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RESEARCH AND POLICY NOTES 1

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Selected Issues

CNB CZECH NATIONAL BANK

RESEARCH AND POLICY NOTES

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Jakub Seidler

1/2014

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Michal Skořepa, Jakub Seidler

Capital Buffers Based on Banks' Domestic Systemic Importance: Selected Issues

Michal Skořepa and Jakub Seidler*

Abstract

Regulators in many countries are currently considering ways to impose domestic systemic importance-based capital requirements on banks. Aiming to assist these considerations, this article discusses a number of issues concerning the calculation of a bank's systemic importance to the domestic banking sector, such as the choice of indicators used and the pros and cons of focusing on an individual or consolidated level. Also, the "equal expected impact" procedure for determining adequate additional capital requirements is presented in detail and some of its properties are discussed. As an illustrative example of the practical use of the procedures presented, systemic importance scores and implied capital buffers are calculated for banks in the Czech Republic. The article also stresses the crucial role of public communication of the motivation for the buffers: regulators should make every effort to explain that the imposition of a non-zero systemic importance-based capital buffer on a bank is not to be interpreted by the markets as a signal that the bank is too big to fail and would therefore be guaranteed a public bail-out if it got into difficulties.

Abstrakt

Regulátoři v mnoha zemích v současnosti zvažují způsoby, jak bankám stanovit dodatečné kapitálové požadavky založené na jejich domácí systémové významnosti. S cílem přispět k těmto úvahám článek rozebírá řadu témat týkajících se výpočtu systémové významnosti banky pro domácí bankovní sektor, jako jsou například volba použitých indikátorů nebo výhody a nevýhody práce s konsolidovanými nebo individuálními daty. Detailně je představen také postup určení adekvátní výše dodatečných kapitálových požadavků vycházející ze zásady „stejného očekávaného dopadu" a jsou popsány některé jeho vlastnosti. Jako ilustrativní příklad praktického použití popsaných postupů jsou vypočteny hodnoty systémové významnosti a z nich plynoucí kapitálové rezervy pro banky v České republice. Článek také zdůrazňuje zásadní roli veřejné komunikace účelu kapitálových rezerv: regulátoři by měli vynaložit veškeré úsilí, aby vysvětlili, že uvalení nenulové kapitálové rezervy založené na systémové významnosti na danou banku by nemělo být účastníky trhu chápáno jako signál, že je tato banka příliš velká, aby padla (too big to fail), a že by tedy měla zaručenou veřejnou pomoc, pokud by se dostala do potíží.

JEL Codes: G21, G28.

Keywords: Bank failure, Basel III, capital adequacy, consolidation, systemic importance, public support.

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Nontechnical Summary

The financial crisis has reignited the debate on how regulators should take into account the size and significance of financial institutions and thus also the impacts that their failure would have on the stability of the financial sector and the economy as a whole. This debate has led to efforts to estimate the systemic importance of individual institutions and, based on the results, to introduce regulatory measures that reduce both an institution's risk of failure and the impact of its possible failure on public resources.

This article discusses selected issues concerning both the assessment of systemic importance of banks in the domestic banking sector (the so-called D-SIB score) and the determination of an additional CET1 capital requirement of a bank on the basis of its systemic importance (the so-called D-SIB capital buffer). The general approach employed respects the core principles set out by the Basel Committee on Banking Supervision (BCBS), which published a methodology for determining, on the basis of a set of indicators, a bank's global or domestic systemic importance, i.e. the impact that the bank's failure would have on the global or domestic economy (BCBS, 2012; BCBS, 2013c). However, our study discusses some other indicators which might be relevant from the perspective of D-SIB score estimates. Also, some other methodological issues are discussed related to the determination of the group of banks on which the buffer is to be imposed, such as the use of individual versus consolidated data and the judgment of whether a bank exceeds the threshold for the overall D-SIB score or for any individual indicator.

Furthermore, we discuss in detail one specific method for estimating appropriate capital buffer rates for individual banks based on their D-SIB scores. This method, based on the historical frequency distribution of the return on risk-weighted assets (RORWA), provides guidance for reasoning about the amount of additional capital needed for banks in a particular banking sector to reduce their probability of failure to the desired low level.

As an illustrative example of the practical use of the procedures presented, systemic importance scores and implied capital buffers are calculated for banks in the Czech Republic. Although this calculation follows the approach used by the Czech National Bank (CNB) as an analytical basis for its decision-making on additional capital requirements for individual banks in the Czech Republic based on the banks' systemic importance, final CNB decision-making on these issues may also take into account other indicators and approaches than those mentioned in this paper.

