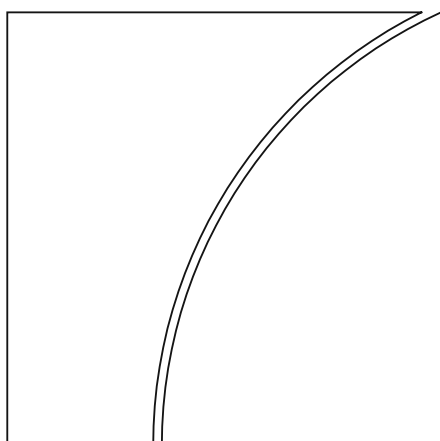# Basel Committee on Banking Supervision

Working Paper 41

G-SIB denominators and scores dynamics: a ten-year assessment

by Massimo Libertucci, Amandine Araujo, Bettina Farkas, Ilaria Petrarca, Alexander Jiron, Florian Naunheim, Roberto Ottolini and Peter Welz

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G-SIB denominators and scores dynamics: a ten-year assessment

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Executive Summary

This paper examines the global systemically important bank (G-SIB) framework ten years after its introduction, covering three complementary perspectives: the evolution of the G-SIB denominators, the relative evolution of scores of G-SIBs and non-G-SIBs, and the adjustments in the balance sheets of G-SIBs.

Since 2013 most G-SIB indicators have grown significantly in nominal terms. This increase is in line with benchmarks for a broader sample of banks than those taking part in the G-SIB assessment. The increase varies across regions, with lower growth rates in Europe and the Americas and higher rates in the rest of the world. The annual growth rates of most denominators spiked at end-2021, primarily due to one-off developments, rather than structural factors.

Since 2013 the average score for G-SIBs has declined, mainly driven by a decrease in complexity and interconnectedness, while the average score of non-G-SIBs has increased. This suggests that the role of G-SIBs in certain activities has been shrinking over time. G-SIBs have increased, however, their relative share in certain other activities (eg cross-border business and payments). The evolution of the scores of non-G-SIBs is more varied than for G-SIBs, with the annual percentage changes in their scores more dispersed and more skewed towards positive values. Overall, the scores of G-SIBs and non-G-SIBs have converged slightly over time.

Finally, the paper presents the results of an econometric analysis that uses a unique data set containing all the G-SIB items reported by banks participating in the G-SIB assessment exercise since 2010. The analysis suggests that G-SIBs have adjusted their balance sheets in a way that is broadly consistent with the incentives of the G-SIB framework.

Introduction

The Basel Committee on Banking Supervision (BCBS) framework for global systemically important banks (G-SIBs)[2] was one of the key responses to the Great Financial Crisis; first introduced in 2011, it was updated in 2013.[3] The BCBS published a first version of the G-SIB methodology in 2011. Two years later the BCBS updated it via the introduction of a formal score calculation (first produced in 2014) associated with higher loss absorbency (HLA) requirements, which were phased in between 1 January 2016 and 31 December 2018 and became fully effective on 1 January 2019. The methodology was revised again in 2018.[4] While both revisions affected several aspects of the framework,[5] the fundamental features of the methodology have remained unchanged over time:[6]

- The methodology relies on an indicator-based quantitative approach to capture the systemic importance of each bank.

- The selected indicators reflect: (i) the cross-jurisdictional activity of the banks; (ii) their size; (ii) their interconnectedness; (iv) the lack of readily available substitutes or financial institution infrastructure for the services they provide; and (v) their complexity.[7] These five categories of systemic importance receive equal weight in the computation of the numerical score that each bank in the sample receives as a measure of its relative systemic importance. The scores are calculated annually in the G-SIB assessment exercise.

- Banks with scores above a minimum threshold, set at 130 basis points, are classified as G-SIBs. The G-SIB score can fall into one of currently existing five buckets. Each bucket determines an incremental higher loss absorbance (HLA) requirement implemented as a capital buffer that needs to be fullfiled with CET1 capital. A bank's score may move between buckets because of absolute or relative changes in a bank's degree of systemic importance compared to the other banks in the sample.

- The methodology allows for the application of supervisory judgment to support the results derived from the indicator-based measurement approach. The use of supervisory judgment is expected to be rare. It must pass a high bar and be approved by the Basel Committee.

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[2] Basel Framework, chapter SCO40, www.bis.org/basel_framework/chapter/SCO/40.htm.

[3] See BCBS (2011) and BCBS (2013).

[4] See BCBS (2018).

[5] BCBS (2013) updated and replaced BCBS (2011) and reflected the lessons learnt from applying the initial assessment methodology at the financial year-ends 2009 to 2011. The list of the main changes relative to BCBS (2011) included: the methodology for determining the sample of banks; the indicator definitions; the application of a cap on the substitutability category; the publication of template and reporting instructions; the process for normalizing banks' scores; the consequences of the empty bucket becoming populated; the fixing of the cutoff score and bucket thresholds; the frequency of updating the denominators; and the disclosure requirements. The further changes introduced by BCBS (2018) and their impact are thoroughly discussed in Part 1.

[6] See FSI (2018).

[7] The 2013 framework comprised 12 indicators: Total exposures (Size category); Intra-Financial System (IFS) assets, IFS liabilities, Securities outstanding (Interconnectedness); Payments activity, Assets under custody, Underwriting activity (Substitutability/financial institution infrastructure); OTC derivatives, Trading and available-for-sale (AFS) securities, Level 3 assets (Complexity); Cross-jurisdictional (CJ) claims, CJ liabilities (Cross-jurisdictional activity).

This paper examines the G-SIB framework ten years after its entry into application.[8] The analysis follows Carvalho et al (2019), which presented a first study of the behaviour of G-SIBs and non-G-SIBs. The following section reviews other works by the BCBS and the Bank for International Settlements (BIS) related to the analysis of the G-SIB framework. The rest of the paper is divided into three parts. Part 1 examines the evolution of the denominators of the indicators of the G-SIB methodology. First, it analyses the long-term trends since the introduction of the methodology. Then, it examines the short-term behaviour of denominators in the last two assessment cycles. Part 2 investigates whether there are significant differences in the evolution of scores between G-SIBs and non-G-SIBs. First, it describes the evolution of the share of the denominators for the two groups. Then, it assesses the scores through various analyses on the evolution of systemic importance across the two groups. Before concluding, Part 3 presents an econometric analysis that assesses whether G-SIBs and non-G-SIBs have adjusted their balance sheets in response to the introduction of the framework – and through these adjustments, whether they have modified their scores – in a statistically significant different way. This analysis makes use for the very first time of a unique data set including all the G-SIB data items reported by banks participating in the G-SIB assessment since 2010.

Review of other related works

Previous BCBS/BIS papers suggest that the behaviour of G-SIBs over the years is consistent with the incentives provided by the G-SIB framework to become less systemically important. This section focuses on those studies from the BCBS, the BIS, or authors whose activities can be reconducted to either one. This paper draws from those contributions, extending the analyses with more recent data and complementing them with different perspectives.

Between 2013 and 2017, most of the G-SIBs had reduced their scores in ways that are consistent with the aims of the G-SIB framework. Carvalho et al (2019) analyse a data set of annual publicly disclosed data on the 12 indicators specified in the G-SIB methodology that was in place at the time. The sample includes 104 banks with a Basel III leverage ratio exposure measure greater than EUR 200 billion between 2013 and 2017. Descriptive statistics reveal that most G-SIBs had reduced their scores during that period, changing their balance sheets consistently with the aims of the G-SIB framework. In contrast, non-G-SIBs had increased their relative scores during the same period. The analysis also reports that the evolution of banks' scores (G-SIB and non-G-SIB) differed across countries/regions.

There is also econometric support for the decline of G-SIBs' systemic importance between 2013 and 2017. Goel et al (2019) estimate the probability of distress on quarterly data of around 500 large global banks from 2005 to 2018. They find that, on average, the probability of default declined significantly relative to the aftermath of the great financial crisis (GFC) and also relative to their pre-crisis levels. For G-SIBs the decline is larger, as expected, and mainly driven by the improvement in G-SIBs' capital ratios and the reduced risks of funding disruptions since the GFC. Notably, the authors also look for shifts in G-SIBs' balance sheet adjustments relative to those of non-G-SIBs before and after the implementation of the framework. The results suggest that the introduction of the framework strengthened some dynamics already observed in the aftermath of the GFC. Specifically, relative to non-G-SIBs, G-SIBs slowed down their growth more significantly, cut their securities holdings less but raised their cash holdings more and reduced the share of uncollateralized borrowing from banks in their overall funding mix.

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[8]   The higher loss absorbency requirements first came into effect in 2014, based on end-2013 data; the identified G-SIBs were subject to the corresponding HLA requirement from 1 January 2016.

These results are consistent with regulatory incentives and existing research. Violon et al (2020) provide empirical evidence on how the framework drove changes on G-SIBs' activity. In a more recent paper Goel et al (2021) look closer into those bank's activity adjustments linking regulatory incentives to profitability using adjusted score values based on fixed denominators and FX rates. Their empirical evidence shows that the less profitable banks lowered their systemic footprint relative to their equally unprofitable peers, which were unaffected by the G-SIB treatment. In contrast, no similar evidence can be identified for more profitable G-SIBs. The authors conclude that an increase in G-SIB loss-absorbency capacity might accelerate the reduction in the scores of the less profitable G-SIBs, thus widening the wedge between these banks and their more profitable competitors. In result, this might increase concentration in the global banking sector and therefore systemic risk.

Part 1: Evolution of denominators

1.1   The long-term picture

This section focuses on the long-term evolution of the denominators of the G-SIB indicators from 2013 to 2022. The sample of banks included in the G-SIB methodology (hereinafter "the assessment sample") is defined by the Basel framework as the 75 largest global banks – based on the financial year-end size category of the G-SIB methodology, defined as the Basel III leverage ratio exposure measure, including exposures arising from insurance subsidiaries.[9] The assessment sample also includes banks that were designated as G-SIBs in the previous year, or that are included via supervisory judgement. The main data set for this analysis consists of the 12 indicators specified in the G-SIB methodology, which were consistently reported from 2013 to 2022.[10]

Since 2013 most indicator denominators have grown significantly in nominal terms – on average by 42% (Graph 1.1). For each G-SIB indicator, the amounts for each bank in the assessment sample are summed together to calculate the respective denominator. The size denominator increased by approximately 55% between 2013 and 2022 (Graph A1.1 in the Annex). However, the over-the-counter (OTC) derivatives notional aggregate amount declined by 18.4% between 2013 and 2020, and then rose rapidly to almost the same level in 2022 as in 2013. The denominator for Level 3 assets[11] also declined after 2013 and started strongly increasing again after 2017.[12] Underwriting activities decreased by around 25% in 2022, the largest decline in a denominator since 2013, almost reverting the strong cumulative increases between end-2019 and end-2021 towards developments seen before.

Exchange rates have also played a role in the evolution of denominators. The dashed lines in Graph 1.1 show estimates of the denominators keeping the euro exchange rates vis-à-vis the local currencies fixed at their 2013 values. Under this assumption, the overall upward trends in denominators remain, but are more muted (with the dashed lines always below the solid lines). This reflects a general depreciation trend of the euro since 2013, with 2021 being the year when the euro depreciated against most major currencies.

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[9] The values of the indicators used in the official scoring had been publicly disclosed by banks with a Basel III leverage ratio exposure measure exceeding EUR 200 billion. The BCBS publicly discloses the indicator values for each bank in the assessment sample since 2013; data can be found at www.bis.org/bcbs/gsib/gsib_assessment_samples.htm. The two trading volume indicators for fixed income and equity and other securities are excluded from this paper. Indeed, these indicators were included in the substitutability and infrastructure category in the current methodology that was applied for the first time in the end-2021 G-SIB assessment.

[10] Unless differently specified, the reference to a year refers to the edition of the assessment that made use of data referring to that year's end (eg 2013 indicates the assessment that used end-2013 data and that was actually run in 2014).

[11] Level 3 assets are typically not traded frequently in active markets, which makes their valuation challenging. Their values can only be estimated using a combination of complex market prices, mathematical models, and subjective assumptions. Examples of Level 3 assets include certain derivatives, private equity investments, and real estate properties.

[12] This finding could be driven by a reclassification effect (that is, a bank reclassifying Level 3 assets into Level 2 assets). In particular any reduction in Level 3 assets could be partially driven by a transfer from Level 3 to the Level 2 category due to increased price transparency.

Denominator of the indicators

Current and former methodology

Graph 1.1

EUR trillions
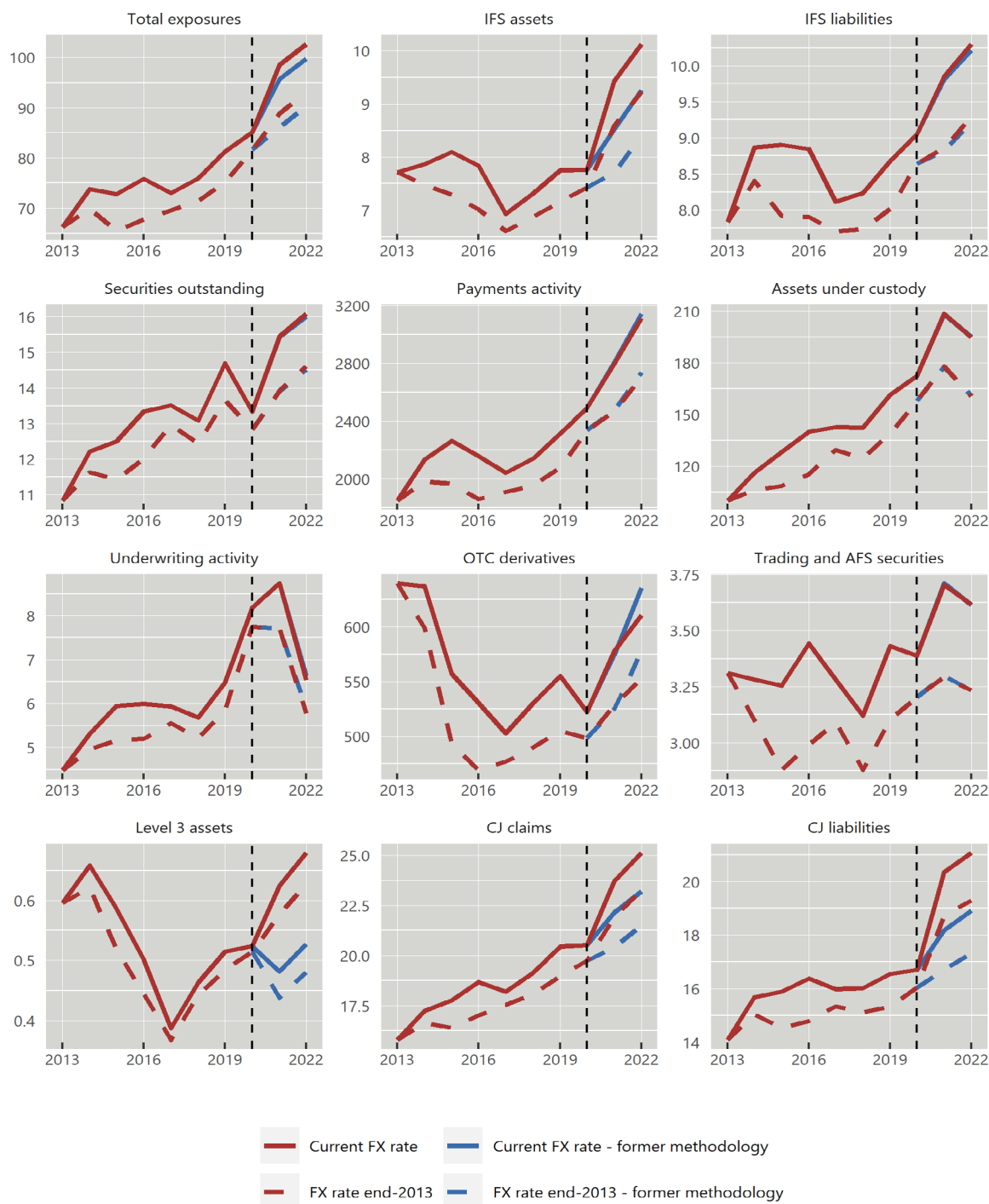
The black dashed line marks the last year the BCBS (2013) methodology (former methodology) was applied. The blue lines show the resulting hypothetical denominator paths for 2021 and 2022 if the former methodology had been applied.

