Effect of the GSIB surcharge on the systemic risk posed by the activities of GSIBs

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Abstract

This study assesses whether the introduction of the GSIB surcharge requirement resulted in GSIBs reducing the systemic risk posed by their activities. We find limited evidence of GSIBs managing their activities to avoid increases in their surcharges. For a sample of international banks, proximity to surcharge thresholds is associated to a decrease in the growth of intra-financial system liabilities, underwriting activities, and holdings of trading and available-for-sale securities. In the case of US GSIBs and the method 2 GSIB surcharge, we find some association between proximity to surcharge thresholds and a decrease in the growth of trading and available-for-sale securities and short-term wholesale funding.

Keywords: bank capital requirements, banking regulation, GSIB surcharge, systemic risk

JEL Classification Codes: G01, G18, G21

1 – Introduction

In the evolving landscape of global finance, the resilience of financial institutions is of paramount concern. This is particularly true for global systemically important banks (GSIBs), as their size, interconnectedness, and complexity imply that their failure can have significant repercussions for other economic agents. Recognizing the unique risks posed by GSIBs, the Financial Stability Board and the Basel Committee on Banking Supervision have adopted the "GSIB surcharge" – a capital buffer standard that aims to reduce the negative externalities these firms may pose by increasing their required capital.[2]

The GSIB surcharge framework measures the systemic risk posed by large banks through a "GSIB score," which accounts for several quantitative measures of their activity, including

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[2] Capital buffer requirements aim to increase the resilience of banks by ensuring that they can withstand a degree of losses and remain above with their minimum capital requirements.

indicators of size, interconnectedness, and complexity. Taking the measures used to calculate the GSIB score as appropriate measures of the systemic risk posed by banks, this study assesses whether the introduction of the surcharge requirement resulted in GSIBs reducing the systemic risk posed by their activities. Specifically, we test whether the rate at which a GSIB grows their systemic risk indicators diminishes when their GSIB score is close to the thresholds that result in a surcharge increase.

Our analysis provides limited evidence of GSIBs managing their activities to avoid increases in their surcharges. For a sample of international banks, we find some association between proximity to surcharge thresholds and a decrease in the growth of intra-financial system liabilities, underwriting activities, and holdings of trading and available-for-sale (AFS) securities. In the case of US GSIBs and the method 2 GSIB surcharge, we find some association between proximity to surcharge thresholds and a decrease in the growth of trading and AFS securities and short-term wholesale funding. Overall, our results should be interpreted cautiously, given that most of the effects are not robust across specifications and have weak statistical significance.

Our study contributes to the literature on the effects of the GSIB surcharge and, particularly, the literature on the impact of the GSIB surcharge on systemic risk and financial stability. Papers in this literature include Goel et at. (2019), who find that GSIBs probability of distress decreased after the introduction of the GSIB surcharge and argue that their systemic importance likely declined; Behn and Schramm (2021), who find that GSIBs lowered their risk taking after being designated as GSIBs; Violon et al. (2020), who find that GSIBs reduce the expansion of their balance sheet after receiving the GSIB designation; Ho et al. 2022, who assess the impact of GSIB designation on the complexity of GSIBs; Behn et al. (2022), who find that GSIBs reduce a range of activities at the end of the year to reduce their GSIB surcharges; Garcia et al. (2023), who also find that GSIBs reduce their balance sheets at the end of a year, particularly their derivatives book and their intra-financial system exposure, to reduce their GSIB surcharge; Bery et al. (2024), who also find that US GSIBs lower their surcharges by decreasing the amount of over-the-counter derivatives in the last quarter of the year; Goel et al. (2022), who find that less profitable banks contracted in response to higher capital surcharges while profitable banks continued to increase their systemic importance; Dzhagityan and Orekhov (2022), who found that the GSIB surcharge – among other policy reforms – contributed to financial stability; Gündüz (2023), who finds a temporary increase in a bank's CDS spread increase after an increase in the GSIB surcharge; and Poledna et al. (2017), who argue that changing network topology would be a better approach to improve financial fragility than the GSIB surcharge.[3] Our findings are consistent with previous findings in the literature, as we find that proximity to an increase in the GSIB surcharge is associated with reductions in the systemic risk indicators of

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[3] Other papers have assessed the impact of the GSIB surcharge on other economic outcomes. For example, Favara et al. (2021) found that GSIBs lent less to corporates after the introduction of the surcharge, but that lending to corporates did not decrease because corporate borrowers switched to other banks. Also, Degryse et al. (2023) found that GSIBs lowered their lending to corporates after being designed as a GSIB, but argue that this effect is mostly due to stricter supervision rather than to the GSIB surcharge.

GSIBs in some cases. Still, the focus and methodology of our analysis are distinct from those of previous studies.

The remainder of this note is organized as follows: Section 2 discusses the motivations behind the GSIB capital surcharge and the calculation of the GSIB score. Section 3 describes our data. Section 4 describes our empirical methodology and presents our regression results. Section 5 concludes and discusses future avenues of research.

2 – Background

In the aftermath of the global financial crisis, bank capital regulations underwent significant reform to mitigate future strain on the financial system. In response to concerns regarding the systemic risk posed by the largest, most interconnected banks, global financial regulators introduced the GSIB surcharge, which requires these banks to maintain higher regulatory capital ratios than smaller, less complex banks. This surcharge requires GSIBs to internalize the costs that their failure can pose to the broader financial system, thereby reducing systemic risk by making the failure of GSIBs less likely. The GSIB surcharge also aims to be proportional to the systemic footprint of each covered bank, incentivizing these banks to reduce the systemic risk they pose.

Under the Basel framework, a bank's GSIB score is based on five equally weighted categories of systemic importance (Basel Committee on Banking Supervision 2021): (1) cross-jurisdictional activity, (2) size, (3) interconnectedness, (4) substitutability/financial institution infrastructure, and (5) complexity. These categories are further subdivided into individual indicators, each with its respective indicator weighting.

