The impact of the identification of GSIBs on their business model

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December 19th, 2017

Working paper[1]

ABSTRACT:

Most research papers dealing with systemic footprint in the banking system either investigate the definition and the measure of systemic risk, or try to identify systemic banks and to quantify the systemic risk buffers. To the best of our knowledge, this paper is among the first to provide empirical evidence on how the recent international regulation designed for globally systemic important banks (GSIBs) drove changes on these institutions' activity. Our data consists of cross-section observations for 97 large international banks from 22 countries from 2005 to 2016 (12 years). We use a "difference-in-difference" econometric approach to quantify the impact of the FSB designation on GSIBs' activity, taking into account both structural differences between GSIBs and non-GSIBs and structural evolutions of the banking system over time. We find that, if everything else is equal, the FSB designation of GSIBs has triggered a slowdown in the expansion of their balance sheet, which resulted in an additional improvement of their leverage ratio. In turn, a sizeable downward pressure is noticed on their profitability. Our results also indicate that the average risk-weight of GSIBs' assets started to increase following their designation. Overall, most significant effects elicited in this paper actually illustrate a mean-reverting process, tending to close structural gaps between GSIBs and non-GSIBs.

JEL classification: G01, G21, G28, G32

Keywords: GSIBs, business model, profitability, RWA, difference-in-difference

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1 Introduction

In the aftermath of the 2007-2008 global financial meltdown, finding a solution to the "too-big to fail" (TBTF) problem became a priority for the G20 leaders and international regulators, such as the Financial Stability Board (FSB [2010]). Whereas this category of banks had already been identified in 1984[2] and the adverse incentives related to their status have largely been analyzed by academics (Flannery and Sorescu [1996]; Freixas et al. [2004]; Brandao Marques et al. [2013]; Gropp et al. [2013]), no concrete measure had been taken until recently to ending the TBTF distortions. Moreover, with the last global financial crisis, size revealed to be only one determinant of the systemic risk; the complexity of a bank's business model, its interconnection with other institutions and internationally driven activities contribute as well to the possibility of contagion.

Thus, one key element of the post-Lehman reform agenda, and a main challenge for international regulators, involves the quantification of banks' systemic footprint and the identification of the financial institutions whose distress or disorderly failure could cause significant disruption to the wider financial system and economic activity. First, several studies developed measures for the systemic footprint of large banks[3]. Second, the international regulators developed a specific framework to make financial institutions more resilient and end the too-big-to-fail paradigm (FSB [2010]; FSB [2013b]).

In this context, the concept of the "Global Systemically Important Bank" (GSIB) has been introduced to characterize the banks to be submitted to the new additional regulation. In November 2011, the Basel Committee on Banking Supervision (BCBS) published a methodology for identifying these systemically important institutions focusing on five main features: size, interconnectedness, availability of substitutes, global

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[2]In 1984, the US federal government took the decision to intervene in order to avoid the failure of any of the nation's 11 largest banks. This lead to the identification of a new category of banks, whose disorderly failure, due to their size, could cause significant disruption in the functioning of financial markets and the economy as a whole.

[3]The Marginal Expected Shortfall and the Systemic Expected Shortfall of Acharya et al. [2017], the SRISK of Acharya et al. [2012] and Engle et al. [2015], and the CoVaR of Adrian and Brunnermeier [2016]. Benoit et al. [2016a] provides a comparative analysis of these systemic risk indicators.

activity and complexity (FSB [2011]; BCBS [2011]). Based on a score analysis, a new typology of banks has been identified and an initial list of 29 GSIBs (17 from Europe, 8 from the US, and 4 from Asia) was published by the FSB in November 2011. This list, revised and published annually by the FSB, went through several changes since its creation, particularly in November 2012 when the methodology was revised and GSIBs were allocated into five 'buckets' of ascending levels of systemic importance (FSB [2013b]; FSB [2014b]; FSB [2015b])[4]

Thus, since November 2012, the GSIBs methodology and classification in buckets were conceived to facilitate further implementation of additional capital requirements, macro-prudential framework and measures taken within the recovery and resolution regulation. Namely, GSIBs are required to comply with different and higher regulatory standards (Basel III capital buffers and higher loss absorbency requirements imposed under the TLAC framework (FSB [2014b]; FSB [2015b])). Additionally, cross-border supervisory colleges are put in place for almost all GSIBs in order to enhance international supervisory cooperation. They are also subject to further resolution planning and regular resolvability assessments (FSB [2016b]).

The roll-out of the framework will take place progressively in the coming years[5]. Currently, international regulators focus on completing the G20 financial regulatory reforms, but they face a dilemma: if adverse distortions persist despite the ongoing reforms, bank resolution could become even more doubtful in case of worldwide distress. Concerns are particularly acute for banks with large cross-border operations where management in case of crisis is of high interest for policy makers and governments.

In this context, this paper evaluates whether the regulatory reforms addressing systemic banks has contributed to the broad G20 objectives to strengthen the resilience

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[4]Benoit et al. [2016b] question the adequacy of BCBSs methodology. They propose a correction of the score methodology and an alternative list of systemically important institutions to be further used to set capital surcharges or alternative tax on systemic risk.

[5]Additional prudential requirements have to be phased in from 1st January 2016 and fully implemented by 1st January 2019. TLAC requirements have to be fulfilled by 2022.

of financial institutions, improving the functioning of financial markets and enhancing financial stability. More precisely, we evaluate whether and how much financial institutions, designated as GSIBs, experienced changes in line with the intended objectives and if unintended consequences also occurred.

To the best of our knowledge, this is the first paper trying to assess the recent evolutions of the business models of such systemic banks. Research work has been driven so far from different points of view: Schich and Toader [2016] investigates this question in the context of banks' debt implicit public guarantees and efficiency of resolution regimes and practices. Moenninghoff et al. [2015] analyzes the shifts in stock market evaluations driven by these recent regulatory frameworks imposed to GSIBs. Birn et al. [2017] investigate how banks can reach all Basel III requirements: using bank-level data from the BCBS's quantitative impact studies for 156 banks between 2011 and 2014, they show that, contrary to other banks in the sample, GSIBs have decreased total balance sheet through the period and that they have also increased highly liquid assets more than other banks.

We provide a comprehensive analysis that seeks to respond to the following questions. Did the FSB designation of GSIBs and its subsequent enforcement of more stringent capital requirements have an impact on their business model? Are there any regulatory driven changes in terms of credit supply to the economy, profitability and risk-taking? In order to bring some insights to questions of high importance for supervisory institutions, our analysis is based on granular balance sheet and income statements and is applied to a large sample of 97 large international banks and covers the period from 2005 to 2016.

The remaining of this paper proceeds as follows. Section 2 presents a brief overview of the GSIB identification methodology used by the BCBS. In Sections 3 and 4 we describe the dataset and the methodology that allows us to analyze empirically our topic of interest. In Section 5, we present the econometric results focusing on different aspects of banks' business model (capital adequacy, balance sheet and income statement

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composition, profitability and risk-taking). Section 6 provides some robustness checks and alternative specifications. Section 7 concludes.

2 Short overview of the GSIB identification methodology

In 2011, the Basel Committee on Banking Supervision (BCBS) established a quantitative methodology to identify global systemically important banks (BCBS [2011]). After several revisions, the latest version has been disclosed in July 2013 (BCBS [2013b]). According to this methodology, banks' systemic footprint is assessed using a set of 12 indicators grouped into five categories. For each indicator, a "market share" is computed at bank-level (i.e. the value of the indicator for bank i is divided by the sum of this indicator's values for all banks in the sample used by the BCBS). Within each of the five categories, the "market shares" of the underlying indicators are then equally weighted to compute a score in basis points. Finally, these five categories' sub-scores are averaged (20% each) to get the final systemic score. See figure 1 for an illustration of this methodology.
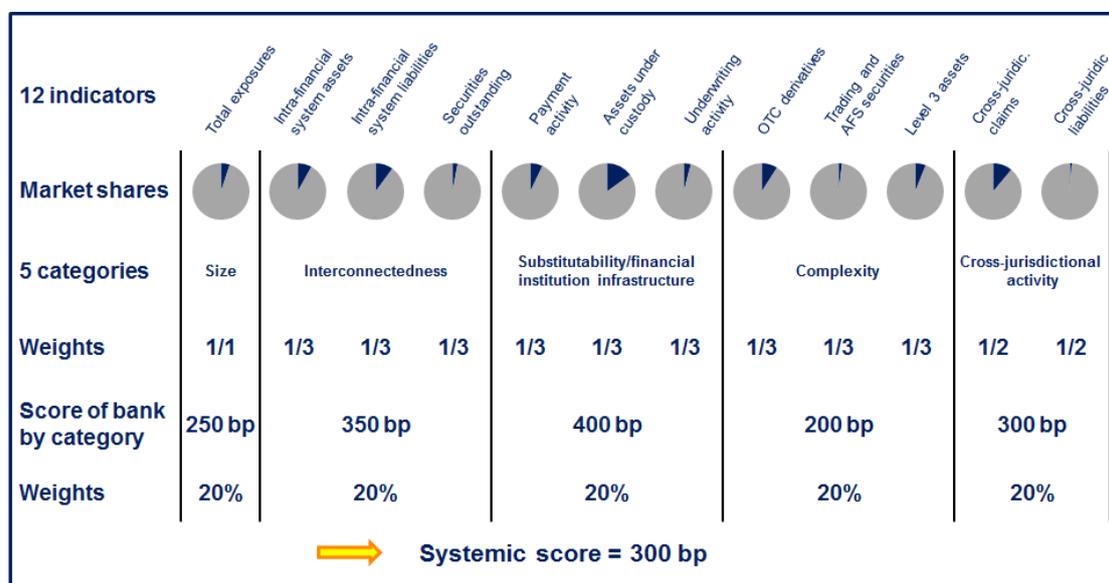

Figure 1: Illustration of current BCBS methodology to identify GSIBs

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Once the systemic score is computed, banks are ordered and further allocated into buckets according to their systemic score value. Only banks with systemic scores above 130 basis points (bp) are labelled as GSIBs. For these banks, the allocation into buckets is made as follows. If its systemic score is between 130 and 230 basis points, the bank will be allocated to the first bucket and face an additional CET1 capital requirement (or "buffer") of 1% of its total risk-weighted assets (RWA). Next buckets are then imposing more and more stringent buffers: 1.5% for banks with systemic scores between 230 and 330 bp, 2% between 330 and 430 bp and 2.5% between 430 and 530 bp.[6] Currently, the fifth and last bucket would trigger a 3.5% buffer if the systemic score were to reach the 530 bp threshold. For the time being, this last bucket is only "dissuasive" and has never been applied to any GSIB. Figure 2 gives an illustation of this allocation of GSIBs into their corresponding buckets.
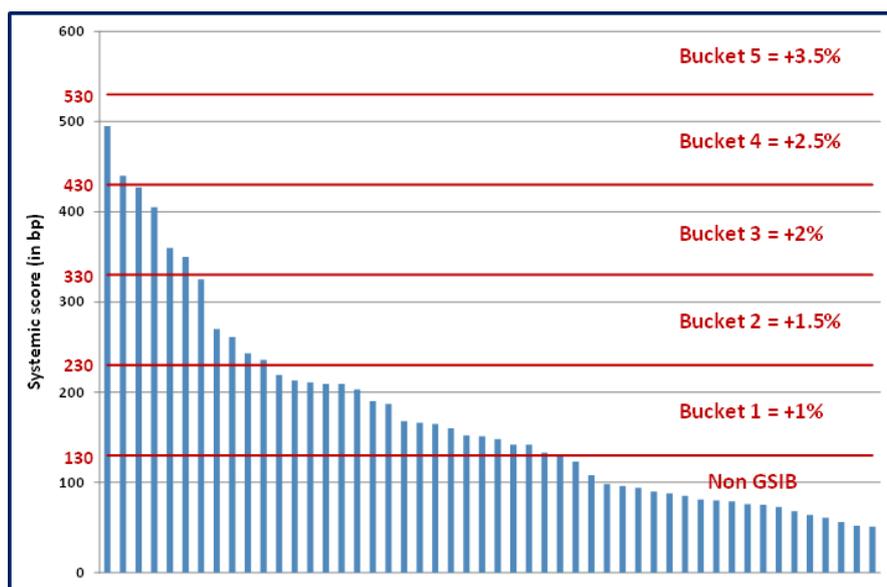
Figure 2: Allocation of GSIBs to systemic risk buckets

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[6]Under the Basel III framework, the minimum CET1 capital requirement imposed to all banks equals 6.5% of their total risk-weighted exposures, including the capital conservation buffer. Therefore, even a 1% additional requirement due to the GSIB buffer is not negligible, as it moves the CET1 requirement of the bank from 6.5% to 7.5% of its exposure. This represents an increase of the CET1 minimum requirement by 15.4%.

The main aim of designating banks as GSIBs is to further impose additonal prudential requirements. However, such additional capital buffers are only one aspect of the *direct* consequences of such GSIB designation. Indeed, among other regulatory obligations directly stemming from the FSB designation, GSIBs - and only GSIBs - are subject to a minimum "TLAC" (Total Loss-absorbing Capacity) requirement ensuring that in case of resolution the bank holds enough instruments to absorb losses and to be recapitalised without public funds intervention (cf. FSB [2014b]). GSIBs are subject to further resolution planning expectations from supervisory authorities. Besides, *indirect* consequences also have to be taken into account. For instance, GSIBs are requested to take part into additional reporting and statistical data collections, such as the FSB Datagaps initiative that imposes a weekly submission of main exposures and financing sources. Finally, the annual publication of the list of GSIBs by the FSB is supposed to bring investors' attention on this particular set of banks, so there should be specific "market discipline" applied to them. Hence, for the remainder of this paper, it is crucial to have in mind that what we call *GSIB designation* or *FSB designation* actually covers this complete set of consequences that applies to GSIBs, and not only the sole capital buffer.

3 Dataset description

Our sample covers 97 large international banks from 22 different countries for 12 years from 2005 to 2016. The selection of banks was made on the basis of their total assets as of end-2015. Only banks with total assets exceeding 200 billion euros, as of end-2015, at the highest level of consolidation (subsidiaries are excluded) were included in the sample. Appendix 1 provides the list of the banks included in our panel. Figure 3 below shows the share of each national banking system into the aggregated total assets for all banks in the sample as of end-2016. For each bank, we collected a set of variables at yearly

frequency[7] using the SNL database.
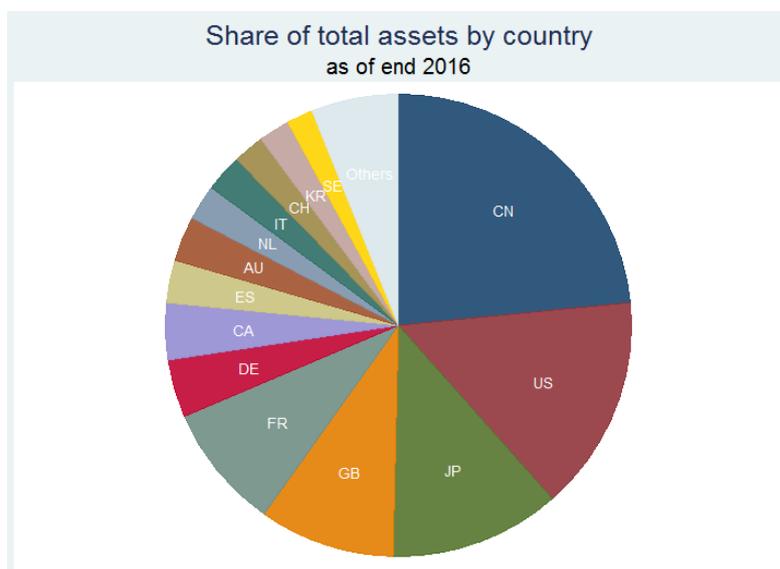
Figure 3: Shares of each national banking system in our sample

The econometric identification strategy (described in next subsection) of the impact of the FSB designation on GSIBs "business model" can be applied to many dependent variables. The purpose of this paper is to investigate the quantitative impact of this new regulatory framework on several topics such as capital adequacy, balance sheet or income composition, profitability, etc. Appendix 2 provides a description of these sets of variables used as dependent variables in the regressions, as well as variables included as bank-specific control variables. It also shows descriptive statistics for GSIBs and non-GSIBs over the two sub-periods.

In order to avoid potential disturbance of our results by extreme outliers, some variables are winsorised at 1st and 99th percentiles[8]. The stationarity of these series is ensured either by scaling them by an aggregate (eg total assets), by using ratios, or by using growth rates.

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[7]Most series were not available at higher frequency (half-yearly or quarterly) for many banks. Moving to such higher frequency would therefore drastically reduce the number of banks in the sample.

[8]This means that, for a given variable, any value larger than the 99th percentile will actually be capped at this level. Similarly, any value lower than the 1st percentile will be raised up to this level.

