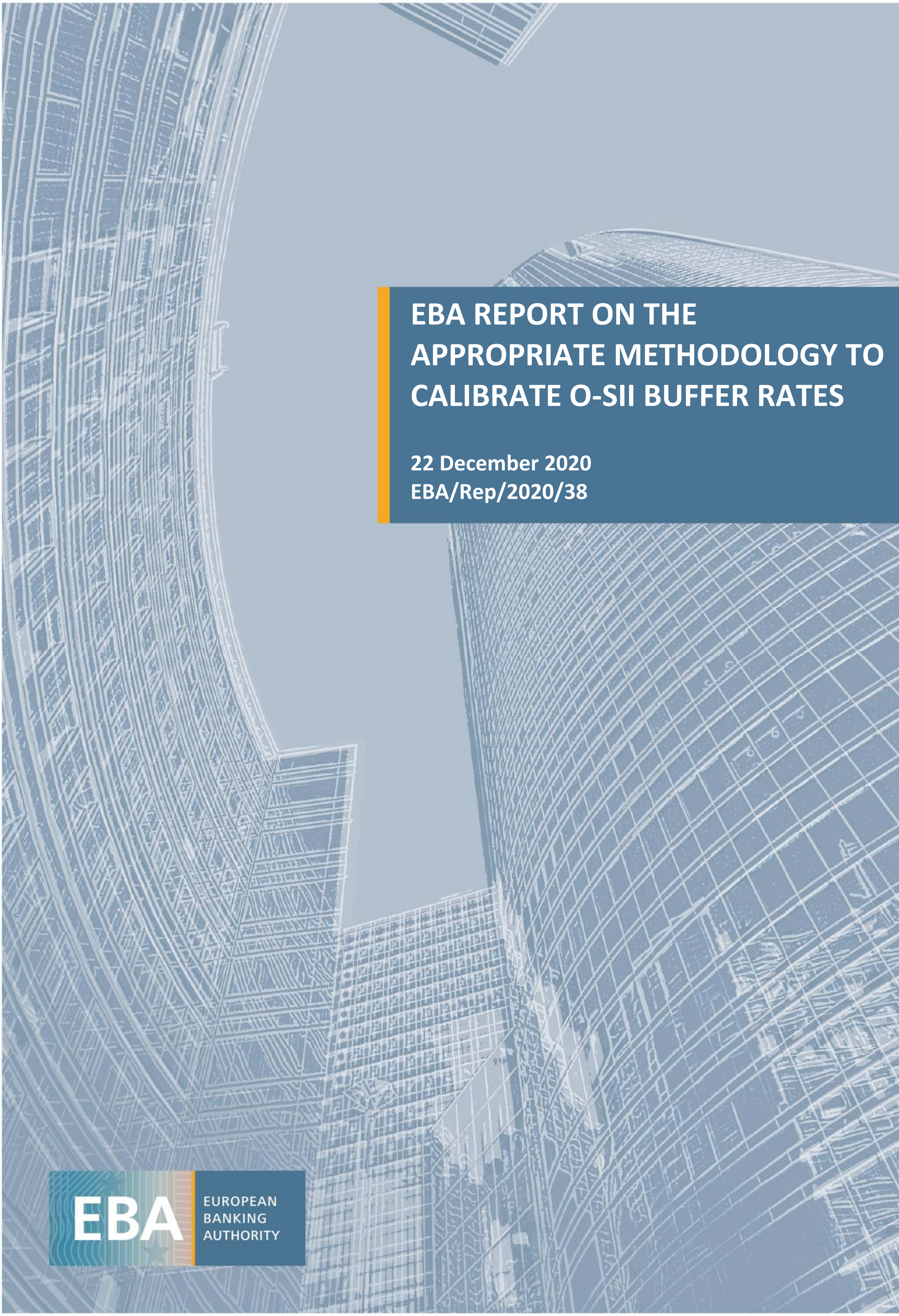

EBA REPORT ON THE APPROPRIATE METHODOLOGY TO CALIBRATE O-SII BUFFER RATES

22 December 2020

EBA/Rep/2020/38

EBA
EUROPEAN BANKING AUTHORITY

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Abbreviations[1]

BCBS	Basel Committee for Banking Supervision
CDS	Credit default swap(s)
CET1	Common equity tier 1
CRD	Capital Requirements Directive
CoVar	Conditional value at risk
D-SIB	Domestic systemically important bank
G-SIB	Global systemically important bank
G-SII	Global systemically important institution
EBA	European Banking Authority
EC	European Commission
ECB	European Central Bank
EEI	Equal expected impact
EL	Expected loss
EU	European Economic Area
ESRB	European Systemic Risk Board
MES	Marginal expected shortfall
MS	Member State(s)
NCA	National competent authority
O-SII	Other systemically important institution
PD	Probability of default
RWA	Risk-weighted assets
RWEA	Risk-weighted exposure amounts
SII	Systemically important institution
SRISK	Systemic risk measure
sLGD	Systemic loss given default
SSM	Single Supervisory Mechanism
SyRB	Systemic risk buffer
TREA	Total risk exposure amounts

[1] EU and EEA countries are often referred to throughout this report by the correspondent two-letters code as defined by Eurostat, e.g. EE for Estonia, EL for Greece, HR for Croatia, etc.

Executive summary

The latest update of the Capital Requirements Directive[2] (CRD V) introduced a mandate[3] for the EBA to report to the European Commission ('the Commission') on the appropriate methodology for the design and calibration of O-SII buffer rates. This report delivers on that mandate by proposing a floor methodology to be implemented in the EU. The proposed methodology does not suggest or request that the authorities should set their O-SII buffer rates specifically at this floor, but rather use it as a fundamental principle and lower bound for their final buffer rate decisions. In a subsequent iteration, the EC and EU co-legislators may issue a legal mandate to the EBA for prescribing the appropriate methodology to calibrate O-SII buffer rates, one that would introduce a floor methodology to O-SII buffer rates set by national authorities, as described in this report. Such a mandate, depending on its timing, could consider further reviews to the macroprudential toolbox in the EU, as well as any international developments on the usability of capital buffers. While a one-size-fits-all methodology seems undesirable and difficult to be pursued in the near term, the need for clarification and enhancement[4] of the framework has been mentioned and expected in the past by several authorities, market participants and the banking industry.

The landscape in the EU concerning institutions identified as O-SIIs is very diverse. Based on December 2018 information provided by national authorities to the EBA, there were 193 O-SIIs in the EU. Its heterogeneity is observed from different angles such as different ownership structures, levels of banking sector concentration and the fact that two institutions with a similar O-SII score may be required to hold a significantly different level of O-SII buffer. The latter holds both for O-SIIs with relatively low scores, as the lowest score for which a national authority applies the maximum permitted buffer of 2% is 742 basis points, and for O-SIIs with relatively high scores with buffer rates near 0%. Though the systemic risk emanating from banks with similar O-SII scores might vary across Member States and national specificities should be taken into account in buffer calibration, this high variation of O-SII buffer rates might not be fully explained by differences in systemic risk[5]. Unjustified heterogeneity is a source of concern from the perspective of a common EU standard, the single market and the banking union in particular. From a financial stability perspective, avoiding possible under-calibration of O-SII buffers is of special importance as insufficiently capitalised banks not only pose systemic risk to their home jurisdictions but might also have negative cross-border spillovers in the Union.

[2] Directive (EU) 2019/878 of the European Parliament and of the Council of 20 May 2019 amending Directive 2013/36/EU as regards exempted entities, financial holding companies, mixed financial holding companies, remuneration, supervisory measures and powers and capital conservation measures (OJ L 150, 7.6.2019, p. 253).

[3] CRD V Article 131 paragraph 3 requests the EBA to report on the appropriate methodology for the design and calibration of O-SII buffer rates.

[4] Notably, the European Banking Authority (2014) Guidelines on the O-SII identification methodology have been showing an increasing number of authorities that choose to explain non-compliance.

[5] See ESRB (2020).

With a view to taking stock of the different experiences and approaches across the Union when setting O-SII buffer rates, the EBA conducted a survey in late 2019 on national practices that confirmed the distinct O-SII buffer rate decisions for similar systemic footprints. The policy recommendations included at the end of this report leverage significantly on a simulation exercise based on end-2019 data conducted by the EBA between May and September 2020. Results of this simulation show that the introduction of an EU-wide floor methodology for setting O-SII buffer rates would have the merit of reducing the unwarranted heterogeneity at the lower end of the buffer rates across the Union while still allowing for a sufficient degree of national discretion in setting more prudent buffer requirements. This floor methodology should be based on O-SII scores resulting from the first stage of the identification process, for consistency and comparability reasons. The data shows that the introduction of this harmonised methodology at EU level would not disrupt significantly the majority of bank-specific O-SII buffer rates set by national authorities. Out of the 206 bank-specific buffer rates received by the EBA for O-SIIs and potential O-SIIs, only 24 banks[6] from 10 countries would see their O-SII buffer rate increased, which accounts for 12% of identified O-SIIs under at least one of the two scenarios tested, with the calibration method as given by the current ECB floor methodology showing milder impacts. The great majority of buffer rates would remain unchanged (182, representing over 88% of identified O-SIIs). Given the mandate and expected delivery of this report by 31 December 2020, as per CRD Article 131 paragraph 3, this report and the embedded results do not include eventual adjustments made by Member States due to the introduction of CRD V and related developments on the O-SII buffer framework[7].

To conclude, the EBA recommends in this report for an EU-wide floor methodology to be introduced in the EU framework, ideally by the year 2022, in the context of the comprehensive review of the buffer framework and according to the technical specifications laid down in section 5.2. For this purpose, EU co-legislators could issue a legal mandate for the EBA covering both the identification process, currently framed by EBA guidelines, and the buffer calibration process. This single mandate would undoubtedly contribute to fostering increasingly harmonised macroprudential supervisory practices in the EU in what concerns this capital buffer of a bank-specific nature, which is naturally less prone to changes along the economic cycle or short-term fluctuations. Furthermore, it would provide an important safeguard against potential under-calibration of the O-SII buffers, thus promoting financial stability across the Union. Once implemented, the EBA suggests a first reassessment of this floor methodology after two years of implementation. An earlier assessment of the floor methodology might be undertaken given exceptional circumstances.

[6] For some of these banks, buffer requirements set by the corresponding authority going forward might be unaffected as some of the observed overlaps between the SyRB and the O-SII buffer in the past are likely to be overcome under the revised framework brought about by CRD V.

[7] As of October 2020, most Member States had not yet transposed CRD V into national law.

Introduction

Buffers for systemically important banks were introduced as part of the 2008-2009 post-crisis regulatory reforms. The objective of these buffers is to address the material impact that a failure of a large, complex and heavily interconnected bank may have on the rest of the financial system and on the economy. It was indeed evident during the global financial crisis that such – systemically important – banks can spread distress to other banks and also beyond borders. Further, by cutting the supply of financial services, in particular credit, they can harm the real economy. Lastly, systemically important banks are also providing critical infrastructure to financial markets, which is difficult to replace at short notice. Capital buffers on such large institutions additionally aim at reducing the incentives these firms have to become ever larger, thus engaging in a self-induced feedback loop of growth and a more substantial systemic footprint. Another, less evident and often more debatable objective is to offset the implicit subsidy or funding advantage otherwise received by acquiring the too-big-to-fail status.

The BCBS developed first a methodology for G-SIBs, which covers both the identification of such firms and the calibration of the additional loss absorbency requirements.[8] With a view to consistent treatment of all global banks, this framework was designed with only a limited degree of discretion left to national supervisors.

The BCBS G-SIB methodology uses an indicator-based approach, with 12 indicators of a bank's systemic relevance spread over 5 categories: size, interconnectedness, substitutability, cross-border activity and complexity. These indicators are computed as shares of a firm in the overall system, and normalised on a range between 0 and 10 000 basis points. The system is measured by the corresponding sample totals for a sample that comprises the largest 75 banks as determined by the Basel III leverage ratio exposure measure. All firms with a score above the threshold of 130 basis points are automatically designated as G-SIBs.

Based on the score, firms are allocated to buckets with a corresponding loss absorbency requirement, expressed in terms of additional CET1 capital that G-SIBs should hold. Supervisors may override the results of this approach and move a G-SIB to a different bucket, or designate a bank that does not fulfil the mechanical criteria as a G-SIB. However, the bar for using such supervisory discretion is high. Notably, discretion should be linked only to the assessment of the systemic implications of a bank's failure (i.e. systemic loss given default), and not to the risk that it will fail (i.e. probability of default).

In 2012, the BCBS issued its framework for dealing with D-SIBs[9]. This framework is less prescriptive than the G-SIB framework, providing national authorities with a minimum set of principles which they should follow when designing their own policy frameworks for domestic banks. The authorities

[8] See BCBS (2011): https://www.bis.org/publ/bcbs207.pdf.

[9] See BCBS (2012): https://www.bis.org/publ/bcbs233.pdf.

should take a domestic perspective, that is, focus on the impact of a bank's failure on the domestic economy and financial system. When doing so, they should take into account the same five dimensions of systemic relevance which are assessed under the G-SIB methodology. The principles give some leeway with respect to cross-border activity, which may be less relevant in the domestic context.

Reflecting the need to retain flexibility and national specificities, the D-SIB framework does not recommend any specific way to calibrate the higher loss absorbency requirements. The authorities are nonetheless advised that their judgement in that regard could be guided by size and concentration of the domestic banking system. Larger (in terms of GDP) and more concentrated banking systems are expected to be required to hold, on aggregate, higher capital buffers. As is the case for the G-SIB buffers, capital buffers for D-SIBs should be met solely with additional CET1 capital not counting towards any other regulatory requirements (i.e. Pillar 1 or Pillar 2).

This report is structured in four main chapters. Firstly, the institutional framework, the mandate given to the EBA and a diagnosis of the current O-SIIs landscape in the EU are depicted. The following chapter dives deeper into the different national specificities and banking sectors, and takes stock of how those translate into very distinct O-SII buffer rate decisions. In the subsequent chapter, existing practice (including outcomes from a comprehensive survey of members on national practices), literature and theoretical discussions regarding possible calibration approaches for the O-SII buffer rate are illustrated. Finally, the last chapter summarises conclusions of our analyses and details policy recommendations, leveraging also on a simulation exercise based on end-2019 data.

2.1 Institutional framework

The BCBS framework was implemented in the EU with the transposition of CRD IV[10]. This directive provides for two kinds of buffers for systemically important banks. The G-SIB buffer is implemented in EU law as the buffer for G-SIIs, and the D-SIB buffer is transposed as the buffer for O-SIIs. These buffers largely overlap each other, meaning that where a European G-SII is also identified as an O-SII, the higher of the two buffers becomes binding. Under CRD IV, these buffers may also overlap with the systemic risk buffer (SyRB).

Member States should designate national authorities which are mandated to set O-SII buffers. These authorities should identify O-SIIs based on at least four criteria: size, importance for the economy of the Member State or of the Union[11], significance of cross-border activities and interconnectedness with the financial system. Under CRD IV, O-SII buffers can be set at no more

[10] Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC.

[11] For the purpose of the application of O-SII buffer rates, the term European Union (EU) will generally mean all jurisdictions under the European Economic Area, which includes all EU countries plus Iceland, Liechtenstein and Norway.

than 2% of total risk exposure amount (TREA), and they must be met with CET1 capital. The identification of O-SIIs, as well as the allocation of buffer rates, should be reviewed at least annually.

The EBA, following its mandate received under CRD IV[12], issued guidelines on the identification of O-SIIs. These comply-or-explain guidelines[13] introduce a scoring approach similar in construction to the G-SIB scores that capture the four dimensions of systemic relevance detailed in the CRD IV text. Recognising the diversity of national banking systems, the EBA guidelines leave room for national discretion when setting the thresholds for O-SIIs (between 275 and 425 basis points) and selecting additional indicators which the national authorities consider useful in terms of measuring systemic risk in their domestic sector or the economy of the Union.

CRD V[14], finalised in May 2019, introduced material changes to the existing O-SII framework. Once the new directive is transposed into national laws, national competent authorities will be able to require each O-SII to maintain an O-SII buffer of up to 3% of TREA, on a consolidated, sub-consolidated or individual basis. They will also be able to impose buffers higher than 3% subject to approval from the Commission. O-SII buffers will be offset only with G-SII buffers, but no longer with the SyRB. The SyRB will then always be cumulative with the higher of the O-SII or G-SII buffer. Further, CRD V raises the additional cap on buffer requirements for O-SIIs that are subsidiaries of a European G-SII or another O-SII: from the higher of 1% and the parent's buffer requirements under CRD IV to the lower of the parent's buffer requirement plus 1% and 3% of the TREA (or the rate imposed on the parent institution, if set above 3%).

In the banking union, national O-SII buffer decisions are subject to the scrutiny of the ECB. National authorities should notify their prospective decisions to the ECB, which may object to the proposed decision (as per Article 5 paragraph 1 of the SSM Regulation) or apply higher requirements than those proposed by the national authorities, in accordance with Article 5 paragraph 2 of the SSM Regulation. The ECB can neither object to the set of institutions identified by national authorities nor scale down the proposed buffer rates.

The ECB assesses the national decisions on O-SII buffers in line with a floor methodology[15.] The ECB O-SII floor methodology is based on banks' systemic importance score, calculated in line with the EBA guidelines, and allocates each bank to one of four categories of systemic importance ('buckets'). Each bucket is associated with a specific O-SII buffer rate that should be considered as a minimum rate. It forms the basis for discussion between the national authorities and the ECB on the assessment of the national decisions on the O-SII buffers. This ECB floor methodology is further explored in this report and tested at an EU-wide level.

[12] Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013.

[13] Currently, five national authorities have explained their non-compliance with these EBA guidelines while one national authority has explained its partial compliance status. The compliance table for these guidelines can be found in https://eba.europa.eu/regulation-and-policy/own-funds/guidelines-on-criteria-to-to-assess-other-systemically-important-institutions-o-siis.

[14] Directive (EU) 2019/878 of the European Parliament and of the Council of 20 May 2019.

[15] See ECB (2017): https://www.ecb.europa.eu/pub/pdf/mpbu/ecb.mpbu201706.en.pdf.

The yearly O-SII identification and buffer rate setting exercise is concluded once national authorities notify the EBA, the Commission and the ESRB of their final decisions[16], by 1 December. These notifications are expected to provide transparency on the sound economic rationale underpinning such decisions.

2.2 Mandate given to the EBA

The recent update in the legal framework introduced changes to the interaction between O-SII buffers and the SyRB, and an increased cap for O-SII buffers. In addition, CRD V introduced a mandate for the EBA to prepare a report to the Commission on the appropriate methodology for the design and calibration of O-SII buffer rates and submit it to the Commission by the end of 2020. The ESRB has also been consulted for the preparation of the report in accordance with the mandate.