Table 1. GSIB Score Systemic Indicator Weights

Category	Systemic Indicator	Indicator Weight
Size	Total exposure	20%
Interconnectedness	Intra-financial system assets	6.67%
	Intra-financial system liabilities	6.67%
	Securities outstanding	6.67%
Substitutability	Payments activity	6.67%
	Assets under custody	6.67%
	Underwritten transactions in debt and equity markets	6.67%
Complexity	Notional amount of over-the-counter (OTC) derivatives	6.67%
	Trading and available-for-sale securities	6.67%
	Level 3 assets	6.67%
Cross-jurisdictional activity	Cross-jurisdictional claims	10%
	Cross-jurisdictional liabilities	10%

Basel Committee on Banking Supervision, 2021.

To calculate each bank's indicator score, the indicator amount is divided by the aggregate global indicator amount.[4] Subsequently, this amount is multiplied by 10,000 to express the indicator score in terms of basis points.

$$Indicator\ score = \frac{bank\ indicator\ amount}{aggregate\ global\ indicator\ amount} \times 10{,}000$$

Then, the category scores are calculated by averaging the respective indicator scores for each of the five categories of systemic importance (size, interconnectedness, substitutability/financial institution infrastructure, complexity, and cross-jurisdictional activity).[5]

The final GSIB score is an average of five category scores:

$$GSIB\ score = \frac{size + interconnectedness + substitutability + complexity + cross\ jurisdictional\ activity}{5}$$

The GSIB framework employs a cut-off score of 130bps for GSIB designation, with each subsequent bucket increment set at 100bps (Basel Committee on Banking Supervision 2013). The GSIB buckets are displayed below.

Table 2. GSIB Framework Method 1 Bucketing Thresholds

GSIB Buckets	
Bucket 5 (+3.5% CET1)	530-629
Bucket 4 (+2.5% CET1)	430-529
Bucket 3 (+2.0% CET1)	330-429
Bucket 2 (+1.5% CET1)	230-329
Bucket 1 (+1.0% CET1)	130-229

Basel Committee on Banking Supervision, 2013.

The Basel GSIB surcharge standard is implemented in the United States as the "method 1" surcharge requirement for US GSIBs. US bank holding companies identified as a GSIB under the method 1 score calculation must also calculate a method 2 score that is used to set an alternative GSIB surcharge. The GSIB's method 2 score calculation includes the same systemic risk indicators as method 1 *except* for the substitutability category, which is replaced by a measure of short-term wholesale funding.

The individual systemic indicator scores are equal to the reported amount of the indicators multiplied by the respective coefficients presented below.[6]

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[4] The aggregate global amount for each indicator is obtained by summing the indicator amounts for largest 75 banks by asset size in the data collected by the Basel Committee.
[5] The Basel Committee capped the contribution of the substitutability category to an individual bank at 100 basis points.
[6] The calibration methodology employed to determine these coefficients is explained in Board of Governors of the Federal Reserve System (2015).

Table 3. US Method 2 GSIB Score Systemic Indicator Weights

Category	Systemic Indicator	Coefficient value (%)
Size	Total exposures	4.423
Interconnectedness	Intra-financial system assets	12.007
	Intra-financial system liabilities	12.490
	Securities outstanding	9.056
Complexity	Notional amount of over-the-counter (OTC) derivatives	0.155
	Trading and AFS securities	30.169
	Level 3 assets	161.177
Cross-jurisdictional activity	Cross-jurisdictional claims	9.277
	Cross-jurisdictional liabilities	9.926

Code of Federal Regulations, 2016.

The GSIB's short-term wholesale funding score is calculated by dividing the average weighted short-term wholesale funding amount by the GSIB's risk-weighted assets and then multiplying by a fixed factor of 350.

Similar to method 1 GSIB scores, US GSIB scores under method 2 equal the sum of the individual systemic indicator scores. Table 4 presents the bucket thresholds for applying the method 2 surcharges.

Table 4. GSIB Framework Method 2 Bucketing Thresholds

GSIB Buckets	
Below 130	0.0%
130-229	1.0%
230-329	1.5%
330-429	2.0%
430-529	2.5%
530-629	3.0%
630-729	3.5%
730-829	4.0%
830-929	4.5%
930-1029	5.0%
1030-1129	5.5%
1130 and above	6.5% + 0.5% for every extra 100bp

Code of Federal Regulations, 2017.

To assess the impact of the Basel GSIB surcharge on the systemic risk of global banks, we use bank-level data from the Bank for International Settlements website, including bank systemic risk indicator values and global denominators.[7] Our panel dataset includes 683 "bank-year" observations and 93 banks, covering 2013 to 2021. Of these observations, we include 276 "bank-year" observations (referring to 40 banks) in our regression analysis, as we exclude observations

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[7] Bank indicator values can be found here: https://www.bis.org/bcbs/gsib/gsib_assessment_samples.htm. Global denominator values can be found here: https://www.bis.org/bcbs/gsib/denominators.htm.

where the bank started with a GSIB score below 100 bps (banks with a score below 100 bps never surpassed 130 bps – the threshold score to be classified as a GSIB – in the following year).

In addition, we consider method 2 data for the eight US bank holding companies that have been deemed GSIBs since the introduction of the US GSIB surcharge requirement (BNY Mellon, Bank of America, Citigroup, Goldman Sachs, J.P. Morgan, Morgan Stanley, State Street, and Wells Fargo). Our panel dataset on the annual changes in systemic risk indicators includes 40 "firm-year" observations as all eight of these bank holding companies have consistently classified as GSIBs from 2016 to 2021.

Figure 1 displays how the global denominators – in the size, cross-jurisdictional activity, interconnectedness, substitutability, and complexity categories – have moved between 2013 and 2021.