4 Difference-in-difference econometric specification

We consider the designation of banks as GSIBs as a *treatment*, using an approach similar to the one developed by Schich and Toader [2016] to analyze the impact of GSIB designation on the value of implicit guarantees, or for instance by Grill et al. [forthcoming, 2018] in a different regulatory context. The group of banks identified as GSIBs will be considered as a *treated* group versus all other large international banks (non-GSIBs) that will constitute a *control* group. As the list of GSIBs is relatively stable (with only a few entries and exits each year, if any), we will consider as a GSIB every bank that has been identified at least once by the FSB. Hence the $GSIB_{i,k}$ binary variable takes value 1 for all period t if the GSIB i located in country k appeared on the FSB list at least once between 2011 and 2016, and 0 otherwise. We can therefore split our dataset into two sub-samples: banks that have been GSIB at least once (*treated* group), and those which never have been (*control* group).

The first list of banks designated as GSIBs has been disclosed by the FSB in November 2011. In this study, we consider that this *treatment* started in 2012. Indeed, the first GSIB designation could not have direct impacts on balance sheets and income statements as of end-2011, and the potential effects of the GSIB designation affected the financial statements starting in 2012. Hence we construct another binary variable $Post2011_t$ that takes value 1 if $t > 2011$ and value 0 otherwise. This second binary variable splits our dataset into two other subsets: before and after the introduction of the *treatment*.

Facing these two groups (*treated* and *control*) and these two subperiods (2005-2011 and 2012-2016), we apply a **difference-in-difference** econometric approach (also referred to as "diff-in-diff" hereafter). We select a given dependent variable Y for all banks i, incorporated in country k at time t, and we regress it on the two binary variables described above, $GSIB_{i,k}$ and $Post2011_t$, and the cross-variable *interaction term* of these two variables: $Interaction_{i,k,t} = GSIB_{i,k} \times Post2011_t$. We also include a set

of bank-specific control variables $B_{i,k,t}$ and a set of country-specific macroeconomic control variables $C_{k,t}$, with $u_{i,k,t}$ being an error term.[9] Appendix 2 describes the sets of bank-specific control variables $B_{i,k,t}$ and country-specific macroeconomic control variables $C_{k,t}$.

$$Y_{i,k,t} = \alpha + \beta GSIB_{i,k} + \gamma Post2011_t + \delta(GSIB_{i,k} \times Post2011_t) + \varphi B_{i,k,t} + \chi C_{k,t} + u_{i,k,t} \quad (1)$$

Given our econometric identification methodology described in equation (1) above, our main parameter of interest will be δ, the "diff-in-diff" estimate. Indeed the binary variable $GSIB_{i,k}$ (coefficient β) will capture the structural differences between GSIBs and non-GSIBs irrespective of the period, while the second binary variable $Post2011_t$ (coefficient γ) will capture the structural changes between the two sub-periods that have affected the whole banking system irrespective of the GSIB status. Finally, our interaction variable (coefficient δ) is of main interest: it captures the impact of the *treatment* on the *treated*, which can be seen as the causal impact of the FSB designation on the Y variable for GSIBs. The example and the graphic illustration (Figure 4) below help visualising the interest of this difference-in-difference approach in a simple univariate case.

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[9]Since we cannot be sure that observations are i.i.d. among banks, we will add clusters at individual level in all our regressions to compute robust standard deviations.

Assuming a univariate case with no covariates and/or control variables, the previous specification (1) simply boils down to

$$Y_{i,k,t} = \alpha + \beta GSIB_{i,k} + \gamma Post2011_t + \delta(GSIB_{i,k} \times Post2011_t) + u_{i,k,t} \qquad (2)$$

Therefore,

- for non-GSIBs before the treatment, $GSIB_{i,k} = 0$ and $Post2011_t = 0$ so
  $Y_{non-GSIB,before} = \alpha + u_{i,k,t}$

- for GSIBs before the treatment, $GSIB_{i,k} = 1$ and $Post2011_t = 0$ so
  $Y_{GSIB,before} = \alpha + \beta + u_{i,k,t}$

- for non-GSIBs after the treatment, $GSIB_{i,k} = 0$ and $Post2011_t = 1$ so
  $Y_{non-GSIB,after} = \alpha + \gamma + u_{i,k,t}$

- for GSIBs after the treatment, $GSIB_{i,k} = 1$ and $Post2011_t = 1$ so
  $Y_{GSIB,after} = \alpha + \beta + \gamma + \delta + u_{i,k,t}$

And consequently, the difference-in-difference estimate δ measures the impact of the treatment on the treated group, controlling for structural differences both between the two groups and between the two periods:

$$(Y_{GSIB,after} - Y_{GSIB,before}) - (Y_{non-GSIB,after} - Y_{non-GSIB,before}) \qquad (3)$$

$$= (\alpha + \beta + \gamma + \delta + u_{i,k,t} - \alpha - \beta - u_{i,k,t}) - (\alpha + \gamma + u_{i,k,t} - \alpha - u_{i,k,t})$$
$$= (\gamma + \delta) - (\gamma) = \delta$$

This econometric identification strategy has important advantages but also some limitations. The difference-in-difference approach will enable the model to take into account
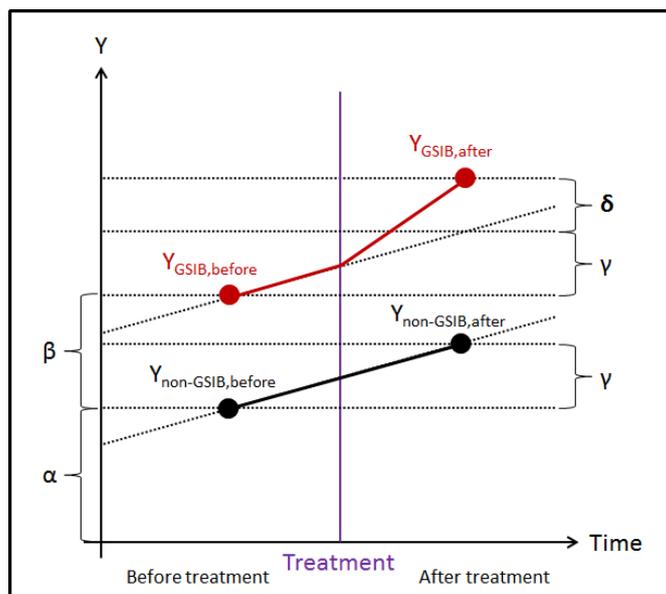
Figure 4: Illustration of the difference-in-difference estimation

general evolutions of the environment, either macroeconomic conditions and/or imple-
mentation of new regulations affecting the whole banking system. This is the purpose
of using a control group and two subperiods. On the other hand, it will not be able to
disentangle the effects of each individual consequence of the identification of a bank as
a GSIB by the FSB. As described in section 2, such identification entails several regula-
tory implications, such as capital buffers and TLAC requirements. Therefore, one should
keep in mind that the estimator δ captures the *overall* effect of all diverse consequences
of the GSIB designation, and not the sole additional capital requirement.

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5 Aspects of banks' business model

All following subsections will investigate particular aspects of banks' "business model" and present the regression results. Subsection 5.1 focuses on the indicators used by the BCBS to identify GSIBs. Subsection 5.2 investigates capital adequacy ratios. Subsections 5.3 and 5.4 show results related to the balance sheet structure for both the asset and the liability sides. Subsection 5.5 displays the income statement analysis[10]. Finally, subsections 5.6 and 5.7 respectively turn to the analyses of profitability and risk-taking on the one hand, and of yields and cost of funding on the other hand.

In all regressions, the size of banks, measured by the log of their total assets, will be used as control variable in order to eliminate any statistically significant size effect during the sample period or across banks. Similarly, the country-specific macroeconomic control variables are included in the regressions, but for the sake of brevity, they are generally not shown in the following regression output tables[11].

5.1 Indicators used in BCBS identification methodology

For this first set of dependent variables, we investigate whether the indicators used by the BCBS to identify GSIBs (cf. section 2) have shown significant evolutions since they have been included into the designation methodology. Indeed, these indicators are likely to be strategically managed in order to avoid - or at least minimize - the additional regulatory constraints that follow the designation as a GSIB. Most of the twelve indicators are neither directly available publicly over the full 2005-2016 period, nor available in the SNL database. However, for eight of them we were able to build proxies using some SNL series. Fortunately, most banks that participate in the BCBS's GSIB identification annual exercise actually disclose the real values of the twelve indicators starting from

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[10]Appendix 3 provides additional results complementing subsections 5.3, 5.4 and 5.5. It uses alternative simplified breakdowns of balance sheet and income statement. Those breakdowns are less granular but available for larger samples of banks. Overall, results shown in Appendix 3 corroborate those of section 5 and are presented only as robustness checks.

[11]Detailed results can be obtained from the authors upon request.

end-2014. Therefore we can easily compare these "real" indicators with our SNL proxies for the years 2014 and 2015[12]. Table 1 below compares these eight indicators used in the BCBS's GSIB identification methodology with the eight proxies that we constructed using the SNL database. As one can notice, the correlation between these real values and our proxies is satisfactory: close to 80-90% for six of them, and rather lower around 45% for intra-financial system assets and liabilities[13].

Table 1 - Correlation with real indicators disclosed for 2014-2015

Variable code (SNL Proxy)	GSIB identification methodology indicator	Num. of. joint obs.	Correlation coefficient
TA	Total exposure	140	97.3%
Bk Loan	Intra-financial system assets	110	43.2%
Bk Dep	Intra-financial system liabilities	103	47.8%
Sec Issued	Securities outstanding	140	86.7%
TradAFS	Trading and AFS securities	121	77.6%
Foreign Loans	Cross-jurisdictional claims	63	86.1%
Foreign Dep	Cross-jurisdictional liabilities	35	94.6%
Derivatives	OTC derivatives	92	98.9%

Looking at the regression results in Table 2, the "GSIB once" dummy variable reveals that GSIBs have structurally a larger share of foreign loans and deposits, and they also hold a much larger portfolio of securities held for trading or available for sales (scaled by total assets). Such structural differencies are also observable in Figure 5.

Turning to the interaction variable, we notice a negative sign for five among the six indicators, which tends to indicate that GSIBs slightly try to reduce their systemic footprints, as measured by these indicators. However the effect is statistically significant only for the growth rate of total assets that decreases by 5.8 pp on average starting with 2012, everything else equal. Combined with the decreasing rate for all banks in the second period, this leads to a significant decrease in the balance sheet size for many GSIBs in the years following their designation. This is coherent with the conclusions of

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[12]Here we would like to warmly thank the authors of Benoit et al. [2016b] for sharing their underlying file containing all these indicators values on a bank-level basis for these last two years. This file is available online at *http://www.runmycode.org/companion/view/51*.

[13]These two latter are not included in regressions for reasons of lack of consistency with the real indicators.
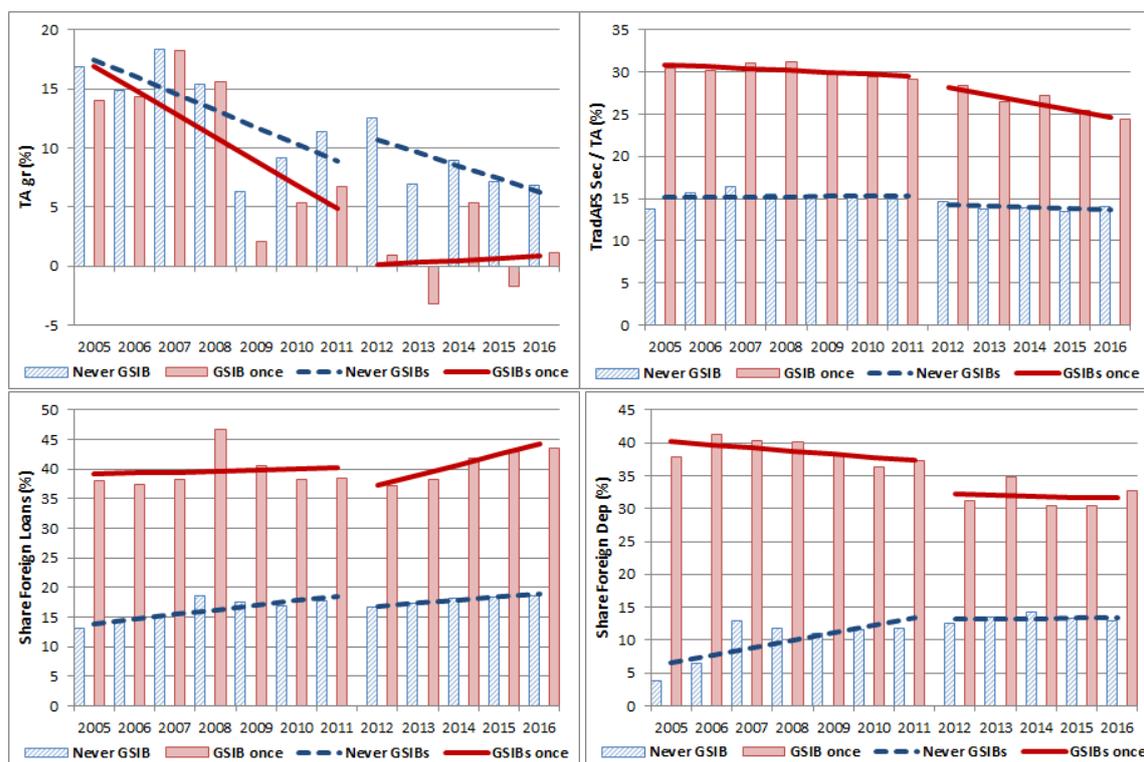
Figure 5: Evolution of average growth rate of TA, Trading and AFS securities over TA, share of foreign loans and share of foreign deposits

Note : Vertical striped blue (resp. red) bars represent the evolution of the averaged variable for non-GSIBs (resp. GSIBs). The four straight lines represent the linear regression trends for both GSIBs (solid, red) and non-GSIBs (dashed, blue) and both sub-periods.

Birn et al. [2017] that shows that GSIBs, contrary to other banks, have decreased in size between 2011 and 2014, size being measured by total exposure.

__Result n° 1__: Everything else equal, GSIBs have strongly curbed the expansion of their balance sheet since the FSB designation started. The reduction of the systemic footprint does not appear significant for the other systemic dimensions of the BCBS methodology as they can be proxied from public data.

Figures in percentage points (pp)	Dependent variable					
	TA gr	Sec Issued / TA	TradAFS Sec / TA	Share Foreign Loans	Share Foreign Dep	Deriv gr
(β) GSIB once	0.177	1.133	12.188***	13.481***	20.530***	10.282
	(1.605)	(3.295)	(2.922)	(4.794)	(7.720)	(10.654)
(γ) Post2011	-1.651**	-0.656	-2.586***	-4.366**	-3.390**	1.268
	(0.834)	(0.877)	(0.760)	(1.737)	(1.712)	(6.678)
(δ) **INTERACTION**	**-5.763*****	**-1.105**	**-1.213**	**0.990**	**-3.406**	**-9.900**
	(1.392)	(1.150)	(1.090)	(3.204)	(3.266)	(9.545)
Size	0.019	0.821	0.090	3.546**	3.449*	-10.429
	(0.636)	(0.757)	(0.890)	(1.716)	(1.948)	(6.363)
Intercept	5.428	8.030	10.014	-60.494**	-54.944	237.252*
	(12.297)	(15.170)	(16.526)	(29.349)	(34.536)	(129.541)
Obs.	1,023	1,069	913	489	291	620
adj-R^2	0.333	0.003	0.379	0.595	0.439	0.223
Macro control var.	YES	YES	YES	YES	YES	YES

<div align="center">Table 2 - GSIB Methodology variables</div>

<div align="center">* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ - Standard deviations in brackets</div>

5.2 Capital adequacy

In this subsection we focus on capital adequacy of banks, which can be measured either using a non-weighted ratio dividing Tier 1 capital (T1) by total assets (TA), which is a proxy of the leverage ratio (hereafter refered to as "leverage ratio"), or using a weighted solvency ratio dividing an own funds capital measure (T1 capital and total own funds - TOF - respectively) by total risk-weighted assets (RWA). Generally, the average values of solvency ratios have risen significantlly over the second sub-period (2012-2016) for both GSIBs and non-GSIBs. For all banks, the average "leverage ratio" increased from 4.72% to 5.56% and the Tier 1 risk-weighted ratio moved from 10.15% to 13.74% (see appendix 2).