Source: Basel Committee on Banking Supervision, authors' calculations.

G-SIB denominators and scores dynamics: a ten-year assessment

**The evolution of some denominators for banks in the G-SIB assessment sample is in line with benchmarks for a broader sample of banks.** We apply benchmarks – where available based on public FSB and BIS data – from a broader sample of banks focusing on three indicators reported for the G-SIB assessment exercise: size, OTC derivatives and cross-jurisdictional claims. We compare the evolution of the size indicator to the evolution of total bank assets in a comparable set of countries[13] and use comparable statistics for OTC derivatives[14] and cross-jurisdictional claims.[15] Results suggests that the banks in the G-SIB assessment sample have not evolved significantly differently from these broader samples of banks; if anything, the G-SIB denominators have grown less than benchmarks, notably OTC derivatives (Graph 1.1.2).

Benchmarks of selected denominators   Graph 1.1.2

Total exposures   OTC derivatives   CJ claims
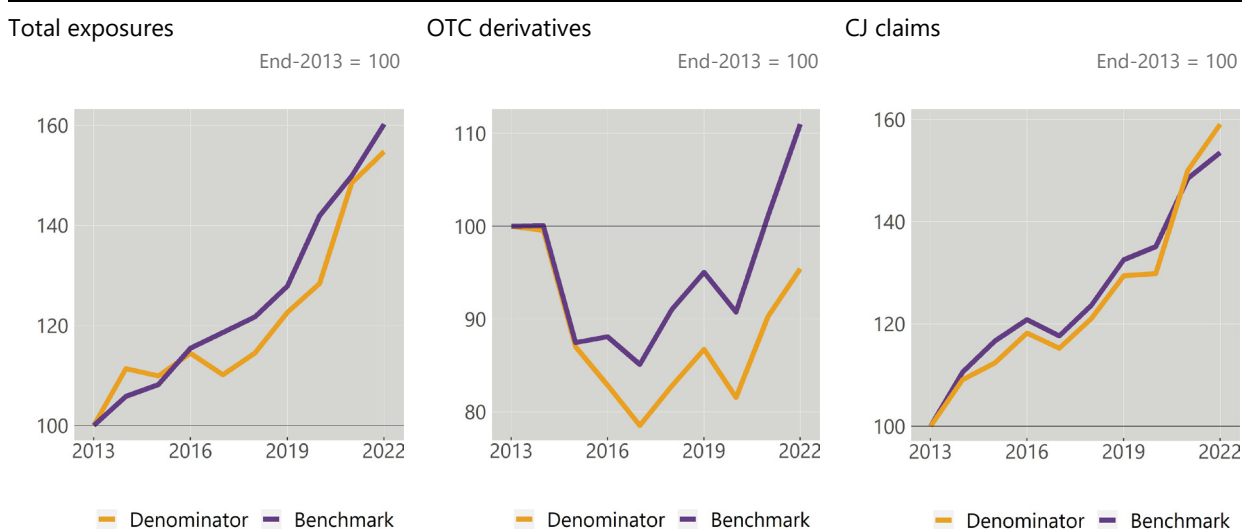
Comparison of the evolution over time of a given denominator with a corresponding benchmark. All values are normalised with the end-2013 values being equal to 100. Size indicator benchmark: FSB Global Monitoring Report on Non-Bank Financial Intermediation 2022, Monitoring data set, value of total financial assets of banks of G29 countries; values in USD converted into EUR using a constant end-2022 exchange rate. OTC derivatives indicator benchmark: BIS OTC derivatives statistics, Table D5.1, notional amounts outstanding and Table D5.2, notional amounts outstanding of credit default swaps; values in USD converted into EUR using year-end exchange rates. Cross-jurisdictional claims indicator benchmark: BIS consolidated banking statistics, Table B1, foreign claims on a guarantor basis, all reporting countries, all instruments, all sectors, all maturities, all currencies; values in USD converted into EUR using year-end exchange rates.

Source: Basel Committee on Banking Supervision, BIS and FSB data, authors' calculations.

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[13]   FSB Global Monitoring Report on Non-Bank Financial Intermediation, available at www.fsb.org/2022/12/global-monitoring-report-on-non-bank-financial-intermediation-2022/.

[14]   BIS OTC derivatives statistics [1]: Global total (all risk categories) (net - net), for total (all instruments), total (all currencies), total (all currencies), total (all maturities), total (all counterparties), all countries (total), all countries (total), total (all ratings), total (all sectors), total (all methods), outstanding - notional amounts; and [2]: Global credit derivatives (net - net), for credit default swaps, total (all currencies), total (all currencies), total (all maturities), total (all counterparties), all countries (total), all countries (total), total (all ratings), total (all sectors), total (all methods), outstanding - notional amounts (available at data.bis.org/topics/OTC_DER).

[15]   BIS consolidated banking statistics, banks from all reporting countries - consolidated total claims in all currencies with residents of all countries (total) (guarantor basis), all sectors (amounts outstanding / stocks, all instruments, total (all maturities)) (available at data.bis.org/topics/CBS).

The growth of denominators has been heterogeneous across regions, with lower growth rates in Europe and the Americas and higher rates in the rest of the world. Indicators for banks in the rest of the world[16] grew on average the most since 2013 (+141%), while the lowest growth rates are observed for banks in Europe (+3%) (Graph 1.2(a) and Graph A1.2(a) in the Annex). These differences are only partly due to exchange rate developments: under the fixed exchange rate assumption, the ranking of regions remains valid. This suggests partly faster organic growth for banks in the rest of the world.

Accordingly, banks in the rest of the world region have increased their weight in the global denominators, while the weight of European banks declined. The geographical mix of banks in the assessment sample has changed over time (Graph 1.2(b)). The number of European banks in the assessment sample declined, while more banks from the rest of the world entered and the number of banks from the Americas was largely unchanged. Banks enter the assessment sample based on their size; therefore, the dynamics that outline the composition of the assessment sample reflect a relative shift of relevance – in terms of their overall size – from European banks to the banks of the rest of the world. Across all indicators the rest of the world increased its average share in denominators from 20% to 32%. At the same time Europe's share declined from 47% to 35% and the share of the Americas remained at about one third. Finally, the overall impact of exchange rate developments has had modest effects only on the contributions to indicator developments for the three regions. This evidence (Graph 1.2(b) and Graph A1.2(b) in the Annex) reflects the fact that the euro exchange rate developments against the currencies in these regions were relatively similar.
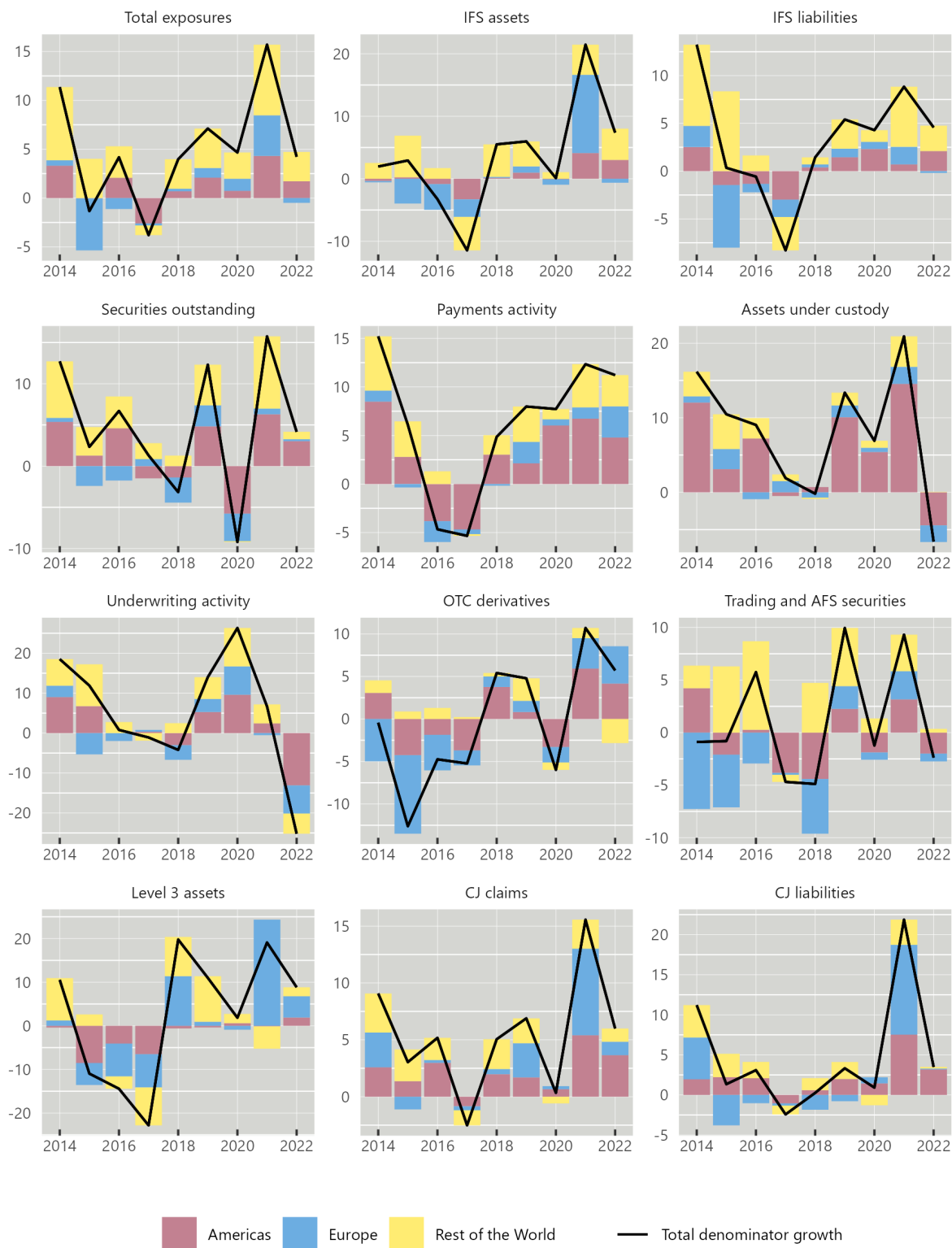
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[16]   Regions are defined as follows: Americas: Brazil, Canada, US; Europe: Switzerland, Germany, Denmark, Spain, Finland, France, Great Britain, Italy, Netherlands, Norway, Sweden; Rest of the world (ROW): Australia, China, India, Japan, Korea, Russia (until 2021), Singapore.

Denominators of the indicators by region

Average annual growth rate of denominator and contribution by region

Graph 1.2(a)

Per cent

Total exposures

IFS assets

IFS liabilities

Securities outstanding

Payments activity

Assets under custody

Underwriting activity

OTC derivatives

Trading and AFS securities

Level 3 assets

CJ claims

CJ liabilities

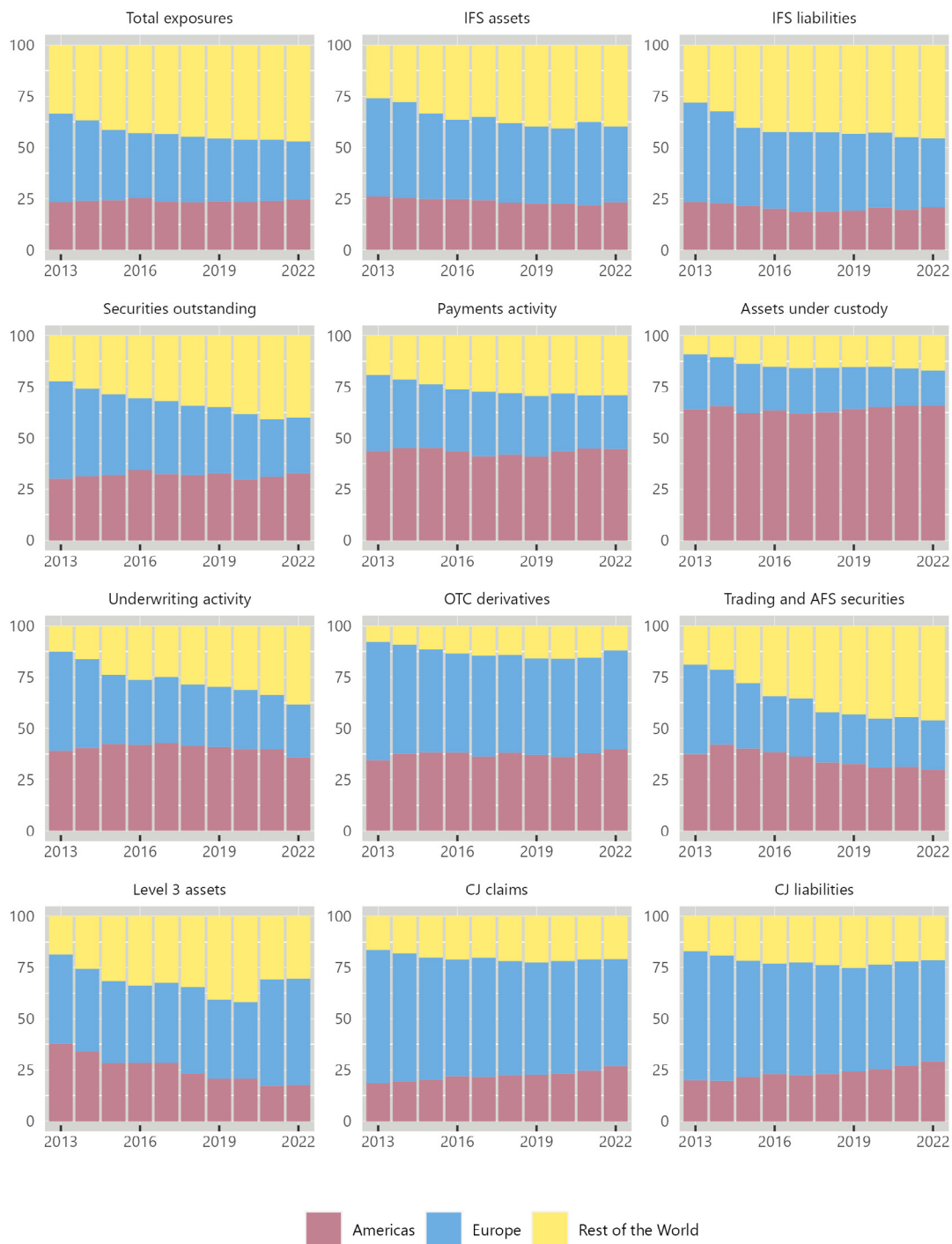Americas   Europe   Rest of the World   —— Total denominator growth

Source: Basel Committee on Banking Supervision, authors' calculations.