Figure 1. Individual Indicator Global Denominators from 2013 to 2021

Indicator — Total exposures as defined for use in the Basel III leverage ratio

Unit: all denominators are in EUR Trillions

Indicator — Intra-financial system assets — Securities outstanding — Intra-financial system liabilities

Unit: all denominators are in EUR Trillions

Indicator — Payments

Unit: all denominators are in EUR Trillions

Indicator — Assets under custody

Unit: all denominators are in EUR Trillions

Indicator — Value of underwritten transactions in debt and equity markets

Unit: all denominators are in EUR Trillions

Indicator — Notional amount of over-the-counter (OTC) derivatives

Unit: all denominators are in EUR Trillions

Indicator — Level 3 assets — Trading and available-for-sale securities

Unit: all denominators are in EUR Trillions

Indicator — Cross-jurisdictional claims — Cross-jurisdictional liabilities

Unit: all denominators are in EUR Trillions

Table 5. Global Denominator Growth Rates (2013 to 2021)

Category	Systemic Indicator	Growth Rate
Size	Total exposure	48.5%
Interconnectedness	Intra-financial system assets	22.2%
	Intra-financial system liabilities	25.8%
	Securities outstanding	42.5%
Substitutability	Payments activity	51.2%
	Assets under custody	108.5%
	Underwritten transactions in debt and equity markets	94.6%
Complexity	Notional amount of over-the-counter (OTC) derivatives	-9.7%
	Trading and available-for-sale securities	11.9%
	Level 3 assets	4.8%
Cross-jurisdictional activity	Cross-jurisdictional claims	50.0%
	Cross-jurisdictional liabilities	44.4%

A majority of the global denominators increased gradually from 2013 to 2021. The indicators that grew the most were assets under custody (108.5%), underwritten transactions in debt and equity markets (94.6%), and payments activity (51.2%). The notional amount of OTC derivatives decreased in absolute terms over this period (-9.7%). Overall, most indicators grew faster than the combined rate of inflation and economic growth across the world in this period, which suggests that the introduction of the GSIB surcharge did not meaningfully limit large international banks ability to grow.

4 – Regression analysis

If the surcharge motivates GSIBs to reduce their systemic risk indicators, firms whose GSIB score is closer to triggering an increase or decrease in 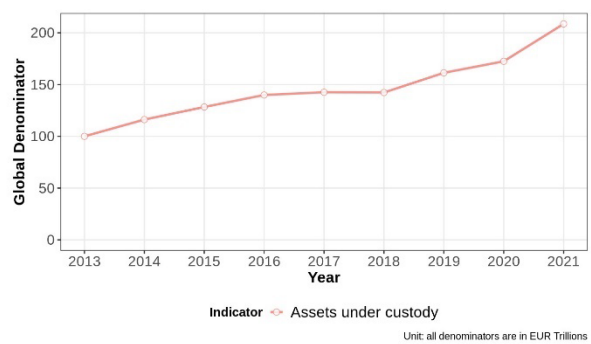the surcharge would likely be more motivated to manage their activities to achieve a reduction in the surcharge. Therefore, a negative association between proximity to surcharge thresholds and growth in systemic risk indicators would be expected. To test whether this association happens in practice, we perform regressions that estimate how the growth rate of firms' systemic risk indicators relates to how close the firm's GSIB score is to triggering an increase or decrease in the surcharge. Specifically, we estimate the following regression equation:

$$\Delta\%RiskIndicator_{it} = \beta_0 + \beta_1 LowScore_{i,t-1} + \beta_2 HighScore_{i,t-1} + \gamma_t + \alpha_i + \epsilon_{it}$$

In this equation, the dependent variable is the percentage change in one of the systemic risk indicators for bank i between t-1 and t, denoted as $\Delta\%RiskIndicator_{i,t}$.[8] The main explanatory variables are indicator variables for (1) whether the t-1 GSIB score of a firm was close to the threshold at which the surcharge would decrease ($LowScore_{i,t-1}$) and (2) whether the t-1 GSIB score of a firm was close to the threshold at which the surcharge would increase ($HighScore_{i,t-1}$). $LowScore_{i,t-1}$ is calculated as follows:

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[8] $\Delta\%RiskIndicator_{i,t} = (RiskIndicator_{i,t} - RiskIndicator_{i,t-1}) / RiskIndicator_{i,t-1}$.

$$LowScore_{i,t-1}$$
$$= \begin{cases} 1, if\ \dfrac{(bottom\ of\ its\ score\ bucket\ range - 1)}{0.95} \geq GSIBScore_{i,t-1} \geq bottom\ of\ its\ score\ bucket\ range \\ 0, otherwise \end{cases}$$

For example, for the first GSIB score bucket (130 to 229), GSIB scores between 130 and 135.8 (which equals 129/0.95) are considered close to the low threshold and scores above 135.8 are not.[9]

Conversely, *HighScore_{i,t-1}* is calculated as follows:

$$HighScore_{i,t-1}$$
$$= \begin{cases} 1, if\ top\ of\ its\ score\ bucket\ range \geq GSIBScore_{i,t-1} \geq (top\ of\ its\ score\ bucket\ range + 1)/1.05 \\ 0, otherwise \end{cases}$$

To account for time-specific differences in the average growth of systemic risk indicators, we introduce year fixed effects into our regression model, denoted by γ_t above. In addition, we include bank-specific fixed effects in some of our specifications, denoted by α_i above. These bank-specific fixed effects control for unobserved, time-invariant firm-specific characteristics that may influence the dependent variable.

For this regression analysis, we exclude observations where a firm's GSIB score in year *t-1* is below 100 bps. GSIB designation has a cut-off score of 130 bps, and a firm with a score below 100 bps never surpassed 130 bps in the following year. Therefore, we exclude these observations because these firms' activity level is unlikely to be directly affected by the GSIB surcharge requirement. In addition, we exclude observations where the average share of the systemic risk indicator in the firm's overall GSIB score is below 1%.[10] This exclusion ensures that regression estimates are not driven by GSIBs with very little activity relating to the specific systemic risk indicator.