The EBA has not been mandated under CRD V to draft technical standards prescribing the methodology to calibrate O-SII buffer rates. The calibration of O-SII buffers thus remains fully at the discretion of the national authorities. Some form of legal mandate may be given in a subsequent iteration, should the Commission and EU co-legislators decide so in light of the EBA report and future developments across Member States. A comprehensive legal package comprising the two greatly interconnected matters of identification and buffer calibration would contribute to a clearer framework and a minimum level of harmonisation in the EU[17]. This harmonisation at the EU level could nonetheless preserve some degree of flexibility to cater for the different Member States' specificities and banking sectors. While a one-size-fits-all methodology seems undesirable and difficult to achieve in the near term, the clarification and enhancement of the framework have been mentioned in the past by market participants and authorities as being welcome and needed[18]. The same conclusion followed the EBA peer review on the existing EBA guidelines on the methodology for identifying O-SIIs[19].

2.3 The European Union O-SII landscape

The landscape in the EU concerning institutions identified as O-SIIs is very diverse. Based on December 2018 information provided by national authorities to the EBA, there were 192 O-SIIs in the EU. As per Figure 1 below, O-SIIs constituting the highest level of consolidation for the entire

[16] National authorities also need to be informed on any decision made by another national authority in case an identified O-SII is a subsidiary of an EU parent institution.

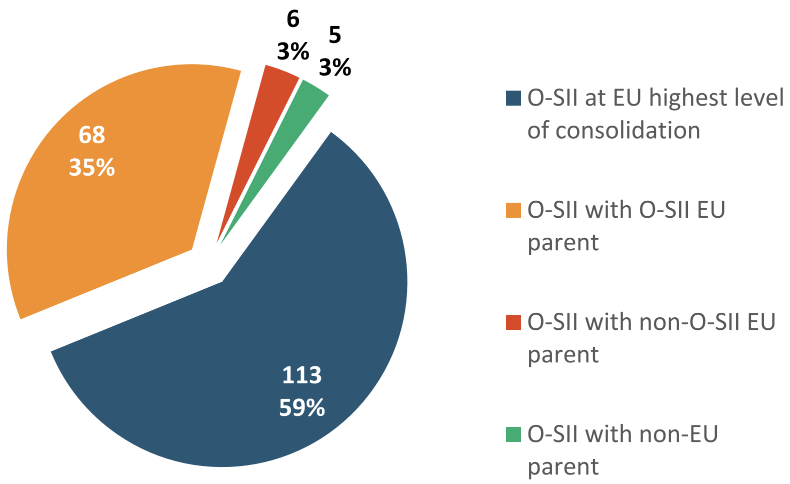
[17] Notably, the EBA Guidelines on the O-SII identification methodology have been showing an increasing number of authorities that choose to explain non-compliance.

[18] See for example the ESRB (2017) and the public consultation feedback of 2016 from the EC available at: https://ec.europa.eu/finance/consultations/2016/macroprudential-framework/docs/summary-of-responses_en.pdf.

[19] See EBA (2017) and the section of this report on the O-SII buffer calibration.

banking group were predominant, with 118 O-SIIs. This number includes both the cases of purely domestic O-SIIs (meaning that the institutions is owned domestically and constitutes the highest EU level of consolidation) and the five O-SIIs that are part of banking groups domiciled outside the EU. Further to that fact, 68 of the observed O-SIIs were subsidiaries of other O-SIIs domiciled elsewhere in the EU. Finally, only six other O-SIIs were subsidiaries of non-O-SIIs entities domiciled elsewhere in the EU.

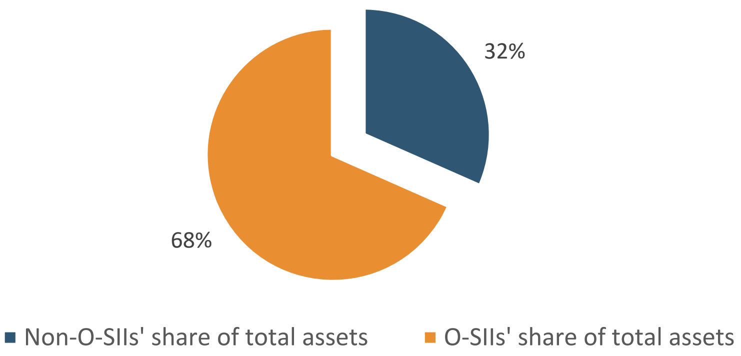
Figure 1 – Number and geographical ownership profile of EU O-SIIs based on end-2018 data



Source: EBA survey of national authorities in 2020; 2018 year-end data.

Institutions identified as O-SIIs, as of December 2018, account for more than two thirds of total assets for the entire EU banking sector, reaching EUR 33 trillion in assets, whereas non-O-SIIs accounted for EUR 15 trillion in assets.

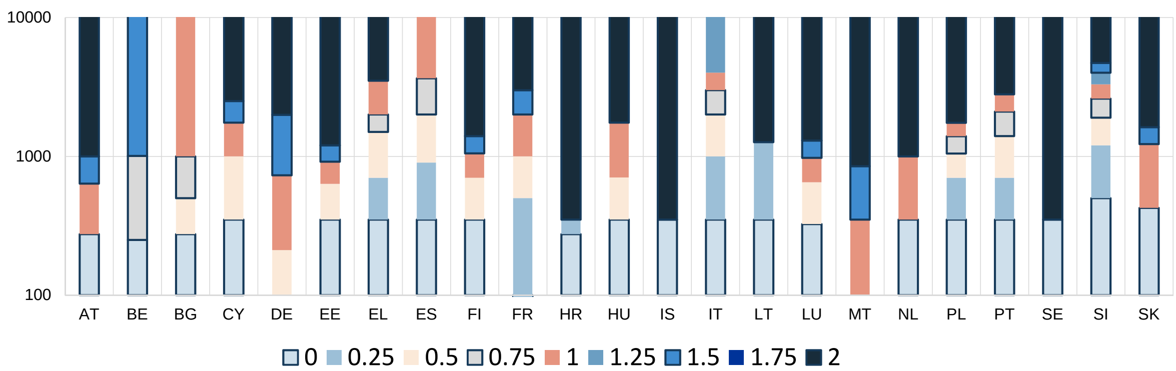
Figure 2 – Share (%) of EU total banking sector assets held by O-SIIs



Source: EBA survey of national authorities in 2020; 2018 year-end data.

The shares in Figure 2 compare with a somewhat smaller predominance by G-SIBs over the global banking sector, as measured by total bank assets (according to IMF staff, G-SIB total assets for 2016 or later represented 44% of the estimated amount for total bank assets worldwide[20]).

Figure 3 – O-SII buffer rates and buckets width by country; y-axis (log transformation of scores)



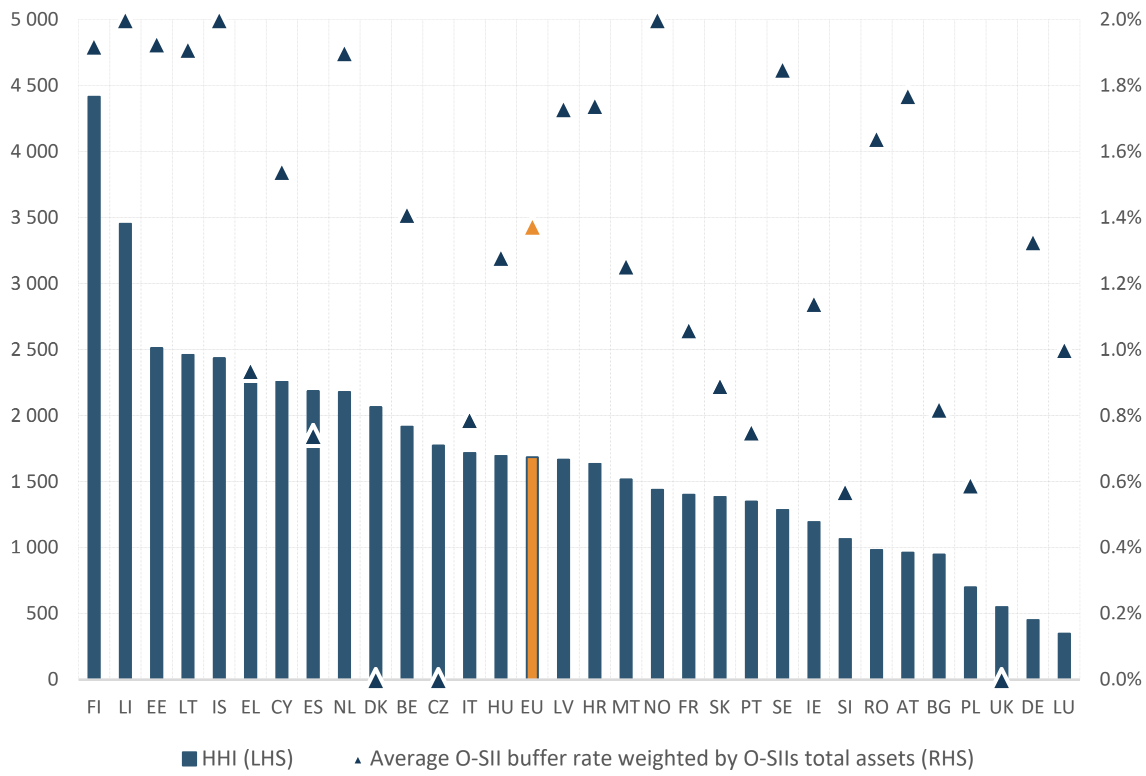
Source: EBA survey of national authorities in 2020; 2018 year-end data; darker shades of blue and grey correspond to higher buffer rates.
Note: despite the Y axis starting at 100 bps, some authorities have declared having first buckets starting at 0 bps of O-SII score; lowest bucket of 0 % O-SII buffer rate includes all non-O-SIIs.

The observed differences in bucket widths and respective O-SII buffer rates presented in Figure 3 point to the excessive heterogeneity in buffer calibration across countries. Particularly, the presence of black shaded bars indicates O-SII buffer rates at the maximum level of the 2% cap under CRD IV. The predominance of such a buffer rate level for comparable O-SII scores illustrates well

[20] See IMF (2017).

the existing heterogeneity, showing that some countries set this buffer rate level typically at a high level or for a much wider range of O-SII scores than others do. This is essentially the case of Sweden, Iceland[21] and Croatia. Likewise, the absence or very limited presence of light blue or light grey shaded bars indicates that the respective country has decided to request O-SIIs to meet the required capital buffer rates at a relatively higher level than other jurisdictions. This is the case of Germany and Malta, most noticeably. On the other hand, where darker shaded bars are less prominent and light blue or light grey shaded bars cover a wider range of O-SII scores, the conclusion is that the respective authority and country require identified O-SIIs to meet comparatively lower levels of buffer rate. This is the case of Spain and Italy, primarily, and of Bulgaria to a lesser extent.

Figure 4 – Herfindahl-Hirschman Index (LHS); average O-SII buffer rate weighted by total assets (RHS)



Source: EBA survey of national authorities in 2020; 2018 year-end data.
Note: EU HHI is computed as a simple average of EU Member States' individual HHI.

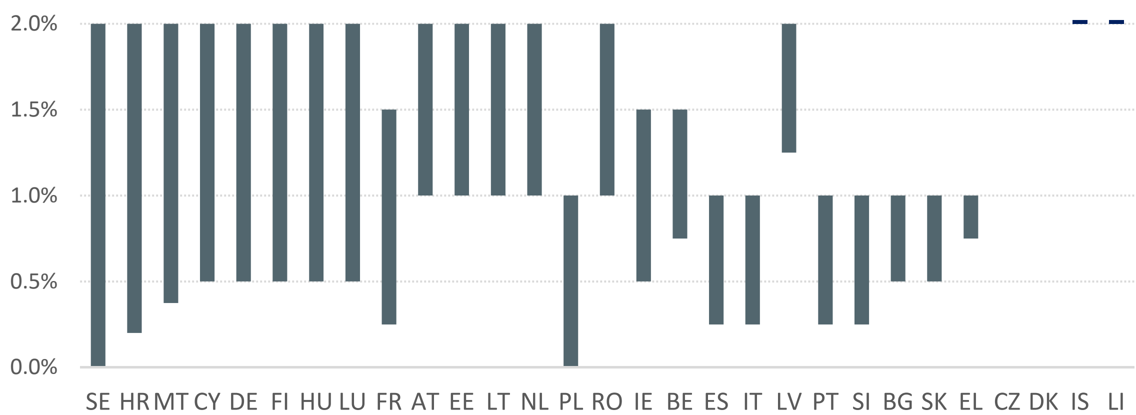
In what regards the different banking sectors' concentration level, as measured by the Herfindahl-Hirschman Index, Finland and Liechtenstein stand out well above all others. At the opposite end,

[21] A bucketing approach has not been implemented in Iceland. O-SIIs in Iceland have similar O-SII scores, and, more importantly, have similar importance for the functioning of the Icelandic financial system. This can be seen in Figure 6 and the relatively narrow band of O-SII scores of identified O-SII banks in Iceland.

Germany and Luxembourg have the least concentrated banking sectors. Interesting to perceive is also the fact that the average HHI across the EU almost evenly splits in half the distribution of countries, confirming the fact that the important differences exist at the level of banking sector concentration.

Concerning the average O-SII buffer rate applied, the most visible cluster from Figure 4 is found at the higher end of the banking sector concentration level. Authorities in charge of overseeing the banking sectors showing the highest degree of concentration are those which are seemingly keener to require O-SIIs to meet higher buffer rates, closer to or at the 2% regulatory cap in place until 2019. The remaining majority of authorities vary widely in terms of the buffer rate requirements.

Figure 5 – Range of O-SII buffer rates (distance from maximum to minimum buffer rate)



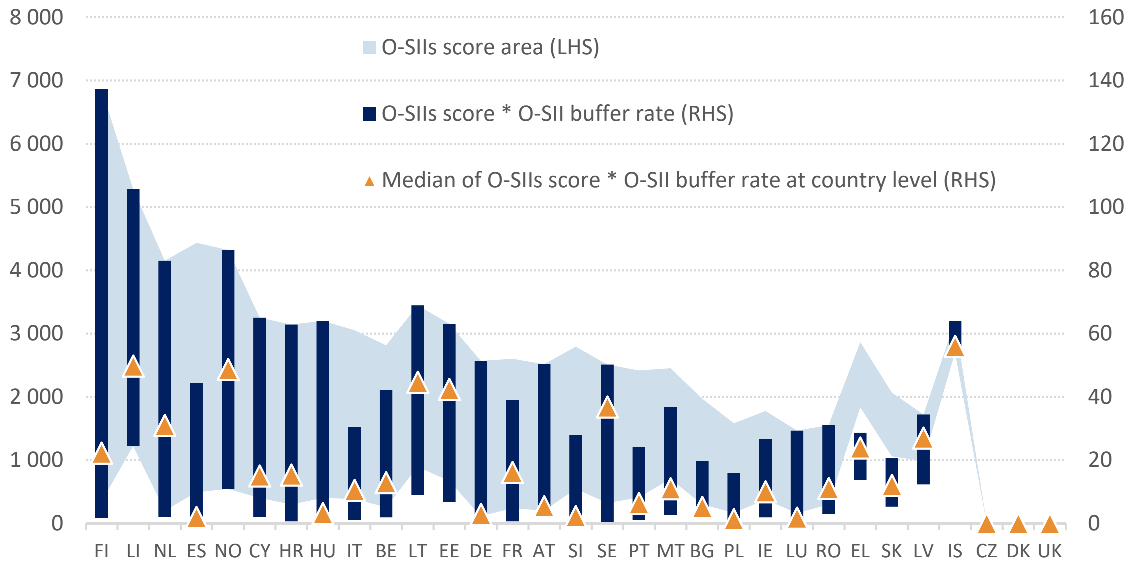
Source: EBA survey of national authorities in 2020; 2018 year-end data.
Note: DK, CZ and UK set the O-SII buffer rate by default at 0%.

In addition to distinct levels of average O-SII buffer rates and levels of concentration, as seen in Figure 4, from Figure 5 it is possible to conclude that the range of O-SII buffer rates set by relevant authorities is very diverse. Only Sweden makes use of both the minimum rate possible of 0% and, at the same time, of 2% rates, the maximum O-SII buffer rate foreseen by CRD IV. The other country setting 0% or higher O-SII buffer rates is Poland, in this case having as maximum rate 1%. All other countries set O-SII buffer rates of 0.2% or higher (except for the United Kingdom, the Czech Republic and Denmark[22]). Six authorities (Austria, Estonia, Lithuania, Netherlands, Romania and Latvia) set as minimum rates 1% or higher, while eight others (Poland, Spain, Italy, Portugal, Slovenia, Bulgaria, Slovakia and Greece) set as a maximum the very same rate of 1%. Figure 5 shows in addition that Iceland, Liechtenstein and Norway set buffer rates of 2% for all identified O-SIIs. While some national decisions, as we will see in this report, seem to be comparable across countries, meaning that for a similar level of systemic footprint similar O-SII buffer rates are set, many other decisions

[22] These cases reflect the fact that 0% rates have been set for all identified O-SIIs, which in the view of these authorities was justified by the use of the SyRB under the macroprudential framework set by CRD IV. With the changes arising from CRD V, these approaches are likely to be reviewed.

seem to be contradictory and to depart from each other. This reality raises important question marks on whether the desired level playing field across the EU is being achieved.

Figure 6 – Dispersion of O-SII score (LHS) and relation with corresponding O-SII buffer rates



Source: EBA survey of national authorities in 2020; 2018 year-end data.
Note: DK, CZ and UK set the O-SII buffer rate by default at 0%.