For this set of dependent variables, we include two ratios describing the level of retail activities in banks' balance sheets (share of loans within total assets, and share of deposits within total liabilities) in order to control for differences between "traditional" commercial banks and more market-oriented banks. We also add the return on average asset (ROA) to take into account differences in assets profitability, which is likely to impact the ability to raise capital.
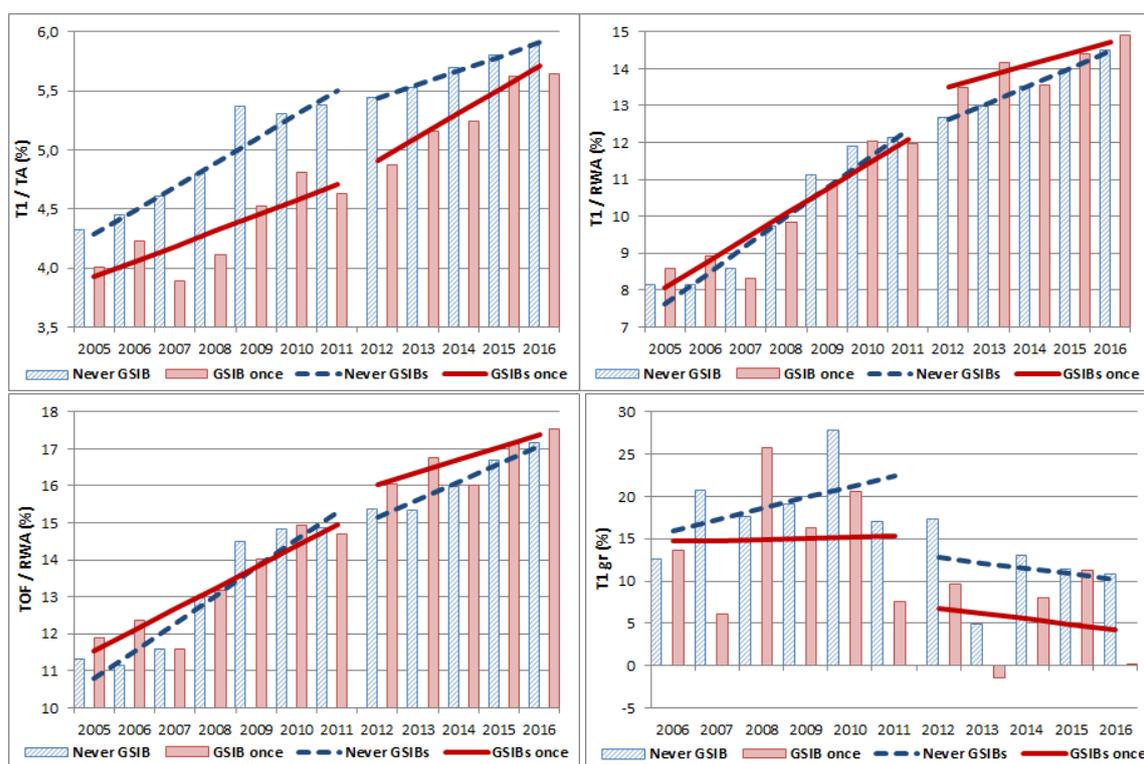
Figure 6: Evolution of the average Tier 1 "leverage" ratio, risk-weighted solvency ratios (Tier 1 and Total own funds) and average growth rate of Tier 1

Note : Vertical striped blue (resp. red) bars represent the evolution of the averaged variable for non-GSIBs (resp. GSIBs). The four straight lines represent the linear regression trends for both GSIBs (solid, red) and non-GSIBs (dashed, blue) and both sub-periods.

Looking at the regression results, a significant gap in behaviour of GSIBs vs. non-GSIBs, after their first designation in 2011, can be observed only for the "leverage ratio" (T1/TA). This means that GSIBs are generally more leveraged than non-GSIBs, and that their "leverage ratio" tends to be 0.94 percentage points lower than these of non-GSIBs, everything else equal. Such structural gap between GSIBs and non-GSIBs does not appear significant for the two risk-weighted capital ratios (T1/RWA and TOF/RWA).

On the contrary, the coefficient of the time dummy variable "Post2011" is positive and strongly significant for the three ratios, which indicates that, everything else equal, banks display, in average, significantly higher solvency levels starting 2012 compared to previous period (2005-2011). This finding is mainly explained by the adoption of the Basel III regulatory framework imposing banks to boost their solvency ratios and

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Figures in percentage points (pp)	Dependent variable		
	T1 / TA	T1 / RWA	TOF / RWA
(β) GSIB once	-0.937**	-0.851	-0.363
	(0.378)	(0.945)	(0.862)
(γ) Post2011	0.475***	2.226***	1.805***
	(0.100)	(0.464)	(0.409)
(δ) **INTERACTION**	**0.592*****	**-0.163**	**0.184**
	(0.201)	(0.589)	(0.593)
Size	0.354**	-0.559	-0.611*
	(0.169)	(0.369)	(0.358)
LOANS / TA	0.004	-0.050**	-0.039
	(0.008)	(0.025)	(0.024)
DEP / TL	0.013*	0.014	0.006
	(0.007)	(0.019)	(0.021)
ROA	0.460***	0.428*	0.293
	(0.117)	(0.238)	(0.252)
Intercept	-2.354	23.465***	29.177***
	(3.435)	(7.043)	(6.907)
Obs.	946	930	957
adj-R^2	0.222	0.352	0.289
Macro control var.	YES	YES	YES

Table 3 - Capital adequacy variables

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ - Standard deviations in brackets

improve their ability to absorb shocks.

An interesting result, although counter-intuitive at a first view, concerns the interaction variable that is significant for the "leverage ratio" only and not for the two risk-weighted solvency ratios (T1/RWA and TOF/RWA). Since the designation of a bank as a GSIB automatically results in an additional capital buffer on top of the risk-weighted minimum solvency requirements, one would have expected a positive and significant coefficient for the interaction variable in the case of these two ratios. In fact, such mechanical explanation does not take into account the general race for higher solvency ratios. Several banks, either GSIBs or not, have increased solvency ratio more than requested by the Basel III standards require, as a response to market and supervisory pressure[14]. This may also come from the fact that some banks among the non-GSIBs sub-group might also be subject to equivalent additional capital requirements, such as

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[14]Through "pillar 2" additional requirements, for instance.

the DSIB requirement[15]. This could partly explain why the GSIB designation has no significant effect on the GSIBs' risk-weighted capital adequacy ratios. On the contrary, the designation has a significant and substantial effect on the "leverage ratio" and leads to an additional increase of the "leverage ratio" of 0.59 percentage points for GSIBs on top of the general improvement of 0.48 percentage points that affected all banks in the second period. As GSIBs used to be more leveraged than other banks before 2011, this further improvement of the leverage ratio helped them bridge this leverage gap. This is the natural result of the Basel III new leverage ratio constraint on banks that were more leveraged than others and that converged to the standard.

Result n°2: The GSIBs designation seems to have triggered an additional increase of the "leverage ratio" for the subgroup of GSIBs since 2012, tending to close the structural leverage gap noticed between GSIBs and non-GIBs. Surprisingly, the designation does not seem to have an impact on the levels of risk-weighted capital ratios in the post-treatment period.

5.3   Assets composition

In this subsection the sample includes 681 observations of our database[16] for which we have a detailed breakdown of the asset side of the balance sheet (illustrated in Figure 6 below). This comprises 245 observations for banks that were designated as GSIBs at least once and 436 observations for non GSIBs. On average, total assets can be broken down into cash and balances with central banks (6.0% of assets over the full panel), loans to banks (6.9%), loans to customers (51.6%), trading account (7.2%), available for sales securities (7.6%), held to maturity securities (2.9%), derivatives (6.6%), other financial assets (1.2%), intangible assets (0.7%) and other assets (9.3%).

According to Tables 4 and 5, GSIBs tend to have a larger share of trading account

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[15]Domestic systemically important banks, see BCBS [2012]

[16]The full database comprises a maximum of 1164 observations (97 banks time 12 years).
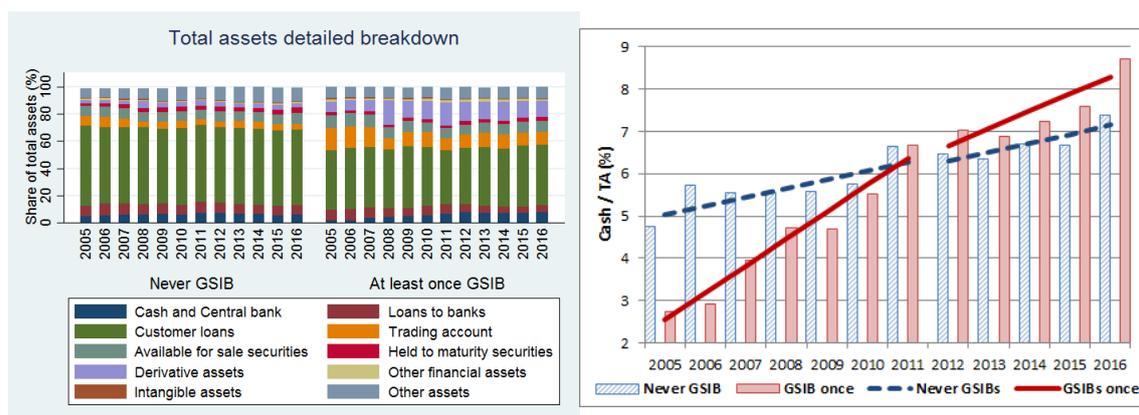
Figure 7: (Left) Evolution of total assets breakdown / (Right) Evolution of average share of cash in total assets

Note (Right) : Vertical striped blue (resp. red) bars represent the evolution of the averaged variable for non-GSIBs (resp. GSIBs). The four straight lines represent the linear regression trends for both GSIBs (solid, red) and non-GSIBs (dashed, blue) and both sub-periods.

and derivatives within their total assets compared to non-GSIBs over the period 2005-2016. Looking at Figure 7 (left) we can see that, on average, some GSIBs have a lower share of customer loans but higher holdings of trading assets. The results reported in Tables 4 and 5 suggest that banks, in general, decreased their shares of interbank loans and derivatives in the second period (2012-2016) compared to the prior period (2005-2011) and favoured the distribution of loans to customers. Going one step further and analysing the results for the interaction variable, we only find a significant positive impact of GSIB designation on the cash and central bank holdings. This proves the effort made by GSIBs to catch up with a higher share of cash and balances with central banks, from a relatively lower level in the pre-treatment period, in a context of favourable macroeconomic environment (quantitative easing and low interest rates) and implementation of a new liquidity framework requiring a substantial increase in the share of liquid asset holdings.[17]. Our findings are in line with the conclusions of Birn et al. [2017] highlighting that between 2011 and 2014, GSIBs have effectively increased

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[17]Cash and balances with central banks are high quality liquid assets taken for 100% as a buffer in the context of the liquidity coverage ratio (LCR).

liquid assets more than other banks. Moreover, as one can see in Figure 7 (right), GSIBs started to increase the share of cash since the crisis, under market pressure to increase their holdings of high quality liquid assets (the so-called flight to liquidity and quality). Still, taking into account this crisis effect in the regressions, using a set of macroeconomic control variables, we find that the GSIB designation pushed further this reallocation of assets towards increasing cash holdings.

Table 4 - Assets detailed composition variables (Part 1)					
Figures in percentage points (pp)	Dependent variable				
	CASH CB / TA	BK LOANS / TA	CUST LOANS / TA	TRADAC / TA	AFS SEC / TA
(β) GSIB once	-1.415	-3.648*	-4.569	7.342***	0.495
	(0.866)	(1.980)	(4.150)	(2.642)	(1.505)
(γ) Post2011	0.707	-1.465**	3.218***	-0.188	-0.753
	(0.579)	(0.635)	(0.996)	(0.638)	(0.635)
(δ) INTERACTION	**2.656***	**-0.276**	**-1.060**	**-1.350**	**0.053**
	(0.812)	(0.925)	(1.517)	(0.962)	(1.020)
Size	0.639	1.950***	-5.551***	0.173	-0.591
	(0.411)	(0.697)	(1.068)	(0.686)	(0.892)
Intercept	-1.798	-28.187**	153.220***	0.758	19.427
	(8.431)	(12.648)	(21.005)	(12.577)	(17.183)
Obs.	681	681	681	681	681
adj-R^2	0.490	0.000	0.100	0.058	0.074
Macro control var.	YES	YES	YES	YES	YES

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ - Standard deviations in brackets

The share of loans to customers in the balance sheet does not appear affected by the GSIB designation. Such finding is in line with Admati and Hellwig (2013) sustaining that, according to the Modigliani-Miller view, higher capital requirements should have a limited impact on the bank's lending policy.

Result n°3: *Everything else equal, the most important change in broad asset structure driven by the GSIB designation has been the increase in the share of cash and central bank reserves that tended to offset the structral gap in the share of cash recorded before 2011 compared to non-GSIBs. Beyond that, the rest of the balance sheet does not seem to have been affected by the GSIB designation, especially the ability of GSIBs to provide loans and finance the real economy remained unchanged.*

Figures in percentage points (pp)	Dependent variable			
	HTM SEC / TA	DERIV / TA	OTH FIN / TA	INTANG / TA
(β) GSIB once	-2.008	7.459***	0.496	0.073
	(1.301)	(2.073)	(0.946)	(0.233)
(γ) Post2011	0.108	-1.844***	0.117	-0.143
	(0.546)	(0.532)	(0.220)	(0.103)
(δ) INTERACTION	**0.009**	**0.342**	**0.039**	**-0.097**
	(0.590)	(0.554)	(0.331)	(0.135)
Size	1.027*	0.201	-0.002	0.065
	(0.596)	(0.413)	(0.236)	(0.082)
Intercept	-13.927	-3.173	2.002	-0.825
	(11.085)	(7.234)	(4.194)	(1.593)
Obs.	681	681	681	681
adj-R^2	0.297	0.442	0.000	0.161
Macro control var.	YES	YES	YES	YES

Table 5 - Assets detailed composition variables (Part 2)

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ - *Standard deviations in brackets*

5.4   Liabilities composition

In this subsection the sample includes 679 observations of our database for which we have a detailed breakdown of the liabilities side of the balance sheet. On average, total liabilities can be split into deposits from banks (11.6% of liabilities over the full sample), customer deposits (53.1%), subordinated debt (1.8%), senior debt obligations (17.5%), derivatives (7.0%), other financial liabilities (2.1%) and other liabilities (6.9%).

In terms of structural differences between the two sub-groups, the estimation results in Table 6 suggest a significant larger share of derivatives and other financial liabilities as well as a lower share of interbank deposits for GSIBs compared to non-GSIB. These features are consistent with previous results for the asset side of the balance sheet. Compared to the first sub-period, a significant change is recorded only for derivatives exposures which have been significantly reduced starting with 2012. Looking at the interaction variables, there is no empirical evidence that the GSIB designation drove major shifts in the liabilities composition of GSIBs, except a slightly significant increase of the share of subordinated debt by 0.3 percentage point. This may be assigned to the introduction of the TLAC requirement, as some of the underlying debt instruments can
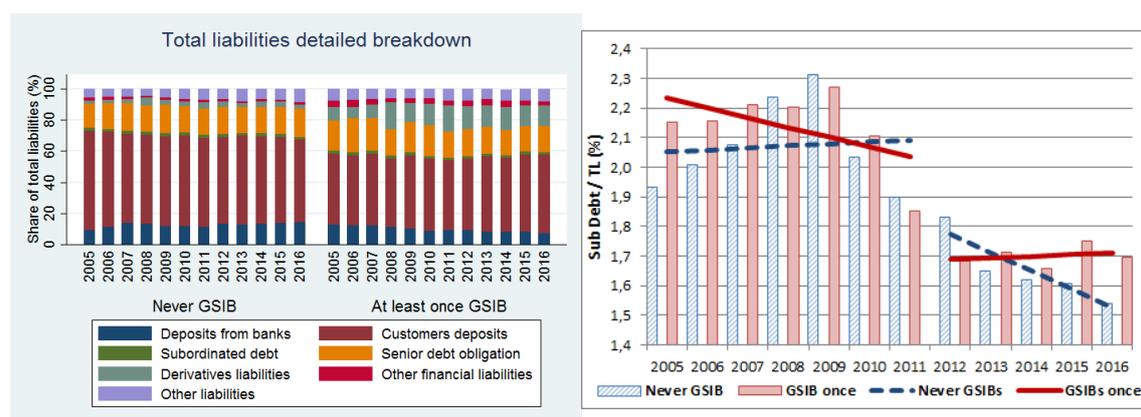
Figure 8: (Left) Evolution of total liabilities breakdown / (Right) Evolution of average share of subordinated debt in total liabilities

Note (Right) : Vertical striped blue (resp. red) bars represent the evolution of the averaged variable for non-GSIBs (resp. GSIBs). The four straight lines represent the linear regression trends for both GSIBs (solid, red) and non-GSIBs (dashed, blue) and both sub-periods.

be eligible to the loss-absorbing capacity of the bank.