Regressions based on all GSIBs worldwide

Table 6 presents our main regression results.[11] In addition to specification 1, which includes firm fixed effects, we also present results based on specification 2 which omits them. This omission implies that the effects of the proximity variables are informed by variation across GSIBs in this specification; however, other idiosyncratic, constant differences across firms are not controlled for. Meanwhile, we include the relevant systemic risk indicator's share of the GSIB score as a

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[9] We have chosen to set low and high score indicator variables based on a percentage distance from the bucket thresholds rather than based on absolute distance because the same absolute change in score (e.g., ten score points) represents a much bigger relative change for a firm with a low GSIB score than for a firm with a high GSIB score.

[10] To determine the average share of a systemic risk indicator in a firm's overall GSIB score we start by calculating, for each year, the ratio between the score contribution of a systemic risk indicator and a firm's full GSIB score. Then, we average this ratio over the years in the analysis.

[11] As an alternative to defining the dependent variable in our regressions as the percentage change in a systemic risk indicator, we defined the dependent variable as the change of systemic risk indicator's share of a firm's GSIB score in regressions presented in Appendix B. Regression results are qualitatively similar.

control variable in specification 2. The existing share of a systemic risk indicator may influence its future path, either because it is a predictor of further expansion or of reduction in exposure.

Table 6. Effect of Proximity to Surcharge Increase or Decrease on Systemic Risk Indicators

Dependent Variables	Explanatory Variables					N
	(1)		(2)			
	$LowScore_{i,t-1}$	$HighScore_{i,t-1}$	$LowScore_{i,t-1}$	$HighScore_{i,t-1}$	Indicator Share of GSIB score	
Δ% total exposures$_{i,t}$	0.035** (0.013)	0.009 (0.015)	0.039*** (0.012)	0.012 (0.012)	0.289*** (0.054)	276
Δ% intra-financial system assets$_{i,t}$	0.109 (0.071)	-0.041 (0.038)	0.052 (0.059)	-0.077*** (0.027)	-2.174*** (0.629)	276
Δ% intra-financial system liabilities$_{i,t}$	-0.020 (0.045)	-0.021 (0.040)	-0.015 (0.042)	-0.058 (0.036)	-0.784** (0.377)	276
Δ% securities outstanding$_{i,t}$	0.053* (0.029)	0.001 (0.022)	0.039 (0.027)	-0.005 (0.020)	0.221 (0.404)	276
Δ% payments activity$_{i,t}$	-0.015 (0.034)	-0.019 (0.034)	0.000 (0.032)	-0.022 (0.031)	-0.319 (0.208)	276
Δ% assets under custody$_{i,t}$	1.174 (1.134)	-0.294 (0.226)	0.950 (0.966)	-0.076 (0.091)	-0.387 (0.310)	234
Δ% underwritten transactions in debt and equity markets$_{i,t}$	-0.080 (0.063)	-0.112 (0.068)	-0.038 (0.062)	-0.077* (0.043)	-2.771* (1.401)	256
Δ% notional amount of OTC derivatives$_{i,t}$	0.043 (0.030)	0.016 (0.028)	0.039 (0.031)	-0.006 (0.022)	-1.046*** (0.309)	219
Δ% trading and AFS securities$_{i,t}$	-0.083 (0.128)	-0.187** (0.088)	-0.013 (0.090)	-0.052 (0.077)	-4.250*** (1.477)	276
Δ% level 3 assets$_{i,t}$	-0.169 (0.126)	0.310 (0.440)	-0.047 (0.083)	0.443 (0.513)	-3.839** (1.866)	268
Δ% cross-jurisdictional claims$_{i,t}$	-0.003 (0.037)	0.022 (0.028)	0.012 (0.029)	0.005 (0.026)	-0.532*** (0.164)	271
Δ% cross-jurisdictional liabilities$_{i,t}$	-0.020 (0.049)	-0.004 (0.037)	-0.005 (0.045)	0.020 (0.030)	-0.652*** (0.213)	276
Year Fixed Effects	Yes		Yes			
Firm Fixed Effects	Yes		No			

Notes: Standard errors in parenthesis. * = p-value < 0.1; ** = p-value < 0.05; *** = p-value < 0.01. Appendix A presents the descriptive statistics of the variables used in the regression analyses of this paper.

In specification 1 (with firm fixed effects), *HighScore$_{i,t-1}$* is a statistically significant predictor of the growth of a GSIB's trading and AFS securities (5% significance). Proximity to an increase in the GSIB surcharge is associated with an 18.7 percentage points (pp) lower growth rate of a firm's trading and AFS securities. Meanwhile, *LowScore$_{i,t-1}$* is a statistically significant predictor of the growth of a GSIB's total exposures (5% significance) and securities outstanding (10% significance). Proximity to a decrease in the GSIB surcharge is associated with a 3.5 pp higher growth rate of a firm's total exposures and with a 5.3 pp higher growth rate of a firm's securities outstanding.

In specification 2 (without firm fixed effects), *HighScore$_{i,t-1}$* is a statistically significant predictor of the growth of a GSIB's intra-financial system assets (1% significance) and underwritten transactions in debt and equity (10% significance). Proximity to an increase in the GSIB surcharge is associated with a 7.7 pp lower growth rate of a firm's intra-financial system assets and with a 7.7 pp lower growth rate of a firm's underwritten transactions in debt and equity. Consistent with specification 1, *LowScore$_{i,t-1}$* is also a statistically significant predictor of the growth of a GSIB's total exposures (1% significance) in specification 2. Proximity to a decrease in the GSIB surcharge is associated with a 3.9 pp higher growth rate of a firm's total exposures.

Specification 2 also shows that firms tend to reduce the systemic risk indicators that comprise a high share of their GSIB score. The score shares of intra-financial system assets, intra-financial system liabilities, underwritten transactions in debt and equity, OTC derivatives, trading and AFS securities, level 3 assets, cross-jurisdictional claims, and cross-jurisdictional liabilities are all negatively associated with the ensuing growth rate of these systemic risk indicators. Total exposures are an exception. Higher score shares of total exposures are associated with higher growth rate in total exposures in the ensuing year.