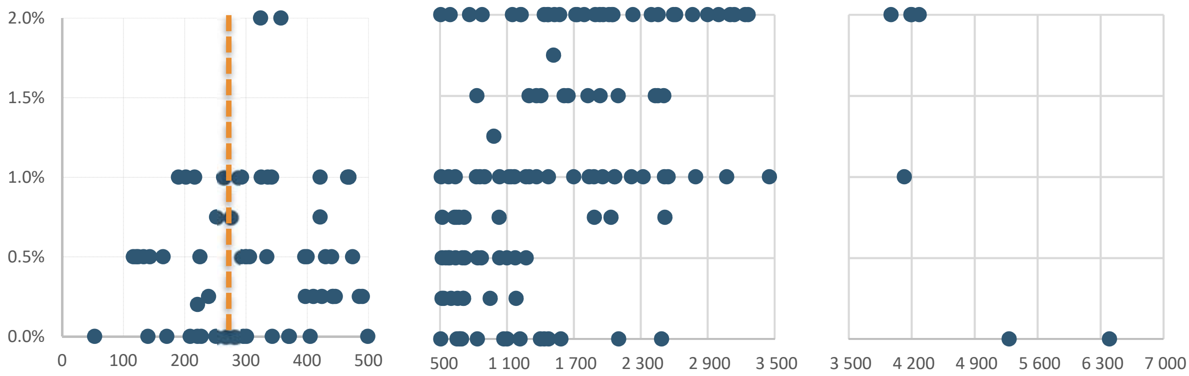
When studying the relation between the distribution of O-SII scores, average O-SII buffer rates and the respective range of rates set by the authorities, important evidence is collected. Figure 6 suggests that, where median bank-specific O-SII scores multiplied by the corresponding buffer rate (orange marker) is both towards the lower end of the dark blue bars showing the relation between O-SIIs scores and buffer rates, and below the light blue area representing O-SIIs scores distribution, authorities may be setting buffer rates at a lower level compared to their peers[23]. This is apparently the case of Spain, Hungary, Slovenia, Portugal, Poland, and Slovakia. Consistently with previous conclusions, countries where those relations and features for Figure 6 do not hold seem to be those setting the O-SII buffer rate at a comparatively higher level, namely, Norway, Lithuania, Estonia and Sweden, and to a lesser extent, Liechtenstein and the Netherlands. It should be noted, however, that the conclusions extracted from Figure 6 hide other important factors such as the particular distribution of O-SII scores[24] resulting from distinct levels of banking sector concentration, as shown in Figure 4, and the ratio of banking sector assets over the country's economic activity, which will be examined in subsequent sections of this report. Further, in the case of a very large number of

[23] Statistical significance has not been tested. However, different buffer rate decisions from relevant authorities for identical levels of systemic importance, as measure by the O-SII scores, are evident.

[24] If the distribution of O-SII scores is skewed, median statistics might represent O-SIIs with a relatively small score causing the orange marker in Figure 6 to be at relatively low levels, as opposed to cases with a more even, symmetric distribution of O-SII scores. The former is the case of HU, for example.

entities in a given national banking system (e.g. Germany or Austria) or where the use of sound supervisory judgement is observed more often and consistently (e.g. Germany), the orange marker will naturally tend to the lower end of the distribution across countries.

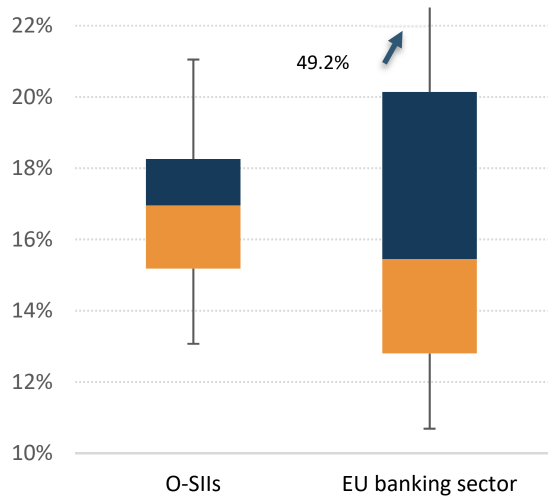
Figure 7 – Relation of O-SII scores to O-SII buffer rates



Source: EBA survey of national authorities in 2020; 2018 year-end data.
Note: orange line stands for the 275 bps threshold, which is the lower bound the EBA recommends for the automatic designation of O-SIIs.

Moving to the relation between scores and buffer rates, Figure 7 shows the heterogeneity of buffer setting within the EU. It depicts on the x-axis the O-SII score, as defined by the EBA guidelines, and on the y-axis the corresponding O-SII buffer rates under CRD IV assigned by the authorities. Assessing Figure 7 in detail, there is a general positive relationship between O-SII scores and buffer rates. However, it becomes noticeable that two O-SIIs with a similar score may be required to hold a significantly different level of O-SII buffer. This holds both for O-SIIs with relatively low scores, as the lowest score for which a national authority applies the maximum permitted buffer of 2% is 342 basis points, and for O-SIIs with relatively high scores with buffer rates near 0%. Though national specificities should be taken into account, this large variation in O-SII buffer rates is a source of concern from the perspective of a common EU standard, the single market and the banking union in particular. In order to level the playing field, to promote more cohesion and achieve an integrated and more profitable EU banking sector, an enhanced degree of harmonisation when setting O-SII buffer rates is an urgent objective to attain.

Figure 8 – O-SIIs' capitalisation level (CET1 ratio fully loaded, end-2018)



Source: EBA survey of national authorities in 2020; 2018 year-end data.
Note: Chart includes the 5th, 25th, 50th, 75th and 95th percentiles. Number for the EU banking sector taken from the EBA Risk Dashboard as of Q4 2018.

Another important dimension to contextualise the current state of play of the O-SII framework and of O-SIIs in general is to assess how well capitalised these institutions are, not only taken in an isolated fashion but also by comparing with a more representative sample of EU banks. To this end, Figure 8 shows that O-SIIs are on average well capitalised, as measured by the CET1 fully loaded ratio, with around three out of four O-SIIs being at or above the 15% mark for that capital ratio. This compares with less than 13% for the EU banking sector, as published on the EBA Risk Dashboard[25] as of Q4 2018. The median CET1 ratio for O-SIIs is 17% while for the EU banking sector it is 15.4%. These numbers show that O-SIIs are generally well capitalised, irrespective of the excessive heterogeneity observed in O-SII buffer rates. Still, some caution is needed since, as per Figure 1, 35% of the O-SIIs belong to an EU banking group, potentially contributing, to some degree, to an overlap of risks, capital and TREA.

[25] The EBA Risk Dashboard is based on a sample of more than 180 European banks (unconsolidated number of banks, including more than 30 subsidiaries) that together account for more than 85% of EU banks' total assets. Aggregate figures for the EU shown in the EBA Risk Dashboard exclude subsidiaries to avoid double counting.

2.4 Aggregate statistics for O-SIIs in the EU

Table 1 – Aggregate statistics for O-SIIs in the EU as of December 2018

	EU total	Average across MS	Median across MS	Maximum across MS	Minimum across MS
Sum of EU O-SIIs' total assets [EUR million]	32 877 499				
Share of EU O-SIIs total assets	68%	74%	81%	95%	37%
O-SIIs total assets over GDP	206%	182%	129%	800%	37%
EU O-SIIs share of credit to domestic private non-financial sector		75%	80%	97%	32%
Total assets of banking sector over GDP	239%	271%	224%	1 417%	50%
Banking sector concentration [HHI index; EU average given as a simple average of all EU Member States]		1 651	1 515	4 415	347
Number of EU O-SIIs	193	6	6	15	2
EU O-SIIs' CET1 ratio		18.06%	16.95%	77.30%	6.63%
EU O-SIIs' buffer rate weighted by O-SIIs' total assets[26]		1.22%	1.28%	2.00%	0.00%

[26] Average and median are computed across country-averages.

O-SIIs across EU Member States

In the course of this chapter several indicators are provided to support the objective of this report and findings underpinning the policy recommendations of the last chapter. These indicators and ensuing analysis will highlight the different perspectives and heterogeneity across countries. In light of this state of play, the need for a more homogeneous approach to the calibration of O-SII buffer rates seems warranted and supportive of an enhanced EU mandate for both the O-SII identification and buffer calibration phases of the yearly exercise. That mandate should, however, provide for some degree of flexibility for national authorities to fine-tune their policies and decisions, catering for national banking sector specificities.

With the 2019 O-SII identification exercise, all EU Member States have O-SIIs identified within their jurisdiction. The total number of O-SIIs within the EU ranged from 173 in 2015 to 203 in 2017.

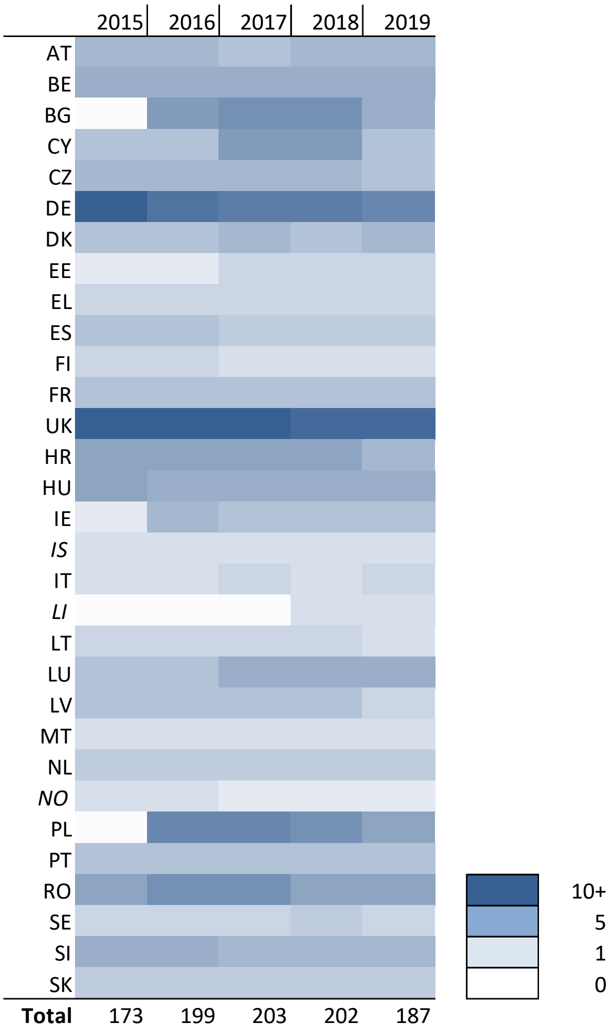
In 2019, most O-SIIs were located in the United Kingdom (15), Germany (12), Poland (9) and Romania (9). The next group of jurisdictions by number of O-SIIs is formed by Belgium, Bulgaria, Hungary and Luxembourg, all with 8 O-SIIs. The number of O-SIIs tends to be stable across the years in the majority of the jurisdictions, with observed year-on-year variations being significant in very few countries. This stability seems to corroborate the structural nature of this capital buffer, which aims at capturing idiosyncratic features of the most relevant institutions in each banking sector and their potential contribution to the amplification or spreading of systemic risk and losses. Among others, this is an important feature to keep in mind going forward, particularly in light of topical discussions on the usability of buffers in a time of crisis[27]. Whether or not bank-specific buffers like the G-SII and O-SII buffers should assume a more permanent form or be fully available for depletion[28], which might be contrary to initial objectives, will likely be under debate by policy makers during the short to medium term. For the purpose of this report, the O-SII buffer should be understood as a structural, thus essentially non-cyclical buffer, which is an important component of the combined buffer requirement[29].

[27] See the COVID-19 pandemic note to the G20 by the Financial Stability Board (2020).

[28] See Behn et al. (2020).

[29] The combined buffer requirement, as framed by the CRD, is comprised of the capital conservation buffer which can be extended by the countercyclical capital buffer, the O-SII and G-SII buffers and the SyRB.

Figure 9 – Number of O-SIIs per EU Member State



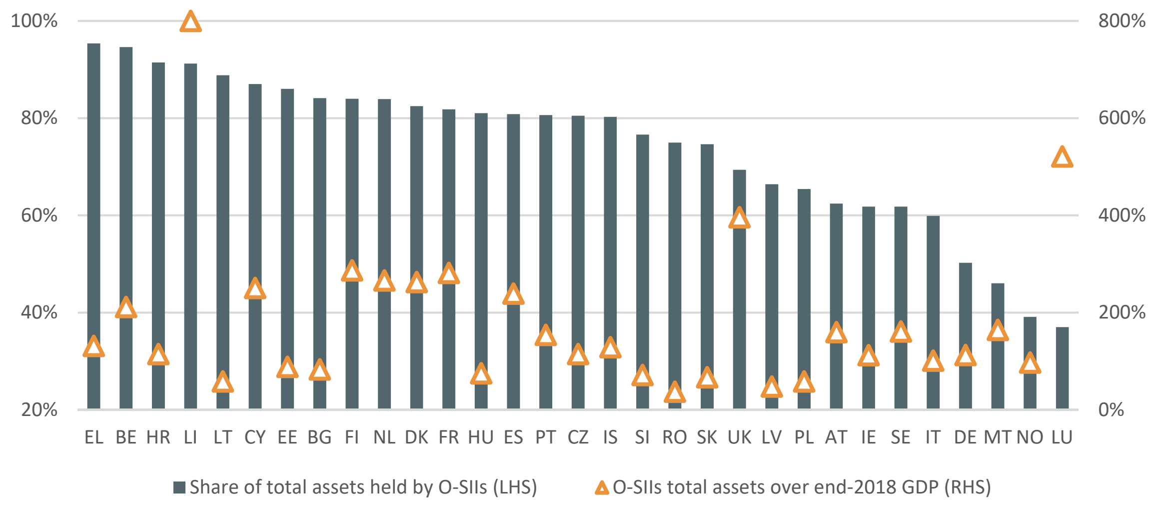
Source: Yearly notifications to the EBA; darker blue shades point to a higher number of identified O-SIIs.

In order to estimate the economic importance of the O-SIIs within the Member States, their share of total banking system assets can measure concentration while total assets measured as a percentage of a specific year's GDP provides a dimensional indication of size and importance of the banking sector as a whole for a given economy. Higher proportions of the banking sector over GDP could point to higher financial stability concerns, which, in principle, would be expected to be mitigated via higher bank-specific O-SII buffer rates.

As the figure below illustrates, in the majority of EU Member States O-SIIs hold between 80% (Czech Republic and Iceland) and 95% (Greece) of total banking assets of each respective market. In 12 Member States, O-SIIs hold between 40% and 80%, and, at the other end of the scale, only in Luxembourg and Norway do O-SIIs hold less than 40% of total assets of the entire banking sector. The median and average share of total assets held by EU O-SIIs in each country's banking sector are 80% and 74%, respectively.

For Liechtenstein, total assets held by O-SIIs represent eight times 2018 GDP for that country, and for Luxembourg and the United Kingdom over five and four times respectively. On the lower bound of this ratio, Romania and Latvia observe respectively a third to a half of a year's GDP. The remaining countries are situated between a ratio of 58% to 300%.

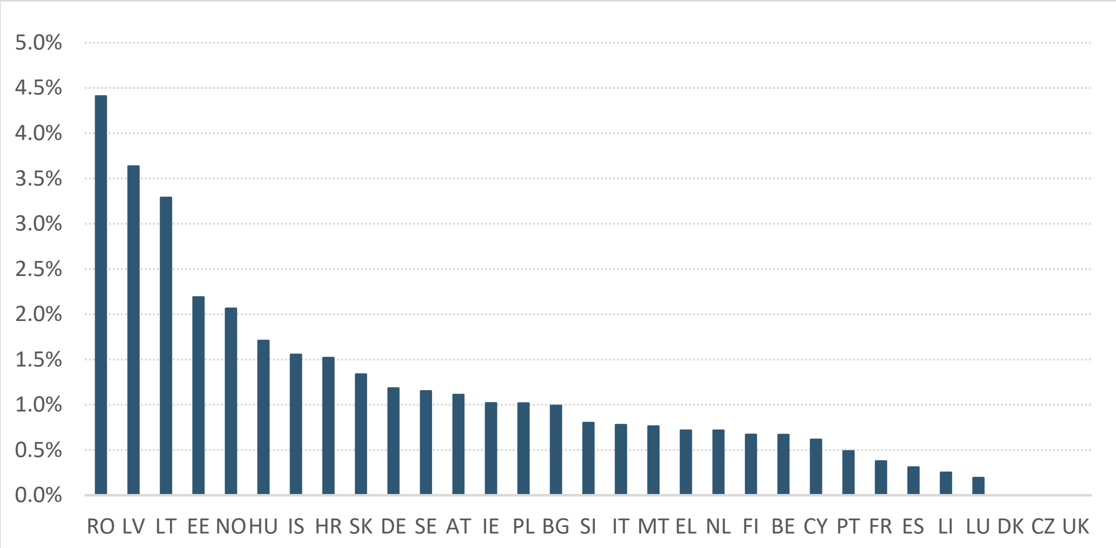
Figure 10 – Share of total assets held by O-SIIs and O-SIIs' total assets over GDP



Source: EBA survey of national authorities in 2020; 2018 year-end data.
Note: share of total assets held by O-SIIs computed in relation to the sum of total assets for the entire national banking sector while O-SIIs' total assets over GDP is computed as the ratio of the sum of O-SIIs' total assets in a given country over that country's GDP.

One complementary way of measuring and assessing the framework for setting the prudential level of O-SII buffer rates deployed so far across the different EU jurisdictions is to take stock of the relation between the level of capital that O-SIIs are requested to hold against their bank-specific O-SII buffer rates set by the corresponding authority and each Member State's GDP. This relation could be a relatively good proxy for the capitalisation level required by the different authorities in light of one institution being identified as systemically important, although this might have been partially addressed in the past by some other capital-based requirements put in place by national authorities. Considering it is a relative measure based on each country's economic output, this metric provides both an indication of the leverage of O-SIIs in a given domestic economy and an estimation of the effort required from identified O-SIIs to address their larger systemic footprint than other entities. Based on evidence illustrated below in Figure 11, the level of effort is quite diverse across the EU, illustrating, on one hand, the heterogeneity of national banking systems and, in parallel, that national authorities take different buffer rate decisions based on the use of each country's GDP as a benchmark. These differences are observed in terms of banking sector concentration (Figure 4), O-SIIs' capital effort measured by the ratio of O-SII buffer requirements over a country's GDP, and in terms of the share of total assets held by O-SIIs (Figure 10).

