4	Royal Bank of Scotland	508.9	Crédit Agricole	465.3	Royal Bank of Scotland	500.7	Credit Agricole	466.2
6	Crédit Agricole	385.1	Crédit Agricole	465.5	Crédit Agricole	476.4	Royal Bank of Scotland	455.3	Crédit Agricole	452.1	Royal Bank of Scotland	446.9
7	Société Générale	370.9	Goldman Sachs International	426.3	Société Générale	403.0	Société Générale	410.9	Société Générale	366.3	Société Générale	398.4
8	Citigroup Global Markets	254.0	Société Générale	356.5	JP Morgan Securities	325.0	JP Morgan Securities	292.0	Goldman Sachs International	288.6	JP Morgan Securities	328.5
9	UniCredit	248.7	Credit Suisse International	320.2	Banco Santander	289.7	Banco Santander	289.0	Banco Santander	283.6	Banco Santander	285.8
10	JP Morgan Securities	243.0	JP Morgan Securities	276.0	BPCE Group	285.8	UniCredit	245.1	JP Morgan Securities	280.2	BPCE Group	277.1
11	Fortis Bank	234.5	UniCredit	245.5	UniCredit	235.3	BPCE Group	244.1	BPCE Group	233.6	Goldman Sachs International	272.0
12	Banco Santander	229.2	Banco Santander	242.3	Lloyds Banking Group	232.5	ING Bank	226.5	Credit Suisse International	232.6	Lloyds Banking Group	232.9
13	ING Bank	221.0	Merrill Lynch International	232.9	Dexia	222.9	Goldman Sachs International	210.9	Merrill Lynch International	213.3	Credit Suisse International	215.7
14	Goldman Sachs International	198.8	ING Bank	218.1	Commerzbank	221.4	Lloyds Banking Group	207.4	Lloyds Banking Group	212.1	Unicredit	215.4
15	Dexia	197.0	Dexia	204.5	Citigroup Global Markets	211.8	Commerzbank	194.6	Nordea Bank	206.9	Citigroup Global Markets	189.2
16	Danske Bank	186.8	Citigroup Global Markets	204.1	ING Bank	198.6	Dexia	188.3	ING Bank	200.1	ING Bank	179.4
17	Merrill Lynch International	185.5	Groupe Caisse d'Epargne	171.7	Goldman Sachs International	190.1	Credit Suisse International	186.1	Unicredit	195.7	Morgan Stanley International	172.1
18	Morgan Stanley International	176.8	Commerzbank	137.7	Credit Suisse International	180.6	Merrill Lynch International	170.5	Citigroup Global Markets	164.7	Nordea	170.5
19	Credit Suisse International	175.6	Intesa Sanpaolo	136.4	Intesa Sanpaolo	157.2	UBS Limited	159.4	UBS	164.1	Bank of New York Mellon	168.9
20	Groupe Caisse d'Epargne	171.1	Groupe Banques Populaires	128.6	Nordea Bank	144.8	Nordea Bank	147.5	Commerzbank	159.6	Commerzbank	166.4
21	HBOS	164.6	HBOS	126.8	Credit Mutuel	142.4	Morgan Stanley International	142.4	Morgan Stanley International	156.0	Merrill Lynch International	160.5
22	Dresdner Bank	160.4	Morgan Stanley International	125.2	BBVA	136.3	Bank of New York Mellon	138.6	Danske Bank	147.6	Nomura International	159.2
23	Commerzbank	152.2	UBS Limited	124.6	Merrill Lynch International	133.9	Rabobank	137.4	Rabobank	136.1	Rabobank	155.9
24	LBBW	135.5	Credit Mutuel	123.8	LBBW	131.9	Intesa Sanpaolo	137.1	Bank of New York Mellon	135.0	Danske Bank	138.6
25	DZ Bank	128.3	DZ Bank	119.0	Morgan Stanley International	130.6	Citigroup Global Markets	135.9	Dexia	133.9	BBVA	136.1
26	Intesa Sanpaolo	124.3	LBBW	117.0	DZ Bank	125.2	BBVA	122.7	BBVA	131.2	Intesa SanPaolo	135.8
27	Credit Mutuel	123.8	Dresdner Bank	115.8	Rabobank	116.7	Danske Bank A/S	119.3	Nomura International	125.6	Dexia	127.8
28	Rabobank	113.8	BBVA	114.2	Nomura International	113.1	Credit Mutuel	119.1	Standard Chartered	125.2	Credit Mutuel	125.9
29	Groupe Banques Populaires	113.8	Nordea Bank	108.1	UBS Limited	111.8	Nomura International	116.9	LBBW	110.8	LBBW	117.1
30	Lehman Brothers International	113.1	Rabobank	101.7			LBBW	107.6	Intesa Sanpaolo	110.6	Standard Chartered	116.7
31	BBVA	112.1					DZ Bank	101.5	DZ Bank	101.7	UBS Limited	108.0
32	Bayerische Landesbank	106.4									DZ Bank	107.1