To understand whether proximity to an increase or decrease in the surcharge affects how firms manage their GSIB surcharge as a whole, we regress a modified version of the GSIB score on the proximity variables. In calculating the GSIB scores used as the dependent variable, we fix the global denominators at their 2013 values. This modification to the GSIB score calculation neutralizes the effect of changes in global denominators on scores, thereby ensuring that the year-on-year measured change in a firm's GSIB score is due to the changes in its systemic risk indicators. Note that we do not modify the GSIB scores used in calculating the proximity variables (which, therefore, continue to reflect the proximity of a firm's GSIB score at a particular point in time to the surcharge bucket thresholds).

Table 7 presents the results of this regression analysis, including a specification that includes firm fixed effects (specification 1) and an alternative specification that omits firm fixed effects (specification 2).

Table 7. Effect of Proximity to Surcharge Increase or Decrease on Firm-Level GSIB Score

Dependent Variables	Explanatory Variables			
	(1)		(2)	
	LowScore$_{i,t-1}$	HighScore$_{i,t-1}$	LowScore$_{i,t-1}$	HighScore$_{i,t-1}$
Δ% GSIB score$_{i,t}$	0.026	-0.009	0.027	-0.009
	(0.021)	(0.017)	(0.016)	(0.016)
Year Fixed Effects	Yes		Yes	
Firm Fixed Effects	Yes		No	
Notes: N = 276 in all regressions. Standard errors in parenthesis. * = p-value < 0.1; ** = p-value < 0.05; *** = p-value < 0.01. Appendix A presents the descriptive statistics of the variables used in the regression analyses of this paper.				

Similar to most of the regressions for individual systemic risk indicators, the regressions with growth in the GSIB score as the dependent variable do not show a statistically significant association between the dependent variable and the proximity variables. Taken together, the

regression results in Tables 6 and 7 suggest that large banks worldwide generally have not meaningfully changed the growth of their activities relating to systemic risk indicators to manage their GSIB surcharge. The main exceptions are possible reductions on the growth of intra-financial system assets and trading and ASF securities for firms close to an increase in their GSIB surcharge and increases in the growth of total exposures for firms in the lower score range of a GSIB surcharge bucket. The association of total exposures with firms in the lower range of a GSIB surcharge bucket may result from a firm's decision to cross a GSIB surcharge bucket (and, therefore, temporarily score in the lower end of a GSIB surcharge bucket) being associated with a plan for sustained growth of a GSIB's activities.

To further assess the effect of the GSIB surcharge on the systemic risk posed by firms, we consider whether proximity to a change in the GSIB surcharge affects a firm's SRISK (which represents a firm's expected capital shortfall in a potential future financial crisis).[12] If a firm constrains its systemic risk to avoid an increase in the GSIB surcharge, then a negative association between proximity to a change in the GSIB surcharge and SRISK may be expected.

Table 8 presents the results of this regression analysis, including a specification that includes firm fixed effects (specification 1) and an alternative specification that omits firm fixed effects (specification 2).

Table 8. Effect of Proximity to Surcharge Increase or Decrease on a Firm's SRISK

Dependent Variables	Explanatory Variables			
	(1)		(2)	
	$LowScore_{i,t-1}$	$HighScore_{i,t-1}$	$LowScore_{i,t-1}$	$HighScore_{i,t-1}$
Δ% SRISK$_{i,t}$	-0.232 (0.233)	0.040 (0.321)	-0.281 (0.282)	-0.142 (0.332)
Year Fixed Effects	Yes		Yes	
Firm Fixed Effects	Yes		No	
Notes: N = 264 in all regressions. Standard errors in parenthesis. * = p-value < 0.1; ** = p-value < 0.05; *** = p-value < 0.01. Appendix A presents the descriptive statistics of the variables used in the regression analyses of this paper.				

The regressions with the percentage change in SRISK as the dependent variable do not indicate a statistically significant association between the dependent variable and the proximity variables. This suggests that GSIB surcharge is not providing strong incentives for firms to constrain their systemic risk, as measured by SRISK.

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[12] SRISK data comes from NYU Stern's V-Lab Systemic Risk Analysis: https://vlab.stern.nyu.edu/srisk. Note that SRISK data is not available for some of the GSIBs. See Brownlees and Engle (2017) for a description of the SRISK framework.

Regressions based on the GSIB method 2 score applied to US GSIBs

To complement the analysis based on the Basel GSIB surcharge requirement, we perform a similar regression analysis based on the method 2 indicators of the eight US GSIBs.[13] Table 9 displays the results. These regressions use data from 2016 to 2021.[14]

Table 9. Effect of Proximity to Surcharge Increase or Decrease on Method 2 Systemic Risk Indicators

| Dependent Variables | Explanatory Variables | | | | | N |
| | (1) | | (2) | | | |
	$LowScore_{i,t-1}$	$HighScore_{i,t-1}$	$LowScore_{i,t-1}$	$HighScore_{i,t-1}$	Indicator Share of GSIB score	
Δ% total exposures$_{i,t}$	-0.015 (0.029)	-0.002 (0.020)	-0.011 (0.018)	-0.016 (0.016)	-0.115 (0.111)	40
Δ% intra-financial system assets$_{i,t}$	-0.127 (0.119)	-0.213 (0.141)	-0.074 (0.103)	-0.129 (0.118)	-3.456 (1.865)	40
Δ% intra-financial system liabilities$_{i,t}$	0.021 (0.069)	0.027 (0.067)	0.014 (0.064)	0.007 (0.055)	0.307 (0.747)	35
Δ% securities outstanding$_{i,t}$	0.050 (0.042)	0.203** (0.080)	0.067 (0.046)	0.103* (0.053)	-0.231 (0.919)	40
Δ% amount of OTC derivatives$_{i,t}$	0.024 (0.042)	0.170 (0.094)	0.012 (0.032)	0.120 (0.070)	-1.309*** (0.351)	35
Δ% trading and AFS securities$_{i,t}$	-0.079 (0.124)	-0.100 (0.073)	-0.112 (0.092)	-0.152* (0.067)	-1.059 (0.840)	40
Δ% level 3 assets$_{i,t}$	0.0173 (0.224)	0.002 (0.201)	-0.031 (0.148)	-0.016 (0.157)	-1.260 (1.020)	30
Δ% cross-jurisdictional claims$_{i,t}$	0.047 (0.052)	-0.044 (0.058)	-0.003 (0.044)	-0.060 (0.047)	0.165 (0.227)	40
Δ% cross-jurisdictional liabilities$_{i,t}$	0.027 (0.105	-0.086 (0.095)	0.002 (0.089)	-0.136 (0.078)	0.469 (0.724)	40
Δ% short-term wholesale funding$_{i,t}$	-0.065 (0.037)	-0.052 (0.047)	-0.054* (0.026)	-0.061 (0.033)	-0.094 (0.065)	40
Δ% method 2 GSIB score$_{i,t}$	-0.032 (0.056)	-0.051 (0.048)	-0.034 (0.039)	-0.063 (0.034)	---	40
Year Fixed Effects	Yes		Yes			
Firm Fixed Effects	Yes		No			