Figure 11 – Proxy of capital held by O-SIIs due to O-SII buffer rate requirement over country's GDP[30]



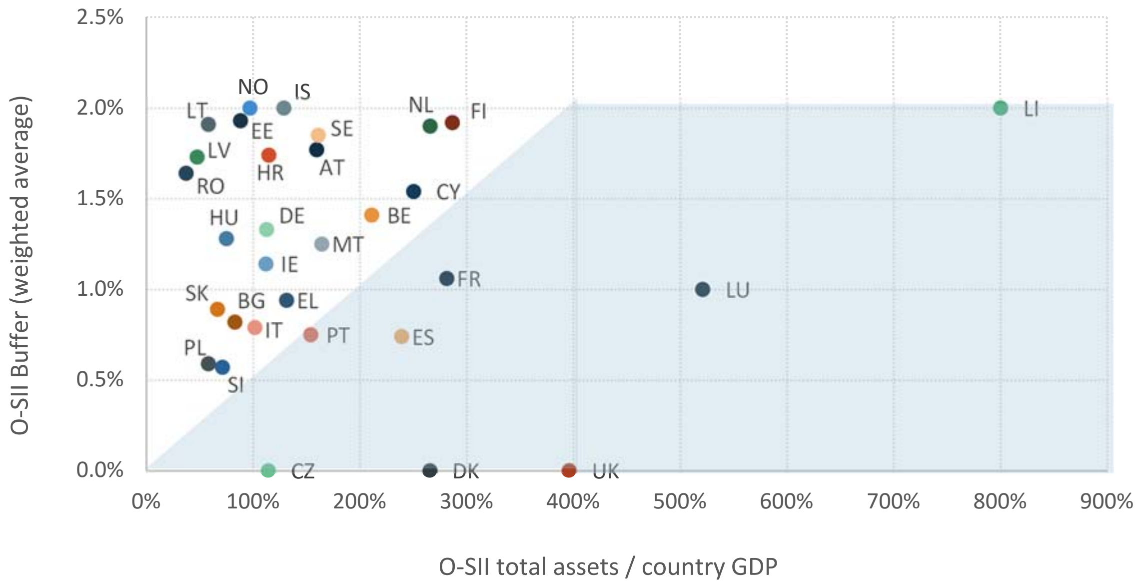
Source: EBA survey of national authorities in 2020; 2018 year-end data.
Note: DK, CZ and UK set the O-SII buffer rate by default to 0%.

In Figure 11, Romania, Latvia and Lithuania with 4.4%, 3.6% and 3.3% respectively appear to be the countries with the higher level of effort to offset the negative externalities that the systemic importance of a group of O-SIIs entails. At the opposite end, Luxembourg with 0.2% seems to be the Member State where that effort level is lowest, closely followed by Liechtenstein and Spain, both with 0.3%. Median and average levels of effort as measured by this proxy are of 1% and 1.3%, respectively and excluding the three countries where the O-SII buffer rate is set to 0% by default. The result is thus a clearly skewed distribution of effort with 19 out of 28 jurisdictions observing below-average effort levels.

Additionally, it will be of interest to examine the single components of the proxy provided for the effort level as illustrated above. For example, do jurisdictions and related authorities with a very high predominance of the banking sector's activity over GDP impose higher O-SII buffer rates? And if that expectation exists, are there any visible differences in the results of the buffer rate decision process? Do those results depend on whether O-SIIs in that jurisdiction are mostly comprised by subsidiaries of banking groups domiciled elsewhere in the EU, outside the EU or of domestic ownership? In Figure 12, the key components of that effort measure are disentangled. On one hand, the level of O-SII buffer rates assigned to which O-SII is crucial considering that similar O-SII scores have resulted in very distinct buffer requirements. On the other hand, setting those buffer rates and authorities' decisions against the particular context of O-SIIs' total assets, both at country and bank-specific level, and the corresponding country's GDP, is appropriate to study the different practices across EU Member States.

[30] Computed as follows: [average O-SII buffer rate as of end-2018 weighted by O-SIIs' total assets as of end-2018] divided by [O-SIIs' end-2018 total assets over countries' end-2018 GDP].

Figure 12 – Relation between weighted average rate for O-SII buffers and O-SIIs' predominance over a country's GDP



Source: EBA survey of national authorities in 2020; 2018 year-end data.
Note: countries within the blue shaded area may be setting lower O-SII buffer rates relative to their peer authorities.

In Figure 12, Romania, Latvia and Lithuania again stand out with high O-SII buffer rates despite having one of the lowest ratios of O-SIIs' total assets over the country's GDP. Hence, these countries can be characterised as having set relatively high buffer rates in comparison with other countries. In the same direction, Estonia and Norway follow closely, which is consistent with the above-average effort seen in Figure 11. Further revealed in Figure 12 is the fact that, for example, Liechtenstein required O-SIIs to meet the maximum buffer rate level of 2% available so far despite its apparently lower level of effort[31], according to the measure illustrated in Figure 11. Regarding Luxembourg, which has the lowest level of effort after the authorities that set O-SII buffer rates to 0% by default, one observes that its level is both due to an approach to buffer setting at the lowest end of the distribution across countries and due to its comparatively high ratio of O-SIIs' total assets over GDP. As in Figure 11, in Figure 12 Portugal, Spain and France appear to be the Member States where the effort level is below-average and closer to Luxembourg and Liechtenstein. For those three cases, the reason for the apparently low effort level required from O-SIIs is largely due to below-average O-SII buffer rates, as illustrated also in Figures 4 and 5. As for Luxembourg, below-average O-SII buffer rates are observed but to a seemingly milder extent than for those three countries. The driving factor for Luxembourg is the predominance of O-SIIs' assets over the country's GDP, which is seen to a much lesser extent in the other three cases. Regarding Liechtenstein, the predominance of banking sector activity is the single contributing factor since this country requires its O-SIIs to meet the highest buffer rate possible under CRD IV of 2%. When

[31] It is appropriate to remember that this report focuses on the implementation of the O-SII capital buffer and its level of harmonisation across EU Member States.

comparing similar ratio levels of O-SIIs assets over the country's GDP, for example between 225% and 300%, we observe that the Netherlands, Finland and Cyprus all require weighted O-SII buffer rates over 1.5% on average (with the first two Member States over 1.9%), while Denmark, Spain and France require less than or very close to 1%, on average.

3.1 Key statistics per EU Member State

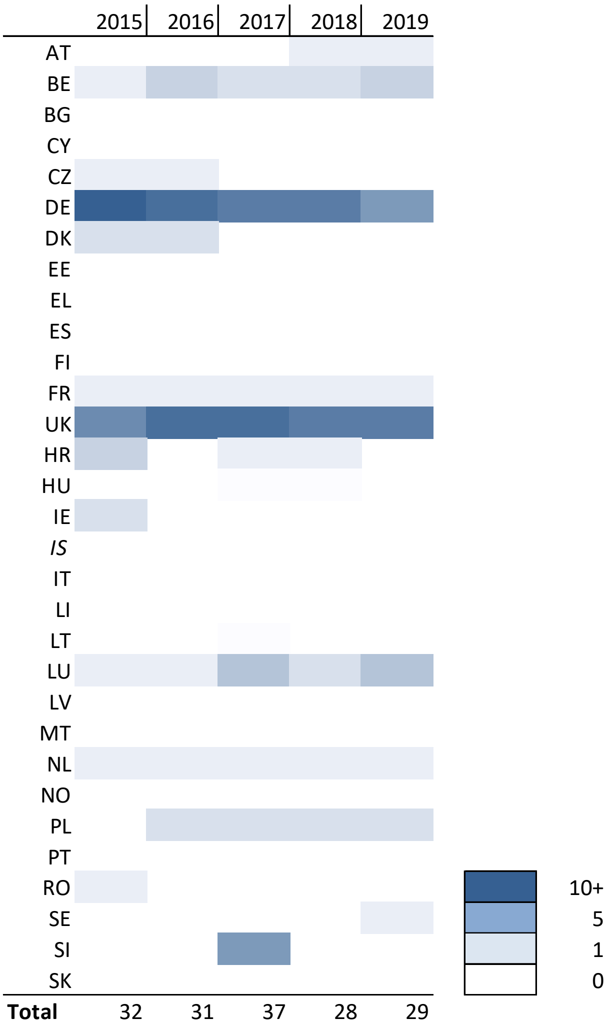
3.1.1 Use of supervisory judgement when identifying O-SIIs

Supervisory judgement allows the capturing of *'national specificities and individual functions that may result in systemic importance'*[32] and may be used by national competent authorities (NCAs), through the means of considering optional indicators, in order to include one or more banks on its O-SIIs list.

From 2015 to 2019, supervisory judgement to further identify O-SIIs has been used between 28 (2018) and 37 (2017) times. However, usage of sound supervisory judgement is not consistent in time and across the Union. There are Member States that have never used this possibility, others only occasionally and some others that have used it consistently at least once per each yearly exercise, meaning that a small number of countries accounted for the majority of O-SIIs' identification on this basis and not via the mechanistic designation. Additionally, this discretion has been limited to between one and four banks in most countries, with two Member States accounting for roughly half of all supervisory judgement decisions taken historically within the EU. Figure 13 below summarises the use of supervisory judgement from 2015 to 2018 in the EU. While this aspect pertains much more to the identification part of the O-SII assessment exercise, it is an important angle to consider when understanding why some of the country figures and comparisons performed in this report deliver the conclusions reached.

[32] Cf. EBA (2014) Guidelines on the criteria to determine the conditions of application of Article 131 paragraph 3 of Directive 2013/36/EU (CRD) in relation to the assessment of other systemically important institutions (O-SIIs) (EBA/GL/2014/10, p. 25).

Figure 13 – Number of O-SIIs identified through supervisory judgement (2015-2019) per MS



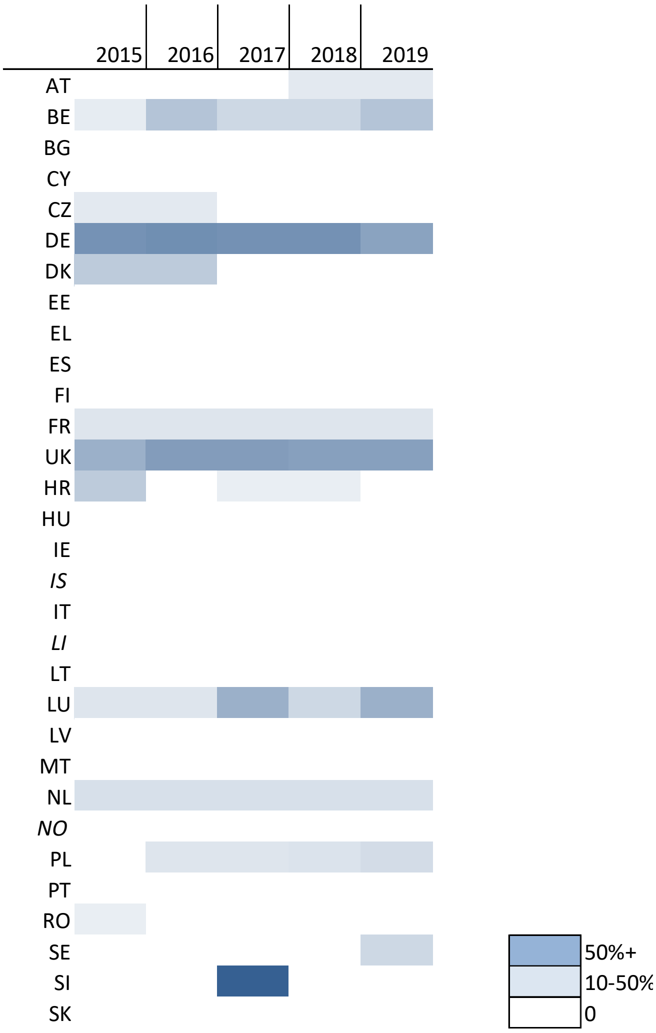
Source: Yearly notifications to the EBA; darker blue shades point to a higher number of identified O-SIIs.

3.1.2 Ratio of supervisory judgement (2015-2018)

Calculating the ratio between the number of O-SIIs identified by applying supervisory judgement to the total number of identified O-SIIs allows an assessment of how many of the designated O-SIIs were subject to supervisory judgement.

The range is broad and in a number of countries the majority of O-SIIs were identified through the exercise of supervisory judgement, in some other cases only a minority or even none.

Figure 14 – Percentage of number of O-SIIs designated through supervisory judgement (2015-2019)



Source: Yearly notifications to the EBA; darker blue shades point to a higher number of identified O-SIIs; percentages of identified O-SIIs.

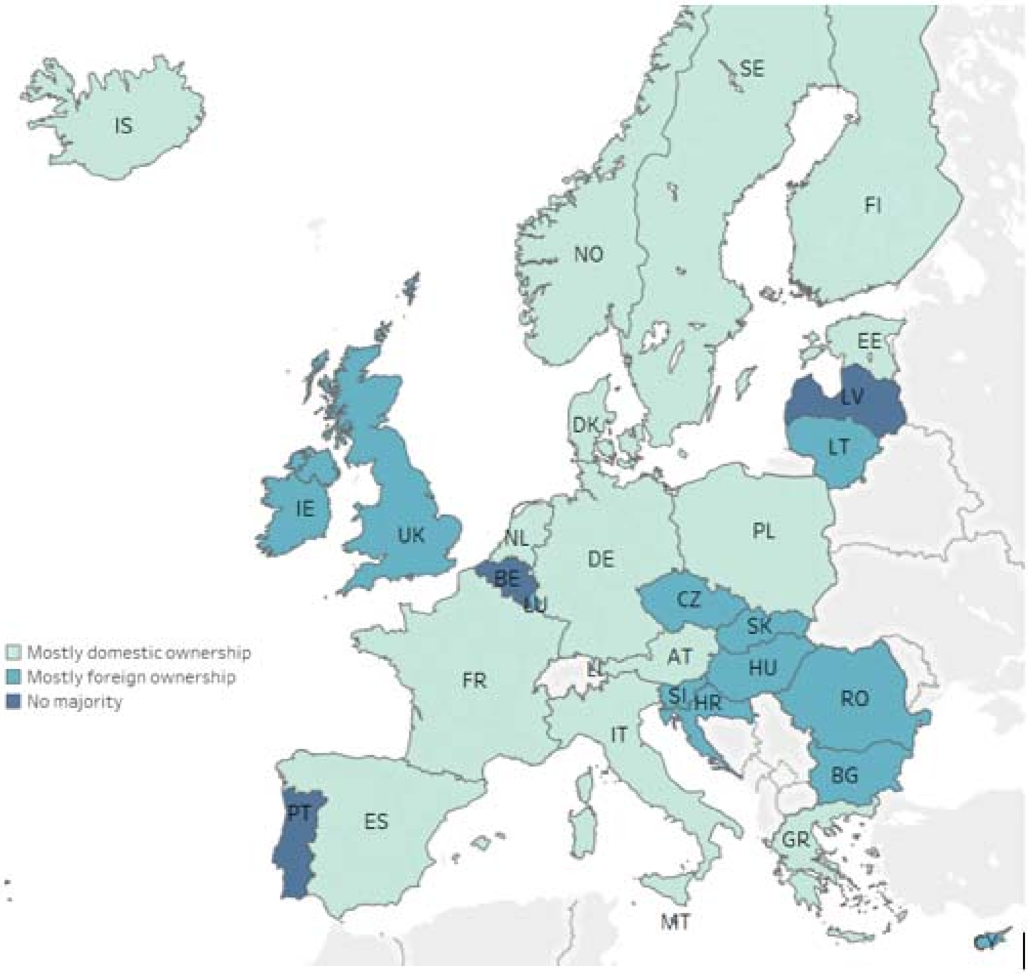
3.1.3 Home or host (2015-2019)

Identifying whether a designated entity is of domestic ownership (i.e. ultimate parent institution at EU level under the jurisdiction of the Member State) or foreign ownership (i.e. subsidiary of a foreign parent institution domiciled elsewhere in the EU or in a non-EU country) allows an assessment of whether in a country its O-SIIs are mostly domestically owned or foreign-owned[33]. This assessment is important but, in reality, it should be acknowledged that there is no right mix

[33] For the purposes of this analysis, countries were considered as mostly of foreign ownership if foreign groups or entities own more than half of the O-SIIs (in number).

between domestic and foreign ownership, neither should it be a policy or supervisory objective in itself. Despite this fact, one can observe that only a couple of jurisdictions show an even split between the number of cases of domestically owned and foreign-owned O-SIIs. Furthermore, as the map below illustrates, a broad geographical pattern can be identified as O-SIIs in Eastern European countries are typically foreign owned, together with Luxembourg, Ireland and the UK, whilst in the remaining EU countries they are mostly of domestic ownership. The predominance of foreign ownership in Eastern Europe is a result of a wave of privatisations and foreign acquisitions during the late 1990s and early 2000s in Eastern Europe led by Western European banking groups entering those markets, which ultimately changed the structure of those banking sectors to the reality known today.

Figure 15 – Map of EU countries with mostly domestic or foreign ownership of O-SIIs for the 2020 exercise



Source: Yearly notifications to the EBA. Note: The map echoes the ownership of O-SIIs based on end-2018 data. Countries with mostly domestic ownership are shown in light green (domestic owners own more than half of all O-SIIs in the respective country in absolute terms). Countries with mostly foreign ownership are shown in blue-green (foreign groups or entities own more than half of all O-SIIs in the respective country in absolute terms). Countries with an equal number of domestically owned and foreign-owned O-SIIs are shown in dark blue-grey.

The conclusions drawn from the diagnosis carried out in this chapter are that the EU O-SIIs landscape is very diverse, not only due to partly justified differences arising from national banking systems heritage, but also due to different approaches when calibrating buffer rates, which include authorities' willingness to set higher buffer requirements. This report and policy recommendations are aimed at avoiding, as a bare minimum, unwarranted discretion and an uneven playing field at the lower end of the O-SII buffer rates distribution across the Union.

Calibration approaches for the O-SII capital buffer

Although their application in regulatory practice has a relatively short history, models have been developed and proposed by the literature in the context of calibrating macroprudential tools such as the O-SII capital buffer. Literature coverage has, however, been more generous in highlighting the underlying concepts and principles that might support the effective application of models as regards the O-SII buffer, rather than detailing what those models might look like and how fit for purpose they have been so far.

In fact, a prerequisite for the extensive application of a calibration approach is its adaptability to a wide range of possible institutions to be identified as O-SIIs. The implementation should be done ensuring a sufficient degree of harmonisation while providing proportionate buffer rates that can be supported by the applicable legal framework. At the same time, an effective implementation should avoid or at least mitigate any practical limitations due to the lack of data and it should provide some room to adjust the calibration to the specificities of the national banking system.

The stability of the calibration results over time can be understood as a further characteristic supporting proper implementation. At the same time the sensitivity of the model to changes in systemic relevance can be assessed as a critical property of the calibration approaches which could interact with or even counteract the stability of the calibration. The assessment of stability should provide information about the capacity of the model to react proportionately – via the change in the buffer rate calibration – to a material temporal variation in systemic risk importance. An excessive volatility in the calibration results, given by a certain method or approach across the relevant time periods, might suggest insufficient risk coverage or overly restrictive buffer rate rules, making capital planning excessively costly and uncertain. In contrast, a favourable degree of sensitivity to changes in the systemic footprint of different banks should ensure that the change in the buffer rate due to developments in the systemic relevance of a bank are proportionate, thus limiting the cost of inefficiencies in the presence of very large institutions seen as too big to fail.