**Table A.3 EA-SIBs sets and bank scores (end-of-year data)**

Rank	2007		2008		2009		2010		2011		2012	
	Name	SI Score	Name	SI Score	Name	SI Score	Name	SI Score	Name	SI Score	Name	SI Score
1	Deutsche Bank	1025.2	BNP Paribas	1212.5	BNP Paribas	1165.7	BNP Paribas	1108.9	Deutsche Bank	1044.6	Deutsche Bank	1035.5
2	BNP Paribas	960.8	Deutsche Bank	988.5	Deutsche Bank	799.6	Deutsche Bank	966.1	BNP Paribas	1029.9	BNP Paribas	960.9
3	Société Générale	569.1	Crédit Agricole	719.5	Crédit Agricole	704.8	Crédit Agricole	725.8	Crédit Agricole	728.5	Crédit Agricole	733.7
4	Crédit Agricole	562.5	Société Générale	569.3	Société Générale	608.8	Société Générale	645.9	Société Générale	630.5	Société Générale	632.1
5	UniCredit	364.0	UniCredit	371.7	Banco Santander	417.9	Banco Santander	437.0	Banco Santander	450.9	Banco Santander	445.4
6	ABN AMRO	351.6	Banco Santander	366.9	BPCE Group	412.2	BPCE Group	378.7	BPCE Group	387.9	BPCE Group	433.6
7	Banco Santander	341.8	ING Bank	325.6	UniCredit	346.1	UniCredit	340.6	Unicredit	353.9	Unicredit	350.1
8	Fortis Bank	327.6	Dexia	306.3	Commerzbank	325.8	ING Bank	310.9	ING Bank NV	344.6	ING Bank	293.7
9	ING Bank	310.3	ABN AMRO	269.3	Dexia	321.0	Commerzbank	297.9	Merrill Lynch International	287.2	Merrill Lynch International	274.0
10	Dexia	291.6	Groupe Caisse d'Epargne	254.4	ING Bank	285.2	Dexia	248.7	Commerzbank	245.8	Commerzbank	264.0
11	Groupe Caisse d'Epargne	259.7	Merrill Lynch International	249.9	Intesa Sanpaolo	231.8	Merrill Lynch International	241.6	Rabobank	227.5	Rabobank	260.1
12	Dresdner Bank	243.1	Commerzbank	207.9	Merrill Lynch International	211.8	Rabobank	212.9	Dexia	220.6	Bank of New York Mellon	216.8
13	Commerzbank	221.1	Intesa Sanpaolo	206.9	Credit Mutuel	199.9	Intesa Sanpaolo	197.2	BBVA	208.9	BBVA	211.9
14	Merrill Lynch International	215.6	Groupe Banques Populaires	192.9	LBBW	196.1	Bank of New York Mellon	191.0	Intesa SanPaolo	197.2	Intesa SanPaolo	211.8
15	LBBW	200.7	Credit Mutuel	183.1	BBVA	195.7	BBVA	183.1	Bank of New York Mellon	190.4	Dexia	209.1
16	DZ Bank	185.8	DZ Bank	181.9	DZ Bank	183.6	Credit Mutuel	174.8	Landesbank BW	179.3	HSBC France	200.9
17	Intesa Sanpaolo	181.3	Dresdner Bank	180.7	Rabobank	165.5	LBBW	166.8	Credit Mutuel	170.3	Credit Mutuel	194.9
18	Credit Mutuel	172.4	LBBW	179.5	HSBC France	163.2	DZ Bank	158.9	ABN AMRO Bank NV	165.6	LBBW	188.9
19	Groupe Banques Populaires	172.2	BBVA	167.9	Bank of New York Mellon	158.9	HSBC France	158.1	DZ Bank	163.7	ABN AMRO Bank	174.4
20	BBVA	160.7	HSBC France	154.3	Bayerische Landesbank	133.1	Hypo Real Estate	129.5	Nordea Bank Finalnd Plc	160.4	DZ Bank	173.3
21	Rabobank	160.1	Rabobank	148.5	Hypo Real Estate	123.0	Bayerische Landesbank	122.6	HSBC France	155.8	Nordea Bank Finland	146.3
22	Bayerische Landesbank	151.6	Bayerische Landesbank	144.1	KBC Bank	111.7	Nordea Bank Finland	118.7	Bayerische Landesbank	138.3	Bayerische Landesbank	124.5
23	HSBC France	137.7	Portigon AG	125.9	NordLB	105.2	KBC Bank	115.4			Banco de Sabadell	114.0
24	Helaba	136.6	Hypo Real Estate	125.5	Portigon AG	102.5	ABN AMRO Group	103.0			La Caixa	111.2
25	Portigon AG	130.0	KBC Bank	120.8	ABN Amro	101.6						
26	Hypo Real Estate	128.2	Helaba	116.6								
27	KBC Bank	127.7										

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