Notes: Standard errors in parenthesis. * = p-value < 0.1; ** = p-value < 0.05; *** = p-value < 0.01. Appendix A presents the descriptive statistics of the variables used in the regression analyses of this paper.

In specification 1 (with firm fixed effects), *HighScore$_{i,t-1}$* is a statistically significant predictor of the growth of a GSIB's securities outstanding (5% significance). Proximity to an increase in the GSIB surcharge is associated with a 20.3 pp higher growth rate of a firm's securities outstanding.

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[13] The method 2 sample includes the following US GSIBs: BNY Mellon, Bank of America, Citigroup, Goldman Sachs, J.P. Morgan, Morgan Stanley, State Street, and Wells Fargo.

[14] Note that, like in the regressions of Table 6, observations are excluded when a systemic risk indicator does not contribute at least 1% to a firm's GSIB score on average. Therefore, the observations of a few firms are excluded from some of the regressions.

Meanwhile, *LowScore$_{i,t-1}$* is not a statistically significant predictor of any of the method 2 systemic risk indicators for US GSIBs.

In specification 2 (without firm fixed effects), *HighScore$_{i,t-1}$* is a statistically significant predictor of the growth of a GSIB's securities outstanding (10% significance) and trading and AFS securities (10% significance). Proximity to an increase in the GSIB surcharge is associated with a 10.3 pp higher growth rate of a firm's securities outstanding and with a 15.2 pp lower growth rate of a firm's trading and AFS securities. Meanwhile, *LowScore$_{i,t-1}$* is a statistically significant predictor of the growth of a GSIB's short-term wholesale funding score (10% significance). Proximity to a decrease in the GSIB surcharge is associated with a 5.4 pp lower growth rate of a firm's short-term wholesale funding score.

The regressions based on US GSIB surcharge method 2 systemic risk indicators generally do not provide much evidence of an effect of proximity to changes in the surcharge to changes on systemic risk indicators. The lack of statistical significance of effects may partly be due to lack of power of the regressions, as we only have 40 observations at most per regression.

5 – Discussion

Our analysis provides limited evidence that the GSIB surcharge has affected global banks' management of their exposures. For the worldwide sample of GSIBs, we find some association between proximity to an increase in surcharge and a decrease in the growth of intra-financial system assets, underwriting activities, and trading and AFS securities. In the case of US GSIBs and the method 2 GSIB surcharge, we find some association between proximity to an increase in surcharge and a decrease in the growth of trading and AFS securities as well as some association between proximity to the lower bound of a score bucket and a decrease in short-term wholesale funding. We also find a positive association between proximity to lower bound of the surcharge bucket and (1) increase in total exposures and securities outstanding for the worldwide sample of GSIBs and (2) increase in securities outstanding for US GSIBs. Overall, our regression results should be interpreted cautiously. Some of the effects are not consistent across specifications, and some are only statistically significant at 10% significance.

This study aims to enhance the understanding of how the GSIB surcharge affects the systemic risk posed by the largest, most complex international banks. In attempting to do so, we focus on how the GSIB surcharge affects firms' systemic risk indicators over time. This analysis helps understand how banks adjust their activities in response to the capital incentives introduced by the surcharge. Still, this analysis only helps answer how the surcharge affects bank systemic risk to the extent that the indicators considered appropriately measure such risk. We test whether proximity to a GSIB surcharge change affects how a firm's SRISK changes over time and find no effect. There have been numerous other attempts in the academic literature to estimate the systemic risk posed by individual banks, which often have significant limitations (see a discussion in Hawley and Migueis 2021). To the extent that better measures of the systemic risk posed by individual banks are available, future research should assess how the GSIB surcharge affects them.