Finally, transparency and ease of communication are two crucial factors that contribute to the disclosure of each calibration approach and of the model used therein being helpful and providing the desired clarity. Transparency, meaning the possibility to share in clear fashion the details related to model calibration, depends on how much information the authorities assess as possible to be provided on the methodology, and whether the results are reproducible. This assessment, in turn, is strictly driven by the model complexity and by the risk tolerance and preferences of the authorities in charge of setting and maintaining each model. Complementary to the transparency dimension, ease of communication helps in interpreting results intuitively, by all types of audience, allowing for a clear understanding of the techniques used and implied regulatory objectives. It contributes as well to the formation of adequate expectations by relevant stakeholders such as top management teams of supervised entities, investors, consumers, depositors and the wider public.

This section of the report contains three subsections. The first covers the literature review of the known calibration approaches worldwide, regardless of how frequent or successful they have been when deployed in the past. The second part of this section provides an overview of practices by national authorities in the EU in charge of calibrating the O-SII buffer. Finally, the last part of this section develops the technical details of the most relevant calibrations approaches together with respective pros and cons.

4.1 Literature review

This section covers the literature review and some of the efforts to develop a sound methodology that might frame capital buffers aimed at tackling systemic risk borne by bank-specific cases. The O-SII buffer case is naturally a noticeable example of it, with significant experience and insights gained since 2013-2014, building on the finalisation of the CRR and CRD IV banking package and implementation. The implementation of the macroprudential toolkit in the EU, particularly with regard to the O-SII capital buffer, brought with it a handful of challenges. These challenges were not only of a technical nature in terms of how best to calibrate and be proportionate about bank-specific surcharges, but also in terms of the promotion of a level playing field in the Union and within any national jurisdiction. Additionally, the complexity and significant interplay between newly introduced prudential tools often led to unwarranted effects. In this section of the report, we will focus on the technical nature of those challenges.

4.1.1 Bucketing approach

Bucketing approaches are widely used in the context of buffer calibration for systemically relevant institutions and are the preferred option both nationally, in the EU context, and internationally within the framework for globally systemic institutions. This method consists of defining a number of 'buckets' of varying width based on hypothetical values of O-SII scores, in order to assign a buffer rate to each bucket, and applying that buffer rate to all O-SIIs whose score is comprised within the related bucket. While different methods may underpin the process of bucket design, these approaches generally offer a flexible, pragmatic framework to account for the uncertainty regarding the systemic footprint of an institution, and allow one buffer rate to be assigned to a range of comparable systemic scores rather than to one particular score only.

A general expectation of any calibration approach for the O-SII capital buffer is to achieve a proportionate relation between the buffer rate set and the systemic importance of the various institutions identified as O-SIIs. To this end, a common regulatory approach is to define a clear and simple assignment, ex-ante, between bank-specific scores compiled for the purpose of the O-SII identification process and the corresponding buffer rates. In most cases, the mapping is described by a step function, by forming buckets of scores where a bucket stands for a predefined interval of bank-specific scores for which systemic importance is measured as similar and to which a specific, common buffer rate is assigned. Proportionality is then achieved by assigning higher buffer rates to higher intervals of systemic scores, increasing buffer rates by a customised but still economically reasonable amount, bucket after bucket. As these expert-set thresholds for each interval and corresponding buffer rates are usually the subject of regulatory communication, their simplicity and transparency when being explained are another significant aspect which contributes positively to an efficient design and calibration of the different buckets.

For domestic systemically important institutions, the BCBS framework[34] does not establish systemic importance scoring and bucketing based on a prescribed methodology, as in the case of the G-SIB framework. Nonetheless, as a principle, it expects systemic importance to be quantified and documented, and for the higher loss absorbency requirements to be commensurate with domestic systemic importance. The framework does, at least implicitly, suggest the potential use of some form of bucketing method for calibration, which subsequently could provide the incentive against banks increasing their systemic importance, in order to avoid higher capital requirements[35].

The EBA guidelines on the identification of O-SIIs provide, as a first step, a harmonised framework for O-SIIs to be identified in the EU, which is followed by a second step where sound supervisory assessment can be applied and further indicators optionally considered by the relevant authorities of the Member States. Overall, the identification methodology provides as an output a scoring that measures systemic importance across the different participants of each banking sector. The resulting EBA O-SII scores may thus contribute to the design process of buckets and buffer rate calibration, as per the expectation set in the EBA guidelines mentioned and following the requirement of Art. 131 (5) of CRD IV. For instance, the ECB[36] allocates O-SIIs into one of four bucket score intervals, whereby each bucket is associated with a specific floor for the O-SII buffer rate. A comprehensive review of regulatory practice can be found in the EBA Peer Review Report finalised in 2017, which contains survey answers on the variants of the bucketing calibration approaches applied at the time by a number of Member States and the degree of comparability among those different approaches[37].

While the different bucketing approaches constitute a frequently used regulatory method to calibrate the buffer rates of other systemically important banks in the EU and elsewhere in the world, the literature studying its properties and performance is relatively scarce. Initial research studied the reliability of systemic scoring methods and provided suggestions to improve the measurement and scoring of systemic importance. Suggestions to improve systemic importance measurements include the use of average instead of year-end data for score calculation[38], adjusting

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[34] See BCBS (2012) and BCBS (2019) for more information.

[35] Point 35 of the BCBS framework (see footnote 6) states: ‘Although the D-SIB framework does not produce scores based on a prescribed methodology as in the case of the G-SIB framework, the Committee is of the view that the HLA requirements for D-SIBs should also be decided based on the degree of domestic systemic importance. This is to provide the appropriate incentives to banks, which are subject to the HLA requirements to reduce (or at least not increase) their systemic importance over time. In the case where there are multiple D-SIB buckets in a jurisdiction, this could imply differentiated levels of HLA between D-SIB buckets.’

[36] See the ECB (2017) for the proposed floor methodology for setting the capital buffer for an identified O-SII.

[37] See EBA (2017) on the peer review of the Guidelines on the criteria to determine the conditions of application of Article 131 paragraph 3 of Directive 2013/36/EU (CRD) in relation to the assessment of O-SIIs, November 2017.

[38] See Behn et al. (2019) for more information.

for the variance of indicators[39] or revaluating the weighting of an indicator's components using data-driven methods[40]. Practical examples illustrating the implementation of data analytical approaches that guide the definition of bucketing rules or clustering methods for systemically important banks are virtually non-existent. While further research in this field would be very welcome, there are non-negligible constraints that may be limiting such efforts. For instance, the wide range of methods for clustering banks could render most regulatory attempts to be seen as partially incomplete. In addition, many jurisdictions have a limited O-SII sample size, which leads to significant challenges and low appetite for the development and backtesting of calibration models. For these reasons, it seems clear that an EU-wide, harmonised approach and implementation[41] cannot emerge from the experience and calibration of any national model alone.

As it is challenging to devise quantitative methods to determine the functional relationship between systemic scores and buckets of buffer rates, there could be good reasons to deviate from the simpler linear mapping between scores and buffer rates, therefore leading to some degree of reliance on supervisory judgement. This could be particularly relevant if the regulator considers introducing a convex[42] shaped mapping, such as the one present in the G-SIB framework[43], in contrast to a linear mapping where equal buffer rate increments are applied across equally sized buckets. Such convex-shaped mapping of buffer rates to bank scores might make it more difficult for other objectives to be accomplished, such as to provide stability to the framework by defining buckets on relatively large intervals of scores or to avoid what could be the introduction of an excessive cliff effect from one bucket to the other. The latter could happen for institutions on the edge of a bucket threshold facing a sharp increase (or decrease) of capital buffer requirements if they cross the subsequent threshold into the next or previous bucket[44].

4.1.2 Equal expected impact approach for calibration

The equal expected impact (EEI) approach seeks to achieve a level of PD that allows the expected impact, respectively expected loss (i.e. PD * sLGD), of an SII to be equal to the expected impact of a reference bank. The buffer is therefore used and calibrated in such a way that the PD of the systemic bank is decreased until the equation holds, where the higher the buffer, the lower the PD. Given the definition of expected loss (EL) as the product of probability of default (PD) and systemic loss given default (sLGD), the idea is that:

[39] See Benoit et al. (2019) for more information.

[40] See Giordana (2013) for more information and also the ESRB notification by the Central Bank of Hungary of 2019 (https://www.esrb.europa.eu/pub/pdf/other/esrb.notification200214_osii_hu~fdad1aa469.en.pdf?9ce432c63561d4518f374f1e40ac4718).

[41] See European Central Bank (2006) and Masciantonio (2013) for more information.

[42] Convex-shaped curve reflecting incremental buffer rates across equally sized buckets and higher bank-specific score intervals.

[43] The G-SIB framework includes, by construction, a convex-shaped curve that serves as a deterrent to increasing systemic footprints. This convex-shaped curve of higher loss absorbency (HLA) buckets includes incremental capital requirement of 50 bps, from bucket 1 to bucket 4, and of 100 bps for any additional bucket added due to G-SIB scores above 530 bps.

[44] See ESRB (2017) for an overview on the use of structural macroprudential instruments in the EU.

$$EL_{SII} = EL_{non-\ SII}$$

and

$$PD_{SII} * sLGD_{SII} = PD_{non-SII} * sLGD_{non-SII}$$

By nature, any one SII will have i $sLGD_{SII}$ higher than $sLGD_{non-SII}$ for any non-SII. In order to bring expected losses from an SII and non-SIIs to the same level, the default probability of the systemically important institution must be reduced by requesting them to hold more capital[45].

In order to measure appropriately the systemic LGD used for the buffer calibration and subsequent decrease of the PD, the O-SII scores are often used, thus avoiding some of the challenges of sLGD measurement and ultimately relying on readily available inputs that measure banks' systemic footprint. This approach explicitly models and adjusts for the distress probability of the institutions under assessment. The underlying assumption for this adjustment is that systemic importance scores or other such measures represent the systemic or social impact of an O-SII becoming distressed or near default, and thus can be interpreted as a systemic LGD (sLGD) proxy. Multiplying the sLGD with a measurement of the probability of distress/default of an O-SII gives as a result the expected systemic loss, i.e. the expected impact.

The EEI suggests that institution-specific systemic impacts of O-SIIs should be equal to the expected impact of a non-O-SII reference institution or to a reference level depending on the degree of risk tolerance. This equality is achieved by increasing the capital buffer of O-SIIs, in order to decrease their probability of distress to an extent which compensates for their higher systemic impact in case of default. The function that links capital ratio increases to reductions in PD starts from the definition of default: it will occur in the event of high losses bringing the bank's capital ratio below a given threshold. The original model for the PD estimation[46] relies on the – linear – relationship between the loss distribution $y_{i,t}$ [47] and the corresponding probability of extreme loss occurrences, taken in logarithmic scale $\ln(x_{i,t})$:

$$y_{i,t} = \alpha + \beta * \ln(x_{i,t}) + \varepsilon_{i,t}.$$

Under the assumption that loss distribution is the same for systemically and non-systemically important banks, the capital surcharge for an SII k_{SII} is equal to:

$$k_{SII} = -\beta \ln \frac{sLGD_{non-SII}}{sLGD_{SII}}.$$ [48]

[45] Passmore and von Hafften (2019) applied EEI to suggest that the Basel III framework underestimates the probability of bank failure and capital surcharge. The authors use SRISK metrics to provide a robustness to the choice of the reference bank score by regressing G-SIB scores on the SRISK measurements.

[46] See Board of Governors of the Federal Reserve System (2015) for more information.

[47] Loss distribution in the original model is based on the ratio between the bank's returns and risk-weighted assets.

[48] Some alternatives to this approach use the distribution of losses to directly estimate the probability of default of a non-O-SII, as in Skořepa and Seidler (2015).

The EEI approach, however, has the drawback that it may not always suggest a higher-than-zero buffer rate for O-SIIs with low probability of distress. On the other hand, it might suggest non-zero buffer rates for non-O-SIIs if they have relatively high probability of distress, which may otherwise suggest that the identification process could benefit from a further examination of how systemically important those banks are. Moreover, considering that the EEI approach often relies on systemic scores, it inherits some of the limitations mentioned for the bucketing approach – for instance, the uncertainty around how appropriate systemic scores are to measure and rank different levels of systemic importance, the variations in the scoring method arising from country-specific features of the financial sector, and the different social costs component of a bank failure (e.g. fixed default costs, which are not captured by O-SII scores). Additionally, the potential for a non-linear mapping between scores and adequate buffer rates is present, and this, together with the sometimes arbitrary choice that underpins the functional form that links the two, could pose an additional problem in the systemic-score-based implementations of the EEI approach.

To integrate successfully the probability of distress measurements into the buffer calibration framework, those estimates need to be reliable. The most widespread estimation method relies on the empirical left tail of the historical distribution of the return on risk-weighted assets (RoRWA) ratio. Using the empirical distribution of RoRWA is both relatively simple to implement and has better data availability for the whole range of O-SIIs than probability of default (PD) estimations based on market valuations of equity available only for publicly listed banks. Even though regulators have at their disposal historical time series data on P&L and RWA, the implementation might run into challenges caused by changes in accounting regimes and data definitions or structural breaks such as in the case of mergers or acquisitions. Beyond the limitations of the input data, regulatory practice has not taken advantage of more elaborate methods of estimation to measure PDs. Rare exceptions indicate that applying other estimation methods could add valuable information to the results, for instance by distinguishing between crisis and non-crisis periods or by considering the different risk profile of a particular institution. Further applied research on bank defaults and bankruptcy prediction might be needed for potential innovations in the implementation of bank-specific PD estimation to come to the fore.

Sensitivity analysis to other main variables of the EEI approach, such as the choice of the reference institution or the loss threshold used to define a bank's distress, has not been conducted so far in the literature. Exploring the sensitivity of EEI methods to its parameters would be important as they are expected to have a substantial effect on the results and could introduce deviations difficult to understand from a more trivial bucketing-based approach, e.g. why in some cases the EEI does not assign non-zero buffer rates to an O-SII.

4.1.3 Estimation of funding cost advantages

The financial crisis brought significant discussions about how to deal with banks considered to be too big to fail. The assumption that society will cover the losses of such banks whenever a bad outcome happens often provides little incentive for banks to weigh appropriately the trade-off between risk and return, thus engaging into excessively risky portfolios and activities. From this perspective, it is desirable to design policies that target the implicit guarantees that those banks benefit from, and the advantages that they imply. A possible approach is through the estimation of the funding advantages from being an SII and the translation of the lower funding costs associated with government support and implicit guarantees – in practice, observable via lower spreads lenders offer to O-SIIs – into macroprudential policies that could offset this unwarranted advantage.

The estimation of the funding cost advantages could reveal valuable information on whether a particular systemically important institution is perceived by its uninsured debt holders, depositors, CDS issuers or investors as a too-big-to-fail (TBTF) institution, i.e. as a banking institution that privately enjoys the benefits of implicit government guarantees and potential government bailout in the event of distress. The detection of funding cost advantages could advise the regulator about the potential presence of distorted risk taking incentives and misallocation of funding in the financial system. The estimation of O-SIIs' funding advantages differs across methodologies and according to the complexity and the data used. The main idea behind such approaches is that, if the credit spread required to lend to a large bank is below the level considered as fundamental, than it is possible that it is due to the implicit guarantees that government support may provide and the belief in a safety net that such guarantees bring to market participants[49]. From the point of view of regulatory practice, the methods for detection or estimation of funding cost advantages could be categorised as follows[50]:

- **Detection of changes in funding advantages based on infrequent market events or on ex post impact analysis of regulatory changes affecting market perceptions.** One possible approach is to identify policy events that influence whether a bank is perceived to be TBTF and to assess abnormal market returns or other changes in risk perception. Another stream of studies tests whether funding advantages can be detected after mergers of banks which are unlikely to be TBTF on their own but together form large enough institutions which could change market perception. The literature also suggested ways to estimate excess returns independent of particular events[51], but estimating the full extent of the funding advantage remains a significant challenge[52]. This arises when the estimation does not take into account the events that lead to a rise in the funding cost advantage, in which case the result only reflects the changes in the funding advantage but not its full extent. Further prerequisites for a valid estimation of the funding cost advantages are the available and appropriately selected controls for institution-specific risks and business characteristics and accounting for events

[49] Against this background, funding advantages frameworks focus, among others, on bond pricing, credit default swap (CDS) spreads, credit ratings, deposits rates and equity prices.

[50] Siegert and Wilson (2015) provide a review and evaluation of different estimation methodologies on which the following paragraphs and the reported result are based.

[51] See Gandhi and Lustig (2015) and Nitschka (2016) for more information.

[52] See also O'Hara and Shaw (1990).

that counteract the formation of TBTF institutions (e.g. a regulatory reinforcement provided for the resolution regime[53]).

- **Estimation methods providing periodical follow-ups on the extent of funding or default risk advantages of TBTF banks:** Studying the cross-section risk premium of the different bank debt liabilities could provide a reasonable approximation of the long-term average funding cost advantages of TBTF banks compared to non-TBTF institutions. Controlling for bank-specific riskiness is a crucial prerequisite of sound estimation and macroprudential supervision. With a sufficiently developed bond market, bond spreads could be suitable for estimating funding advantages. As an alternative, deposit rate differentials could be looked at, though this may require narrowing down the sample to the uninsured (parts of the) deposits and caution when choosing the appropriate controls for the quality variability of deposit services. Leveraging on the fact that several rating agencies publish both support and standalone ratings that measure bank default risk, with and without expected government support, calculating their difference – i .e. the rating uplift – could provide an interesting proxy for the extent of how much default risk is affected by the potential public support. This fact alone testifies that the market perceives rating uplifts as relevant, which leads to some degree of undesired competitive advantage. Lastly, CDS risk premiums[54] can also be used to infer default risk advantages of a perceived TBTF status. In summary, some studies have found long-run average funding cost advantages of between 0 and 100 basis points, with some exceptions that reach up to multiples of this upper limit.

If bond prices or CDS are used to estimate funding advantages, then the spread for large banks is compared to the one for smaller banks by questioning whether any difference can be explained by other factors, i.e. macroeconomic factors and banks' characteristics, rather than with an implicit public support guarantee. After controlling for general and idiosyncratic factors, the difference in spreads between systemic and non-systemic banks, if observed, could be interpreted as a funding advantage given to systemically important banks. A similar approach could be applied to deposits, comparing the risk premiums and interest rates paid on uninsured deposits, after controlling for macroeconomic factors, for the bank risk profile and for the value of associated deposit services. If investors believe in government intervention during a crisis period to support large banks, then it is plausible that SIIs are able to offer lower rates than smaller banks while still attracting uninsured deposits. The assumption that those differences are not motivated by other factors besides the perception of too-big-to-fail status is therefore essential. For equity prices, the framework would need to be more elaborated and comprise a comparison of stock returns between SIIs and non-SIIs, not only historically but also during major events that may change expectations related to government support, in order to infer the effects of implicit guarantees.