Table 6 - Liabilities detailed composition variables						
Figures in *percentage points (pp)*				Dependent variable		
	BK DEP / TL	CUST DEP / TL	SUB DEBT / TL	SENIOR DEBT / TL	DERIV / TL	OTH FIN / TL
(β) GSIB once	-8.589***	-3.660	0.306	1.361	7.957***	2.330**
	(2.794)	(7.078)	(0.355)	(3.281)	(2.067)	(1.160)
(γ) Post2011	-0.275	1.191	-0.141	-0.370	-1.679***	0.070
	(0.969)	(1.332)	(0.157)	(1.379)	(0.627)	(0.255)
(δ) **INTERACTION**	**-0.425**	**0.325**	**0.290***	**-0.668**	**0.198**	**-0.205**
	(1.009)	(1.783)	(0.170)	(1.709)	(0.667)	(0.364)
Size	6.046***	-6.673***	-0.198*	0.309	-0.100	0.098
	(0.904)	(1.578)	(0.114)	(1.043)	(0.597)	(0.176)
Intercept	-99.621***	175.307***	6.281***	10.675	1.735	-0.429
	(15.936)	(29.621)	(2.142)	(20.829)	(10.797)	(3.147)
Obs.	679	679	679	679	679	679
adj-R^2	0.061	0.000	0.079	0.267	0.454	0.042
Macro control var.	YES	YES	YES	YES	YES	YES

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ - Standard deviations in brackets

Result nº4: *Everything else equal, apart from a small increase of subordinated debt, the GSIB designation does not seem to have changed the liability structure of GSIBs' balance sheet.*

5.5 Income statement composition

In this part of the analysis, the sample includes 637 observations. The net interest income contributes to the operating income up to 65.3%. Net fees and commissions income represents 21.5% of it, net gains on securities 7.1% and other non-interest income 6.2%. Personnel expenses consume around 27.3% of the operating income, other operating expenses 27.2%, impairments on customers' loans 12.5%, other impairments 2.8% and the income tax 7.0%. Net resulting profit represents 24.0% of the operating income.

Detailed income statement
+ Net interest income
+ Non-interest income
of which: Net Fee and Commission Income
of which: Realized and Unrealized Gains on Securities
of which: Other Non-interest Income
= Operating income
- Operating expense
of which: Personnel Expense
of which: Other Operating Expense
- Total impairments
of which: Customers loans impairments
of which: Financial assets impairments
of which: Non-financial impairments
- Income Tax
- Other items (net)
= Net Profit
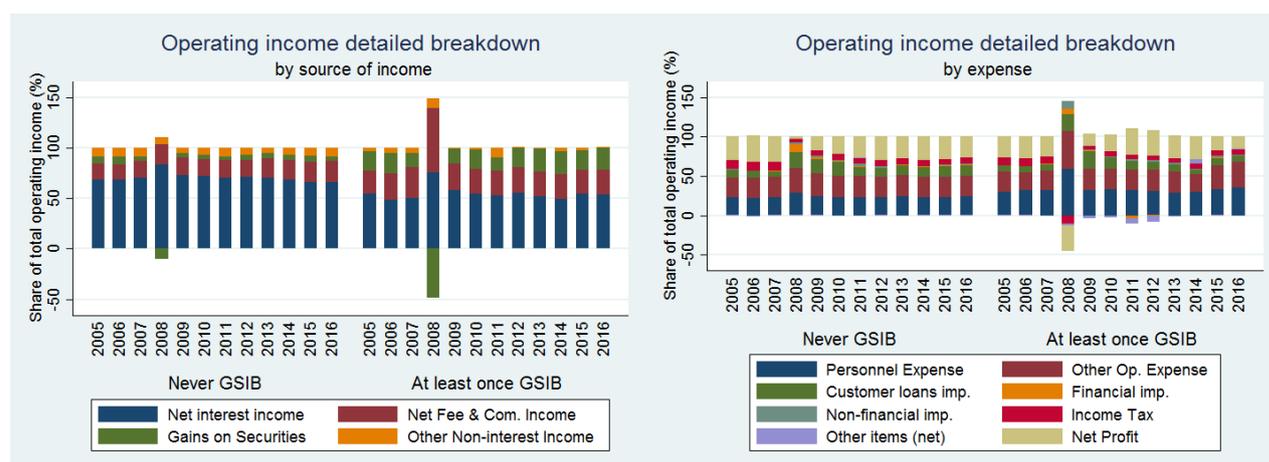
Figure 9: Evolution of breakdowns of operating income

There is clear empirical evidence on the existence of a major structural difference in the revenue mix of the two groups: the income generated by interest bearing activities is much lower for GSIBs than for other banks while the revenues from trading securities are considerable higher. Net gains on securities have increased for all banks during the second sub-period to the detriment of net interest income. On the other hand, we do not identify any impact of the GSIB designation on the revenue mix.

Figures in percentage points (pp)	Dependent variable				
	NET INT INC / OP INC	NFC INC / OP INC	SEC GAIN / OP INC	OTH NON INT INC / OP INC	PERS EXP / OP INC
(β) GSIB once	-21.009***	3.054	18.263***	-1.802	3.093
	(5.389)	(3.567)	(5.095)	(2.127)	(4.405)
(γ) Post2011	-7.954**	2.101	6.711**	-1.687	-3.347
	(3.114)	(1.409)	(2.700)	(1.118)	(2.230)
(δ) INTERACTION	**1.911**	**-4.796**	**6.050**	**-2.963**	**-2.228**
	(2.767)	(3.797)	(5.816)	(2.288)	(3.385)
Size	5.704**	1.812	-7.563***	-0.549	2.331
	(2.750)	(1.283)	(2.314)	(1.011)	(2.445)
LOANS / TA	0.213	-0.466***	0.246	-0.122*	-0.164
	(0.134)	(0.135)	(0.157)	(0.067)	(0.137)
DEP / TL	0.383***	-0.013	-0.089	-0.134***	-0.019
	(0.122)	(0.064)	(0.097)	(0.041)	(0.125)
RWA Density	-0.190**	0.029	0.021	0.214**	-0.043
	(0.089)	(0.089)	(0.095)	(0.100)	(0.092)
Intercept	-47.068	-1.074	132.818***	17.005	-7.576
	(52.964)	(25.978)	(46.711)	(19.956)	(48.827)
Obs.	637	637	637	637	637
adj-R^2	0.340	0.198	0.067	0.125	0.197
Macro control var.	YES	YES	YES	YES	YES

Table 7 - Income statement composition variables (Part 1)

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ - *Standard deviations in brackets*

As suggested by the estimated coefficient γ, an immediate consequence of the financial crisis has been the significant increase of impairments on customer loans and financial assets; these latter have significantly decreased over the second sub-period (2012-2016). For the same reason, the net profit (scaled by operating income) appears 21.6 pp larger in the second sub-period, for the complete set of banks. The model fails to find evidence that the FSB designation has significantly impacted the components of the income statement.

Figures in percentage points (pp)	Dependent variable				
	CUST LOAN IMP / OP INC	FIN AS IMP / OP INC	NON FIN IMP / OP INC	INC TAX / OP INC	NET PROF / OP INC
(β) GSIB once	-8.904*	-6.668**	-1.835	-1.635	24.457
	(5.048)	(3.221)	(1.161)	(1.554)	(15.034)
(γ) Post2011	-7.729**	-3.733**	-1.671*	-0.121	21.553***
	(3.776)	(1.727)	(0.944)	(0.756)	(8.073)
(δ) INTERACTION	**-0.842**	**2.049**	**-0.350**	**1.808**	**-4.610**
	(3.405)	(1.499)	(0.806)	(1.234)	(7.309)
Size	5.331**	1.983**	1.153	0.695	-12.531*
	(2.655)	(0.975)	(0.771)	(0.555)	(7.580)
LOANS / TA	0.243	-0.056**	-0.018	0.088*	0.291
	(0.191)	(0.027)	(0.018)	(0.049)	(0.215)
DEP / TL	-0.085	-0.038	-0.005	0.033	-0.155
	(0.111)	(0.034)	(0.014)	(0.022)	(0.289)
RWA Density	0.001	0.079**	0.040**	0.056**	-0.013
	(0.100)	(0.038)	(0.018)	(0.027)	(0.207)
Intercept	-75.632	-28.882*	-20.514	-17.311	223.261
	(51.811)	(16.574)	(12.912)	(12.157)	(150.737)
Obs.	637	637	637	637	637
adj-R^2	0.152	0.067	0.064	0.150	0.100
Macro control var.	YES	YES	YES	YES	YES

Table 8 - Income statement composition variables (Part 2)

$* \ p < 0.1; \ ** \ p < 0.05; \ *** \ p < 0.01$ - *Standard deviations in brackets*

Result n°5: *The FSB designation of GSIBs seems not to have had any statistically significant impact on their income statement (income source mix, expenses, impairments and net profit).*

5.6 Profitability and Risk-taking

In this subsection, we investigate whether the FSB designation had a significant impact on GSIBs' profitability and on their risk taking behaviour. Over the full sample of banks for which the data is available, the average return on average assets (ROA) equals 0.66% and the average return on average equity (ROE) equals 10.5%. Non-performing loans (NPL) represent 2.73% of the average loan portfolio. The RWA density (i.e. total RWAs over total assets), which *de facto* indicates an average risk-weight of all assets, equals 47.4% over the full 2005-2016 period. As shown in Figure 10, the structural differences between the two groups of banks that are recorded in the first sub-period become even

greater in the second sub-period (2012-2016). Each of the three profitability variables (ROA, ROE and RORWA) follow a similar patern: GSIBs and non-GSIBs both start with a rather comparable profitability level in 2005-2007. Then GSIBs tend to be more heavily affected during the 2008-2009 crisis. Finally, in the aftermath of the crisis, profitability is recovering for all banks from crisis level, but GSIBs' profitability remains at a lower level.
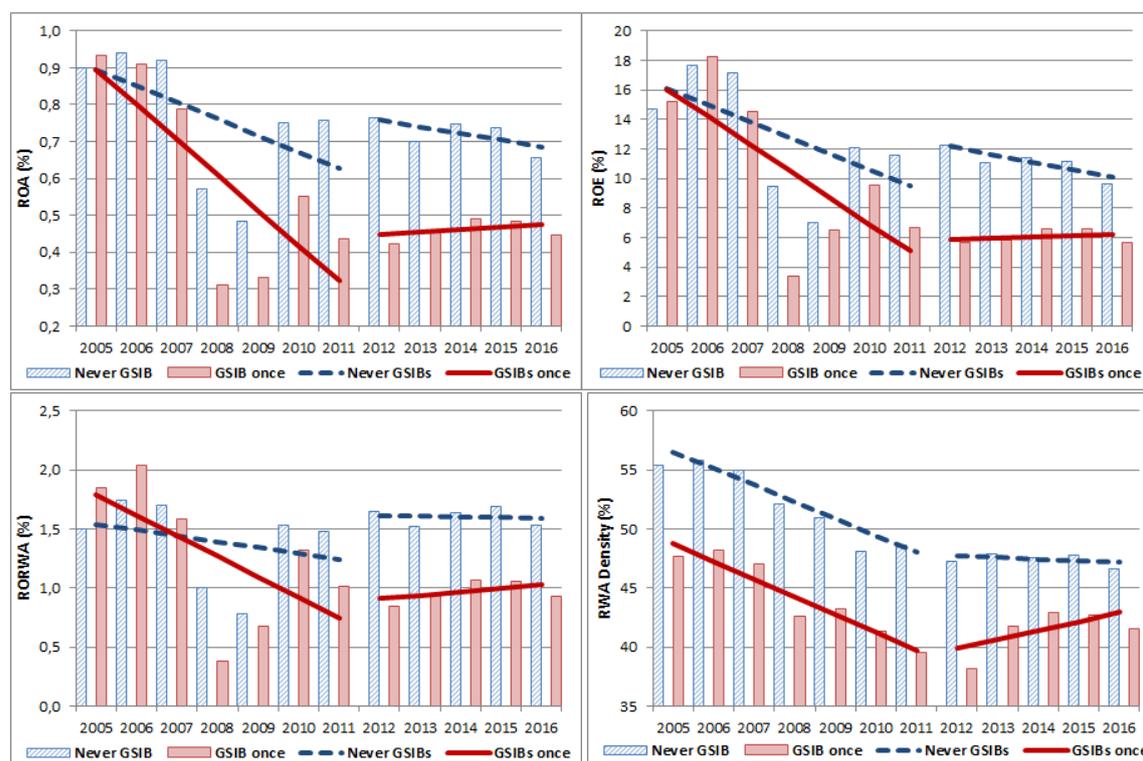
Figure 10: Evolution of ROA, ROE, RORWA and RWA density

Note : Vertical striped blue (resp. red) bars represent the evolution of the averaged variable for non-GSIBs (resp. GSIBs). The four straight lines represent the linear regression trends for both GSIBs (solid, red) and non-GSIBs (dashed, blue) and both sub-periods.

The results of the regressions fail to confirm the existence of a structural difference between the two-subgroups of banks over the whole study period (2005-2016), all things being equal. The 2012-2016 subperiod is characterized by a significantly higher profitability than the 2005-2011 subperiod, which is consistent given the fact that the first

Figures in percentage points (pp)	Dependent variable				
	ROA	ROE	RORWA	NPL / LOANS	RWA Density
(β) GSIB once	-0.016	1.968	0.012	0.739	-2.939
	(0.092)	(1.558)	(0.184)	(0.690)	(3.609)
(γ) Post2011	0.166***	2.103***	0.477***	0.156	-1.353
	(0.040)	(0.769)	(0.117)	(0.240)	(0.970)
(δ) **INTERACTION**	**-0.074**	**-3.047*****	**-0.552*****	**-0.675***	**4.472*****
	(0.053)	(1.044)	(0.158)	(0.347)	(1.444)
Size	0.040	-0.397	0.043	-0.610**	2.629**
	(0.036)	(0.645)	(0.081)	(0.289)	(1.125)
LOANS / TA	0.000	0.038	-0.005	-0.009	0.289***
	(0.002)	(0.032)	(0.004)	(0.014)	(0.082)
DEP / TL	0.004***	0.065*	0.011**	-0.017	-0.013
	(0.001)	(0.036)	(0.004)	(0.013)	(0.058)
Intercept	-0.729	6.291	-1.234	13.569***	2.352
	(0.720)	(13.115)	(1.628)	(5.247)	(22.243)
Obs.	1,026	1,007	926	998	994
adj-R^2	0.403	0.360	0.240	0.205	0.359
Macro control var.	YES	YES	YES	YES	YES

Table 9 - Profitability and Risk-taking

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ - Standard deviations in brackets

subperiod includes the financial crisis. Such overall improvement of profitability can be seen for the three ratios: ROA, ROE and RORWA.

The difference-in-difference estimator suggests that the GSIB designation had a significant negative impact on the ROE and the RORWA, respectively of -3.0 pp and -0.55 pp, and offset the upward profitability trend noticed from the first to the second subperiod for all banks. As noted above, this can be seen graphically in Figure 10 showing that profitability recovered for all banks from crisis level, but GSIBs' profitability is still lagging behind.

Econometrically, we do not find an impact of the designation on the return on assets (ROA) of GSIBs[18]. Therefore, taking the ROA as exogenous, and everything else equal, we interpret the negative impact of the designation on the return on equity (ROE) as a "mechanical" effect of the general improvement of GSIBs' leverage ratio (LR), as it can easily be seen looking at the accounting equation (4) below.

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[18]The lower ROA of GSIBs compared to non-GSIBs after 2011 remains unexplained by this study.

$$ROE = \frac{R}{TE} = \frac{R}{TA} \times \frac{TA}{TE} = ROA \times \frac{1}{LR} \qquad \Rightarrow \qquad ROA \times \underset{\nearrow}{\frac{1}{LR}} = R\overset{\searrow}{O}E \qquad (4)$$

Besides, we notice a sizeable relative increase of the RWA density for GSIBs following their designation by the FSB in 2011 (+4.47 pp), while the other banks tend to slightly lower their RWA density. In our view, this evolution of GSIBs' RWA density is likely to have two main drivers.

Firstly, for GSIBs, the reduction in the size of balance sheets driven by the introduction of systemic scores and the FSB designation (as seen in section 5.1) did not affect the RWA in the same proportion. The increase in riskier activity, that comes immediately to mind, may not be the main reason. Birn et al. [2017] tend to underline that off-balance sheet (OBS) activity increased only for GSIBs starting 2011[19]. Such increase of OBS items would then translate into an increase of RWAs, but not of total assets (by construction), which would ultimately result in an increase of the RWA density of GSIBs. Meanwhile, such off-balance sheet activities (for example guarantees and undrawn credit lines) are not riskier than balance sheet activities when correctly measured.