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Appendix A

Table A.1 – Summary Statistics for Method 1 Regression Variables

Dependent Variables	Summary Statistics							
	N	Mean	SD	Min	Max	P25	P50	P75
Δ% total exposures	276	0.0387	0.0973	-0.3121	0.3468	-0.0157	0.0442	0.0920
Δ% intra-financial system assets	276	0.0443	0.2392	-0.5293	1.3639	-0.0922	0.0272	0.1387
Δ% intra-financial system liabilities	276	0.0379	0.2184	-0.5045	1.0196	-0.0938	0.0110	0.1181
Δ% securities outstanding	276	0.0518	0.1629	-0.5320	0.6180	-0.0413	0.0344	0.1458
Δ% payments activity	276	0.0823	0.1893	-0.4152	1.1438	-0.0204	0.0667	0.1457
Δ% assets under custody	276	0.2074	1.4967	-0.7912	22.8882	-0.0056	0.0697	0.1805
Δ% underwritten transactions in debt and equity markets	268	0.1466	0.5330	-0.7297	6.6452	-0.0407	0.0634	0.2060
Δ% notional amount of OTC derivatives	276	0.0599	0.2613	-0.4333	2.7491	-0.0750	0.0292	0.1468
Δ% trading and AFS securities	276	0.0989	0.6305	-0.8549	7.0775	-0.1535	0.0023	0.2021
Δ% level 3 assets	270	0.1020	1.2036	-1	18.484	-0.1680	-0.0221	0.1628
Δ% cross-jurisdictional claims	276	0.0808	0.1596	-0.3609	1.0043	-0.0052	0.0602	0.1383
Δ% cross-jurisdictional liabilities	276	0.0837	0.2242	-0.4663	1.2937	-0.0331	0.0556	0.1745
Δ% GSIB score	276	0.0412	0.1022	-0.2857	0.3864	-0.0211	0.0297	0.0981
Δ% SRISK	264	0.1909	1.7775	-4.5135	24.4739	-0.1471	0.0291	0.2813
low score	276	0.0978	0.2976	0	1	0	0	0
high score	276	0.1304	0.3374	0	1	0	0	0
total exposures share of GSIB score	276	0.1934	0.0858	0.0379	0.4955	0.1344	0.1767	0.2407
intra-financial system assets share of GSIB score	276	0.0671	0.0246	0.0129	0.1400	0.0512	0.0632	0.0794
intra-financial system liabilities share of GSIB score	276	0.0668	0.0282	0.0121	0.1686	0.0490	0.0642	0.0809
securities outstanding share of GSIB score	276	0.0593	0.0232	0.0078	0.1325	0.0447	0.0580	0.0727
payments activity share of GSIB score	276	0.0683	0.0567	0.0096	0.3727	0.0399	0.0532	0.0769
assets under custody share of GSIB score	276	0.0801	0.1575	0.0009	0.7710	0.0137	0.0322	0.0683
underwritten transactions in debt and equity markets share of GSIB score	276	0.0696	0.0408	0	0.2007	0.0418	0.0615	0.1015
notional amount of OTC derivatives share of GSIB score	276	0.0717	0.0592	0.0008	0.2631	0.0204	0.0594	0.1111
trading and AFS securities share of GSIB score	276	0.0687	0.0393	0.0071	0.2471	0.0421	0.0657	0.0882
level 3 assets share of GSIB score	276	0.0682	0.0490	0	0.2778	0.0336	0.0547	0.1024
cross-jurisdictional claims share of GSIB score	276	0.1075	0.0614	0.0028	0.2616	0.0604	0.1104	0.1417
cross-jurisdictional liabilities share of GSIB score	276	0.1060	0.0586	0.0056	0.2551	0.0578	0.0972	0.1379

Table A.2 – Summary Statistics for Method 2 Regression Variables

Dependent Variables	Summary Statistics							
	N	Mean	SD	Min	Max	P25	P50	P75
Δ% total exposures	40	0.0453	0.1072	-0.1673	0.3468	0.0046	0.0582	0.0994
Δ% intra-financial system assets	40	0.0296	0.2004	-0.2574	0.7720	-0.1174	0.0083	0.0921
Δ% intra-financial system liabilities	40	0.0269	0.1659	-0.4576	0.3376	-0.0552	0.0189	0.1311
Δ% securities outstanding	40	0.0120	0.1704	-0.4367	0.2949	-0.0801	0.0069	0.0943
Δ% amount of OTC derivatives	40	0.0347	0.1768	-0.3157	0.5871	-0.0827	0.0229	0.1152
Δ% trading and AFS securities	40	-0.0244	0.2128	-0.5782	0.3936	-0.1584	-0.0340	0.0980
Δ% level 3 assets	35	-0.0460	0.3950	-1	1.1818	-0.2153	-0.0309	0.0661
Δ% cross-jurisdictional claims	40	0.0693	0.1362	-0.1210	0.6053	-0.0084	0.0495	0.1268
Δ% cross-jurisdictional liabilities	40	0.0697	0.2481	-0.3602	1.1337	-0.0498	0.0075	0.1404
Δ% short-term wholesale funding	40	0.0263	0.0971	-0.1684	0.3001	-0.0254	0.0097	0.0781
Δ% method 2 GSIB score	40	0.0191	0.1032	-0.2036	0.2867	-0.0553	0.0225	0.0540
low score	40	0.3	0.4641	0	1	0	0	1
high score	40	0.2	0.4051	0	1	0	0	1
total exposures share of GSIB score	40	0.1509	0.0843	0.0409	0.3057	0.0651	0.1464	0.2268
intra-financial system assets share of GSIB score	40	0.0430	0.0140	0.0146	0.0727	0.0330	0.0434	0.0532
intra-financial system liabilities share of GSIB score	40	0.0556	0.0336	0.0080	0.1266	0.0259	0.0558	0.0843
securities outstanding share of GSIB score	40	0.0693	0.0355	0.0134	0.1388	0.0370	0.0689	0.0930
amount of OTC derivatives share of GSIB score	40	0.0632	0.0382	0.0038	0.1090	0.0202	0.0786	0.0965
trading and AFS securities share of GSIB score	40	0.0708	0.0325	0.0187	0.1303	0.0488	0.0710	0.0982
level 3 assets share of GSIB score	40	0.0422	0.0320	0	0.1103	0.0211	0.0385	0.0562
cross-jurisdictional claims share of GSIB score	40	0.0664	0.0338	0.0276	0.1444	0.0371	0.0610	0.0808
cross-jurisdictional liabilities share of GSIB score	40	0.0672	0.0340	0.0218	0.1569	0.0487	0.0554	0.0748
short-term wholesale funding share of GSIB score	40	0.3715	0.2129	0.1432	0.6970	0.1820	0.2996	0.5874

Appendix B

As an alternative to the main analysis in this paper, we considered setting the dependent variable as the change in a systemic risk indicator's share of a firm's GSIB score. Table B.1 presents the results of regressions with this alternative dependent variable. Which of the approaches to define the dependent variable is preferable is not obvious to us and their empirical results are qualitatively similar, so we have chosen to define the dependent variable as the percentage change in the systemic risk indicator in the main analysis as that approach is a bit simpler.