[53] Cetorelli and Traina (2018), employing a synthetic control research design on a sample of 159 US banks, of which 23 are treated as the largest public banks, find that the 'living will' regulation increases a TBTF bank's annual cost of capital by 22 basis points, or 10 percent of total funding costs.

[54] Bjilsma et al. (2014) estimate funding cost advantages between 60 and 120 bps from end of 2009 to 2011, but earlier in 2008 the TBTF advantage had been close to zero. This is corroborated by the findings of Kolaric et al. (2019) for 154 international financial institutions following a rating downgrade due to internal reasons and, controlling for other factors, the CDS spread of a non-TBTF bank will widen around 67 bps more than the CDS spread of a TBTF institution.

Credit ratings can be used as an additional approach to estimate funding advantages. In this case, two steps are required. First, the expected government support is retrieved from the comparison between 'standalone' and 'with support' ratings, usually provided by major credit rating agencies. The differences between the two ratings, called 'uplift', provides a measure of the implicit guarantee. Secondly, given the previous differential and the historical relationship between credit ratings and funding costs, one could estimate the corresponding funding advantages.

As an alternative to these approaches, models that are more sophisticated could be used, such as structural and option pricing models, to capture the differences in perceived risks between large and small banks and quantify the value of the implicit guarantees provided by government support. The funding cost differential between large and small banks could be used to compute the benefits from implicit guarantees, which could then be translated into capital requirements under the assumption that systemically important institutions should pay a premium for the status of being too big to fail. To this end, it is important to take into account the differences in the funding profile of banks since they directly impact the overall result and the actual benefit from being systemically important. Given that large banks easily get access to capital markets and that a higher share of their financing is provided by senior and subordinated debt when compared to small banks' funding scheme which relies more heavily on deposits, their funding advantages could be overestimated. In general, funding costs through deposits are lower than through capital markets, which could possibly reduce the differential in terms of the total funding costs between large and small banks, reducing the funding advantages attributed to the implicit guarantee. After a proper estimation of the funding advantages of O-SIIs, the government support is measured taking into account banks' funding scheme. The amount of government support attributed to funding advantages is in the end mapped into a capital-based instrument.

The above-mentioned methods, however, do not provide an estimation of the full extent of social costs caused by potential failure of institutions with TBTF status. A helpful exercise to support this type of calibration approach could be to estimate the expected value of capital injections into banks that are identified as O-SIIs (thus deemed as TBTF), then spreading eventual capital shortfalls to cover that potential bail-out value, in a proportionate manner by the sample of identified TBTF institutions, by means of additional capital buffer requirements. To estimate the probability of distress, one estimation could rely on the structural credit risk à la Merton (1974) which in turn could introduce cyclicality into the measurements[55]. A caveat when estimating the expected value of government capital support is that it cannot be translated directly into losses as the net present value of future profits may underestimate the ex post costs of a bail-out. One way to avoid this underestimation is to assess the full scale of market bias introduced by the presence of TBTF institutions, by taking account of more than just the cost of any government bail-out and moving forward to grasp the full range of the distortive effects on competition and efficient market allocation[56].

[55] See Siegert and Willison (2015) and Mora (2018) for more information.

[56] In the context of a specific regulatory event, Iyer et al. (2019) find that after the replacement of the 2008 Danish government guarantee covering all bank liabilities by a deposit insurance limit of DKK 750 000 (circa EUR 100 000),

4.1.4 Network analysis for calibration

Financial system contagion involves complex risks that are not fully captured in the indicators used in the O-SII identification process, which focuses on the relative importance of individual institutions in the banking system. Hence, the O-SII buffer may only partially capture the risk characteristics of the existing financial network and counterpart ties. The cost in case of distress of a single node in that network is therefore the key measurement rather than a combined network taken altogether. In analysing implications of the financial links of systemically important banks, the emergence of systemic risks can be located. Existing literature offers approaches based on network analysis, which can serve as a tool to identify additional institutions as systemically important, but also to add relevant information to the buffer calibration process.

Interconnectedness and contagion can arise from both direct and indirect linkages among financial institutions. Direct linkages may arise when institutions' bilateral exposures originate 'default cascades' after one bank defaults on its contractual obligations. Indirect financial contagion occurs through commonly held or correlated assets which generate negative externalities and propagate through non-contractual channels or through spillover effects in which the mere presence of negative news can adversely affect a large number of banks[57].

Measuring financial interconnectedness in the literature has been proposed through market dynamics and/or correlations of asset prices especially in times of crisis[58]. In that sense, the dynamics of the banking sector can be derived through bilateral exposures between banks, by measuring the number and value of interbank loans originated and interbank deposits collected by a given bank. One such indicator is PageRank[59], which measures both the relative importance of a specific bank and its lenders and borrowers. The availability of data on interbank exposures has made it possible in quantitative analysis to move from using simulated networks in models to the possibility of distinguishing between different types of exposures. Another measure of 'too connected to fail' (TCTF)[60] is the DebtRank, which is based on the concept of feedback centrality. One such procedure[61] combines the impact effects obtained from stress measures that rely on feedback centrality properties with default probabilities of institutions. The intuition in their DebtRank method is that when a bank is almost insolvent it propagates losses in the network by

systemically important banks successfully retained and attracted uninsured deposits in a crisis at the expense of non-systemic banks.

[57] See Clerc et al. (2016) for more information.

[58] Several papers have developed risk measures for financial contagion. Recent literature considers it through market dynamics and/or correlations of asset prices, especially in times of crisis, such as Acharya et al.(2010), Hollo et al. (2012) and Billio, et al. (2012).

[59] Centrality as a concept stems from sociology where it was primarily developed to identify the agents with critical positions in a network, and to identify their importance or power. As importance can be interpreted in different ways, there exist different definitions of centrality. PageRank is an eigenvector centrality for which the algorithm was developed by Google (Page et al., 1999) where each connected neighbour gets a fraction of the source node's centrality. For an overview of network centrality measures see Temizsoy et al. (2016).

[60] The concept refers to a financial institution which is highly connected to other institutions in the system and whose failure/distress may cause a major disturbance in the entire network.

[61] See De Souza et al (2016) for more information.

paying only 10% of its liabilities for the network members. The creditors of the defaulted bank, in turn, suffer losses and undergo the same process, and the feedback process continues until the system converges.

Looking at the correlation of asset prices can complement the interbank-exposure data and the results from network stress testing approaches[62]. Certain measures such as ΔCoVaR use only market price data, while measures such as SRISK and MES contain information (albeit limited) about the balance sheet structure and the resilience of the involved financial counterparties. In contrast to bucketing frameworks which utilise book-value-based systemic scores, some of the market-value-based indicators have been extensively researched. Market-value-based indicators have been suggested by some as suitable candidates to design and implement buckets for the allocation of SIIs[63]. However, they have not been used in regulatory practice, possibly due to some of their theoretical and practical disadvantages[64]. One of these visible disadvantages is the significant reliance on public listings and market data, which alone would significantly limit their institutional scope and potential for harmonised implementation in the EU[65]. In addition, a number of relatively easy-to-implement indicators to monitor the potential exposure of financial institutions to indirect contagious spillover effects caused by stressed deleveraging or by the liquidation of a systemically important institution were proposed recently by Cont and Schaanning (2019)[66]. The authors show that a centrality type indicator of a network formed by liquidity-weighted portfolio overlaps can proxy fire sales losses given by stress tests.

Contagion models, which take into account the varying resilience of the network members, can further support the attempt to measure interconnectedness. One such method is proposed in Espinosa-Vega and Sole (2010), where an index of contagion is calculated by an algorithm that starts at the 'trigger bank' and tracks the implications of a 'failure' through several rounds until no failures occur. The contagion index identifies the most contagious banks that would yield the highest average losses across all other banks in the sample. Another framework that analyses the potential system losses caused by the default of a single bank is the approach by Fink et al. (2015). In the scenario addressed, an initial shock propagates through the network of banks by increasing the expected losses of the credit portfolios of all directly and indirectly connected banks. This approach observes the relationship between banks' capital ratios and their probabilities of default and computes the aggregate Tier 1 capital loss to the banking system as a unit to measure the costs of

[62] There is wide research available on market-value-based indicators like the CoVaR type measurements and the SRISK. See Adrian and Brunnermeier (2016) and Acharya et al. (2012) for more information.

[63] See, for example, Yun et al. (2019).

[64] For example, Löffler and Raupach (2013) suggest that measuring systemic risk with ΔCoVaR by regulators might create an incentive for banks to increase their idiosyncratic risk and that datasets available for estimating systemic risk might not include a sufficient number of extreme events. Tavolaro and Visnovsky (2014) point out that data availability is limited to listed institutions only, but also market valuation reflects market participants' expectations, which may differ considerably from forward-looking potential adverse scenarios or even from the fundamentals of the economy. Also, the reduced form modelling implied in SRISK and other market-value-based metrics do not provide information on the underlying risks and on sources of the systemic distress. On measurement reliability see also Danielsson et al. (2016).

[65]. Karaś and Szczepania (2020) suggest the possibility to bypass the data limitation problem for subsidiaries in Member States of Central and Eastern Europe.

[66] See Cont and Schaanning (2019).

interconnectedness. Siebenbrunner et al. (2017) refine the contagion channel by also looking at fire sales and mark-to-market losses of banks. Apart from tracking contagion losses, risks associated with bank interconnectedness can also be measured using Shapley values, which originate in game theory and portfolio management and decompose losses from a joint default by multiple banks into the individual banks' contributions to systemic risk[67].

4.1.5 Expert judgement

Most calibration practices incorporate a variable degree of expert supervisory judgement in choosing certain parameters or including qualitative information that can give further insight on the monitoring of indicators and the identification of areas for action. Moreover, the approach of supervisory judgement may be used in cases when supervisory authorities recognise the need to complement the quantitative assessment with a qualitative dimension. Some of the abovementioned measures of systemic importance can complement mechanistic measurements used internationally. In turn, this can contribute to a more holistic picture of the systemic footprint of large and complex institutions, informing macroprudential authorities on whether that additional layer of expert judgement is needed for the final calibration of the buffer requirements.

Supervisory judgement may guide the designation of banks as O-SIIs not identified in a first step by the quantitative, rule-based identification methods, i.e. those that are below the cut-off score. It can also inform the reallocation of a bank into a higher bucket. Supervisory judgement could typically reflect national specificities or qualitative criteria which are hard to quantify, for instance 'time-dependent' factors (i.e. behavioural reaction of the bank itself) or 'reputational contagion' (behaviour of third parties[68]). Expert judgement just as well could support or give reason to some of the choices made in model-based buffer calibration approaches. In that case, expert judgement guides certain assumptions behind the modelling process and hence could have a sizeable impact on the results obtained.

4.2 National practices (survey results)

During December 2019 and with the aim of collecting up-to-date and detailed information for the assessment of the frameworks used by relevant authorities, a survey on national practices was promoted by the EBA. Authorities from all EU Member States responded to the survey, including EEA countries. Thirty-two questions were circulated including a number of quantitative questions related to banking sector concentration measurement, level of O-SII capitalisation and O-SII buffer rates. In addition, granular information on the approach and processes used for the calibration of

[67] See ECB (2019)..

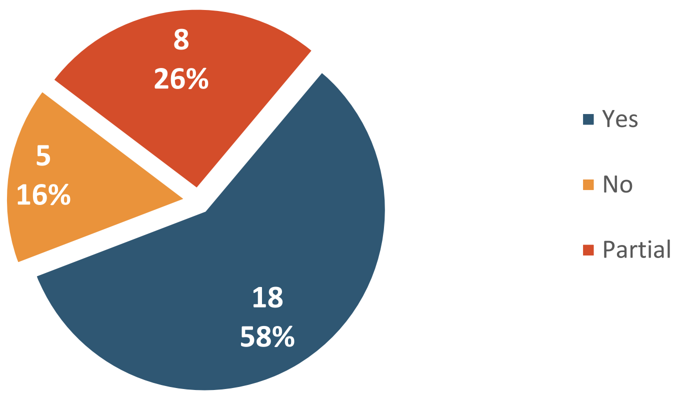
[68] See, for example, Central Bank of Cyprus (2015).

O-SII buffer rates was covered. In this section, the focus will be on the calibration methods applied by the relevant authorities.

The results from the survey carried out by the EBA point to the lack of harmonisation of the methodologies used to calibrate the O-SII buffer rate in European countries. This is observed both at the methodological level and in the link between the calibration approach and the O-SII scores prescribed by the EBA guidelines on the criteria to identify O-SIIs.

As Figure 17 illustrates, a large share of countries use O-SII scores with a view to calibrating O-SII buffer rates, with a total of 18 countries acknowledging such use and 8 countries only partially[69]. Still, five countries report not using O-SII scores for calibration purposes.

Figure 16 – Use of O-SII scores, as prescribed by EBA GLs, for O-SII buffer calibration



Source: EBA survey of national authorities in 2020; 2018 year-end data.

[69] The partial use of O-SII scores in Slovenia is related to the identification threshold, which is set 0.75 percentage points higher than the maximum defined in the EBA. Namely, in 2017, the Bank of Slovenia decided to raise the threshold for the identification of O-SIIs from 350 to 500 basis points, consequently adjusting the link between O-SII scores and corresponding buffer rates. On all other accounts, the Bank of Slovenia is compliant with the EBA GLs.

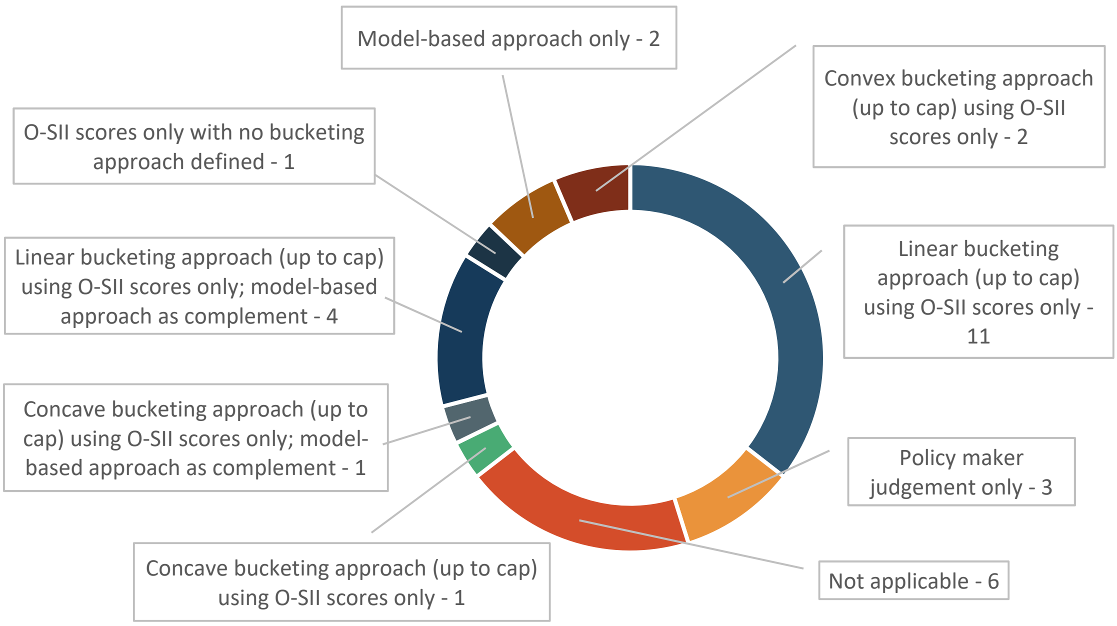
The Central Bank of Ireland draws on a number of measures of systemic importance to inform O-SII buffer calibration. These are EBA O-SII score, size and domestic financial intermediation. This approach looks to ensure that buffers are appropriate and reflect an institution's systemic importance, while acknowledging the specificities of the Irish banking system. A strict mechanical link between EBA O-SII score and buffer calibration would not suitably capture systemic importance given national specificities, whereby the Irish banking system is composed of a number of domestically focused retail banks and a number of internationally focused institutions, some of which are large and complex.

The National Bank of Slovakia (NBS), for the purpose of O-SII identification, uses the EBA methodology outlined in the EBA/GL/2014/10, extended by three optional indicators (i.e. partial use of EBA O-SII scores): total risk exposure amount, retail loans and retail deposits. These were included with the aim of addressing specificities of the Slovak banking system, which is represented by a relatively small number of banks having a traditional business model predominantly focused on providing loans and deposit collection. Hence, systemic importance of local banks is influenced by domestic exposures rather than by financial market operations, trading, derivatives or cross-border interbank activities. That is why the EBA scoring methodology was in Slovakia extended by an additional three indicators (with weights of 6.67% that are evenly distributed across each indicator), with the aim of capturing the domestic structural character of the Slovak banking system. This modification of EBA O-SII scores does not materially change the O-SII scores, e.g. the ranking of O-SII banks is not changed.

The option whether to use O-SII scores to calibrate the respective buffer could be linked to the methodology applied to the calibration of the buffer rates. While calibration methods such as the bucketing approach have a strong connection to the scores, other methods more reliant on expert judgement or on model-based approaches could have a weaker link with O-SII scores.

As shown in Figure 17, the bucketing method is the most common approach used by European national authorities to calibrate the O-SII buffer rate with a total of 19 out of 31 countries reporting this methodology – although 5 of them complement it with model-based approaches. Among the bucketing approaches, the linear approach[70] to set the buckets is the most common choice. The exclusive use of a model-based approach is reported only by two countries. Three national authorities calibrate the O-SII buffer rate by applying expert judgement without the support of further approaches and one country defines buffer rates based on O-SII scores without a bucketing approach. Six countries[71] in the survey did not answer the question about the approach followed to calibrate the O-SII buffer rate.

Figure 17 – Calibration methods used to set O-SII buffer rates



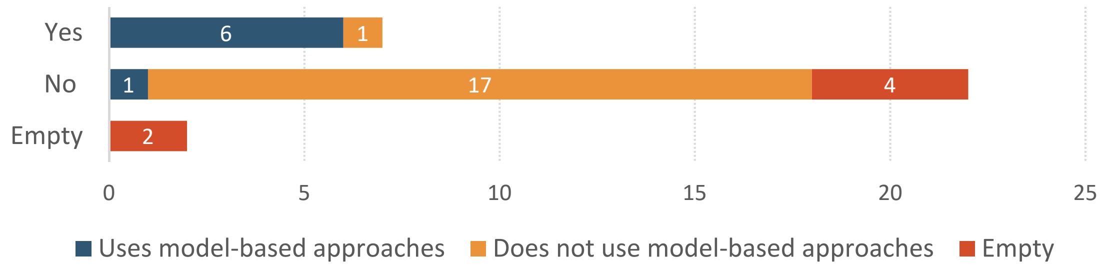
Source: EBA survey of national authorities in 2020; 2018 year-end data.