Secondly, the increase in the amount of RWAs for GSIBs could be partly explained by the change in regulation through the period combined with their higher exposure to market activities and particularly to counterparty credit risk and market risk. Indeed, the revision of market risk framework (under Basel 2.5 and Basel III) drove important revisions (counterparty risk capital charges, higher asset value correlation parameter for exposures to certain financial institutions, higher risk weights for securitized assets or derivatives) and had a large impact on overall RWA[20]. Hence, this change of weights would have affected differently the two groups on banks and would have also triggered

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[19]This is an *indirect* observation based on the difference between total leverage exposure measure, that comprises OBS items, and total assets that does not.

[20]See BCBS [2013a] showing that Group 1 banks' RWA increased in the aggregate by approximated 16.1% after applying the Basel 2.5 and Basel III frameworks.

an increase of the average risk-weight of GSIBs' balance sheet, independent from their change in activity.

Finally, we cannot exclude the remaining explanation that some GSIBs might have started to gradually shift their assets towards more heavily weighted (ie. riskier) assets. However, if such voluntary risk-shifting is occurring for some banks in search for higher returns, it has not yet materialized in an improved profitability for GSIBs, as discussed before.

Whatever explanation for the underlying phenomenon of the increased RWA density of GSIBs, this fact also brings insights for why we do not notice any significant impact of the designation on GSIBs' risk-based solvency ratios (see section 5.2). As mentionned before, there has been a global race toward solvency ratios higher than the minimum for all banks, so that non-GSIBs did not increase these ratios less than GSIBs, contrary to what may have been expected from the design of the GSIB surcharge. But we can also add that this higher increase of RWA density for GSIBs also played a role. As we have seen, we shed light on a significant upward pressure on GSIBs' leverage ratio that is attributable to the designation. However, the increase of the RWA density canceled out this effect on solvency ratios, as shown in the equation (5) below.

$$\frac{T1}{RWA} = \frac{T1}{TA} \times \frac{TA}{RWA} = LR \times \frac{1}{RWA\,dens} \quad \Rightarrow \quad \overset{\nearrow}{LR} \times \frac{1}{\underset{\nearrow}{RWA\,dens}} = (\overset{\rightarrow}{\frac{T1}{RWA}}) \quad (5)$$

Result n⁰6: *Everything else equal, it seems that the introduction of systemic scores and the GSIB designation entailed a deleveraging with direct negative effects on their levels of return on average equity (ROE). Meantime, the GSIB designation seems to have triggered an increase of their RWA density.*

5.7 Yield analysis

In this subsection we focus on the yield of loans, costs of funding and interest margins. Over the available sample for the complete 2005-2016 period (686 observations), the average yield on loans equals 5.2% while the average cost of deposits is 2.0%, so the difference (net customer interest spread) is 3.2%. The total funding cost rate is 2.4% and the global net interest margin is 2.2%.
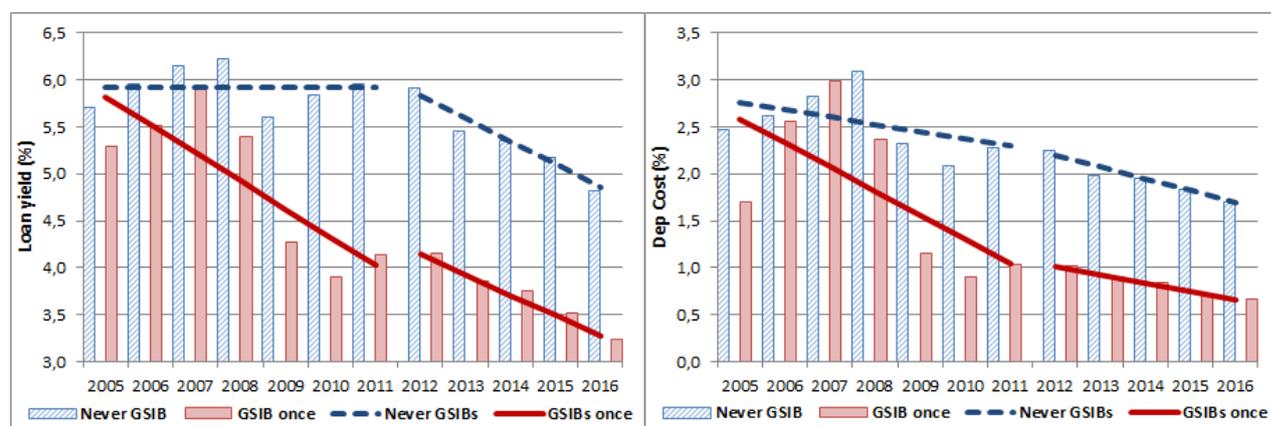
Figure 11: Evolution of averages of loans yield and cost of deposits

Note : Vertical striped blue (resp. red) bars represent the evolution of the averaged variable for non-GSIBs (resp. GSIBs). The four straight lines represent the linear regression trends for both GSIBs (solid, red) and non-GSIBs (dashed, blue) and both sub-periods.

The results of regressions, and particularly the estimated coefficient β, suggest that GSIBs benefit from a structural lower cost of deposit and also of a lower total funding cost, both in the range of 0.4 percentage points. Such funding advantage can be related to both the existence of implicit public support (cf. Schich and Toader [2016]) and the greater diversification of GSIBs (in terms of activity and geographic locations) that could lower their idiosyncratic risk in the view of investors.

This lower cost of liabilities is passed on to the loans portfolio as the average loan yield for GSIBs is structurally 0.9 pp lower than for non-GSIBs. However, these structural features have not evolved through time, neither for all banks, nor for GSIBs alone, as a result of designation. The lack of significativity of the coefficient γ for, the "Post2011" time

Table 10 - Yield variables

Figures in percentage points (pp)	Dependent variable				
	LOAN YIELD	DEP COST	CUST INT SPREAD	FUND COST	NIM
(β) GSIB once	-0.894*	-0.399**	-0.669	-0.376*	-0.515*
	(0.498)	(0.196)	(0.482)	(0.223)	(0.285)
(γ) Post2011	-0.107	-0.184	-0.113	-0.091	-0.052
	(0.110)	(0.118)	(0.083)	(0.100)	(0.063)
(δ) **INTERACTION**	**0.093**	**0.103**	**-0.008**	**0.063**	**-0.052**
	(0.134)	(0.139)	(0.116)	(0.131)	(0.087)
Size	-0.179	0.007	-0.188*	-0.065	-0.079
	(0.114)	(0.077)	(0.098)	(0.080)	(0.058)
LOANS / TA	-0.017*	0.004	-0.024**	0.002	0.001
	(0.009)	(0.004)	(0.009)	(0.005)	(0.006)
DEP / TL	-0.014**	-0.019***	0.006	-0.032***	0.005
	(0.007)	(0.004)	(0.007)	(0.005)	(0.004)
SOVYIELD	0.286***	0.247***	0.004	0.302***	0.023
	(0.041)	(0.038)	(0.031)	(0.031)	(0.020)
Intercept	10.330***	2.641*	7.812***	5.133***	3.423***
	(2.278)	(1.603)	(1.954)	(1.790)	(1.216)
Obs.	686	686	686	686	686
adj-R^2	0.675	0.717	0.114	0.785	0.319
Macro control var.	YES	YES	YES	YES	YES

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ - *Standard deviations in brackets*

dummy variable can be explained mainly by the introduction of the 10-year sovereign debt spread as a macroeconomic control variable (shown in the regression table), describing the evolution of the general interest rates environment. As for the interaction variable, we do not notice any direct impact of the GSIBs designation on these five dependent variables.

Result n° 7: *The GSIB designation did not have any impact on loans yields, cost of funding nor margins. Such absence of impact on cost of funding, that appears to be structurally lower for GSIBs, corroborates the fact that the designation of GSIBs did not put an end to the implicit public support.*

6 Robustness checks

6.1 Alternative starting date of treatment

In section 4, we described that we chose to split our panel into the two sub-periods 2005-2011 and 2012-2016, so we included the $Post2011_t$ time dummy variable in the regressions. As explained above, this cutoff date between 2011 and 2012 seems the more natural since the first list of GSIBs was published in November 2011. However, on the one hand, someone could argue that a longer time is needed for real effects of this designation to materialize into the balance sheet / income statement of GSIBs. This would lead to postpone the cutoff date, for instance considering that the "treatment" only started in 2013 or 2014, instead of 2012. On the other hand, another one could say that most effects may have been anticipated, either by banks themselves, or by the market[21]. This would argue for setting an earlier cutoff date, for instance in 2011 or 2010. Therefore, we re-ran all the regressions displayed in section 5, each time using an alternative starting date of the "treatment" ranging from 2010 to 2014, with 2012 being the baseline starting date used in all previous sections of the paper.

Table 11 below shows the coefficient δ of the interaction variable for all dependent variables discussed in section 5 and for all alternative starting date of treatment between 2010 and 2014. As one can notice in this table, coefficients generally remain of the same magnitude, as well as their significance level. This indicates that the natural choice - although still "arbitrary" - we made to consider 2012 as the start of the second sub-period is not driving the results, and that similar conclusions would have been drawn if we had decided to set an earlier or later cutoff date.

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[21]As mentioned by Moenninghoff et al. [2015], the *Financial Times* published two lists of systemic banks in 2009 and 2010, before the first official publication of the FSB list in November 2011.

Set of variables	δ coefficient for dependent variable:	Treatment starting in				
		2010	**2011**	**2012**	**2013**	**2014**
Indicators used in GSIB methodology	TA gr	-5,079***	-5,532***	-5,763***	-3,401**	-2,154*
	Sec Issued / TA	-0,646	-1,113	-1,105	-1,137	-1,524
	TradAFS Sec / TA	-1,209	-1,198	-1,213	-1,411	-1,3
	Share For Loans	1,438	1,496	0,99	0,794	0,987
	Share For Dep	-2,317	-2,561	-3,406	-3,427	-3,759
	Deriv gr	4,356	-10,074	-9,9	-2,724	-5,06
Capital adequacy	T1 / TA	0,45**	0,482**	0,592***	0,649***	0,648***
	T1 / RWA	-0,321	-0,271	-0,163	-0,453	-0,61
	TOF / RWA	-0,132	0,045	0,184	0,062	-0,247
Assets composition	CASH CB / TA	2,75***	2,633***	2,656***	2,394***	2,296***
	BK LOANS / TA	0,015	-0,45	-0,276	-0,121	-0,154
	CUST LOANS / TA	-1,64	-1,658	-1,06	-0,301	-0,261
	TRADAC / TA	-1,827	-1,956*	-1,35	-1,118	-1,241*
	AFS SEC / TA	-0,47	-0,213	0,053	0,351	0,391
	HTM SEC / TA	-0,2	-0,078	0,009	0,042	0,023
	DERIV / TA	1,237**	1,353**	0,342	-0,381	-0,392
	OTH FIN / TA	0,176	0,052	0,039	0,044	-0,142
	INTANG / TA	-0,097	-0,119	-0,097	-0,082	-0,06
Liabilities composition	BK DEP / TL	-0,265	-0,294	-0,425	-0,137	-0,157
	CUST DEP / TL	-1,185	-0,882	0,325	0,674	1,109
	SUB DEBT / TL	0,331*	0,318*	0,29*	0,318**	0,269*
	SENIOR DEBT / TL	0,023	-0,69	-0,668	-0,585	-1,152
	DERIV / TL	1,156*	1,274*	0,198	-0,418	-0,329
	OTH FIN / TL	-0,115	-0,282	-0,205	-0,181	-0,277
Income statement	NET INT INC / OP INC	0,308	1,205	1,911	0,128	1,385
	NFC INC / OP INC	-6,197	-5,368	-4,796	-4,785	-3,826
	SEC GAIN / OP INC	6,519	4,897	6,05	7,004	6,083
	OTH NON INT INC / OP INC	0,189	-0,124	-2,963	-2,282	-3,005*
	PERS EXP / OP INC	-3,571	-3,214	-2,228	-1,097	0,973
	CUST LOAN / OP INC	-1,931	-0,258	-0,842	-2,523	-2,772
	FIN AS IMP / OP INC	0,51	0,526	2,049	2,021	1,904
	NON FIN IMP / OP INC	-1,739	-0,818	-0,35	-0,291	-0,646
	INC TAX / OP INC	3,008*	2,127	1,808	1,529	1,007
	NET PROF / OP INC	6,064	1,798	-4,61	-6,663	-9,781*
Profitability and risk-taking	ROA	-0,063	-0,101*	-0,074	-0,03	-0,039
	ROE	-2,302*	-3,273***	-3,047***	-2,017**	-1,817**
	RORWA	-0,456**	-0,567***	-0,552***	-0,403**	-0,392**
	NPL / LOANS	-0,392	-0,552	-0,675*	-0,743**	-0,699**
	RWA Density	4,186**	3,855**	4,472***	5,381***	5,55***
Yiels analysis	LOAN YIELD	-0,146	-0,04	0,093	0,309*	0,333**
	DEP COST	-0,042	0,026	0,103	0,232	0,206
	CUST INT SPREAD	-0,111	-0,054	-0,008	0,055	0,107
	FUND COST	-0,174	-0,1	0,063	0,229	0,204
	NIM	-0,056	-0,058	-0,052	0,002	0,045

Table 11 - Alternative starting date of treatment

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

6.2 Alternative definition of "GSIB" sub-sample

Similarly, section 4 explains that the $GSIB_{i,k}$ dummy variable indicates all banks that have been identified as GSIB at least once by the FSB between 2011 and 2016. Alternative definition of such "GSIB" sub-sample could have been used instead. Therefore, we re-ran all regressions presented in section 5 using two alternative GSIB binary variables. With the first alternative we simply focus on the initial list of GSIB published by the FSB in November 2011, and simply ignore the few changes of this list that intervened in the following years. We refer to this first alternative dummy variable as "GSIB 2011" in the regression table. The second alternative consists in restraining the binary variable to banks that have constantly been listed as GSIBs between 2011 and 2016, and therefore use a stable list of permanent GSIBs. We refer to this second alternative dummy variable as "GSIB always" in the regression table.

The "GSIB always" variables identifies 26 banks. "GSIB 2011" adds the following 3 banks compared to "GSIB always": Lloyds Banking Group, Commerzbank and Dexia. "GSIB once" adds the following 5 banks compared to "GSIB 2011": Industrial and Commercial Bank of China, China Construction Bank Corporation, Agricultural Bank of China Limited, BBVA and Standard Chartered.

Table 12 below displays the results for these two alternative definitions. Like in Table 11, we only present the δ coefficient of the interaction variable for all dependent variables we look at in this paper. Similarly, we notice that most results remain the same whatever definition for the GSIB sub-sample is used.

Set of variables	δ coefficient for dependent variable:	GSIB binary variable used		
		GSIB once	GSIB 2011	GSIB always
Indicators used in GSIB methodology	TA gr	-5,763***	-6,31***	-5,434***
	Sec Issued / TA	-1,105	-1,832	-1,679
	TradAFS Sec / TA	-1,213	-1,725	-1,203
	Share For Loans	0,99	-0,487	-1,255
	Share For Dep	-3,406	-5,824	-9,139*
	Deriv gr	-9,9	-22,878**	-19,72*
Capital adequacy	T1 / TA	0,592***	0,545**	0,491**
	T1 / RWA	-0,163	0,108	-0,273
	TOF / RWA	0,184	0,298	-0,181
Assets composition	CASH CB / TA	2,656***	2,683***	2,542***
	BK LOANS / TA	-0,276	-1,122	-0,742
	CUST LOANS / TA	-1,06	-1,05	-0,277
	TRADAC / TA	-1,35	-2,095**	-2,77**
	AFS SEC / TA	0,053	0,157	2,128**
	HTM SEC / TA	0,009	0,229	0,126
	DERIV / TA	0,342	0,32	0,027
	OTH FIN / TA	0,039	0,032	-0,003
	INTANG / TA	-0,097	-0,045	-0,11
Liabilities composition	BK DEP / TL	-0,425	0,245	0,059
	CUST DEP / TL	0,325	1,075	1,354
	SUB DEBT / TL	0,29*	0,258	0,33*
	SENIOR DEBT / TL	-0,668	-1,826	-1,378
	DERIV / TL	0,198	0,123	-0,73
	OTH FIN / TL	-0,205	-0,475	-0,796*
Income statement	NET INT INC / OP INC	1,911	-0,502	4,704
	NFC INC / OP INC	-4,796	-7,231	-7,411
	SEC GAIN / OP INC	6,05	11,843	4,436
	OTH NON INT INC / OP INC	-2,963	-3,621	0,355
	PERS EXP / OP INC	-2,228	-4,634	-1,139
	CUST LOAN / OP INC	-0,842	-3,679	1,756
	FIN AS IMP / OP INC	2,049	2,231	0,643
	NON FIN IMP / OP INC	-0,35	-0,89	-1,89
	INC TAX / OP INC	1,808	2,978*	3,166
	NET PROF / OP INC	-4,61	0,333	-7,774
Profitability and risk-taking	ROA	-0,074	-0,091*	-0,079
	ROE	-3,047***	-3,07***	-2,267**
	RORWA	-0,552***	-0,497***	-0,442**
	NPL / LOANS	-0,675*	-0,509	-0,072
	RWA Density	4,472***	3,264**	3,585**
Yiels analysis	LOAN YIELD	0,093	0,011	0,048
	DEP COST	0,103	0,014	0,015
	CUST INT SPREAD	-0,008	-0,018	0,031
	FUND COST	0,063	-0,023	-0,055
	NIM	-0,052	-0,084	-0,065

Table 12 - Alternative definition of GSIB sub-sample

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

6.3 Alternative econometric specifications

Buffer rates

Replacing the dummy variable $GSIB_{i,k}$ in the interaction term by the level of GSIB buffer applied to each bank gives us an alternative econometric specification to equation (1).

$$Y_{i,k,t} = \alpha + \beta GSIB_{i,k} + \gamma Post2011_t + \delta(Buffer_{i,k,t} \times Post2011_t) + \varphi B_{i,k,t} + \chi C_{k,t} + u_{i,k,t}$$
(6)

This alternative specification takes into account the various levels of the GSIB buffers (from 1% to 2.5%) instead of the binary variable $GSIB_{i,k}$. Overall results are displayed in column "Buffer rates" of Table 13. If the sign and significance level of coefficients can still be interpreted as in equation (1), on the other hand the magnitude of coefficients no longer correspond to the "diff-in-diff" estimator. For the sake of clarity of interpretation, we favored the usual diff-in-diff equation (1) in the main sections of this paper.