Table B.1 – Effect of Proximity to Surcharge Increase or Decrease on Systemic Risk Indicators and Aggregate Method 1 GSIB Score

Dependent Variables	Low Score$_{-1}$ and High Score$_{it-1}$					N
	(1)		(2)			
	LowScore$_{i,t-1}$	HighScore$_{i,t-1}$	LowScore$_{i,t-1}$	HighScore$_{i,t-1}$	Indicator Share of GSIB score	
Δ total exposures score contribution / GSIB score$_{i,t}$	0.005** (0.002)	0.001 (0.003)	0.005** (0.002)	0.001 (0.002)	0.071*** (0.013)	276
Δ intra-financial system assets score contribution / GSIB score$_{i,t}$	0.007* (0.004)	-0.002 (0.003)	0.004 (0.003)	-0.005** (0.002)	-0.147** (0.057)	276
Δ intra-financial system liabilities score contribution / GSIB score$_{i,t}$	0.000 (0.002)	-0.000 (0.002)	0.000 (0.002)	-0.003 (0.002)	-0.068** (0.029)	276
Δ securities outstanding score contribution / GSIB score$_{i,t}$	0.003 (0.002)	-0.000 (0.002)	0.002 (0.002)	-0.001 (0.002)	0.017 (0.023)	276
Δ payments activity score contribution / GSIB score$_{i,t}$	-0.002 (0.003)	0.002 (0.003)	-0.001 (0.003)	0.000 (0.003)	-0.014 (0.018)	276
Δ assets under custody score contribution / GSIB score$_{i,t}$	0.003 (0.002)	-0.001 (0.001)	0.003* (0.002)	-0.000 (0.001)	-0.011*** (0.002)	234
Δ underwritten transactions in debt and equity markets score contribution / GSIB score$_{i,t}$	-0.002 (0.004)	-0.003 (0.003)	-0.001 (0.004)	-0.002 (0.002)	-0.126** (0.036)	256
Δ notional amount of OTC derivatives score contribution / GSIB score$_{i,t}$	0.003 (0.003)	-0.000 (0.003)	0.002 (0.003)	-0.001 (0.002)	-0.070* (0.039)	219
Δ trading and AFS securities score contribution / GSIB score$_{i,t}$	-0.003 (0.006)	-0.008* (0.005)	0.000 (0.004)	-0.004 (0.004)	-0.166** (0.049)	276
Δ level 3 assets score contribution / GSIB score$_{i,t}$	-0.000 (0.007)	-0.006 (0.008)	0.001 (0.006)	-0.001 (0.008)	-0.163** (0.052)	268
Δ cross-jurisdictional claims score contribution / GSIB score$_{i,t}$	0.003 (0.002)	0.001 (0.002)	0.003 (0.002)	0.000 (0.002)	-0.015 (0.009)	271
Δ cross-jurisdictional liabilities score contribution / GSIB score$_{i,t}$	0.002 (0.004)	0.002 (0.003)	0.003 (0.004)	0.002 (0.002)	-0.032* (0.018)	276
Δ GSIB score / GSIB score$_{i,t}$	0.029 (0.022)	-0.010 (0.018)	0.030* (0.018)	-0.009 (0.018)	--	276
Δ SRISK / GSIB score$_{i,t}$	11.964 (12.801)	24.694 (15.715)	13.091 (13.714)	21.668 (14.301)	--	264
Year Fixed Effects	Yes		Yes		--	
Firm Fixed Effects	Yes		No		--	
Notes: Standard errors in parenthesis. * = p-value < 0.1; ** = p-value < 0.05; *** = p-value < 0.01.						

Table B.2 – Summary Statistics for Table B1 Regression Variables

Dependent Variables	Summary Statistics							
	N	Mean	SD	Min	Max	P25	P50	P75
Δ total exposures score contribution / GSIB score	276	-0.0005	0.0151	-0.0543	0.0584	-0.0075	-0.0006	0.0074
Δ intra-financial system assets score contribution / GSIB score	276	-0.0001	0.0142	-0.0696	0.0628	-0.0061	0.0000	.0067064
Δ intra-financial system liabilities score contribution / GSIB score	276	-0.0000	0.0129	-0.0457	0.0626	-0.0064	-0.0004	0.0046
Δ securities outstanding score contribution / GSIB score	276	0.0003	0.0071	-0.0261	0.0299	-0.0044	-0.0001	0.0037
Δ payments activity score contribution / GSIB score	276	0.0008	0.0119	-0.0664	0.0857	-0.0035	0.0005	0.0050
Δ assets under custody score contribution / GSIB score	276	-0.0006	0.0080	-0.0446	0.0327	-0.0022	-0.0002	0.0016
Δ underwritten transactions in debt and equity markets score contribution / GSIB score	268	0.0000	0.0178	-0.0842	0.1346	-0.0062	-0.0003	0.0051
Δ notional amount of OTC derivatives score contribution / GSIB score	276	0.0002	0.0130	-0.0731	0.0597	-0.0023	0.0007	0.0051
Δ trading and AFS securities score contribution / GSIB score	276	-0.0009	0.0208	-0.1210	0.0857	-0.0104	0.0000	0.0102
Δ level 3 assets score contribution / GSIB score	270	-0.0011	0.0287	-0.1935	0.1791	-0.0085	-0.0010	0.0081
Δ cross-jurisdictional claims score contribution / GSIB score	276	0.0006	0.0113	-0.0489	0.0622	-0.0048	0.0004	0.0054
Δ cross-jurisdictional liabilities score contribution / GSIB score	276	0.0013	0.0184	-0.1096	0.0806	-0.0066	0.0015	0.0089
Δ GSIB score / GSIB score	276	0.0464	0.1132	-0.3099	0.3864	-0.0238	0.0317	0.1062
Δ SRISK / GSIB score	264	10.898	90.896	597.037	505.002	32.344	10.208	51.779