70 Spain uses a linear approach to set buffer rates but just up to 1%, not up to the cap.

71 The Czech Republic, Denmark, Ireland, the Netherlands, Romania and the United Kingdom. In the case of the Czech Republic, Denmark and the United Kingdom, the O-SII buffer rate is set to 0% for all institutions. The Netherlands is neither using a convex, concave nor linear bucketing approach, though it resembles mostly a concave bucketing approach. The Netherlands is also not supplementing its approach with any model.

Only a few countries map the results from model-based approaches to the final O-SII buffer rate. Of the seven countries that use model-based approaches to set O-SII buffer rates (five of them as a complement to the bucketing approach – see Figure 18), only one does not map the results obtained to the final O-SII buffer rate (see Figure 19)[72].

Figure 18 – Are results from model-based approaches mapped to the final O-SII buffer rate?[73]



Source: EBA survey of national authorities in 2020; 2018 year-end data.

As seen in Table 1 below, a majority of countries (18 out of 31) currently employ models to set or complement the calibration of the O-SII buffer rate. Seven countries (Belgium, Estonia, Finland, Croatia, Hungary, Ireland and Latvia) are using the EEI approach, while 11 others have implemented different model-based approaches. Interestingly, countries that have opted for the EEI approach can be generally characterised as smaller economies. All of these seven countries (except for Ireland) exhibit Herfindahl-Hirschman Index values (see Figure 3) and average O-SII buffer rates weighted by total assets (see Figure 11) that are above average, which might suggest that the EEI approach has properties that are comparatively seen as more useful in concentrated and small banking sectors[74]. Keeping that in mind, the choice to implement the EEI approach seems to be correlated with a relatively conservative approach when setting O-SII buffer rates as five of these seven countries have set for at least one institution the maximum O-SII buffer rate (2% as per the applicable legal framework up to end 2019). For the other two jurisdictions, the highest buffer is set at 1.5% (see Figure 5). In the same direction, none of those seven countries has set any O-SII buffer rate equal to 0% with only one jurisdiction setting the lower O-SII buffer rate below 0.5% (Croatia with the lower buffer rate set at 0.2%).

[72] Malta uses a model-based approach as a complement to a linear bucketing approach but does not map the result from the model-based approach to the final O-SII buffer rate. Malta however does not fully apply and comply with the EBA Guidelines on the criteria to identify O-SIIs, therefore making it inviable to compare, as a first step, bank-specific scores and, as a second step, buffer rates assigned to identified O-SIIs.

[73] Hungary does not identify any model-based approach in the methods used to set the O-SII buffer rate but replied positively to the question of whether results of a model based approach are mapped to the final O-SII buffer rate.

[74] Typically, in small and open economies and banking systems, even institutions with a relatively low volume of total assets (in EU terms) can contribute sufficiently to the build-up of domestic systemic risks that may justify high O-SII buffer rates.

Table 2 – Current use of models to calibrate O-SII buffer rates

	Models currently in use to set or complement the calibration of the O-SII buffer rate?	Feasiblity, in general, to implement in country model-based approach(-es) (Y/N)
AT	Other	N
BE	EEI	Y
BG	Network analysis and peer reviewing	N
CY		N
CZ		Y
DE	Other	Y
DK		Y
EE	EEI	Y
EL	Other	N
ES		N
FI	EEI	Y
FR	Other	N
HR	EEI	Y
HU	EEI	Y
IE	EEI	N
IS		N
IT		N
LI	Other	N
LT	Combination of two or more model-based approaches	Y
LU		Y
LV	EEI	Y
MT	Other	N
NL		
NO		N
PL	Other	Y
PT		N
RO		N
SE	Other	N
SI		N
SK	Other	N
UK		Y

Source: EBA survey of national authorities in 2020; 2018 year-end data.

Regarding the general feasibility to implement model-based approaches in their respective countries, either due to unavailability of data or due to results being seen as inappropriate, a slight majority of national authorities (17 out of 31) provided a negative view about that possibility. Notably, this includes also a number of countries that, to some extent, are already employing EEI or other models in their buffer calibration process. The feasibility of implementing a model-based approach does not seem to correlate with the relative size of the financial sector. At the same time, countries with a predominance of foreign-owned O-SIIs seem to be more confident[75] in this regard

[75] According to the domestic-foreign ownership separation provided in Figure 15, of the 13 countries that find model-based approaches feasible only 3 are countries with predominantly domestically owned O-SIIs.

compared to countries with domestically owned O-SIIs predominance or where ownership of O-SIIs is split between domestic and foreign investors.

4.3 Diving deeper on main calibration approaches

This section will detail the technical aspects of the core calibration approaches tested to date. The main advantages and disadvantages will be highlighted in a qualitative manner, which aims at easing the understanding about each calibration approach, underlying methodologies and assumptions, together with the biggest challenges regulators, supervisors and other practitioners have been facing.

4.3.1 Bucketing approach

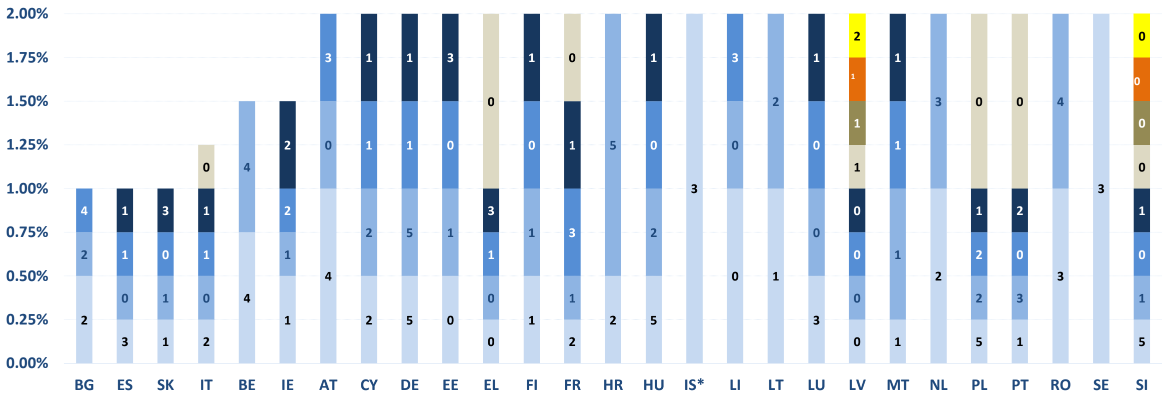
As mentioned in section 4.1, bucketing approaches are widely used in the context of buffer calibration for systemically relevant institutions. Currently, bucketing schemes are the preferred option both nationally, in the EU context, and internationally, within the framework for globally systemic institutions. Different statistical methods may underpin different bucket designs, together with expert judgement or model-based approaches.

Most Member States calibrate O-SII buffers based on bucketing schemes, sometimes in combination with other methods. On the other hand, using only model-based approaches to design the buckets is uncommon. Out of the 19 countries in the euro area, 16 use different bucketing approaches. As for non-euro-area countries, four jurisdictions follow a bucketing approach with at least two buckets. The EBA O-SII scoring method is generally the foundation for the design of bucket cut-off scores and width. Expert judgement is commonly used in the buffer rate setting process, both as regards buckets' width or granularity and corresponding buffer levels and with respect to the choice of optional indicators envisaged by the EBA identification guidelines. As illustrated firstly in Figure 3, the number of buckets ranges from two (in several countries) to seven (Slovenia), with heterogeneous ranges and widths across the different national bucketing schemes. Figure 20 illustrates further the variety of bucketing approaches and outcomes. The number of O-SIIs in each bucket, the width of the defined buckets and the O-SII cut-off scores are very distinct across EU Member States. Buckets are not always of equal size and width dispersion is considerable, while buffer rates range from 0% to 2%, the latter being the regulatory maximum until the entry into force of CRD V. For a minority of countries (4 out of 16), the maximum rate is below the regulatory cap. In addition, buckets can remain unpopulated in several jurisdictions, also as a way of discouraging further growth of O-SIIs' systemic footprint, following the example of the G-SIB framework where the highest bucket will always be an unpopulated one in order to discourage further increases of the footprint[76]. In the case of the O-SII framework, relevant differences

[76] The G-SIB framework foresees a mechanism whereby one additional top bucket will always be added in the event that a previously unpopulated bucket becomes populated by any identified G-SIB.

between banking sectors and O-SIIs' systemic footprint may lead to one or several unpopulated middle buckets.

Figure 19 – Thresholds for O-SII buffer rates in each bucket and number of O-SIIs allocated



Source: Yearly notifications to the EBA; end-2019 information.
Note: Different colour shades illustrate the different buckets in each jurisdiction and the upper limit of each section on the y axis refers to the applicable buffer rate for each bucket. The number within the bars indicates the number of O-SIIs to which that buffer rate applies. Bars illustrate the applicable buffer rates in each jurisdiction. Given the introduction of CRD V during 2020, the applied methodology might have been revised by the relevant national authorities between the time of the data collection and the publication of the report (e.g. in some cases the methodology for end-2018 was applied to end-2019 data to deliver preliminary results for simulation purposes).

4.3.1.1 Advantages

- Bucketing schemes constitute a pragmatic option to calibrate this bank-specific buffer since there is no generally accepted theory regarding optimum capital levels for offsetting systemic risk[77].
- Calibration allows for the incorporation of expert judgement as well as of various criteria in each jurisdiction, catering for the particularities of banking sectors in each country, different economic cycles and context or the impact generated by the default of an O-SII.
- It is a simple and predictable methodology in the sense that the buffer level assigned to each bucket is clearly specified and the increase/decrease produced by a change in the O-SII score can be assessed.
- It is conceptually aligned with the Basel G-SIB framework.

[77] Estimation methods for systemic risk are not consensual, which leads to it not being a direct input for buffer calibration.

4.3.1.2 Disadvantages

- The flexibility of this approach and the lack of generally accepted principles for buffer calibration give rise to heterogeneous calibration results across jurisdictions, noticeably both at the euro-area and at the EU level.

- The economic rationale behind this approach is very limited. In consequence, the bucketing approaches are largely expert-driven. Since buffer rates assigned to each bucket may be, in some cases, politically sensitive, this could be a major contributing factor to heterogeneous calibrations across the EU.

4.3.2 Equal expected impact (EEI)

The expected impact framework leverages on the assumption that the expected loss to the rest of the financial system and the economy from the failure of an SII should be equal to that of a reference institution or of a non-SII. The rationale of this approach is thus to foster a level playing field independently of institutions' size and importance, while reducing the social cost associated with implicit government guarantees.

4.3.2.1 Advantages

- This approach is underpinned by a theoretical economic concept.

- This framework offers the theoretical possibility of directly targeting the additional expected losses that an institution may impose from being systemically important (higher LGD), by lowering its probability of default. By doing so, a level playing field should theoretically be achieved between O-SIIs and non-O-SIIs at domestic level, thus calling on O-SIIs to build higher capital surcharges than non-O-SIIs.

4.3.2.2 Disadvantages

- The model, easy in its practical implementation, has some drawbacks affecting its common and extensive application. It requires several strong assumptions, namely regarding the loss distribution for SIIs and non-SIIs, assumed to be identical and on which testing of scarcely available data should occur[78]. Such tests are particularly hindered by the limited amount of suitable observations representing extreme events that lead to extreme losses. Moreover, the quantitative estimation should be properly evaluated, facing possible sampling and data

[78] The assumption of same loss distribution between O-SII and non O-SII allows the analytical simplification of the model, leading to the closed formula for k_{SII} computation.

quality issues. While the estimation should be performed using extreme losses, the threshold for their identification also requires further assumptions[79].

- A second set of issues is linked to the difficulties implied in the definition of a common sLGD that – also if not strictly related to the econometric implementation of the model – is a crucial point of the buffer calibration under the EEI approach. In general, the sLGD refers to a broad and difficult-to-compute concept of social loss: the system-wide costs generated by a failing institution, which could go well beyond direct losses by shareholders and bondholders[80]. In this context, the O-SII score should be seen only as a fallback proxy for systemic importance, which captures several magnitudes contributing to systemic risk but involves making significant assumptions on its representativeness[81].

- In addition, though a certain degree of divergence between scoring methods is made tolerable via the definition of the common and consolidated identification framework given by the EBA guidelines[82], the same degree of divergence could limit consistency across different countries in representing the proxy of the sLGDs. This is true for the computation of sLGD, but also for the identification of the reference bank, especially when it is assumed to be the first non-O-SII bank in a specific jurisdiction[83].

- Finally, the major assumption that PD varies with capital level also implies that different calibrations may be obtained as capital regulation evolves, which brings some unwarranted volatility to the buffer calibration. Additionally, the result from EEI infers the additional capital an O-SII should have in comparison to a non-OSII, which should take into account the differential on other bank-specific capital requirements such as the ones assigned on the basis of Pillar 2 requirements.

[79] The threshold should be expressed as a quantile of the overall probability distribution of economic results. Additionally, regarding the EEI approach, losses in regulatory practice so far have been computed by normalising returns (e.g. net income) on risk-weighted assets (RWA), in order to analyse banks' performance with respect to their risk profile. The harmonisation of estimation methods could be limited by the continuous evolution in prudential regulation and accounting regimes – affecting both returns and RWA – time series could suffer a structural break not easily quantifiable, potentially generating biased econometric estimations.

[80] The impact of such an event can be both social and economic, possibly through lower GDP, higher unemployment and public deficits, widespread market volatility and the opportunity cost of the resources allocated to rescuing the failing institution, among other potential channels.

[81] The extent to which the EBA scores capture any of these magnitudes seems to be far from clear as scores are linear combinations of simple indicators whose connection to actual losses generated by banks' defaults has not been demonstrated.

[82] EBA GLs on identification and scoring methods allow national authorities to include optional or additional information useful in better representing national specificities.

[83] A possible solution is to set $sLGD_{non-SII}$ equal to the EBA identification threshold. However, it could suffer some side effects, as the EBA GLs give the possibility to national authorities to increase or decrease the 350 bps identification threshold by 75 bps.

4.3.3 Estimation of funding advantages

The differential in funding costs between systemically and non-systemically important banks, if related to a perception of government support, should be addressed within the EU macroprudential toolkit via the implementation and calibration methodology of O-SII buffer rates.

4.3.3.1 Advantages

- The estimation of funding advantages that SIIs may benefit from makes it possible to target the unwarranted implicit guarantee that provides these banks with an incentive to increase their systemic importance, which is one of the main goals behind the identification of SIIs and the calibration of the corresponding O-SII buffer rate. Since funding advantages vary over time, it is also an important tool in the assessment of the effectiveness of macroprudential policies, namely the application of the O-SII buffer pursuing the reduction of systemically important institutions' footprint.

- The theoretical possibility of individually estimating the funding advantage of each bank could also be a valuable tool to ensure a level playing field across banks operating in different EU jurisdictions. Each bank has its own business model and funding scheme, which will have implications for potential funding advantages being available to any bank taken individually. This link could help in diminishing the differential in the expected government support from being an O-SII across the EU.

4.3.3.2 Disadvantages

- The O-SII framework should reduce the probability of default of SIIs independently of whether or not they are resolvable. The funding cost advantage, however, is rather a measure of credibility and of resolution frameworks.

- One of the features perceived as being what distinguishes O-SIIs from other banks is related to the possibility of having government support during stress events. Regardless of factors such as size, complexity, importance and interconnectedness used to measure banks' systemic importance, the group of banks with estimated funding advantages in any given country may not match with identified O-SIIs. This is due to the fact that government support cannot be fully confirmed until any such decision and event is developing, which means that the existence of implicit guarantees is a perception of the market about a potential government bail-out rather than an absolute certainty, observable or accurately measureable.

- Funding advantages estimates may suffer from an identification problem. The funding advantages could depend on factors that are hard to measure, such as those associated with size (greater diversification, cost reduction in the services offered associated with economies of scale, higher liquidity and better access to capital markets during stress events) and issuance frequency. A possibility for circumventing this issue is through a difference in difference approach with the assessment of funding advantages between large and small firms in different industries, which would not benefit from government support during stress periods, and comparing the results with the ones for the banking system. If the findings point to a greater funding advantage inside the banking system, one could argue that the differential against other industries could be attributed to implicit government guarantees.

- The sample period is also a concern given that differences in funding costs vary over time, with the changes being motivated by variations in the risk perception and changes in regulation. As a result, the use of post-crisis data should be used to assess funding advantages of large banks under the current perception of government support.

- This framework is difficult to implement in countries in which the majority of banks are not listed on the stock exchange[84], or in which banks do not use sophisticated funding instruments. In both situations, the data necessary to apply this approach is not available. A solution to bypass this could be through the use of large ticket unsecured deposits.

[84] According to S&P Global Market Intelligence, by the end of 2018 close to 90% of banks in the EU were not listed on any stock exchange. The percentage varies across EU jurisdictions but the predominance of non-listed banks is common.