Country FE

Instead of using country-specific macroeconomic control variables that evolve over time, we could simply have used country fixed effects (FE) as shown in equation (7) below. Results of this alternative specification are shown in column "Country FE" of Table 13.

$$Y_{i,k,t} = \alpha + \beta GSIB_{i,k} + \gamma Post2011_t + \delta(GSIB_{i,k} \times Post2011_t) + \varphi B_{i,k,t} + \chi FE_k + u_{i,k,t} \quad (7)$$

Country FE * 2

Taking into account that the 2008-2009 financial crisis may have affected differently all countries represented in the panel, these country fixed effects may be differentiated between the pre and post crisis as in equation (8) below. These alternative results are

displayed in column "Country FE * 2" of Table 13.

$$Y_{i,k,t} = \alpha + \beta GSIB_{i,k} + \gamma Post2011_t + \delta(GSIB_{i,k} \times Post2011_t) + \varphi B_{i,k,t}$$

$$+\chi_1 FE_{k,(2005-2007)} + \chi_2 FE_{k,(2008-2016)} + u_{i,k,t} \qquad (8)$$

Crisis dummy

Finally, in order to specifically isolate the impact of the financial crisis, on top of the macroeconomic control vairables, we could have added a "crisis" time-specific dummy variable taking value equal 1 only for years 2008 and 2009, like in equation (9) below. These results are available in column "Crisis dummy" of Table 13. However, one should note that the effects of the financial crisis are already - at least partly - taken into account in the baseline regression used in the main sections of this paper, since the growth rate of the economy is included in the set of country-specific macroeconomic control variables.

$$Y_{i,k,t} = \alpha + \beta GSIB_{i,k} + \gamma Post2011_t + \delta(GSIB_{i,k} \times Post2011_t) + \varphi B_{i,k,t} + \chi C_{k,t} + \lambda Crisis_t + u_{i,k,t}$$

$$(9)$$

Stability of results

As it can generally be seen in Table 13, all conclusions we drew in this paper remain robust to all these alternative econometric specifications.

Table 13 - Alternative econometric specifications						
		Specification				
Set of variables	δ coefficient for dependent variable:	Baseline	Buffer rates	Country FE	Country FE * 2	Crisis dummy
		Eq. (1)	Eq. (6)	Eq. (7)	Eq. (8)	Eq. (9)
Indicators used in GSIB methodology	TA gr	-5,763***	-2,783***	-5,963***	-4,701***	-5,818***
	Sec Issued / TA	-1,105	-1,077	-1,997	-1,073	-1,019
	TradAFS Sec / TA	-1,213	-0,177	-0,864	-0,76	-1,205
	Share For Loans	0,99	-1,806	2,351	2,254	0,738
	Share For Dep	-3,406	-2,86	-2,578	-2,775	-3,555
	Deriv gr	-9,9	-3,243	-11,94	-5,981	-7,954
Capital adequacy	T1 / TA	0,592***	0,416***	0,637***	0,406**	0,597***
	T1 / RWA	-0,163	-0,26	0,052	-0,366	-0,147
	TOF / RWA	0,184	-0,249	0,248	-0,082	0,186
Assets composition	CASH CB / TA	2,656***	1,355***	2,554***	2,117***	2,526***
	BK LOANS / TA	-0,276	-0,378	-0,471	-0,658	-0,177
	CUST LOANS / TA	-1,06	-0,333	-1,238	-0,934	-1,003
	TRADAC / TA	-1,35	-1,464**	-1,463	0,057	-1,217
	AFS SEC / TA	0,053	1,236**	0,474	0,584	0,058
	HTM SEC / TA	0,009	-0,022	-0,019	-0,061	-0,018
	DERIV / TA	0,342	0,551	0,641	-0,768	0,173
	OTH FIN / TA	0,039	-0,053	-0,066	-0,088	0,065
	INTANG / TA	-0,097	-0,077	-0,087	-0,061	-0,099
Liabilities composition	BK DEP / TL	-0,425	-0,122	-1,402	-1,624*	-0,447
	CUST DEP / TL	0,325	0,258	2,135	1,92	0,293
	SUB DEBT / TL	0,29*	0,177*	0,184	0,156	0,296*
	SENIOR DEBT / TL	-0,668	-0,533	-1,823	-0,728	-0,489
	DERIV / TL	0,198	0,138	0,761	-0,447	0,068
	OTH FIN / TL	-0,205	-0,613**	-0,315	-0,022	-0,167
Income statement	NET INT INC / OP INC	1,911	3,149*	2,348	1,107	0,546
	NFC INC / OP INC	-4,796	-3,114	-6,513*	-8,083*	-5,698
	SEC GAIN / OP INC	6,05	0,298	6,98	9,986	8,488
	OTH NON INT INC / OP INC	-2,963	0,661	-3,142	-3,049	-3,008
	PERS EXP / OP INC	-2,228	1,693	-1,985	-3,114	-3,171
	CUST LOAN / OP INC	-0,842	2,472	0,744	-0,948	-1,627
	FIN AS IMP / OP INC	2,049	0,504	2,544	2,395	1,497
	NON FIN IMP / OP INC	-0,35	-0,182	-0,064	-1,002	-0,598
	INC TAX / OP INC	1,808	1,527	0,62	2,179	2,404*
	NET PROF / OP INC	-4,61	-11,315*	-6,606	-2,993	-2,099
Profitability and risk-taking	ROA	-0,074	-0,053*	-0,092	-0,037	-0,052
	ROE	-3,047***	-1,682**	-3,106***	-2,333**	-2,703***
	RORWA	-0,552***	-0,339***	-0,534***	-0,367**	-0,508***
	NPL / LOANS	-0,675*	-0,063	-0,383	-0,716*	-0,676*
	RWA Density	4,472***	3,355***	3,479**	3,231**	4,675***
Yiels analysis	LOAN YIELD	0,093	-0,019	-0,105	-0,064	0,058
	DEP COST	0,103	-0,006	-0,131	0,007	0,086
	CUST INT SPREAD	-0,008	-0,011	-0,043	-0,089	-0,023
	FUND COST	0,063	-0,089	-0,216	-0,032	0,061
	NIM	-0,052	-0,021	-0,053	-0,098	-0,061

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

7   Concluding remarks

This diff-in-diff analysis of 97 banks over 12 years is designed to identify the changes in GSIBs characteristics after the first designation in 2011, when controlling for the changes also experienced by other banks. It helps to identify initial structural differences between GSIBs and other banks. In that respect, we show that GSIBs are structurally more leveraged. Both sides of their balance sheet are characterized by a lower share of loans/deposits with other banks, a larger share of derivatives and a larger share of foreign loans/deposits. Regarding the income statement, we notice a smaller share of net interest margin in the net operating income, to the benefit of net gains on securities. We also find empirical evidence that GSIBs benefit from a lower funding costs, that is likely to indicate lower perceived risk due to higher diversification and implicit public support.

GSIBs are also specific in the changes they incurred after 2011, the year of the first designation by the FSB. Using our econometric identification methodology, we identified some key effects of the designation on GSIBs that are all intertwined in a very coherent manner. The starting point is that the GSIB designation triggered a very significant slowdown in the expansion of their balance sheet (cf. section 5.1). Combined with the substantial increase of capital that was requested by the Basel III framework, these two effects led to a major improvement of the leverage ratio for GSIBs (cf. section 5.2). In terms of profitability, we do not find an impact of the designation on the return on assets (ROA) of GSIBs. However, taking the ROA as exogenous, and everything else equal, the general improvement of GSIBs' leverage ratio (LR) "mecanically" resulted in a negative impact on the return on equity (ROE). This downward pressure on ROE is empirically shown through our regressions (see section 5.6).

Meanwhile, the RWA density (ie. ratio of RWA over Total assets) incurred a significant increase for GSIBs following the first designation in 2011 for a variety of potential

reasons (see section 5.6). This, added to the global race towards solvency ratios higher than minimum standards, helps understanding why we do *not* find empirical evidence that the GSIB designation led to an improvement of GSIBs' solvency ratios larger than other banks', contrary to what would have been expected given the design of GSIB surcharge.

In some respect, GSIBs often catch up with other banks levels in terms of leverage as well as share of cash in the balance sheet. This latter evolution helping to catch up with the new liquidity coverage ratio. Therefore, it seems that the new Basel III regulatory framework exerted a "mean-reverting" pressure on these business model characteristics for which a structural gap was noticed before 2011 between GSIBs and non-GSIBs.

Finally, we should also recall that we cannot observe any negative impact of the GSIB designation on their issuance of loans to customers and their ability to finance the economy.

Overall, the contribution of this paper is twofold. First, to the best of our knowledge, it is among the first paper presenting a comprehensive and systematic evaluation of the impacts that the designation of GSIBs had on numerous aspects of their activity: balance sheet allocation, income statement composition, capital adequacy, profitability, etc. Second, it underlines that the increase in leverage ratio to close the gap with other banks in central in the change of GSIBs' business model, reducing their return on equity but not their ability to provide loans to the economy, at least on the observed period.

Appendices

Appendix 1 - List of banks included in the panel

N	Institution Name	Country	Total assets (€bn)	Identified as GSIB by the FSB						
				At least once	in 2011	in 2012	in 2013	in 2014	in 2015	in 2016
1	Dexia SA	BE	213	1	1	0	0	0	0	0
2	UBS Group AG	CH	872	1	1	1	1	1	1	1
3	Credit Suisse Group AG	CH	765	1	1	1	1	1	1	1
4	Industrial and Comm. Bank of China	CN	3293	1	0	0	1	1	1	1
5	China Construction Bank Corp.	CN	2860	1	0	0	0	0	1	1
6	Agricultural Bank of China Limited	CN	2670	1	0	0	0	1	1	1
7	Bank of China Limited	CN	2476	1	1	1	1	1	1	1
8	Deutsche Bank AG	DE	1591	1	1	1	1	1	1	1
9	Commerzbank AG	DE	480	1	1	0	0	0	0	0
10	Banco Santander, SA	ES	1339	1	1	1	1	1	1	1
11	Banco Bilbao Vizcaya Argentaria, SA	ES	732	1	0	1	1	1	0	0
12	BNP Paribas SA	FR	2077	1	1	1	1	1	1	1
13	Credit Agricole Group	FR	1723	1	1	1	1	1	1	1
14	Societe Generale SA	FR	1382	1	1	1	1	1	1	1
15	Groupe BPCE	FR	1235	1	1	1	1	1	1	1
16	HSBC Holdings Plc	GB	2252	1	1	1	1	1	1	1
17	Barclays Plc	GB	1421	1	1	1	1	1	1	1
18	Lloyds Banking Group Plc	GB	958	1	1	0	0	0	0	0
19	Royal Bank of Scotland Group Plc	GB	935	1	1	1	1	1	1	1
20	Standard Chartered Plc	GB	613	1	0	1	1	1	1	1
21	Morgan Stanley and Co. International	GB	401	1	1	1	1	1	1	1
22	UniCredit SpA	IT	860	1	1	1	1	1	1	1
23	Mitsubishi UFJ Financial Group, Inc.	JP	2330	1	1	1	1	1	1	1
24	Mizuho Financial Group, Inc.	JP	1511	1	1	1	1	1	1	1
25	Sumitomo Mitsui Financial Group	JP	1457	1	1	1	1	1	1	1
26	ING Groep N.V.	NL	845	1	1	1	1	1	1	1
27	Nordea Bank AB (publ)	SE	616	1	1	1	1	1	1	1
28	JPMorgan Chase and Co.	US	2362	1	1	1	1	1	1	1
29	Bank of America Corporation	US	2074	1	1	1	1	1	1	1
30	Wells Fargo and Company	US	1830	1	1	1	1	1	1	1
31	Citigroup Inc.	US	1699	1	1	1	1	1	1	1
32	Goldman Sachs Group, Inc.	US	816	1	1	1	1	1	1	1
33	Bank of New York Mellon Corporation	US	316	1	1	1	1	1	1	1
34	State Street Corporation	US	230	1	1	1	1	1	1	1
	Total for GSIBs		47236	34	29	28	29	30	30	30
35	Commonwealth Bank of Australia	AU	626	0	0	0	0	0	0	0
36	Australia and NZ Banking Group	AU	623	0	0	0	0	0	0	0
37	Westpac Banking Corporation	AU	571	0	0	0	0	0	0	0
38	National Australia Bank Limited	AU	529	0	0	0	0	0	0	0
39	KBC Group NV	BE	275	0	0	0	0	0	0	0
40	Banco do Brasil S.A.	BR	404	0	0	0	0	0	0	0
41	Itau Unibanco Holding S.A.	BR	394	0	0	0	0	0	0	0
42	Caixa Economica Federal	BR	369	0	0	0	0	0	0	0
43	Banco Bradesco S.A.	BR	347	0	0	0	0	0	0	0
44	Royal Bank of Canada	CA	805	0	0	0	0	0	0	0
45	Toronto-Dominion Bank	CA	803	0	0	0	0	0	0	0
46	Bank of Nova Scotia	CA	611	0	0	0	0	0	0	0
47	Bank of Montreal	CA	469	0	0	0	0	0	0	0
48	Canadian Imperial Bank of Commerce	CA	342	0	0	0	0	0	0	0

N	Institution Name	Country	Total assets (€bn)	Identified as GSIB by the FSB						
				At least once	in 2011	in 2012	in 2013	in 2014	in 2015	in 2016
49	Bank of Communications Co., Ltd.	CN	1147	0	0	0	0	0	0	0
50	Industrial Bank Co., Ltd.	CN	830	0	0	0	0	0	0	0
51	China Merchants Bank Co., Ltd.	CN	811	0	0	0	0	0	0	0
52	China Minsheng Banking Corp., Ltd.	CN	804	0	0	0	0	0	0	0
53	Shanghai Pudong Development Bank	CN	799	0	0	0	0	0	0	0
54	China Everbright Bank Company	CN	549	0	0	0	0	0	0	0
55	Ping An Bank Co., Ltd.	CN	403	0	0	0	0	0	0	0
56	Hua Xia Bank Co., Limited	CN	321	0	0	0	0	0	0	0
57	Bank of Beijing Co., Ltd.	CN	289	0	0	0	0	0	0	0
58	China Guangfa Bank Co., Ltd.	CN	279	0	0	0	0	0	0	0
59	Bank of Shanghai Co., Ltd.	CN	240	0	0	0	0	0	0	0
60	DZ BANK AG	DE	509	0	0	0	0	0	0	0
61	Landesbank Baden-Wurttemberg	DE	244	0	0	0	0	0	0	0
62	Bayerische Landesbank	DE	212	0	0	0	0	0	0	0
63	Danske Bank A/S	DK	469	0	0	0	0	0	0	0
64	Banco de Sabadell, SA	ES	213	0	0	0	0	0	0	0
65	La Banque Postale, SA	FR	230	0	0	0	0	0	0	0
66	Nomura International Plc	GB	336	0	0	0	0	0	0	0
67	Nationwide Building Society	GB	262	0	0	0	0	0	0	0
68	State Bank of India	IN	408	0	0	0	0	0	0	0
69	Intesa Sanpaolo SpA	IT	725	0	0	0	0	0	0	0
70	Cassa depositi e prestiti SpA	IT	410	0	0	0	0	0	0	0
71	Japan Post Bank Co., Ltd.	JP	1617	0	0	0	0	0	0	0
72	Norinchukin Bank	JP	790	0	0	0	0	0	0	0
73	Sumitomo Mitsui Trust Holdings, Inc.	JP	455	0	0	0	0	0	0	0
74	Resona Holdings, Inc.	JP	384	0	0	0	0	0	0	0
75	Shinkin Central Bank	JP	274	0	0	0	0	0	0	0
76	Japan Housing Finance Agency	JP	214	0	0	0	0	0	0	0
77	Shinhan Financial Group Co., Ltd.	KR	312	0	0	0	0	0	0	0
78	KB Financial Group Inc.	KR	296	0	0	0	0	0	0	0
79	NongHyup Financial Group Inc.	KR	289	0	0	0	0	0	0	0
80	Hana Financial Group Inc.	KR	274	0	0	0	0	0	0	0
81	Woori Bank	KR	245	0	0	0	0	0	0	0
82	Korea Development Bank	KR	215	0	0	0	0	0	0	0
83	Cooperatieve Rabobank U.A.	NL	663	0	0	0	0	0	0	0
84	ABN AMRO Group NV	NL	394	0	0	0	0	0	0	0
85	DNB ASA	NO	292	0	0	0	0	0	0	0
86	PAO Sberbank of Russia	RU	394	0	0	0	0	0	0	0
87	Svenska Handelsbanken AB (publ)	SE	274	0	0	0	0	0	0	0
88	Skandinaviska Enskilda Banken	SE	274	0	0	0	0	0	0	0
89	Swedbank AB (publ)	SE	225	0	0	0	0	0	0	0
90	DBS Group Holdings Limited	SG	316	0	0	0	0	0	0	0
91	Oversea-Chinese Banking Corp.	SG	269	0	0	0	0	0	0	0
92	United Overseas Bank Limited	SG	223	0	0	0	0	0	0	0
93	Cathay Financial Holding Co., Ltd.	TW	239	0	0	0	0	0	0	0
94	Federal Home Loan Banks	US	1002	0	0	0	0	0	0	0
95	U.S. Bancorp	US	423	0	0	0	0	0	0	0
96	PNC Financial Services Group, Inc.	US	347	0	0	0	0	0	0	0
97	Capital One Financial Corporation	US	339	0	0	0	0	0	0	0
Total for Non-GSIBs			28696	0	0	0	0	0	0	0

Note: Banks are ranked by (i) GSIBs vs. Non-GSIBs, (ii) country and (iii) decreasing total assets as of end-2016.