Denominators of the indicators by region

Contribution of regions to denominators over time   Graph 1.2(b)

Source: Basel Committee on Banking Supervision, authors' calculations.

1.2 Zooming in on the increase in denominators between end-2020 and end-2021

In 2018 the BCBS introduced a revised assessment methodology for G-SIBs, which entered into application in 2022 based on end-2021 data.[17] The revisions introduced several enhancements to the G-SIB framework: (i) amending the definition of cross-jurisdictional indicators consistent with the definition of BIS consolidated banking statistics and including foreign derivatives claims/liabilities; (ii) introducing a trading volume indicator and modifying the weights within the substitutability category; and (iii) extending the scope of consolidation to insurance subsidiaries for several indicators.[18]

Overall, in the year of the application of the new methodology all denominators grew significantly, with the largest average year-on-year increase since the data reporting started (+14.9%). Between end-2020 and end-2021, all denominators grew year on year (yoy), with nine denominators increasing by more than 10%. The biggest surges in the denominators are observed for cross-jurisdictional liabilities (+21.9%), intra-financial system assets (+21.5%) and assets under custody (+20.9%).

Increases in the denominators were more moderate between end-2021 and end-2022. In that period, only one of the original methodology's 12 denominators (the payments activity indicator) increased by more than 10%, following a 12.3% increase between end-2020/21, while three denominators declined: underwriting activity (-25.2%), assets under custody (-6.6%), and trading and available-for-sale securities (-2.4%).

We assess four factors that may have affected changes in the denominators: sample changes, FX rates, methodology changes, and business developments. The first one captures the contribution of banks added to or removed from the assessment sample between two periods. The second factor captures changes in the exchange rates between the reporting currencies of the assessment sample banks vis-à-vis the euro. As the reported indicators of all banks are converted to euros, depreciation of the euro against the banks' reporting currencies increases the denominators. The third factor captures changes in the G-SIB assessment methodology, which is only relevant for the period between end-2020 and end-2021 when the revisions were implemented for the first time. The amendments to the definition of cross-jurisdictional indicators and the extension of the scope of consolidation to insurance subsidiaries may have affected the relevant denominators. The fourth factor captures the changes related to any business developments of banks included in the assessment sample.

The spike in denominator growth rates between 2020 and 2021 was chiefly due to the change in methodology and FX rates; these dynamics were not sustained between 2021 and 2022, suggesting a one-off development rather than a structural one. Graph 1.3 displays the total change in denominators and its decomposition into the four factors between end-2020/21 and end-2021/22. Between end-2020 and end-2021, the changes in FX rates had a positive impact of 5.6 pp on average on all the denominators, while the methodology change had a positive impact on nine out of 12 indicators, with the largest positive impact on Level 3 assets, cross-jurisdictional liabilities and intra-financial system assets. The impact of sample changes was limited across the denominators, and business developments of banks had a mixed impact, being positive for 10 and negative for two of the original methodology's 12 indicator denominators. In contrast, between end-2021 and end-2022, changes in FX rates had a much

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[17] Available at www.bis.org/bcbs/publ/d445.pdf and as part of the Basel Framework Scope and Definitions (SCO) Standards (SCO40 – Global Systemically Important Banks). The revised methodology was first implemented in 2022, using end-2021 data. The revised methodology was scheduled to be implemented in connection with the end-2020 G-SIB assessment but was postponed until the end-2021 G-SIB assessment to allow for additional operational capacity for banks and supervisors during the Covid-19 pandemic. See Basel Committee sets out additional measures to alleviate the impact of Covid-19, 3 April 2020, www.bis.org/press/p200403.htm.

[18] The extension of the scope of consolidation to include insurance subsidiaries affected the following indicators: the total exposure measure (size category); intra-financial system assets, intra-financial system liabilities, securities outstanding (interconnectedness); notional amount of OTC derivatives and Level 3 assets (complexity).

smaller impact (around 1.3 pp on average) with an overall positive contribution to the change of the denominators. Sample adjustments had a noticeable negative impact on trading volume equities and other securities sub-indicator and on the notional amount of OTC derivatives denominator. Most of the changes in the indicators were related to business developments. Overall, the results suggest that the observed increase in the denominators between 2020 and 2021 can be mostly explained by FX rate movements and methodology changes, pointing towards a one-off development on the level of denominators rather than a structural increase in denominator growth rates.

Change in denominators   Graph 1.3

End-2020 to end-2021   End-2021 to end-2022
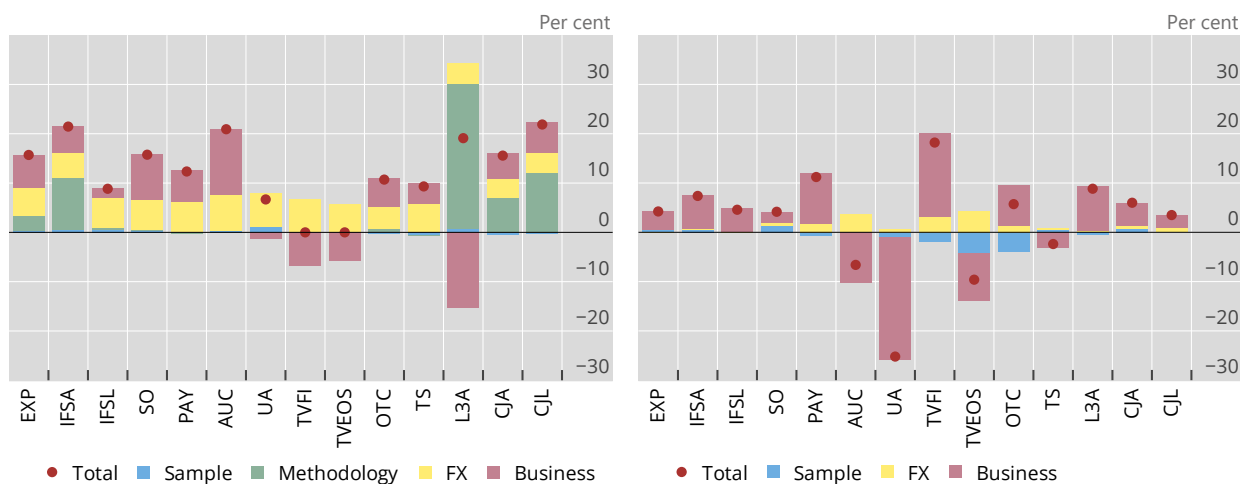
The graphs display the total change in denominators and its decomposition between end-2020 and end-2021 as well as end-2021 and end-2022 into four factors. The first one (Sample) captures the contribution of banks added to or removed from the assessment sample between two periods. The second factor (Methodology) captures changes in the G-SIB assessment methodology, which is only relevant for the period between end-2020 and end-2021. The third factor (FX) captures changes in the exchange rates between the reporting currency of the assessment sample banks vis-à-vis the euro. The fourth factor (Business) captures the changes related to any business developments of banks included in the assessment sample.

Source: Basel Committee on Banking Supervision, authors' calculations.

Part 2: Relative evolution of scores of G-SIBs and non-G-SIBs

2.1.   Differences in the global denominators

To analyse any significant divergence in the change in scores between G-SIBs and non-G-SIBs we first assess the evolution of the denominators for the two groups. The G-SIB sample comprises banks designated as G-SIBs in each annual assessment. As the G-SIB list can change each year, our sample of G-SIBs is not balanced over time.[19] The non-G-SIB sample encompasses all the remaining banks that are part of the assessment sample.

The denominator dynamics between G-SIBs and non-G-SIBs have been heterogeneous; the largest divergence is observed for the complexity indicators and – to a lesser extent – for the interconnectedness, substitutability and cross-jurisdictional activity indicators. Graph 2.1 plots the indexed values in each assessment year of the indicators reported by G-SIBs and non-G-SIBs compared to the inception of the methodology. Graph A2.1(a) available in the Annex plots their absolute amounts. The evolution of the denominators differs more strongly for the indicators of complexity. When compared to their 2013 amounts, they have been consistently lower and often decreasing for G-SIBs, and higher and generally increasing for non-G-SIBs.[20] When looking at the remaining categories, all denominators were larger in 2022 than in 2013 for both groups of banks; nevertheless, there are differences, particularly for intra financial system assets and liabilities (interconnectedness), assets under custody (substitutability), and cross jurisdictional liabilities (cross-jurisdictional activity). Although the dynamics in these indicators differ significantly between non-G-SIBs and G-SIBs, their impact on total denominators is limited, as the volumes associated with non-G-SIBs are relatively low. For the remaining indicators, the denominators have followed similar patterns across both groups of banks. These findings are confirmed when fixing exchange rates at their end-2013 values (see Graph A2.1(b) in the Annex).
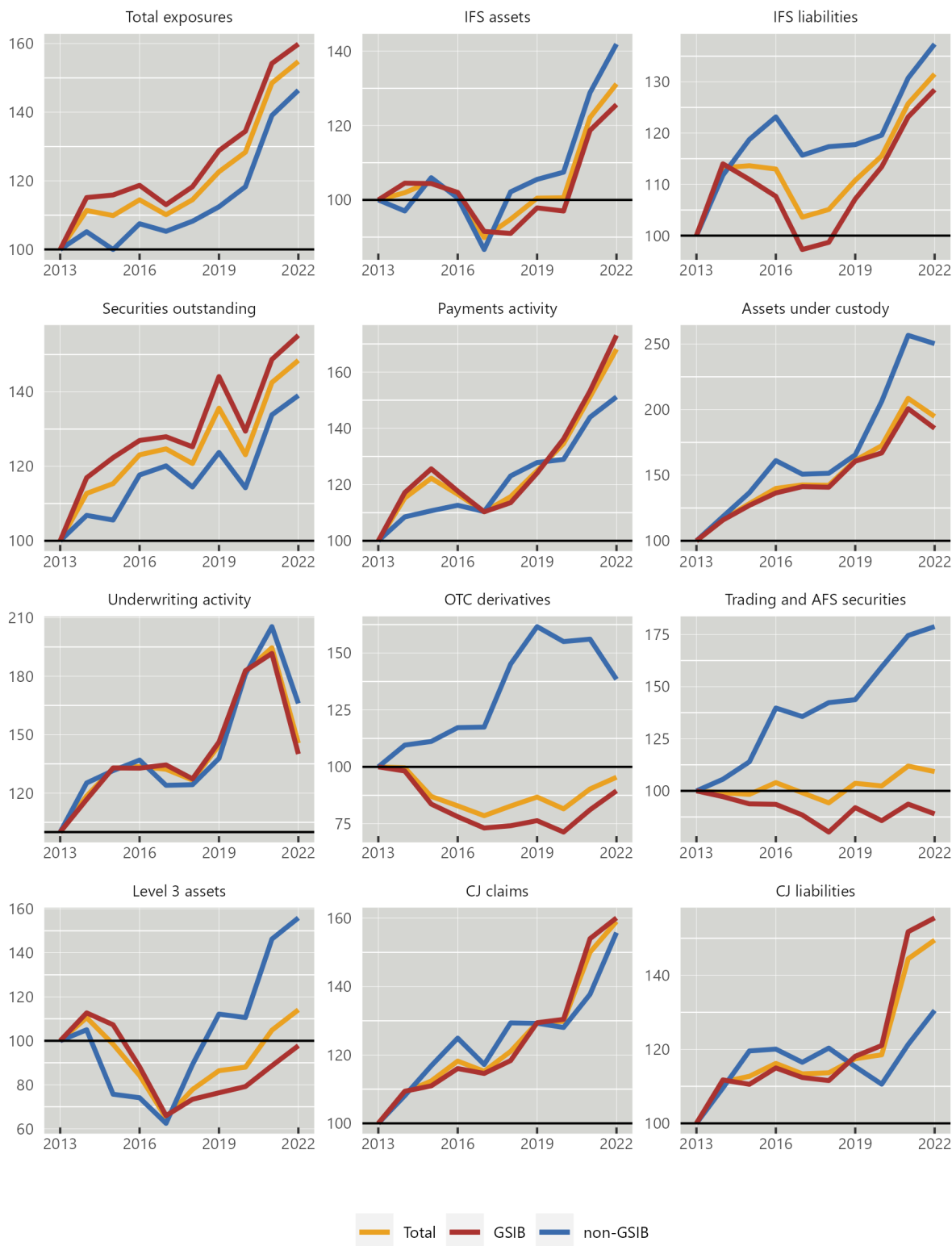
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[19]   The total number of banks identified as G-SIBs has been broadly stable over the years: their number has ranged between 29 and 30 when including also those banks designated as G-SIBs through supervisory judgement. However, only 25 banks have always been identified as G-SIBs throughout the entire period (2013-2022) spanned by the methodology. Eight banks have changed status over this period: four have become G-SIBs (Toronto Dominion (CA), RBC (CA), China Construction (CN) and Agricultural Bank of China (CN)), two of them have no longer been designated as G-SIBs (BBVA (ES) and Unicredit (IT)), and one is no longer included in the assessment sample (RBS (GB)). Moreover, in 2023 Credit Suisse (CH) was taken over by UBS (CH).

[20]   The values reported by G-SIBs for OTC derivatives, trading and AFS securities and Level 3 assets declined by 10.5%, 11% and 2% respectively. In the same timeframe, the same values reported by non-G-SIBs increased by 30%, 79% and 56%, albeit from lower levels.

Denominator of the indicators: G-SIBs vs non-G-SIBs

Graph 2.1

End-2013 = 100

Total exposures

IFS assets

IFS liabilities

Securities outstanding

Payments activity

Assets under custody

Underwriting activity

OTC derivatives

Trading and AFS securities

Level 3 assets

CJ claims

CJ liabilities

Total — GSIB — non-GSIB

Source: Basel Committee on Banking Supervision, authors' calculations.