4.3 Summary of main calibration approaches pros and cons

Table 3 - Summary of main calibration approaches

	Bucketing	EEI	Funding cost advantages
Adaptability	+ Flexible in terms of data availability and country-specific implementation; + Good degree of consistency with Basel G-SIB framework; + Proportional with systemic importance, although finding the optimal design needs complementary quantitative methods or expert judgement; - EU-wide convergence could be limited by the various scoring methods across jurisdictions to reflect country specificities.	+ Based on theoretical economic concept and relatively easy in its practical implementation if appropriate data is available (in most aspects comparable to bucketing although probability of distress estimation adds to its complexity); + Could contribute to a level playing field between O-SII and non-O-SII institutions within a Member State; - EU-wide convergence could be limited by heterogeneous scoring methods across jurisdictions and possibly other differences in the definition of systemic relevance (i.e. 'reference bank' and sLGD); - Profit and loss time series might be hard to consistently access for the probability of distress estimations.	± Funding cost differentials between Member States may hinder the level playing field on which this method may provide most valuable information; - Could depend on factors that are hard to measure, especially to standardise (individual bank riskiness, country-specific regulatory changes, etc.); - Challenging to implement in countries where a significant number of banks are not listed on the stock exchange, have no CDS pricing or are relatively inactive in bond financing or in using other sophisticated funding instruments.
Stability	± Stability over an EU-wide sample has not been explored but national regulatory frameworks do not generally show signs of major shifts (number of O-SIIs and bucket shifts has been somewhat stable from one year to the other); -	± Stability of the model depends on i) sampling issues and ii) assumptions made by national authorities on how to define default events; - It is hard to assess its stability over time empirically as there is no publicly available information on the result of the EEI estimations.	± Funding costs vary over time, with the changes being motivated by variations in risk perception and changes in regulation. The resulting variation could understate the potential funding cost advantages which could arise under stress periods and limit the forward-looking validity of some estimations.
Sensitivity	+ Provides a comprehensive, multi-dimensional impact measurement of potential systemic impact factors affecting systemic importance scores; + Provides a uniform calibration framework for extending the information	+ Probabilistic view with different estimation methods measuring individual probability of distress; ± Although based on the systemic impact measurement, EEI incorporates the advantages and disadvantages of the bucketing approach;	+ Quick to incorporate present developments; ± Controlling for the riskiness of the institution concerned might prove challenging and require country-specific estimation;

	gathered via the systemic importance scoring; ± Generally, it does not entail explicit risk measurement, though some indicators of systemic importance scores may correlate with systemic risk; - Systemic importance scoring provides information only on the *relative* importance of the institution, but regulators might have to further translate it into actual systemic loss amounts.	- Arguably changes in other capital buffers and requirements should be accounted for, but their effect on the probability of distress might bring some unwarranted volatility in the O-SII buffer rate calibration (e.g. accounting for the activation/deactivation of a cyclical buffer or cyclical variation in the PDs); - Does not include explicit measurements of systemic risk, i.e. the trigger event (no direct information on contagion risk, or risk of system-wide stress, though this might be proxied implicitly by the systemic impact scores).	- Does not provide information on increased risk resilience; - Estimated funding advantages could be biased if banks with implicit guarantees are not identified as systemically important or vice versa.
Ease of communication	+ Simple, intuitive and predictable methodology helping communication; - Calibration considerations based on expert judgement may be challenging to corroborate.	± Relatively complex compared to bucketing both in the underlying theory and the estimation requirements but it could be seen as more exact and explicit communicational content; ± Trade-off might be found between the simplicity of the communication on the parametrisation of the model and the transparency of communication.	+ Highlights market distortions and reasoning for the O-SII buffer that the bucketing approach and EEI might not expose, i.e. implicit government subsidies and funding cost advantages; + Underlying methods of estimation might require detailed methodological explanations.
Transparency and information content	+ Expectations and changes in the buffer rate can be derived and understood clearly from O-SII scores developments; - If applied within an excessively flexible framework may lead to a deficit of transparency regarding national-level decision on setting of bucket thresholds, corresponding buffer rates and systemic risk reduction expected to be achieved.	+ Transparent economic foundation; + May provide some information on risk tolerance of the regulator, if there is a high degree of transparency and effective communication about parametrisation of the model and probabilities of distress; ± Depending on the choice of the authority, it could be just as or somewhat less transparent than the bucketing approach (e.g. because the P&L distribution and the probability of distress estimates may not get published).	+ Provides unique information about the bias in funding costs and indirectly and implicitly on the extent of incentive misalignment; - More complex modelling may limit transparency.

Policy recommendations

5.1 A diverse and heterogeneous European O-SII landscape

As of end-2018, the great majority of European O-SIIs were either domestic EU parent groups or subsidiaries of an EU-parent located elsewhere in the Union. O-SIIs represent roughly two thirds of the total assets of the EU banking sector. The distribution of O-SIIs among countries is, however, unequal with only a few countries accounting for a relatively high number of O-SIIs. While the average number of O-SIIs across countries is 6, there have been countries (Bulgaria, Germany, Poland and the UK) that consistently identified more than 10 O-SIIs over the years (see Figure 9). Equally, the share of business activity conducted by O-SIIs is quite disperse across Member States.

At a national level, the concentration level of the banking sector is rather heterogeneous, with Member States' HHI ranging from less than 500 up to over 4 400, with the EU average being slightly above 1 600. The median, which splits in half the distribution of countries, is 1 515. This landscape is justified by several reasons, which can be mainly summarised as being due to the specificities and historical developments of the different banking sectors. Likewise, the ratio of O-SIIs' total assets over domestic GDP ranges from 20% to 800%.

The use of additional indicators under the supervisory judgement phase of the O-SII identification process is also unevenly distributed among countries, possibly contributing to differences in the ratio of O-SIIs' total assets over domestic GDP. Most authorities' O-SII identification decisions are based on the application of the first step of the identification process only, which is based on the mandatory indicators described in the EBA guidelines. Hence, those authorities either do not make use of the supervisory judgement option foreseen in the second step of the O-SII identification process or results of that judgement do not designate additional O-SIIs, whereas the rest of the authorities use additional indicators for supervisory judgement decisions leading to an enlarged O-SIIs list, to cater for impactful national characteristics of their banking systems. In addition, the choice of additional indicators by the authorities during the sound supervisory judgement phase, whilst allowed in the EBA guidelines, is often not uniform among Member States. Notwithstanding, there is a general positive relationship between O-SII scores and O-SII buffer rates, though the range of O-SII buffer rates and number of buckets vary widely amongst countries.

The last phase of the O-SII designation process consists of calibrating the appropriate buffer rates for designated institutions. This step happens once O-SII scores and the set of both automatically identified O-SIIs and O-SIIs added due to sound supervisory judgement has been established, in accordance with EBA guidelines for the authorities that have declared compliance. The survey carried out in 2020 by the EBA on national calibration practices points to a considerable degree of variation in the methodologies used and to the lack of harmonisation when calibrating the O-SII buffer rates in European countries. This is observed both at the level of methodological parameters and in the link between the calibration approach chosen and O-SII scores prescribed by the EBA guidelines. The bucketing approach is the most widely used calibration method but other methods, in particular different model-based approaches, are used either as a complement or as an alternative to the bucketing approach. The differences between the national banking systems as well as between the calibration methodologies lead to the fact that two O-SIIs with a given score may be subject to a different buffer rate if they are located in different EU Member States.

In summary, the overview of the current O-SII landscape and buffer calibration practices has confirmed a high level of diversity of both economic indicators and supervisory practices, possibly making a fully fledged common EU standard challenging to achieve. Though systemic importance and related risks emanating from banks with similar O-SII scores might vary across Member States and national specificities should be taken into account in buffer calibration, this high variation of O-SII buffer rates might not be fully explained by differences in the systemic footprint. Nevertheless, given the absence of best practice in the O-SII calibration, developing a common fully fledged methodology seems challenging. Such a fully fledged methodology would need to allow for national specificities and for the possibility of relatively high buffer rates to be set if high levels of systemic risk are posed by a bank in circumstances that might not be fully known today. Otherwise, the authorities might be unable to account for elevated systemic risk posed by O-SIIs in their jurisdiction, which might have detrimental effects for financial stability in the Member State and the Union. From a financial stability perspective, avoiding possible under-calibration of O-SII buffers is of special importance as insufficiently capitalised banks not only pose systemic risk to their home jurisdictions but might also have negative cross-border spillovers in the Union. While the risks from undercapitalised banks is clear and pronounced if O-SII buffer rates are set too low, authorities should be mindful also that setting buffer rates too high, in particular circumstances such as for host authorities, may undermine competition levels across the different regions and Member States.

Thus, introducing a floor methodology such as the ones described below could be seen as a natural and desired first step, which bears attractive potential to increase harmonisation and convergence of practices that will lead to less heterogeneous results across the Union. This floor methodology should be based on O-SII scores resulting from the first stage of the identification process, for consistency and comparability reasons. It could also mitigate systemic risk by acting as a safeguard against potential under-calibration of O-SII buffer rates. Ultimately, the feasibility of a robust, fully fledged methodology should be explored in the more distant future after greater experience and empirical evidence are gathered and if the convergence level and outcomes achieved in the medium to long-term are still judged as insufficient. Under the current macro-financial environment characterised by the Covid-19 outbreak and the ensuing pandemic crisis, some degree of caution is advised on the path of reducing the unwarranted heterogeneity in the O-SII buffer rates calibration.

5.2 The floor methodology in the SSM area

The first floor methodology applicable in a large number of EU jurisdictions was introduced in 2016 by the ECB, for O-SIIs located in the countries participating in the banking union. The introduction of the floor methodology contributed to the reduction in heterogeneity concerning O-SII buffers applicable in the SSM[85] area. The objective for full implementation of the methodology was set for 1 January 2022.

The methodology follows four principles consisting of i) provision of a floor for capital buffers set by national authorities, ii) adoption of a bucketing approach rather than a continuous function approach, iii) calculation of scores on the basis of the EBA's O-SII identification framework and their allocation to four buckets, whereby iv) a non-zero calibration of the buffer for the first bucket applies. Since this methodology establishes a floor for any given bucket, the O-SII buffer for each bank in a particular bucket must be at least equal to or greater than the minimum buffer rate associated with each bucket. Likewise, considering that the lowest floor rate is a non-zero buffer rate, this means that institutions that have been identified as O-SIIs cannot have an O-SII buffer requirement of 0%.

The cluster analysis carried out for the design of the given calibration approach combined several methodologies. It was carried out by the ECB together with SSM jurisdictions and suggested four buckets for the floor methodology. The thresholds set in 2016 are summarised below:

Table 4 – ECB floor methodology bounds and minimum buffer rates per bucket

Bucket	**Overall EBA score (basis points)**	**Minimum O-SII buffer rate**	**Bucket bandwidth (basis points)**
1	… -1 249	0.25%	1 250
2	1 250-1 949	0.50%	700
3	1 950-2 899	0.75%	950
4	2 900- …	1.00%	…

Source: ECB (2017): Chapter 1 – 'Topical issue ECB floor methodology for setting the capital buffer for an identified Other Systemically Important Institution (O-SII)', in Macroprudential Bulletin *Issue 3 pp. 4-11, June 2017.*

During the simulation exercise conducted by the EBA for this report, an alternative set of technical parameters for the different buckets and minimum O-SII buffer rates were considered. This alternative floor methodology includes an increased level of granularity in the technical parameters used (i.e. higher number of buckets leading to a more granular buffer rate allocation). This is justified by the objective of regulators and authorities of achieving more appropriate and fairer

[85] ECB (2017): chapter 1 – 'Topical issue ECB floor methodology for setting the capital buffer for an identified Other Systemically Important Institution (O-SII)', in *Macroprudential Bulletin* Issue 3 pp. 4-11, June 2017 (https://www.ecb.europa.eu/pub/pdf/mpbu/ecb.mpbu201706.en.pdf).

results across Member States while preserving a considerable degree of discretion for national specificities to be considered.

Table 5 – Alternative floor methodology examined by the EBA in 2020

Bucket	Overall EBA score (basis points)	Minimum O-SII buffer rate	Bucket bandwidth (basis points)
1	… -749	0.25%	400
2	750-1 299	0.50%	550
3	1 300-1 949	0.75%	650
4	1 950-2 699	1.00%	750
5	2 700-4 449	1.25%	1 750
6	4 450- …	1.50%	…

Source: EBA

For the purposes of assessing the impact of these floor methodologies and select one of the two as the appropriate methodology to consider as a minimum when calibrating O-SII buffer rates, the full implementation of these methods has been simulated. With that in mind, the resulting buffer rates set by national authorities were collected for further analysis. The following section summarises the insights obtained.

5.3 Summary of EBA simulation results

In order to provide evidence-based recommendations, a simulation based on end-2019 data under the CRD IV umbrella was carried out by the EBA to test the design of both EU-wide floor methodologies. Different floor methodologies, as presented previously, were tested, including a higher number of buckets, buffer rates and more granular thresholds as compared to the floor methodology adopted in the euro area in 2016. A bucketing approach for buffer calibration has been maintained under the different scenarios.

The results of the simulation were collected between May and September 2020 reflecting buffer rate decisions based on end-2019 data under national O-SII methodologies applied by the last official designation. This exercise was done assuming that an EU-wide floor methodology under the two floor methodologies was in place at that time. The simulation illustrates that some authorities would see their current decisions superseded by the EU-floor methodology, for the tested scenarios. Out of the 206 bank-specific O-SII buffer rates received by the EBA for O-SIIs and potential O-SIIs, only 24 banks would see their O-SII buffer rate increased, which accounts for 12% of identified O-SIIs under at least one of the two scenarios tested, with the calibration method as given by the current ECB floor methodology showing milder impacts. The great majority of buffer rates would remain unchanged (182 representing over 88% of identified O-SIIs), and for those banks that would observe an increase some cases could have been due to the overlapping use by authorities of the SyRB. At the country level, the introduction of an EU-wide floor methodology, as per Table 4 and currently in place for the euro area since 2016, means that six countries[86] would see at least one O-SII with a higher buffer rate than at present. These results compare with the alternative methodology laid out in Table 5 that observed 10 countries[87] with at least 1 identified O-SII being assigned a higher buffer rate than the one applicable at present.

An important caveat to these results is related to the national practices with respect to the use of the SyRB. Several national authorities, in particular those not participating in the banking union, set the SyRB rates applicable to all exposures at the levels equal to, or higher, than the O-SII buffers. Under CRD IV, this would have made the O-SII buffer irrelevant, as the two buffers were not additive. In practice, only in a very small number of cases would the introduction of the O-SII floor methodology lead to higher actual combined buffer requirements. This might change with the transposition of CRD V, which would decouple the O-SII buffer and the systemic risk buffer due to their cumulative nature going forward, likely prompting the authorities concerned to revise their practice.

These results point to a higher degree of convergence in authorities' decisions and reduction of unjustified differences, while still allowing for diverse levels of prudency that each national authority may wish to calibrate in light of its own assessment of its banking sector peculiarities. The introduction of an EU-wide floor methodology in the near term would contribute to further harmonisation and promote a minimum level of homogeneity across the EU without significantly disrupting current practices of Member States or curtailing their room of manoeuvre. Such implementation might also mitigate systemic risk by acting as a safeguard against potential under-calibration of O-SII buffer rates.

On the other hand, the revised framework provided by CRD V foreseeing O-SII buffer rates up to 3% or higher (subject to the approval of the Commission) may prompt a new wave of additional heterogeneity when setting O-SII buffer rates, albeit at higher minimum levels. This unlikely situation, if confirmed over a two to three-year horizon and assuming that an EU-wide floor methodology is in place, may warrant complementing a buffer rate calibration with additional technical features to mitigate any unjustified heterogeneity. However, the fact that any O-SII buffer rate above 3% is subject to the endorsement of the Commission provides an important backstop to prevent excessive heterogeneity at the higher end of the O-SII buffer rates spectrum, hence making it less likely for uneven competition practices to emerge across the Union from this possibility.

[86] Czech Republic, Denmark, Norway, Romania, Sweden and Slovenia.

[87] Czech Republic, Denmark, Greece, Italy, Norway, Romania, Spain, Sweden, Slovakia and Slovenia.

5.4 Policy recommendations: a common floor methodology will level the playing field for O-SIIs

Considering the current diversity of the O-SII landscape and the simulation results, the implementation of the same parameters as the 2016 ECB floor methodology across the EU appears beneficial in order to reduce excessive heterogeneity at the lower end of the O-SII buffer rates spectrum and further harmonisation in the short term, without significant disruption to current national practices. The EBA therefore recommends the introduction of an EU-wide floor methodology in the EU framework through a new mandate embedded in the CRD, ideally by 2022, possibly in the context of a comprehensive review of the macroprudential toolbox as well as taking into account the international developments on the usability of buffers. This floor methodology should be based on O-SII scores resulting from the first stage of the identification process, for consistency and comparability reasons.

The unknown extent of the impact on the financial sector and duration of the current health crisis calls for prudence as regards a more granular and detailed calibration approach. This possibility, however, should not be excluded and be kept as a longer-term prospect. The exact calibration of the floor should therefore be reassessed once every three years. Nevertheless, it should be acknowledged that the proposed calibration in line with the 2016 ECB floor was established prior to the 2020 pandemic outbreak in the EU. Hence, consideration should be given to the timing of the introduction for the floor methodology at an EU-wide level, so as to avoid too frequent changes and excessive disruptions to the framework. The EBA suggests a first reassessment only after two years of implementation of the floor methodology in the EU. At that time and without precluding any outcome, the alternative floor methodology assessed in the simulation exercise carried out for this report, or a revised version of it, could be implemented if deemed appropriate. Given the exceptional circumstances, this assessment might proceed earlier.

Notwithstanding, the difficulties caused by the heterogeneity of national banking systems, further harmonisation of calibration methodologies could contribute to a more robust setting of O-SII buffers. Such considerations peak in favour of further developing a fully fledged methodology. While, given the aim of a harmonised single rulebook, the application of a consistent fully fledged model for the single market could indeed be appropriate, at this moment and for the near to medium term, the lack of research and empirical evidence seems to render the development of a fully fledged methodology too challenging.

Conclusions

Pursuing the mandate for the EBA to report to the Commission on the appropriate methodology for the design and calibration of O-SII buffer rates, this report proposes a floor methodology to be implemented in the EU. This methodology is proposed not with the aim of advising national authorities to set their O-SII buffer rates specifically at this floor, but rather to use it as a fundamental principle and lower bound for their final buffer rate decisions.

In a subsequent iteration, the Commission and EU co-legislators may issue a legal mandate to the EBA for prescribing the appropriate methodology to calibrate O-SII buffer rates, one that would introduce a floor methodology to O-SII buffer rates set by national authorities, according to the technical specifications laid down in section 5.2 of this report. Such a mandate, depending on its timing, could consider further reviews to the macroprudential toolbox in the EU, as well as any international developments on the usability of capital buffers.

The introduction of this EU-wide floor methodology would provide an important safeguard against potential under-calibration of the O-SII buffers, thus promoting financial stability across the Union. In the context of withstanding future shocks caused by the aftermath of the pandemic crisis, this floor methodology would strengthen the prospects of ensuring a minimum level playing field across systemically important institutions in the EU.

To conclude, the EBA recommends in this report for an EU-wide floor methodology to be introduced in the EU framework, ideally by the year 2022. EU co-legislators could issue a legal mandate for the EBA to cover both the identification process, currently framed by EBA guidelines, and the buffer calibration process. This floor methodology should thus be based on O-SII scores resulting from the first stage of the identification process, for consistency and comparability reasons. Notwithstanding any substantial review of the macroprudential toolkit in the EU, this single mandate would undoubtedly contribute to fostering increasing harmonisation of macroprudential supervisory practices in the EU with regard to this structural capital buffer of an idiosyncratic nature, which is naturally less prone to changes over the course of the economic cycle or short-term fluctuations. Should the mandate to the EBA require the EBA to draft technical standards on the appropriate methodology to calibrate O-SII buffer rates, it would seem unbalanced to keep the O-SII identification process framed by EBA guidelines.

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