Appendix 2 - Definition of dependent variables, control variables and descriptive statistics

Country-specific macroeconomic control variables

For every set of dependent variables, the following set of country-specific macroeconomic control variables are included in the regressions to take into account potential discrepancies between economies in terms of growth, wealth, unemployment, inflation, public debt, aggregate credit growth, and sovereign yield. The annual growth rate of exchange rate against the euro is also included since our dataset in entirely denominated in euros, for consistency reasons.

Set of country-specific macroeconomic control variables $C_{k,t}$

Variable code	Variable description
GDP gr	Real GDP Growth (%)
GDPperCap	GDP per Capita
UR	Unemployment Rate (%)
INFL	Inflation (%)
PUBD / GDP	Public Debt / GDP (%)
DOMCRED gr	Domestic Credit Growth (%)
SOVYIELD	10-year sovereign debt yield (%)
FX RATE gr	Annual growth rate of exchange rate against Euro (%)

1. GSIB Methodology variables

Dependent variables

Variable code	Variable description	Obs.	Mean
TA gr	Total Assets (TA) Growth Rate	1023	8,94%
Sec Issued / TA	Securities issued over TA	1069	19,77%
TradAFS Sec / TA	Trading and available-for-sale securities over TA	913	19,72%
Share For Loans	Foreign loans over total net loans	489	24,79%
Share For Dep	Foreign deposits over total deposits	291	21,21%
Deriv gr	Notional amount of derivatives growth rate	620	25,7%

Bank-specific control variables included for this set of variables

Variable code	Variable description
Size	Balance sheet size (log of Total assets)

Means by sub-group and sub-period

Variables	All banks			GSIB (at least once)		Never GSIB			
	Mean 2005-2011 (A)	Mean 2012-2016 (B)	T-test (B)-(A) t-stat	Mean 2005-2011 (C)	Mean 2012-2016 (D)	Mean 2005-2011 (E)	Mean 2012-2016 (F)	T-test (E)-(C) t-stat	T-test (F)-(D) t-stat
TA gr	11,8% *Obs = 542*	5,71% *Obs = 481*	-7,489 ***	10,32% *Obs = 193*	0,48% *Obs = 167*	12,62% *Obs = 349*	8,49% *Obs = 314*	1,78 **	7,977 ***
Sec Issued / TA	20,42% *Obs = 592*	18,95% *Obs = 477*	-1,536	21,9% *Obs = 215*	18,22% *Obs = 167*	19,58% *Obs = 377*	19,35% *Obs = 310*	-1,777 **	0,741
TradAFS Sec / TA	20,8% *Obs = 507*	18,36% *Obs = 406*	-3,022 ***	30,18% *Obs = 188*	26,39% *Obs = 143*	15,27% *Obs = 319*	13,99% *Obs = 263*	-15,084 ***	-12,72 ***
Share For Loans	24,68% *Obs = 267*	24,92% *Obs = 222*	0,131	39,77% *Obs = 93*	40,88% *Obs = 68*	16,61% *Obs = 174*	17,88% *Obs = 154*	-10,162 ***	-8,871 ***
Share For Dep	22,25% *Obs = 166*	19,84% *Obs = 125*	-0,943	38,82% *Obs = 68*	31,92% *Obs = 44*	10,75% *Obs = 98*	13,27% *Obs = 81*	-9,672 ***	-5,686 ***
Deriv gr	33% *Obs = 314*	18,2% *Obs = 306*	-2,843 ***	19,64% *Obs = 111*	3,44% *Obs = 100*	40,31% *Obs = 203*	25,37% *Obs = 206*	2,351 **	3,507 ***

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

2. Capital adequacy dependent variables

Dependent variables

Variable code	Variable description	Obs.	Mean
T1 / TA	Tier 1 Capital over Total Assets ("leverage ratio")	990	5,09%
T1 / RWA	Tier 1 Capital over RWA (solvency ratio)	972	11,72%
TOF / RWA	Total own funds over RWA (solvency ratio)	1000	14,63%

Bank-specific control variables included for this set of variables

Variable code	Variable description
Size	Balance sheet size (log of Total assets)
LOANS / TA	Loans to total assets
DEP / TL	Deposits to total liabilities
ROA	Return on average assets

Means by sub-group and sub-period

Variables	All banks			GSIB (at least once)		Never GSIB		T-test	T-test
	Mean 2005-2011 (A)	Mean 2012-2016 (B)	T-test (B)-(A) t-stat	Mean 2005-2011 (C)	Mean 2012-2016 (D)	Mean 2005-2011 (E)	Mean 2012-2016 (F)	(E)-(C) t-stat	(F)-(D) t-stat
T1 / TA	4,72% *Obs = 556*	5,56% *Obs = 434*	7,393 ***	4,33% *Obs = 201*	5,31% *Obs = 143*	4,94% *Obs = 355*	5,68% *Obs = 291*	3,851 ***	2,097 **
T1 / RWA	10,15% *Obs = 548*	13,74% *Obs = 424*	13,356 ***	10,15% *Obs = 201*	14,1% *Obs = 143*	10,15% *Obs = 347*	13,55% *Obs = 281*	-0,018	-1,159
TFP / RWA	13,24% *Obs = 551*	16,33% *Obs = 449*	11,607 ***	13,31% *Obs = 201*	16,72% *Obs = 159*	13,2% *Obs = 350*	16,12% *Obs = 290*	-0,33	-1,276

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

3. Assets composition dependent variables

Dependent variables

Variable code	Variable description	Obs.	Mean
CASH CB / TA	Cash and Balances with Central Banks over TA	681	5,97%
BK LOANS / TA	Net Loans to Banks over TA	681	6,94%
CUST LOANS / TA	Net Customer Loans over TA	681	51,61%
TRADAC / TA	Trading Account and Fair Value Securities over TA	681	7,24%
AFS SEC / TA	Available for Sale Securities over TA	681	7,57%
HTM SEC / TA	Held to Maturity Securities over TA	681	2,9%
DERIV / TA	Total Derivative Assets over TA	681	6,6%
OTH FIN / TA	Other Financial Assets over TA	681	1,16%
INTANG / TA	Total Intangible Assets over TA	681	0,69%

Bank-specific control variables included for this set of variables

Variable code	Variable description
Size	Balance sheet size (log of Total assets)

Means by sub-group and sub-period

Variables (/ TA)	All banks			GSIB (at least once)		Never GSIB		T-test (E)-(C) t-stat	T-test (F)-(D) t-stat
	Mean 2005-2011 (A)	Mean 2012-2016 (B)	T-test (B)-(A) t-stat	Mean 2005-2011 (C)	Mean 2012-2016 (D)	Mean 2005-2011 (E)	Mean 2012-2016 (F)		
CASH CB	5,4% _Obs = 356_	6,6% _Obs = 325_	4,687 ***	4,2% _Obs = 129_	7,33% _Obs = 116_	6,08% _Obs = 227_	6,2% _Obs = 209_	3,092 ***	-2,13 **
BK LOANS	7,46% _Obs = 356_	6,37% _Obs = 325_	-2,449 **	6,96% _Obs = 129_	5,12% _Obs = 116_	7,75% _Obs = 227_	7,07% _Obs = 209_	1,196	2,927 ***
CUST LOANS	51,84% _Obs = 356_	51,37% _Obs = 325_	-0,417	43,6% _Obs = 129_	43,4% _Obs = 116_	56,52% _Obs = 227_	55,79% _Obs = 209_	8,209 ***	8,233 ***
TRADAC	7,89% _Obs = 356_	6,53% _Obs = 325_	-3,963 ***	12,03% _Obs = 129_	9,89% _Obs = 116_	5,54% _Obs = 227_	4,67% _Obs = 209_	-7,783 ***	-7,211 ***
AFS SEC	7,65% _Obs = 356_	7,48% _Obs = 325_	-0,883	8,47% _Obs = 129_	7,98% _Obs = 116_	7,19% _Obs = 227_	7,21% _Obs = 209_	-2,029 **	-1,42
HTM SEC	2,68% _Obs = 356_	3,14% _Obs = 325_	1,268	2,1% _Obs = 129_	2,43% _Obs = 116_	3,01% _Obs = 227_	3,54% _Obs = 209_	1,864 **	2,195 **
DERIV	6,49% _Obs = 356_	6,72% _Obs = 325_	0,586	12,23% _Obs = 129_	13,21% _Obs = 116_	3,23% _Obs = 227_	3,11% _Obs = 209_	-11,733 ***	-11,326 ***
OTH FIN	1,12% _Obs = 356_	1,2% _Obs = 325_	-0,136	1,38% _Obs = 129_	1,51% _Obs = 116_	0,97% _Obs = 227_	1,03% _Obs = 209_	-1,685 **	-1,465
INTANG	0,78% _Obs = 356_	0,58% _Obs = 325_	-2,97 ***	0,94% _Obs = 129_	0,62% _Obs = 116_	0,69% _Obs = 227_	0,56% _Obs = 209_	-2,81 ***	-0,954

$* \ p < 0.1; ** \ p < 0.05; *** \ p < 0.01$

4. Liabilities composition dependent variables

Dependent variables

Variable code	Variable description	Obs.	Mean
BK DEP / TL	Total Deposits from Banks over Total liabilities	679	11,6%
CUST DEP / TL	Total Deposits from Customers over Total liabilities	679	53,1%
SUB DEBT / TL	Total Subordinated Debt over Total liabilities	679	1,84%
SENIOR DEBT / TL	Senior Debt Obligations over Total liabilities	679	17,52%
DERIV / TL	Derivative Liabilities over Total liabilities	679	6,97%
OTH FIN / TL	Other Financial Liabilities over Total liabilities	679	2,12%

Bank-specific control variables included for this set of variables

Variable code	Variable description
Size	Balance sheet size (log of Total assets)

Means by sub-group and sub-period

Variables (/ TL)	All banks			GSIB (at least once)		Never GSIB		T-test (E)-(C) t-stat	T-test (F)-(D) t-stat
	Mean 2005-2011 (A)	Mean 2012-2016 (B)	T-test (B)-(A) t-stat	Mean 2005-2011 (C)	Mean 2012-2016 (D)	Mean 2005-2011 (E)	Mean 2012-2016 (F)		
BK DEP	11,58%	11,62%	-0,866	10,95%	8,44%	11,97%	13,56%	1,309	4,764
	Obs = 372	*Obs = 307*		*Obs = 142*	*Obs = 116*	*Obs = 230*	*Obs = 191*		***
CUST DEP	53,49%	52,63%	0,357	45,4%	48,16%	58,48%	55,35%	5,541	3,081
	Obs = 372	*Obs = 307*		*Obs = 142*	*Obs = 116*	*Obs = 230*	*Obs = 191*	***	***
SUB DEBT	1,94%	1,73%	-6,059	1,93%	1,73%	1,94%	1,73%	0,044	0,007
	Obs = 372	*Obs = 307*	***	*Obs = 142*	*Obs = 116*	*Obs = 230*	*Obs = 191*		
SENIOR DEBT	17,88%	17,08%	-1,784	19,24%	16,66%	17,04%	17,33%	-1,537	0,44
	Obs = 372	*Obs = 307*	**	*Obs = 142*	*Obs = 116*	*Obs = 230*	*Obs = 191*		
DERIV	6,67%	7,33%	0,798	12,19%	14,1%	3,27%	3,22%	-11,498	-11,348
	Obs = 372	*Obs = 307*		*Obs = 142*	*Obs = 116*	*Obs = 230*	*Obs = 191*	***	***
OTH FIN	2,24%	1,99%	-0,352	3,5%	3,23%	1,46%	1,23%	-7,081	-6,093
	Obs = 372	*Obs = 307*		*Obs = 142*	*Obs = 116*	*Obs = 230*	*Obs = 191*	***	***

$* \ p < 0.1;\ ** \ p < 0.05;\ *** \ p < 0.01$

5. Income statement composition dependent variables

Dependent variables

Variable code	Variable description	Obs.	Mean
NET INT INC	Net interest income over Operating income	663	65,25%
NFC INC	Net Fee and Commission Income over Op.Inc.	663	21,52%
SEC GAIN	Realized and Unrealized Gains on Securities over Op.Inc.	663	7,06%
OTH NON INT INC	Other Non-interest Income over Op.Inc.	663	6,17%
PERS EXP	Personnel Expense over Op.Inc.	663	27,32%
OTH EXP	Other Operating Expense over Op.Inc.	663	27,17%
CUST LOAN IMP	Customers loans impairments over Op.Inc.	663	12,52%
FIN AS IMP	Financial assets impairments over Op.Inc.	663	1,35%
NON FIN IMP	Non-financial impairments over Op.Inc.	663	1,46%
INC TAX	Income Tax over Op.Inc.	663	7,01%
OTH ITEMS	Other items (net) over Op.Inc.	663	-0,81%
NET PROF	Net Profit over Op.Inc.	663	23,99%

Bank-specific control variables included for this set of variables

Variable code	Variable description
Size	Balance sheet size (log of Total assets)
LOANS / TA	Loans to total assets
DEP / TL	Deposits to total liabilities
RWA Density	RWA over Total assets

Means by sub-group and sub-period

Variables (/ OP INC)	All banks			GSIB (at least once)		Never GSIB		T-test (E)-(C) t-stat	T-test (F)-(D) t-stat
	Mean 2005-2011 (A)	Mean 2012-2016 (B)	T-test (B)-(A) t-stat	Mean 2005-2011 (C)	Mean 2012-2016 (D)	Mean 2005-2011 (E)	Mean 2012-2016 (F)		
NET INT INC	66,62%	63,54%	-1,78	56,25%	52,92%	72,59%	68,48%	6,978	6,028
	Obs = 367	Obs = 296	**	Obs = 134	Obs = 94	Obs = 233	Obs = 202	***	***
NFC INC	22,13%	20,76%	-0,381	31,25%	24,62%	16,89%	18,97%	-4,132	-4,048
	Obs = 367	Obs = 296		Obs = 134	Obs = 94	Obs = 233	Obs = 202	***	***
SEC GAIN	4,5%	10,25%	2,787	7,22%	21,11%	2,93%	5,19%	-0,988	-6,973
	Obs = 367	Obs = 296	***	Obs = 134	Obs = 94	Obs = 233	Obs = 202		***
OTH NON INT INC	6,75%	5,45%	-1,158	5,28%	1,36%	7,59%	7,36%	1,65	2,812
	Obs = 367	Obs = 296		Obs = 134	Obs = 94	Obs = 233	Obs = 202	**	***
PERS EXP	28,37%	26,03%	-1,423	35,97%	31,54%	24%	23,46%	-4,728	-4,841
	Obs = 367	Obs = 296		Obs = 134	Obs = 94	Obs = 233	Obs = 202	***	***
CUST LOAN IMP	13,59%	11,19%	-2,695	13,34%	8,67%	13,74%	12,35%	0,195	2,573
	Obs = 367	Obs = 296	***	Obs = 134	Obs = 94	Obs = 233	Obs = 202		**
FIN AS IMP	1,83%	0,75%	-2,108	0,76%	0,23%	2,44%	0,99%	1,381	2,327
	Obs = 367	Obs = 296	**	Obs = 134	Obs = 94	Obs = 233	Obs = 202		**
NON FIN IMP	1,69%	1,18%	-0,705	2,34%	1,44%	1,31%	1,05%	-1,05	-0,993
	Obs = 367	Obs = 296		Obs = 134	Obs = 94	Obs = 233	Obs = 202		
INC TAX	7%	7,01%	0,117	4,56%	6,34%	8,4%	7,32%	3,078	1,48
	Obs = 367	Obs = 296		Obs = 134	Obs = 94	Obs = 233	Obs = 202	***	
NET PROF	21,09%	27,59%	2,178	17,07%	24,72%	23,4%	28,93%	1,17	0,932
	Obs = 367	Obs = 296	**	Obs = 134	Obs = 94	Obs = 233	Obs = 202		