These dynamics affected the contribution of G-SIBs to the global denominators, which shrunk most for complexity indicators, while staying broadly constant for most of the remaining indicators. Graph 2.2(a) shows the share of each indicator's denominator associated to G-SIBs and non-G-SIBs. For OTC derivatives, trading and AFS securities and – except for the early years of the methodology – for Level 3 assets, the share of G-SIBs has decreased over time.[21] These findings are confirmed when looking at the average annual growth rates of denominators between the two groups of banks (see Graph A2.2 in the Annex).

Extending the analysis beyond the methodology's assessment sample reveals that the role of G-SIB has been shrinking across all categories of systemic importance, suggesting a decrease in the importance of G-SIBs even when measured against a broader sample of banks. Since the G-SIB framework relies on a relative scoring methodology, it is heavily dependent on the definition of the reference sample (ie the assessment sample), which is meant to include a broadly constant number of banks over time. A drawback of this approach is that the assessment sample is a self-contained universe: indeed, it does not account for how the banks in the assessment sample have evolved with respect to the rest of the banking system, the broader financial system or the world economy.

We extend the previous analysis by using the values reported by all banks subject to the G-SIB disclosure requirements that have participated to the G-SIB assessment exercise over the years. Differently from the assessment sample, this sample of banks is defined as all banks with a leverage ratio exposure measure (including exposures arising from insurance subsidiaries) that exceeded EUR 200 billion in the previous year-end.[22] As a consequence of this nominally fixed threshold, the number of banks that are part of the total sample has increased over time because of new entrants, also reflecting the developments in the broader banking sector. The total sample has grown from 86 banks in 2013 to 107 in 2022. Graph 2.2(b) shows how the contribution to the total values of indicators of banks that are part of the assessment sample – either G-SIBs or non-G-SIBs – has evolved when all participating banks are considered. The contribution of relatively smaller banks – that is, those banks larger than EUR 200 billion, but not large enough to make it to the top-75 list – has increased over time across almost all indicators. This surge was particularly strong for securities outstanding (interconnectedness, from 4% to 13%), Trading and AFS securities (complexity, from 3% to 12%) and Level 3 assets (complexity, from 2% to 14%). As a corollary of the progressively larger role of smaller banks, the role of G-SIBs has shrunk across all indicators. This suggests that the systemic importance of G-SIBs has been decreasing when considering a broader definition of the banking system. This is also in line with the findings in Part 1.[23]

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[21]   For OTC derivatives, trading and AFS securities and for Level 3 assets the share attributable to G-SIBs changed from 88%, 77% and 72% in 2013 to 82%, 63% and 62% in 2022 respectively.

[22]   SCO40.32-34 define disclosure requirements. For each financial year-end, all banks with a leverage ratio exposure measure, including exposures arising from insurance subsidiaries, which exceeded EUR 200 billion in the previous year-end (using the exchange rate applicable at the financial year-end) should be required by national authorities to make publicly available the indicators used in the assessment methodology. Banks should note in their disclosures that those figures are subject to revision and restatement.

[23]   This is also confirmed when comparing average denominators of these three groups of banks. On average across time and indicators, average denominators of G-SIBs have grown less than the average denominators of non-G-SIBs, both in the assessment sample and in the additional sample.

Contribution of G-SIBs and non-G-SIBs to the denominator of the indicators

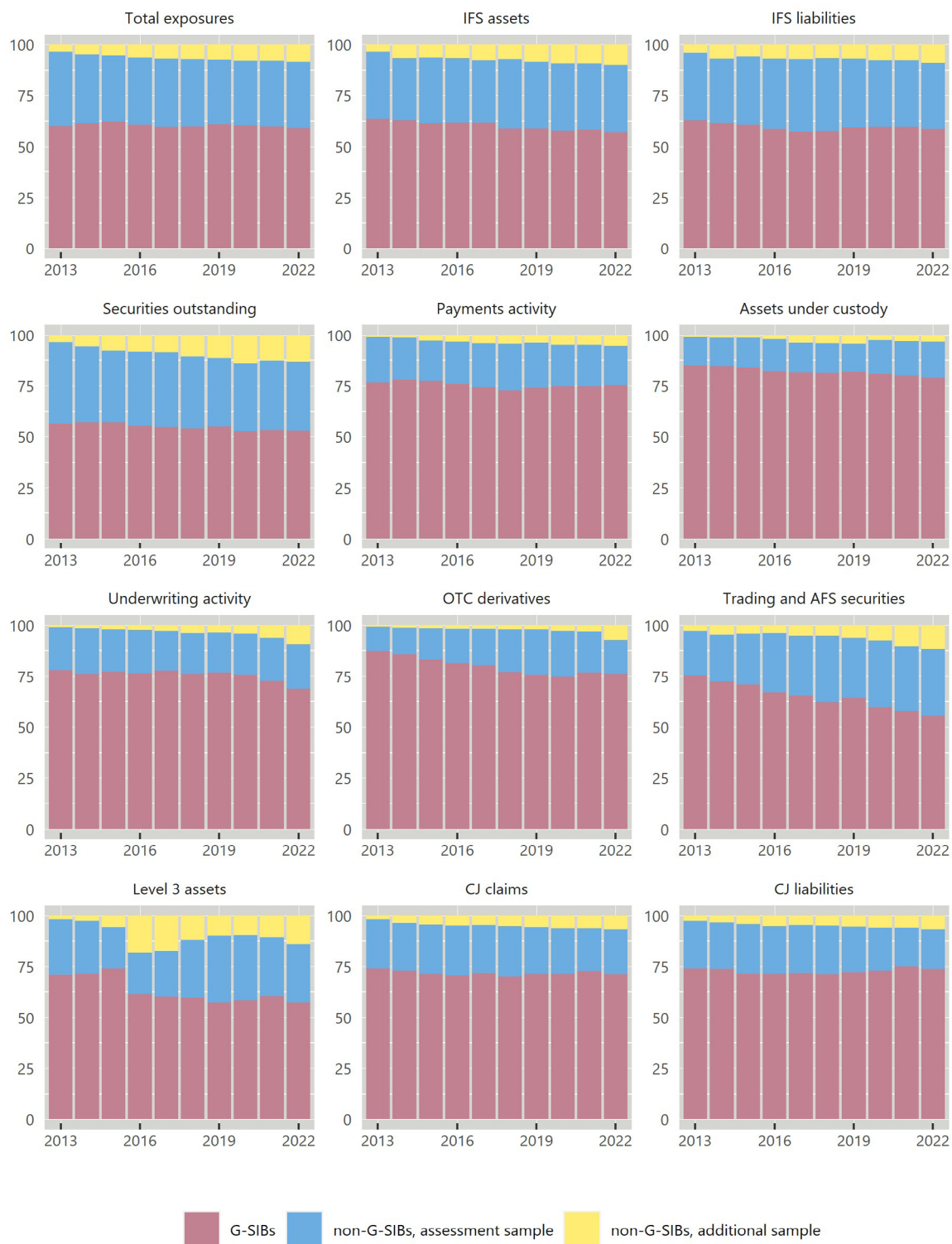Assessment sample   Graph 2.2(a)

Per cent
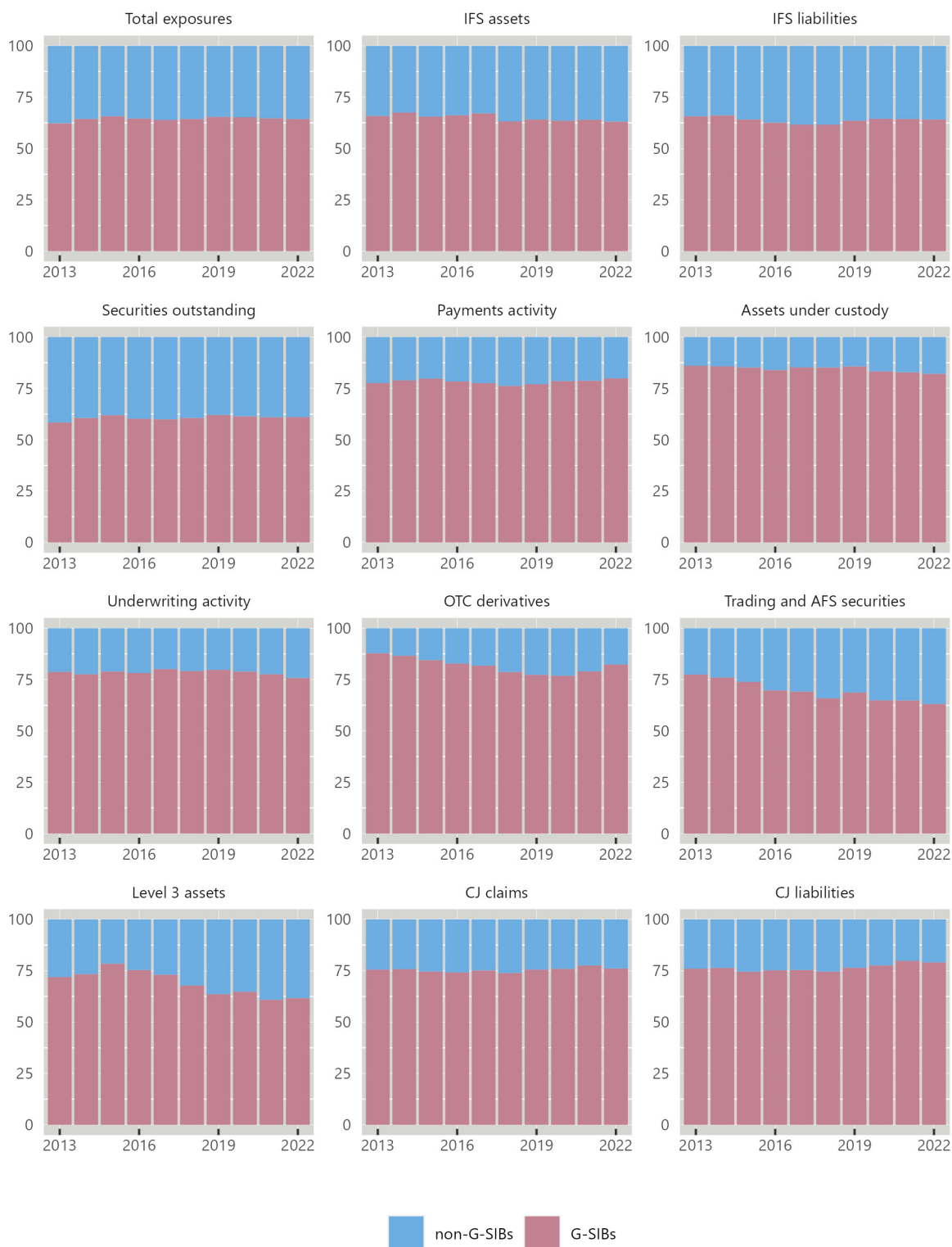
non-G-SIBs   G-SIBs

Source: Basel Committee on Banking Supervision, authors' calculations.

Contribution of G-SIBs and non-G-SIBs to the denominator of the indicators

Total sample   Graph 2.2(b)

Per cent

G-SIBs   non-G-SIBs, assessment sample   non-G-SIBs, additional sample

Source: Basel Committee on Banking Supervision, authors' calculations.

2.2 Differences in G-SIB scores

The scores of non-G-SIBs have grown more on average than those of G-SIBs and their growth rates are more dispersed. We can calculate how each reporting bank's score has evolved yoy. Graph 2.3, left panel, shows the density of yoy growth in scores across time and banks. The density for G-SIBs tends to be more concentrated around zero, while the density for non-G-SIBs is more skewed towards positive values and more dispersed. Moreover, the scores of several non-G-SIBs have grown substantially more than most of the other non-G-SIBs, in the order of 30% to 40%, as shown by the right tails of the density and in the scatterplot (Graph 2.3, right panel). In addition, the Annex presents evidence based on absolute score changes measured in basis points, rather than percent of previous year's score levels (Graph A2.3), and further evidence on the concentration of denominators between the two groups of banks (Graphs A2.3.2 and A2.3.3). When comparing the two concepts of growth in scores as annual percentage changes and absolute change in scores in basis points it is quite natural that relative score changes of smaller banks may be larger than those for larger banks given lower initial score levels of smaller banks. However, measured in basis points larger banks see larger variations in their score levels as the underlying absolute indicators amounts can vary more than those of smaller banks.

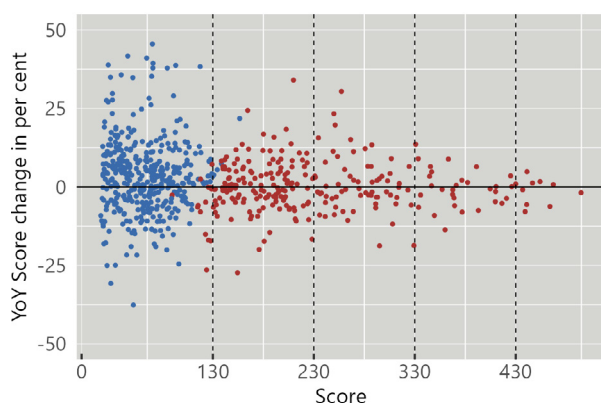Score change   Graph 2.3

Density of yoy-score change   Percentage score change vs total score
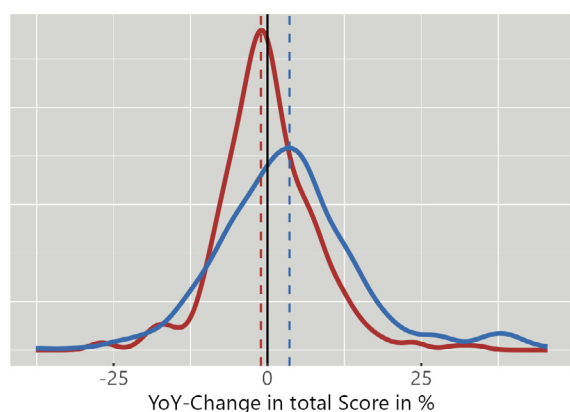
Source: Basel Committee on Banking Supervision, authors' calculations.

2.3 Systemic importance from the G-SIB framework's perspective

G-SIBs have decreased their average score by 12 bp (5%) since the introduction of the framework, while the average score of non-G-SIBs has increased by 1.5 bp (2.6%). In this section we analyse the evolution of the systemic importance of G-SIBs. In line with the framework, we use G-SIB scores – and their evolution over time – to capture systemic importance. Graph 2.4, left panel, shows the changes of the average scores for G-SIBs relative to 2013, and a breakdown in the five main categories used by the G-SIB framework. First, the average score for G-SIBs has decreased over time, by 12 bp. Conversely, the average scores of non-G-SIBs increased by 1.5 bp (Graph 2.4, right panel).

The cumulative decrease in the average score of G-SIBs since 2013 is mainly driven by a reduction in complexity and interconnectedness. By the end of 2022 all categories contributed negatively to the decline in the average score of G-SIBs, with complexity accounting for the largest part with 8.5 bp and interconnectedness contributing 1.8 bp. In addition, in 2022 the contribution from size turned negative (-0.1 bp) after pushing averages scores up most of the time.

The average score of non-G-SIBs increased only marginally between 2013 and 2022 by 1.5 bp (Graph 2.4, right panel). In terms of driving forces the picture is reversed with respect to G-SIBs: by 2022, complexity was the only positive contributor with 4.1 bp, while size (-1.2 bp) and cross-jurisdictional activity (-1.0 bp) are the two largest drags on the average score of non-G-SIBs.

Score change

Contribution of categories to average score change for G-SIBs (LHS) and non-G-SIBs (RHS)   Graph 2.4
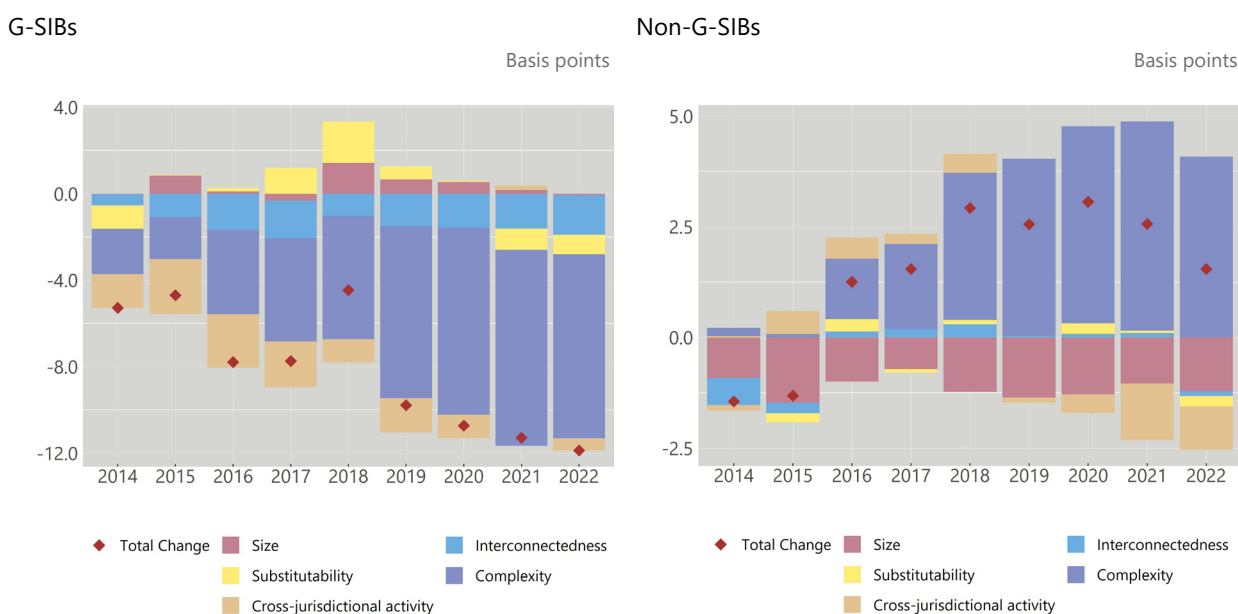
G-SIBs   Non-G-SIBs

Decomposition of the average changes in the scores of G-SIBs and non-G-SIBs relative to 2013, based on the five indicator categories. A G-SIB is any bank designated as such in a given year.

Source: Basel Committee on Banking Supervision, authors' calculations.

The evolution of individual bank scores is more nuanced, but there are indications of some convergence over time. To examine the evolution of the scores of G-SIBs and non-G-SIBs since the introduction of the framework, we first compare banks' scores at the first and last assessment cycle (end-2013 and end-2022 respectively) for a balanced sample of 61 banks. Scores of G-SIBs have decreased for 18 out of the 27 G-SIBs in 2013, while the scores of non-G-SIBs have increased for 24 out of the 34 non-G-SIBs in 2013 (Graph 2.5, left panel). This is in line with the incentives that the G-SIB framework provides by imposing a penalty – in the form of the HLA capacity – for the most systemically important banks. More broadly, these findings indicate some convergence in scores over time, also at bank level: banks with smaller scores (the non-G-SIBs) have on average increased their scores, while banks with larger scores which are subject to the HLA requirement (G-SIBs) have on average decreased their scores in the ten years since the introduction of the methodology (Graph 2.5, right panel).

We have found formal evidence of convergence between scores. To test more formally any evidence of convergence in score within our sample, we estimate the following model:
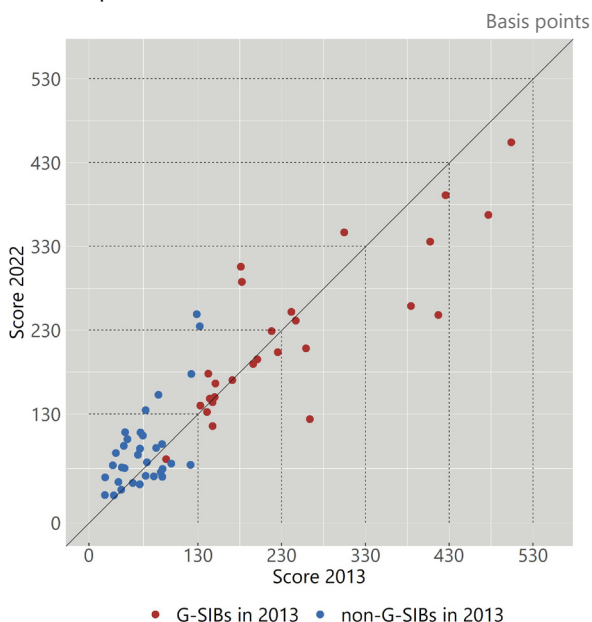
$$\log(Score_{i,2022}) - \log(Score_{i,2013}) = \alpha + \beta \log(Score_{i,2013}) + \varepsilon_{i,t} \qquad [1]$$

where i is a bank in this sample. The estimate of the β coefficient is negative (-0.29) and significant (t-statistic =-5.36) (see Table A1 in the annex for further results). This result confirms that the growth of the score is inversely related to the level it had at the inception of the framework. [24] In line with standard literature on income convergence we interpret this result as an indication of the fact that the initial differences in scores between banks have shrunk over time.[25]
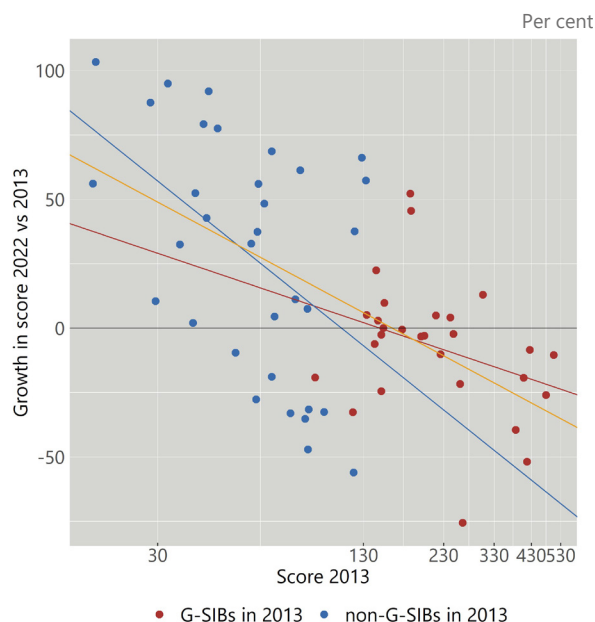

Score change   Graph 2.5

Score comparison: 2013 vs 2022   Growth in score[1]

(1) The "Score 2013" x-axis is in log-scale and shows the tick mark labels for the bucket cut-off values. "Growth in scores 2022 vs 2013" is defined as: (100*(log(Score2022)-log(Score2013))). The amber, red and blue solid lines show the regression lines for model [1] fitting data for the assessment sample, the G-SIBs and the non-G-SIBs respectively.

Source: Basel Committee on Banking Supervision, authors' calculations.

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[24]   This analysis borrows from the literature on income convergence (Durlauf et al (2009)), which refers to this concept as β-convergence. We obtain the same outcome when we focus on an alternative convergence concept, which focuses on the cross-section dispersion of the (log of) scores across banks, and if it is increasing or shrinking. In that literature a reduction in the dispersion of log-income can be interpreted as convergence because it suggests that the differences in scores have abated. If σ_t is the standard deviation across the i banks in the sample of the (log of the) score in a given year t, σ-convergence occurs between 2013 and 2022 if $\sigma_{2022}-\sigma_{2013}<0$. This is the case for the banks in the assessment sample: the variance of the (log of) scores decreased from 0.46 in 2013 to 0.45 in 2022; for the level of the scores in basis points the standard deviation declined by 19 bp from 119 to 100.

[25]   Not only did the convergence of the score take place for the all the banks in the assessment sample, but also within the two sub-samples of G-SIBs and non-G-SIBs. We re-estimated model [1] for each sample separately. Also in this case, we obtain negative coefficients (G-SIBs in 2013: $\hat{\beta}$=-0.18; Non-G-SIBs in 2013: $\hat{\beta}$=-0.44). For the G-SIB sample, this indicates that these banks have become more similar in terms of their systemic footprint.

The evolution of the scores of G-SIBs and non-G-SIBs must be interpreted in light of the relative methodology of the G-SIB framework. For example, if each bank in the assessment sample uniformly doubled the amounts of their indicators, their G-SIB scores would be unaffected. However, ceteris paribus the systemic importance of the banks in the assessment sample relative to the worldwide economy and the broader financial sector would have increased. To account for this feature of the G-SIB methodology we assess how G-SIBs' scores have evolved relative to alternative benchmarks (Graph 2.6, right panel), following the analysis in Goel et al (2019). First, we relax the relativity assumption of the framework by calculating the hypothetical average score of G-SIBs that results, if both denominators and exchange rates were kept constant at their 2013 values while indicator values at bank level changed over time (Graph 2.6, right panel, dashed line). In this scenario G-SIBs' systemic importance initially declined, then plateaued in the period 2015-2016; and then steadily increased afterwards, more than offsetting the initial decline. This can be interpreted as the overall growth relative to 2013 of G-SIBs when measured by their indicators, that is their business activity.

The average score of G-SIBs has also declined over time relative to the broader economy and the rest of the financial system. To show this we assess how the average systemic importance of G-SIBs has evolved relative to the broader economy and the rest of the financial system. For this purpose, we also calculate alternative hypothetical G-SIB scores by adjusting the end-2013 denominators using proxies of the developments of either the world economy (nominal global GDP growth) or the financial sector (global banking assets and global banking and non-banking financial intermediaries' assets). Specifically, in this scenario it is assumed that the dynamics of the denominators follow respectively those of the above external benchmarks, eg in the case of nominal global GDP the annual growth rates of all denominators are assumed to be equal to annual nominal global GDP growth (and likewise for the other two external benchmarks). At the same time, actual developments of indicators at bank level are used to calculate banks' hypothetical G-SIB scores. The solid lines in Graph 2.6, right panel show what the average G-SIB scores would have been. Independently of the chosen approach, this analysis suggests that the relative importance of G-SIBs – as measured against global trends – has generally declined over time. In other words, our analysis suggests that even if G-SIBs have grown, they did not keep pace with the evolution of either the broader economy or the global financial sector. In turn, this implies that the role of G-SIBs has shrunk over time. This finding is consistent with other results available in the literature.[26]

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[26]   Goel at al (2019) refer to the results, based on the work of Brownlees and Engle (2016), which use SRISK and report a decline by roughly 17% for G-SIBs from 2013 to 2017. Afterwards, Furukawa et al (2021) examine the effects of too-big-to-fail reforms using ΔCoVaR and SRISK. Developments in these market-based systemic risk measures suggest that the reforms have led to a larger decline in the systemic risk contribution of G-SIBs than of other banks.
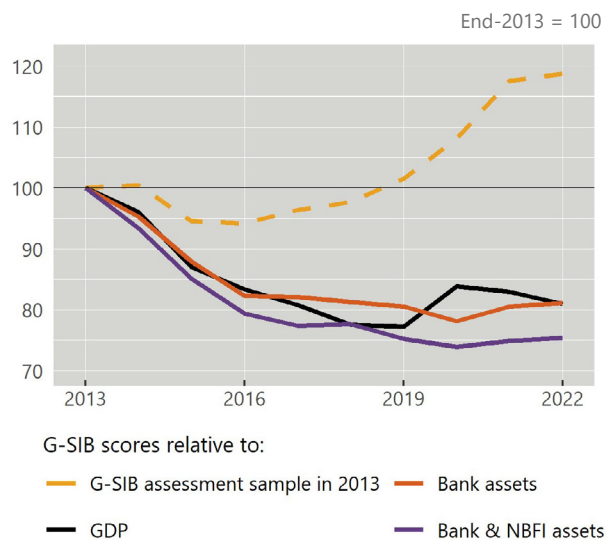
Relative systemic importance

Average scores
Graph 2.6

G-SIBs vs non-G-SIBs

End-2013 = 100
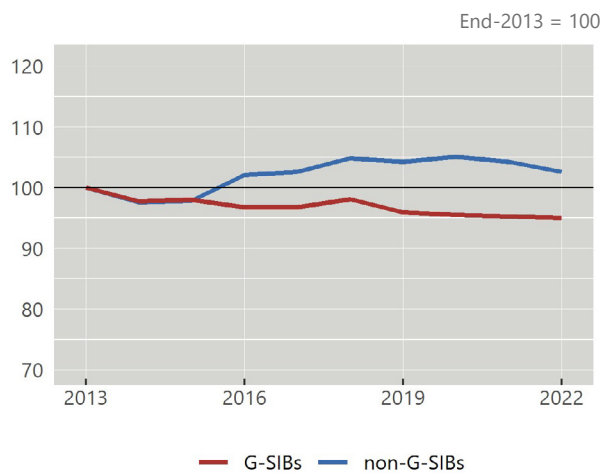
G-SIBs relative to other benchmarks

End-2013 = 100

G-SIB scores relative to:

- G-SIB assessment sample in 2013
- Bank assets
- GDP
- Bank & NBFI assets

In the left-hand side graph, the solid red line "G-SIBs" indicates average G-SIBs' scores as per the BCBS assessment. The solid blue line "non-G-SIBs" indicates average non-G-SIBs' scores as per the BCBS assessment. In the right-hand side graph, the dashed amber line "G-SIB assessment sample in 2013" displays the average G-SIBs' scores if fixing both the denominator and the exchange rates to their 2013 values. The remaining three solid lines adjust the 2013 denominator by the growth rates of the respective items listed in the legend. Results do not take into account trading volume indicators, as they were not collected in 2013.

Source: Basel Committee on Banking Supervision, FSB, authors' calculations.