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

6. Profitability and Risk-taking dependent variables

Dependent variables

Variable code	Variable description	Obs.	Mean
ROA	Return on average assets	1037	0,66%
ROE	Return on average equity	1017	10,5%
RORWA	Return on average RWA	930	1,34%
NPL / LOANS	Share of NPL over Total Loans	1003	2,73%
RWA Density	Total RWA over Total Assets	1000	47,4%

Bank-specific control variables included for this set of variables

Variable code	Variable description
Size	Balance sheet size (log of Total assets)
LOANS / TA	Loans to total assets
DEP / TL	Deposits to total liabilities

Means by sub-group and sub-period

Variables	All banks			GSIB (at least once)			Never GSIB		T-test (E)-(C)	T-test (F)-(D)
	Mean 2005-2011 (A)	Mean 2012-2016 (B)	T-test (B)-(A) t-stat	Mean 2005-2011 (C)	Mean 2012-2016 (D)	Mean 2005-2011 (E)	Mean 2012-2016 (F)		t-stat	t-stat
ROA	0,69%	0,63%	-1,635	0,59%	0,46%	0,74%	0,72%	3,201	5,588
	Obs = 556	*Obs = 481*		*Obs = 202*	*Obs = 167*	*Obs = 354*	*Obs = 314*	***	***
ROE	11,52%	9,37%	-3,8	9,9%	6,08%	12,4%	11,12%	2,816	6,948
	Obs = 536	*Obs = 481*	***	*Obs = 189*	*Obs = 167*	*Obs = 347*	*Obs = 314*	***	***
RORWA	1,3%	1,38%	1,16	1,19%	0,97%	1,37%	1,6%	1,742	6,579
	Obs = 492	*Obs = 438*		*Obs = 177*	*Obs = 153*	*Obs = 315*	*Obs = 285*	**	***
NPL / LOANS	2,65%	2,83%	0,941	3,25%	3,12%	2,3%	2,67%	-3,922	-1,431
	Obs = 540	*Obs = 463*		*Obs = 199*	*Obs = 161*	*Obs = 341*	*Obs = 302*	***	
RWA Density	49,09%	45,33%	-3,326	44,07%	41,45%	51,97%	47,45%	5,237	3,38
	Obs = 551	*Obs = 449*	***	*Obs = 201*	*Obs = 159*	*Obs = 350*	*Obs = 290*	***	***

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

7. Yield dependent variables

Dependent variables

Variable code	Variable description	Obs.	Mean
LOAN YIELD	Total Loans Yield	686	5,22%
DEP COST	Total Deposits Interest Cost	686	2%
CUST INT SPREAD	Customer Interest Spread	686	3,21%
FUND COST	Cost of Funds	686	2,36%
NIM	Net Interest Margin	686	2,16%

Bank-specific control variables included for this set of variables

Variable code	Variable description
Size	Balance sheet size (log of Total assets)
LOANS / TA	Loans to total assets
DEP / TL	Deposits to total liabilities

Means by sub-group and sub-period

Variables	All banks			GSIB (at least once)		Never GSIB		T-test	T-test
	Mean 2005-2011 (A)	Mean 2012-2016 (B)	T-test (B)-(A) t-stat	Mean 2005-2011 (C)	Mean 2012-2016 (D)	Mean 2005-2011 (E)	Mean 2012-2016 (F)	(E)-(C) t-stat	(F)-(D) t-stat
LOAN YIELD	5,57%	4,83%	-3,316	4,7%	3,5%	5,96%	5,36%	4,036	4,534
	Obs = 362	Obs = 324	***	Obs = 113	Obs = 93	Obs = 249	Obs = 231	***	***
DEP COST	2,25%	1,72%	-5,812	1,76%	0,92%	2,47%	2,04%	4,065	5,538
	Obs = 362	Obs = 324	***	Obs = 113	Obs = 93	Obs = 249	Obs = 231	***	***
CUST INT SPREAD	3,33%	3,08%	-1,69	2,94%	2,58%	3,5%	3,28%	2,596	2,57
	Obs = 362	Obs = 324	**	Obs = 113	Obs = 93	Obs = 249	Obs = 231	***	**
FUND COST	2,6%	2,1%	-5,91	2,03%	1,22%	2,85%	2,46%	4,49	5,162
	Obs = 362	Obs = 324	***	Obs = 113	Obs = 93	Obs = 249	Obs = 231	***	***
NIM	2,25%	2,05%	-2,381	1,88%	1,51%	2,42%	2,26%	3,674	4,749
	Obs = 362	Obs = 324	**	Obs = 113	Obs = 93	Obs = 249	Obs = 231	***	***

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Appendix 3 - Alternative simplified breakdowns

Assets composition - Simple breakdown

Dependent variables

Variable code	Variable description	Obs.	Mean
CASH / TA	Cash and cash equivalent over Total assets	1011	12,89%
LOANS / TA	Loans over Total assets	1011	48,95%
SEC / TA	Securities over Total assets	1011	30,7%
INTANG / TA	Intangible assets over Total assets	1011	0,92%
LOANS to DEP	Loans to deposits ratio	919	99,36%

Bank-specific control variables included for this set of variables

Variable code	Variable description
Size	Balance sheet size (log of Total assets)

Means by sub-group and sub-period

Variables	All banks			GSIB (at least once)		Never GSIB		T-test	T-test
	Mean 2005-2011 (A)	Mean 2012-2016 (B)	T-test (B)-(A) t-stat	Mean 2005-2011 (C)	Mean 2012-2016 (D)	Mean 2005-2011 (E)	Mean 2012-2016 (F)	T-test (E)-(C) t-stat	T-test (F)-(D) t-stat
CASH / TA	12,55%	13,29%	1,445	12,2%	14,8%	12,74%	12,46%	0,746	-3,063
	Obs = 549	*Obs = 462*		*Obs = 199*	*Obs = 164*	*Obs = 350*	*Obs = 298*		***
LOANS / TA	49,58%	48,21%	-1,153	42,14%	40,32%	53,81%	52,54%	8,154	7,624
	Obs = 549	*Obs = 462*		*Obs = 199*	*Obs = 164*	*Obs = 350*	*Obs = 298*	***	***
SEC / TA	30,57%	30,87%	0,207	38,58%	36,49%	26,01%	27,77%	-9,96	-6,034
	Obs = 549	*Obs = 462*		*Obs = 199*	*Obs = 164*	*Obs = 350*	*Obs = 298*	***	***
INTANG / TA	1,02%	0,8%	-2,97	1,36%	0,98%	0,83%	0,7%	-4,624	-3,082
	Obs = 549	*Obs = 462*	***	*Obs = 199*	*Obs = 164*	*Obs = 350*	*Obs = 298*	***	***
LOANS to DEP	101,76%	96,55%	-1,503	96,41%	85,9%	104,6%	102,28%	1,891	4,16
	Obs = 496	*Obs = 423*		*Obs = 172*	*Obs = 148*	*Obs = 324*	*Obs = 275*	**	***

$* \ p < 0.1; ** \ p < 0.05; *** \ p < 0.01$

Assets simple composition variables

Figures in percentage points (pp)	Dependent variable				
	CASH / TA	LOANS / TA	SEC / TA	INTANG / TA	LOANS / DEP
(β) GSIB once	-2.322	-4.302	6.936*	0.390	-6.308
	(1.899)	(4.006)	(3.612)	(0.290)	(9.191)
(γ) Post2011	-0.557	3.297***	-1.729*	-0.130	1.660
	(0.826)	(0.794)	(0.928)	(0.084)	(2.165)
(δ) **INTERACTION**	**2.998***	**-1.819**	**-2.322**	**-0.115**	**-4.603***
	(1.069)	(1.209)	(1.427)	(0.108)	(2.712)
Size	2.253***	-5.764***	3.545***	0.055	1.025
	(0.748)	(0.886)	(1.146)	(0.058)	(1.814)
Intercept	-28.278**	158.251***	-39.818*	-0.078	87.592**
	(14.355)	(16.893)	(21.115)	(1.170)	(35.605)
Obs.	1,011	1,011	1,011	1,011	919
R^2	0.037	0.088	0.122	0.043	0.060
Macro control var.	YES	YES	YES	YES	YES

$* \ p < 0.1; ** \ p < 0.05; *** \ p < 0.01$ - *Standard deviations in brackets*

Liabilities composition - Simple breakdown

Dependent variables

Variable code	Variable description	Obs.	Mean
DEP / TL	Deposits over Total liabilities	1064	56,09%
OTH FL / TL	Other Financial Liabilities over Total liabilities	1064	36,04%
NFL / TL	Non-Financial Liabilities over Total liabilities	1064	7,86%

Bank-specific control variables included for this set of variables

Variable code	Variable description
Size	Balance sheet size (log of Total assets)

Means by sub-group and sub-period

Variables	All banks			GSIB (at least once)		Never GSIB			
	Mean 2005-2011 (A)	Mean 2012-2016 (B)	T-test (B)-(A) t-stat	Mean 2005-2011 (C)	Mean 2012-2016 (D)	Mean 2005-2011 (E)	Mean 2012-2016 (F)	T-test (E)-(C) t-stat	T-test (F)-(D) t-stat
DEP / TL	55,92%	56,3%	0,357	49,58%	53,44%	59,39%	57,78%	5,076	2,032
	Obs = 586	Obs = 478		Obs = 207	Obs = 163	Obs = 379	Obs = 315	***	**
OTH FL / TL	36,41%	35,58%	-0,678	42,26%	38,26%	33,22%	34,19%	-4,852	-1,977
	Obs = 586	Obs = 478		Obs = 207	Obs = 163	Obs = 379	Obs = 315	***	**
NFL / TL	7,65%	8,11%	-0,672	8,14%	8,3%	7,38%	8,02%	-1,043	-0,31
	Obs = 586	Obs = 478		Obs = 207	Obs = 163	Obs = 379	Obs = 315		

$* \ p < 0.1; \ ** \ p < 0.05; \ *** \ p < 0.01$

Liabilities simple composition variables

Figures in percentage points (pp)	Dependent variable		
	DEP / TL	OTH FL / TL	NFL / TL
(β) GSIB once	-2.231	1.399	0.812
	(5.459)	(5.342)	(1.804)
(γ) Post2011	0.926	-1.344	0.401
	(0.924)	(0.981)	(0.415)
(δ) **INTERACTION**	**0.878**	**-0.908**	**0.033**
	(1.312)	(1.366)	(0.510)
Size	-6.345***	6.623***	-0.297
	(1.299)	(1.339)	(0.302)
Intercept	169.032***	-85.169***	16.156***
	(25.077)	(25.714)	(6.248)
Obs.	1,064	1,064	1,064
R^2	0.000	0.007	0.022
Macro control var.	YES	YES	YES

$* \ p < 0.1; \ ** \ p < 0.05; \ *** \ p < 0.01$ - *Standard deviations in brackets*

Income statement composition - Simple breakdown

Dependent variables

Variable code	Variable description	Obs.	Mean
NET INT INC / OP INC	Net interest income over Operating income	1026	62,62%
NON INT INC / OP INC	Non-interest income over Operating income	1026	37,38%
OP EXP / OP INC	Operating expense over Operating income	1026	56,83%
TOTAL IMP / OP INC	Total impairments over Operating income	1026	13,85%
INC TAX / OP INC	Income Tax over Operating income	1026	6,97%
NET PROF / OP INC	Net Profit over Operating income	1026	22,79%

Bank-specific control variables included for this set of variables

Variable code	Variable description
Size	Balance sheet size (log of Total assets)
LOANS / TA	Loans to total assets
DEP / TL	Deposits to total liabilities
RWA Density	RWA over Total assets

Simplified income statement

+ Net interest income
+ Non-interest income
= Operating income
- Operating expense
- Total impairments
- Income Tax
- Other items (net)
= Net Profit

Means by sub-group and sub-period

Variables (/ OP INC)	All banks Mean 2005-2011 (A)	All banks Mean 2012-2016 (B)	All banks T-test (B)-(A) t-stat	GSIB (at least once) Mean 2005-2011 (C)	GSIB (at least once) Mean 2012-2016 (D)	Never GSIB Mean 2005-2011 (E)	Never GSIB Mean 2012-2016 (F)	T-test (E)-(C) t-stat	T-test (F)-(D) t-stat
NET INT INC	63,62% Obs = 575	61,33% Obs = 451	-1,78 **	53,76% Obs = 208	50,81% Obs = 161	69,21% Obs = 367	67,17% Obs = 290	7,143 ***	8,327 ***
NON INT INC	36,38% Obs = 575	38,67% Obs = 451	1,78 **	46,24% Obs = 208	49,19% Obs = 161	30,79% Obs = 367	32,83% Obs = 290	-7,143 ***	-8,327 ***
OP EXP	57,92% Obs = 575	55,44% Obs = 451	-1,237	64,39% Obs = 208	62,4% Obs = 161	54,25% Obs = 367	51,57% Obs = 290	-3,312 ***	-4,943 ***
TOTAL IMP	15,39% Obs = 575	11,88% Obs = 451	-2,768 ***	15,42% Obs = 208	9,43% Obs = 161	15,37% Obs = 367	13,25% Obs = 290	-0,024	2,936 ***
INC TAX	6,94% Obs = 575	7,01% Obs = 451	0,117	5,21% Obs = 208	6,55% Obs = 161	7,93% Obs = 367	7,26% Obs = 290	2,87 ***	1,404
NET PROF	20,53% Obs = 575	25,68% Obs = 451	2,178 **	16,35% Obs = 208	21,65% Obs = 161	22,89% Obs = 367	27,92% Obs = 290	1,774 **	2,065 **

$* \ p < 0.1; \ ** \ p < 0.05; \ *** \ p < 0.01$

	Income statement simple composition variables					
Figures in percentage points (pp)		Dependent variable				
	NET INT INC / OP INC	NON INT INC / OP INC	OP EXP / OP INC	TOTAL IMP / OP INC	INC TAX / OP INC	NET PROFIT / OP INC
(β) GSIB once	-14.137***	14.137***	0.385	-9.179**	-0.485	10.948
	(3.751)	(3.751)	(5.937)	(4.165)	(1.286)	(10.531)
(γ) Post2011	-5.602**	5.602**	-6.366**	-7.333***	0.416	13.250***
	(2.311)	(2.311)	(2.983)	(2.833)	(0.775)	(5.074)
(δ) **INTERACTION**	**0.664**	**-0.664**	**2.385**	**-0.318**	**0.855**	**-3.667**
	(2.483)	(2.483)	(4.326)	(2.591)	(1.007)	(4.909)
Size	4.781**	-4.781**	0.912	5.427***	0.231	-7.073
	(2.215)	(2.215)	(3.496)	(1.985)	(0.458)	(5.778)
LOANS / TA	0.438***	-0.438***	-0.335**	0.190	0.048	0.129
	(0.090)	(0.090)	(0.136)	(0.122)	(0.036)	(0.167)
DEP / TL	0.222**	-0.222**	0.113	-0.136	0.034*	-0.076
	(0.100)	(0.100)	(0.134)	(0.102)	(0.019)	(0.239)
RWA Density	-0.193***	0.193***	-0.197**	0.042	0.067***	0.087
	(0.061)	(0.061)	(0.081)	(0.071)	(0.025)	(0.108)
Intercept	-27.458	127.458***	65.790	-70.089*	-8.574	126.502
	(46.472)	(46.472)	(67.554)	(37.896)	(9.020)	(115.425)
Obs.	968	968	968	968	968	968
R^2	0.307	0.307	0.140	0.133	0.108	0.076
Macro control var.	YES	YES	YES	YES	YES	YES

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ - *Standard deviations in brackets*

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