Part 3: G-SIBs' balance sheet adjustments

Previous sections indicate that on average the scores of G-SIBs have declined over time, while the scores of non-G-SIBs have increased; however, these trends may reflect other factors in addition to the introduction of the G-SIB framework and the phase-in of the capital surcharges. Goel et al (2019) investigate how these trends may reflect a broader cyclical decline in G-SIBs' risk-taking. The literature contributions that Goel et al (2019) cite also points at the profound changes in banks' balance sheet management since the GFC.[27]

To complement previous findings, this section presents an econometric analysis of the shifts in G-SIBs' balance sheet adjustments relative to those of non-G-SIBs. This analysis aims to better identify the role of the G-SIB framework among these other cyclical and structural developments. We adapt the methodology of Goel et al (2019) that uses a difference-in-difference estimation approach with three time periods. Differently from Goel et al (2019) we distinguish among the following phases: (i) the run-up to the introduction of the G-SIB assessment methodology in 2010-12 ("pre-G-SIBs"); (ii) the early years since the introduction of the framework, during which capital surcharges had been phased in, 2013–17 ("childhood"); and (iii) the years since the framework has been fully implemented, 2018–22 ("maturity"). This approach allows us to assess shifts in G-SIBs' adjustments relative to those of non-G-SIBs from one phase to another (Table 1). In particular, we are able to analyse how G-SIBs reacted to the introduction of the framework, and between the early years of the framework and its maturity phase.

This analysis uses for the first time a unique data set containing data for all G-SIB items, for all reporting banks, covering all reporting years (2010-2022).[28] This choice is motivated by the fact that it contains pre-and post-framework data, that is both before and after 2012, which allows to compare the G-SIBs with all the eligible, but not identified other banks that participated to the assessment. The data set that we use for this analysis contains an unbalanced panel of 126 banks from 22 countries. The use of this unique data set represents an asset of this work. Goel et al (2019) rely on banks' balance sheet disclosures to proxy some components of the G-SIB score. The variables included in our data set are, on the contrary, all the items in the G-SIB assessment template.[29] As the structure of the template has changed over time, many items have not been collected for the entire time period. Hence, we have recalculated a set of variables reflecting main components of the balance sheet by reconstructing each item's time series.

The analysis controls for differences at individual bank and country/time level. In the spirit of Goel et al (2019) we estimate:

$$y_{i,j,t} = \alpha + \gamma_1[childhood_t * GSIB_{i,j,t}] + \gamma_2[maturity_t * GSIB_{i,j,t}] + \delta_i + \beta_{j,t} + \varepsilon_{i,j,t} \qquad [2]$$

where $y_{i,t}$ represents the variable of interest in bank i in country j at time t. y is a vector of variables including: the (log of) total exposures as used for the leverage ratio; the ratio relative to total exposures of respectively OTC derivatives, Level 3 assets, cash (proxied by liquid securities), securities and cross-jurisdictional claims. $GSIB_{i,j,t}$ is a binary variable that takes value one for the banks that, each year, were designated as G-SIBs.[30] *Childhood* is a dummy variable that takes value 1 in the years between 2013

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[27]   Indeed, Adrian et al (2018) highlight that these changes reflect the need of many major banks to bring leverage – which had spiked in the run-up to the crisis – back to sustainable levels. On top of that, broader challenges to banks' profitability, such as low interest rates and new non-bank competitors, required decisive changes to banks' business models.

[28]   End-2010 to End-2012 data was collected for the purpose of impact assessment and calibration of the G-SIB framework.

[29]   The G-SIB assessment reporting template is available under the following link: www.bis.org/bcbs/gsib/reporting_instructions.htm.

[30]   Goel at al. (2019) define a G-SIB a bank that has been identified as a G-SIB at least once since 2013. Data reveal a high persistence of the G-SIB status over time, but a few banks enter and exit the G-SIB group. See Section 2.1 for further details.

and 2017; *maturity* is a dummy variable that takes value 1 in the years afterwards. Therefore, γ_1 and γ_2 are to be interpreted as changes from pre-framework to childhood and from pre-framework to maturity, respectively. If the G-SIB framework provides the intended incentives, it should be the case that G-SIBs adjust their balance sheet to reduce their systemic risks, compared to non-G-SIBs, and therefore γ_1 and γ_2 would be significantly negative coefficients in equation [2]. Finally, we include both bank (δ_i) and country-time fixed effects ($\beta_{j,t}$).

The results of the econometric analysis indicate that some adjustments in G-SIBs' balance sheets occurred. Differently from previous analysis, we find no evidence that G-SIBs have grown in size more slowly than the other banks in our sample (Table 1, first and second row, column (1)). The difference between our results (lack of evidence or the positive sign of the coefficients) and previous ones (Goel et al (2019)), negative coefficients in all analysis periods up to 2017) could be motivated by the extension of both the sample of banks, and the time period, which includes most recent years. The result is consistent with the descriptive aggregate analysis from Section 2.1: eg the size denominator of G-SIBs grew by 13% between 2013 and 2017 while non-GSIB's size denominator grew by 5.3%. However, in the later period from 2018 to 2022, the size denominator of both groups grew by the same – and larger – amount (35%). More broadly, this result can also be interpreted in light of the determinants of scale economies for banks: for instance, Beccalli, et al (2015) found that scale economies are negatively related with a bank's contribution to systemic risk, but positively related to the too-big-to-fail status. These results are in line with what we found for non-G-SIBs and G-SIBs, respectively. Turning to complexity indicators, G-SIBs have significantly reduced their amount of OTC derivatives in the second phase (second row, column (2)). Similarly, relative to their peers, G-SIBs reduced the weight of Level 3 assets on size during the childhood period (first row, column (3)). This adjustment became more pronounced during the maturity period (second row, column (3)). Consistently with previous research, the securities ratio is adjusted significantly downwards (column (5)). In line with expectations, G-SIBs have increased the amount of liquid securities that are used in the framework to offset the value of trading securities (column (4)); the sign of this coefficient should in fact be interpreted in the opposite way than the rest of the table, as the framework should incentivize G-SIBs to have more – rather than less – liquid assets. We then turn our attention to cross-jurisdictional activity. We find that the ratio of cross-jurisdictional claims over size is adjusted significantly upwards (first and second rows, column (6)). This result is probably partly driven by the very strong aggregate growth in 2021, when the cross-jurisdictional claims measured by the denominator increased by 21.9%; for G-SIBs the growth rate in that year (25.4%) was much larger than for non-G-SIBs (9.7%). Overall, these results depict a behaviour of G-SIBs as containing some sources of systemic risks in the early years of the methodology, only in few cases balancing those reductions with an expansion of the same or other sources of systemic risk during maturity. The results presented in Table 1 are robust to the exclusion of the year 2010, which may suffer from data quality issues, and to a specification of the cross-jurisdictional claims ratio that does not account for the most recent methodological changes.

G-SIBs' balance sheet adjustments analysis: main results						Table 1
Dependent variable:	(Log) size	OTC /size	L3A /size	Cash /size	Securities /size	CJC /size
	[1]	[2]	[3]	[4]	[5]	[6]
Adjustment:						
from pre-framework to childhood ($\gamma1$)	-0.027	-1.571	-0.011***	0.023**	-0.036**	0.052**
	(0.065)	(1.298)	(0.002)	(0.010)	(0.018)	(0.025)
from pre-framework to maturity ($\gamma2$)	0.371***	-3.314**	-0.013***	0.036***	-0.070***	0.058***
	(0.067)	(1.649)	(0.002)	(0.011)	(0.020)	(0.022)
Number of observations	1,208	1,206	1,208	1,055	1,055	1,208
R-squared	0.987	0.953	0.753	0.866	0.821	0.961

*/**/*** indicates statistical significance at the 10/5/1% level. Robust standard errors in parentheses.

All columns are based on the regression: $y_{i,j,t} = \alpha + \gamma_1[childhood_t * GSIB_{i,j,t}] + \gamma_2[maturity_t * GSIB_{i,j,t}] + \delta_i + \beta_{j,t} + \varepsilon_{i,j,t}$ where $y_{i,j,t}$ represents the variable of interest in bank i in country j at time t. y is a vector of variables including: the (log of) total exposures as used for the leverage ratio (=size); the ratio relative to total exposures of respectively OTC derivatives, Level 3 assets, cash (proxied by liquid securities), securities, and cross-jurisdictional claims. $GSIB_{i,j,t}$ is a binary variable that takes value one for the banks that, each year, were designated as G-SIBs. Childhood is a dummy variable that takes value 1 in the years between 2013 and 2017; maturity is a dummy variable that takes value 1 in the years afterwards. Both bank (δ_i) and country-time fixed effects ($\beta_{j,t}$) are included.

Source: Basel Committee on Banking Supervision, authors' calculations.

Conclusion and suggestions for future work

This paper examines the G-SIB framework ten years after its introduction. This analysis covers three complementary perspectives: the evolution of the denominators, the evolution of scores of G-SIBs relative to non-G-SIBs, and the adjustments in the balance sheets of G-SIBs. The results provide an assessment of the effectiveness of the incentives provided by the G-SIB framework during the last 10 years and give useful insights for the development of further research and policy initiatives.

Since 2013 most G-SIB indicator denominators have grown significantly in nominal terms and in line with benchmarks for a broader sample of banks than those taking part in the G-SIB exercise. Denominators have grown on average by 42% in nominal terms. This trend does not appear to be specific to those banks that are part of the G-SIB assessment. The evolution of the corresponding denominators mimics closely the developments in total bank assets, OTC derivatives and international claims reported by a sample of banks representative of the whole banking sector. However, not all denominators have grown (eg OTC derivatives declined by about 5% between 2013 and 2022), while other indicators (eg Level 3 assets or underwriting) have evolved differently over time. Developments would have been more muted if the exchange rates were fixed at their end-2013 values, reflecting a general depreciation trend of the euro in weighted-averages terms. However, the general picture of overall upward trends in denominators remains even when controlling for changes in FX rates.

One-off factors appear to have driven the short-term dynamics of denominators observed at end-2021. The annual growth rates for most denominators spiked in that assessment year; however, this increase was chiefly due to the introduction of changes to the G-SIB methodology and FX rates. These dynamics were not sustained between 2021 and 2022, suggesting a one-off development due to the inclusion of additional items, such as insurance business, under the revised methodology, rather than a structural increase in growth rates.

In line with broader macroeconomic developments, European banks have become smaller relative to their peers outside Europe when measured by their G-SIB indicators. Aggregate indicators of banks in the rest of the world countries grew the most on average since 2013, also due to the inclusion of more banks from those countries into the G-SIB assessment sample. At the same time, European countries' banks posted the lowest growth rates and a smaller number of banks in the assessment sample. As a result, banks in the rest of the world have increased their share in the denominators. These findings are consistent with the broader macroeconomic picture. If we compare the regional developments of denominators with GDP, we find that the worldwide share of GDP of the European countries that are part of the G-SIB assessment has shrunk from 22.9% in 2013 to 18.9% in 2022. Countries from the Americas accounted for 37.9% of the world GDP in 2013 and for 36.4% in 2022. At the same time, the countries of the rest of the world have seen their GDP share growing in the same period from 32.1% to 35.7%.

Overall, the scores of G-SIBs and non-G-SIBs have converged slightly over time. Average scores of G-SIBs declined by about 5% between 2013 and 2022, while average scores of non-G-SIBs increased by 2.6%. The decline in the average score of G-SIBs is broad based across banks. At the same time, there is more variability in the annual growth rates of the scores of non-G-SIBs. Average score declines of G-SIBs were mostly driven by reductions in complexity and interconnectedness.[31] The evidence we found on the reduction of the average scores and the decreased role in some activities must be complemented with evidence at indicator level. This suggests that G-SIBs have specialized in other activities (eg cross-border business and payment activities), as witnessed by their increased shares in the corresponding denominators.

Comparison with broader benchmarks seems to indicate that G-SIBs have also seen their role shrinking across all categories of systemic importance. This holds when we run comparisons that expand the sample of banks or consider benchmarks that can be derived from the evolution of world GDP, bank assets and non-bank financial intermediary asset.

G-SIBs appear to have adjusted their balance sheets after the introduction of the framework. Our analysis indicates that some adjustments have further strengthened during the second phase of the application of the methodology. While not conclusive (for instance, in relation to our results on the dynamics of size), these findings can be read in conjunction with other results of this study. They hint to the fact that firms have further adjusted to the post-crisis authorities' determination to end the too-big-to-fail issue (FSB (2013)).

Seasonality in indicators and window dressing should be considered when assessing the findings of this work. Several contributions[32] identified the existence of material seasonality in data measurement of G-SIB indicators at year-end. To a significant extent, this is associated with window-dressing in the G-SIB framework. For example, Naylor et al (2024) suggest that aggregate amounts of repos and OTC derivatives tend to decline significantly at year-end. These reductions would be reflected in the observed year-end values analysed in this paper, which might therefore understate actual developments. In addition, if window dressing was carried out at different levels of intensity across G-SIBs and non-G-SIBs, the assessment of the relative development of scores between the two groups would need to be revisited. Further work should be carried out to assess if – and if so, how – denominators' dynamics and score evolution would be affected if window dressing was considered, for instance, by performing the same analysis at higher reporting dates' frequency.

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[31] This reduction also reflects an internal reshuffling in the G-SIB list. The share of the aggregate scores of G-SIBs that are allocated in buckets 3 and 4 has declined form 27.0% in 2013 to 19.5% in 2022. At the same time all other buckets' market shares have grown; most notably the share of bucket 2, which rose from 16.0% to 21.4%. These results also reflect the changes in the number of banks per bucket and suggest that banks have migrated from the highest two buckets to lower buckets; given this, one could argue that within the assessment sample the largest G-SIBs have tended to become smaller.

[32] For a survey, see Torstensson, P. and P. Welz (2023).

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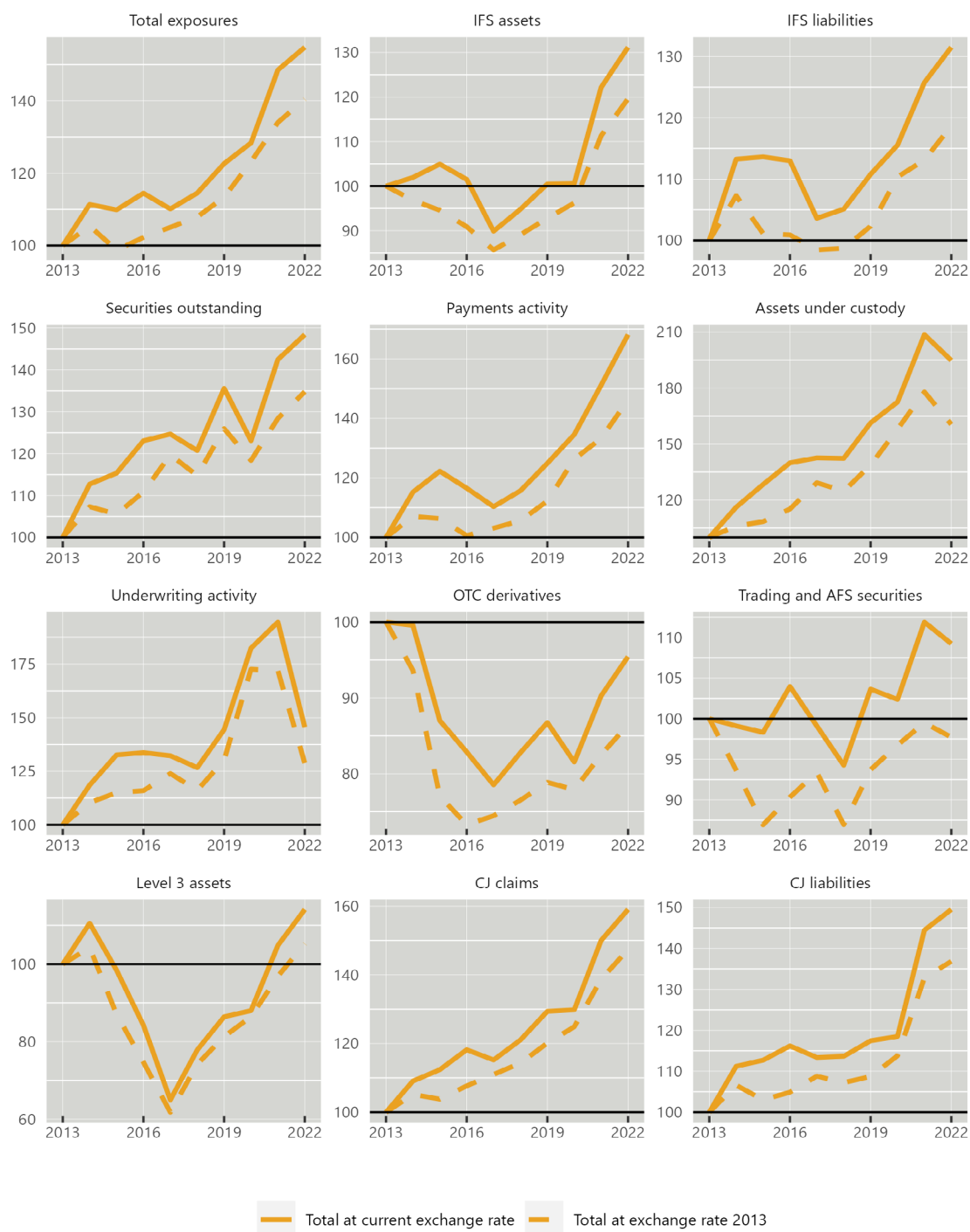
Annex – Additional graphs and tables

Denominator of the indicators

Current exchange rates vs 2013 exchange rates | Graph A1.1

End-2013 = 100
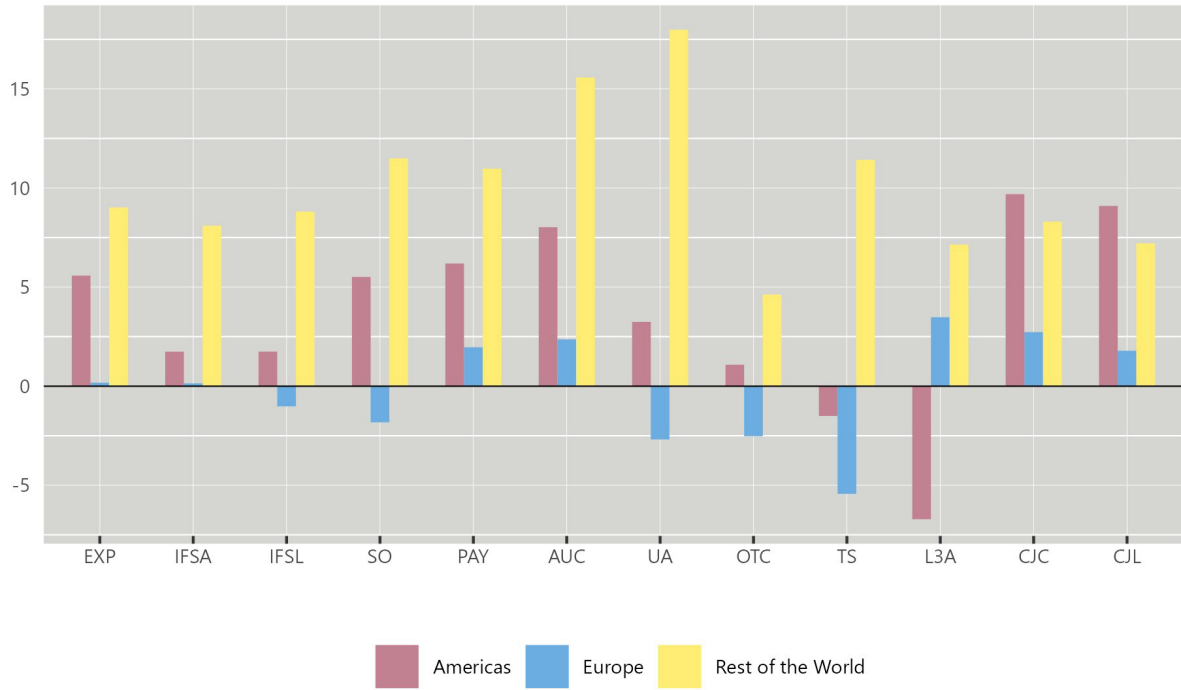

Total at current exchange rate — Total at exchange rate 2013

Source: Basel Committee on Banking Supervision, authors' calculations.

Denominators of the indicators: average annual growth rates 2013-2022

Per cent

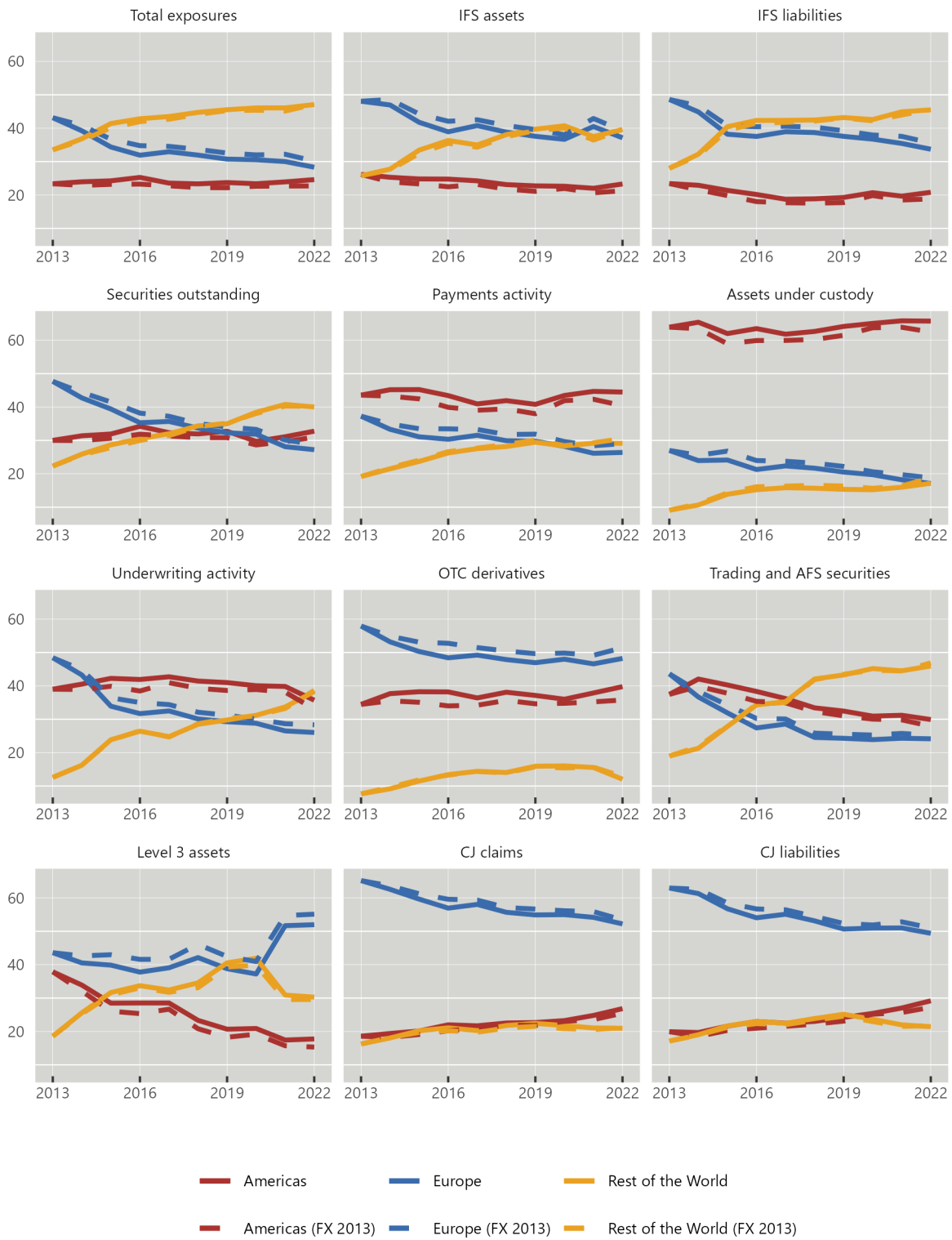Americas   Europe   Rest of the World

Source: Basel Committee on Banking Supervision, authors' calculations.

Denominators of the indicators: contribution of regions

Per cent

Source: Basel Committee on Banking Supervision, authors' calculations.

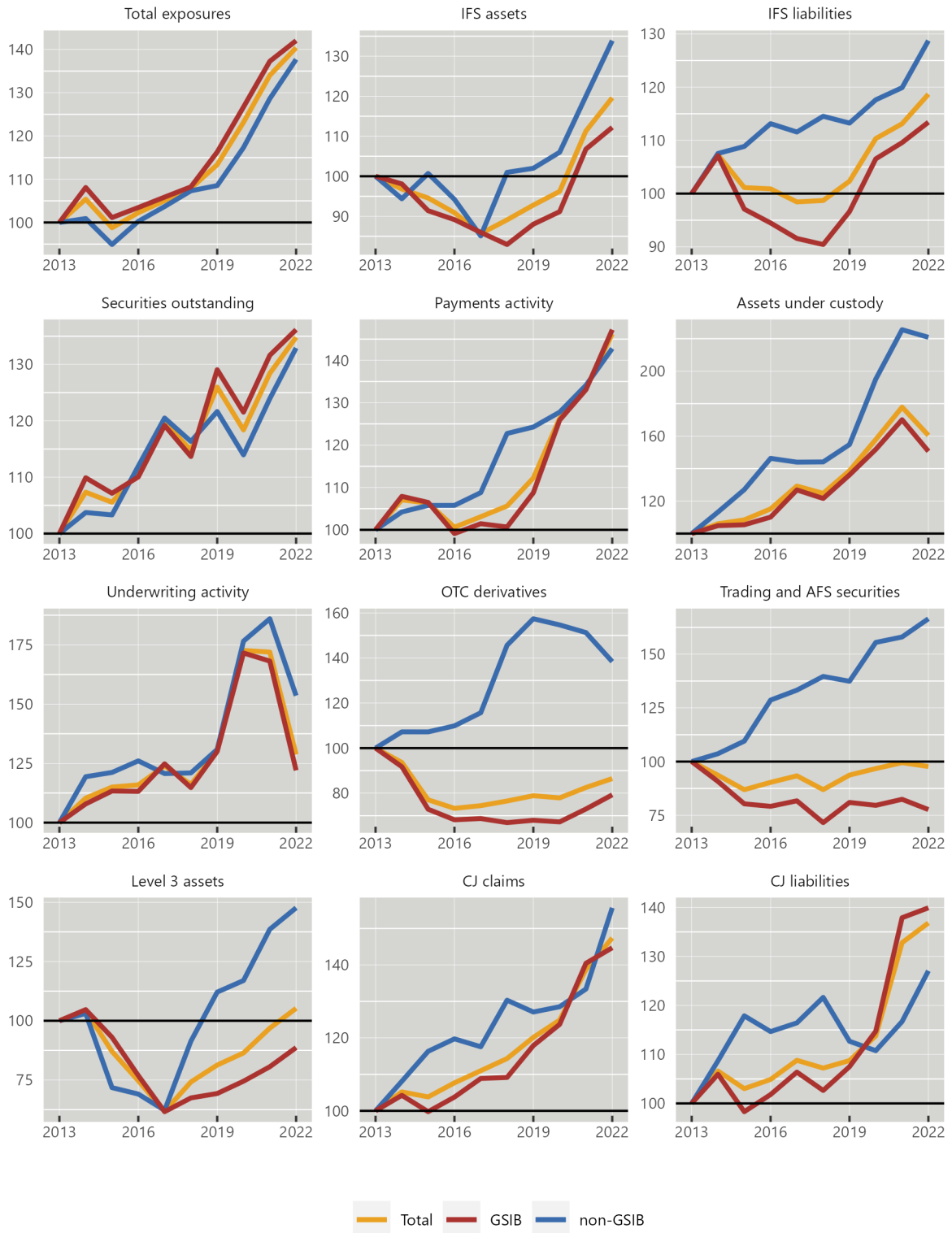## Denominator of the indicators: G-SIBs vs non-G-SIBs

EUR trillions
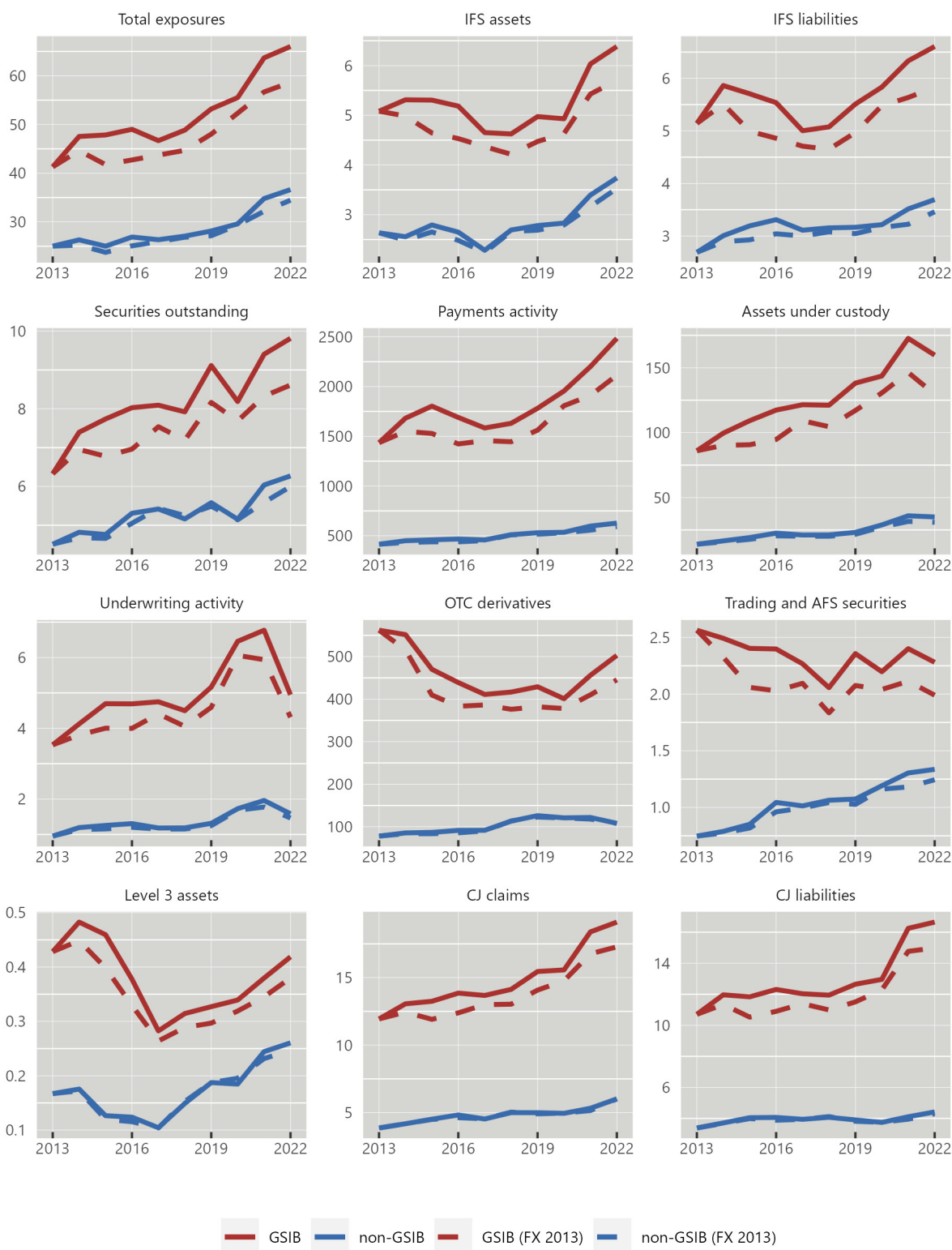
Source: Basel Committee on Banking Supervision, authors' calculations.

Evolution of denominators: G-SIBs vs non-G-SIBs

End-2013 FX   Graph A2.1(b)

End-2013 = 100

Total exposures · IFS assets · IFS liabilities · Securities outstanding · Payments activity · Assets under custody · Underwriting activity · OTC derivatives · Trading and AFS securities · Level 3 assets · CJ claims · CJ liabilities

Legend: Total — GSIB — non-GSIB

Source: Basel Committee on Banking Supervision, authors' calculations.

Mean growth rate of denominators: G-SIBs vs non-G-SIBs

Average annual growth rate and contribution by group
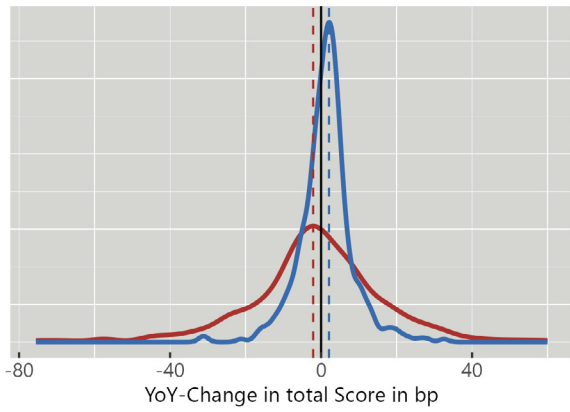
Graph A2.2

Per cent

G-SIBs   non-G-SIBs   —— Total denominator growth
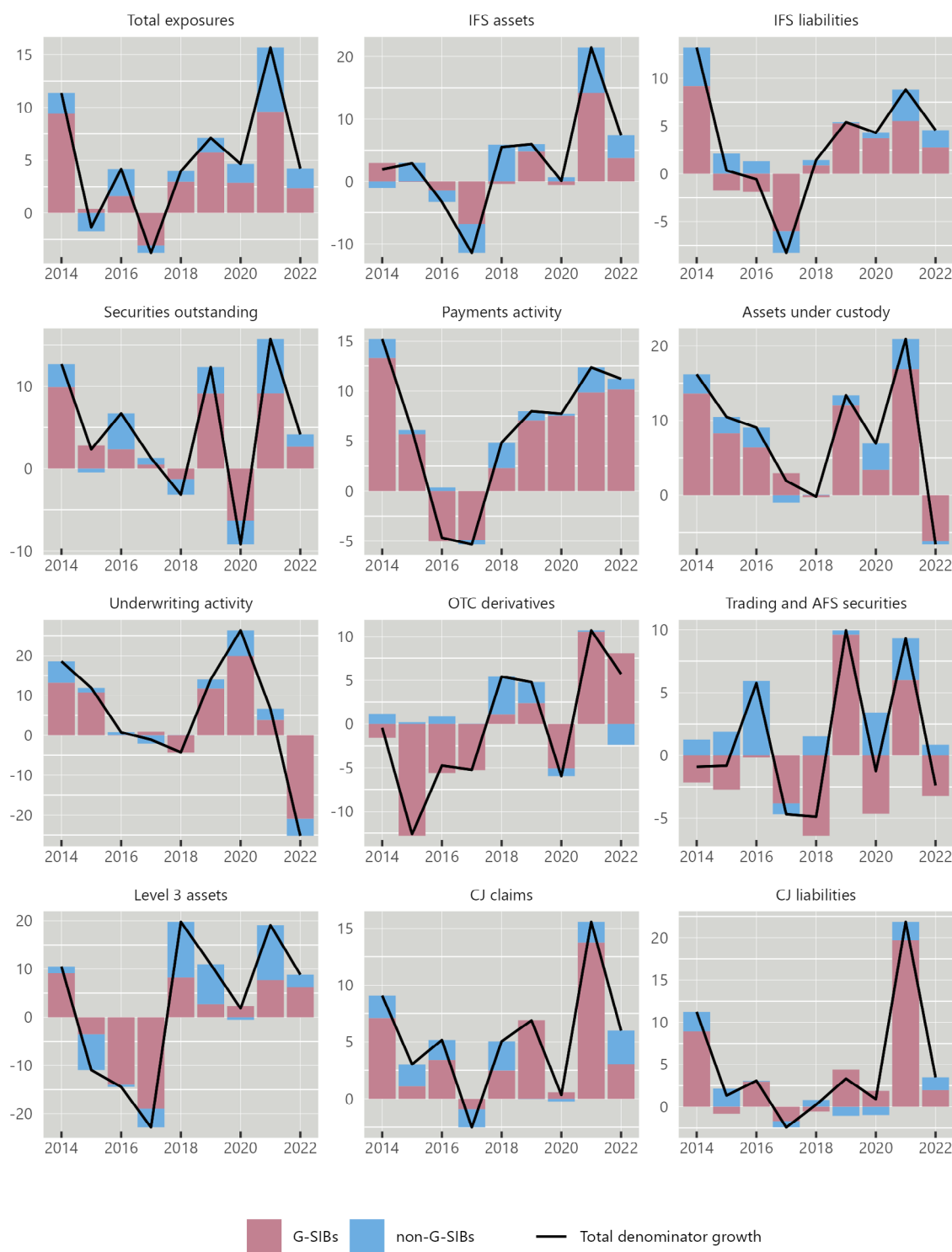
Source: Basel Committee on Banking Supervision, authors' calculations.

Score change

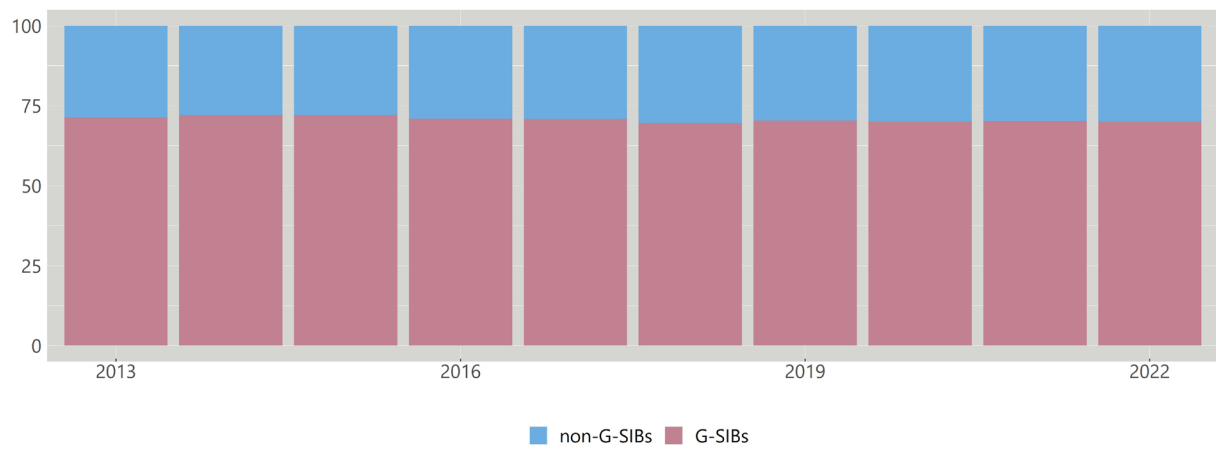Density of yoy-score change in basis points

Absolute score change vs Total score
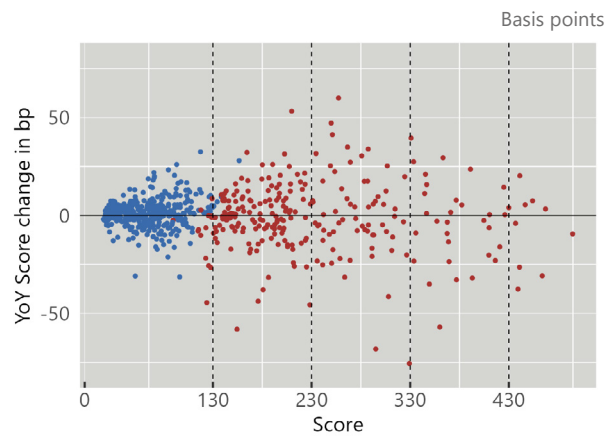
Source: Basel Committee on Banking Supervision, authors' calculations.

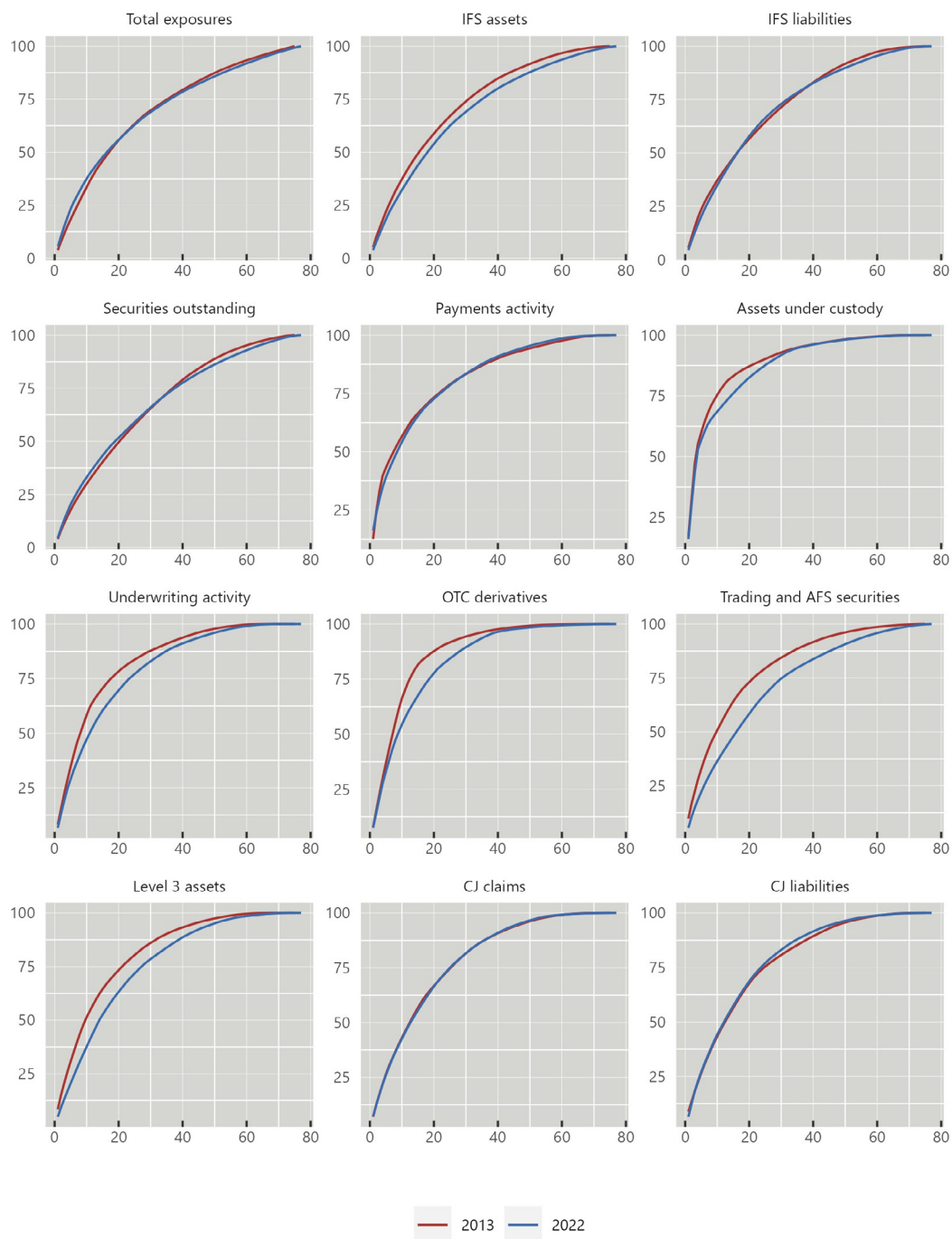## Shares of sum of scores for G-SIBs vs non-G-SIBs

Graph A2.3.2

Per cent

non-G-SIBs   G-SIBs

Source: Basel Committee on Banking Supervision, authors' calculations.

Score concentration: banks denominator share vs number of banks

Per cent

The graph shows for the years 2013 and 2022 the cumulative bank share in the indicator denominators (y-axis), where banks are sorted from largest to smallest by the amount of the indicator (x-axis).

Source: Basel Committee on Banking Supervision, authors' calculations.

Table A1 – Convergence in scores: econometric analysis

Dependent Variable: Ln(Score_2022) - Ln(Score_2013)				Table A1
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Ln(Score_2013)	-0.293	0.055	-5.358	0.000
Constant	1.486	0.259	5.740	0.000
Included observations	61			
Adjusted R-squared	0.316			
F-statistic	28.705			
Prob(F-statistic)	0.000			
Source: Basel Committee on Banking Supervision, authors' calculations.				