Overall, this study presents a comprehensive approach to D-SIB regulation, while other existing studies tend to deal with estimation of the systemic importance of banks in a given jurisdiction, but not with evaluation of the appropriate buffer rate.

Last but not least, we discuss in detail the issue of appropriate communication, especially in view of the often invoked link between regulation based on banks' systemic importance and the too-big-to-fail problem. We stress that a non-zero capital buffer should be communicated in a way that prevents it from being interpreted as a signal that the bank is too big to fail and would therefore be guaranteed a public bail-out if it got into difficulties.

1. Introduction

The financial crisis in recent years has reignited the debate on how financial sector regulators should take into account the size and significance of financial institutions and thus also the impact that their failure would have on the stability of the financial sector and the economy as a whole. This debate has led to efforts to estimate the systemic importance of individual institutions and, based on the results, to introduce regulatory measures that reduce both an institution's risk of failure and the impact of its possible failure on public resources and also motivate it thereby to reduce its systemic importance itself.

Given how the financial crisis unfolded, attention was focused first on the banking sector, as it was the hardest hit area of the economy at the start of the crisis. In late 2011, the Basel Committee on Banking Supervision (BCBS) published a methodology for determining a bank's global systemic importance (the so-called G-SIB score), i.e. the impact that its failure would have on the global economy (BCBS, 2011). It also proposed additional capital requirements (G-SIB buffers) and other steps that regulatory authorities should take in dealing with banks displaying extremely high global systemic importance.

In late 2012 the BCBS published a document containing rules for calculating a bank's systemic importance also to the domestic economy (D-SIB score). This publication, however, leaves the assessment of additional capital requirements (G-SIB buffers) and suitable regulatory actions against banks based on their domestic systemic importance largely to the competent home regulatory authority. As the Czech Republic is a member of the EU, the key factor as regards regulation based on systemic importance is the form in which these BCBS guidelines have been incorporated into the regulatory legislation of the EU, specifically the directive and regulation on capital adequacy known as CRD IV/CRR.

In this article, we discuss some of the issues that arise when a regulator intends to introduce D-SIB buffers. Also, we suggest one specific approach to both determining the D-SIB scores of individual banks and setting appropriate D-SIB buffers on the basis of the score obtained for a particular institution. We apply the suggested approach to the Czech banking sector, while noting that final CNB decision-making on these issues may also take into account other indicators and approaches than those mentioned in this paper.

The article is structured as follows. Section 2 summarises the principles of regulation of systemically important banks as suggested by the BCBS and as applied in practice in selected countries. Section 3 describes a way of estimating capital buffers for individual banks based on their systemic importance. The following section applies the above-mentioned approach to the Czech banking sector. Section 5 points out a major pitfall in the communication of the buffers relating to the conceptual link between systemic importance and "too-big-to-fail" status. Section 6 summarises the main conclusions.

2. Systemic Importance of a Bank

2.1 Measurement of Systemic Importance

The fact that bank regulation may need to be sensitive to a bank's systemic importance has been acknowledged for a number of years (see, e.g., BCBS, 2002). Early specific definitions were rather simple: RBNZ (2001), for instance, while viewing a bank as systemically important if its "failure could have a material impact on the financial sector as a whole and/or the wider economy", adopted the operational definition that a bank was systemically important if the size of its liabilities exceeded a certain threshold. The dramatic repercussions caused by the failure of Lehman Brothers in September of 2008 made it clear, however, that the sheer size of the balance sheet is not the only parameter that may make a bank systemically important. Thus, a search for more sophisticated measures of systemic importance started in earnest.

This search has taken two directions, usually called model-based and indicator-based. The former approach uses one of the several existing models for determining a bank's contribution to overall systemic risk (e.g., Acharya et al., 2010, Adrian and Brunnermeier, 2011, Drehmann and Tarashev, 2011, Chan-Lau et al., 2009; for a survey, see Bisias et al., 2012, or de Bandt et al., 2013). For example, Adrian and Brunnermeier (2011) suggest measuring the systemic importance of a bank as its ΔCoVaR, that is, the increase in the value at risk of the whole financial system connected with the bank getting into distress in the sense of reaching a given extreme level of its own value at risk. Drehmann and Tarashev (2011) define the systemic importance of a bank as the share of the bank in the total expected loss due to a systemic event, where the calculation of the share takes into account the network position of the bank and thus its ability to participate in intra-sectoral contagion.

The list of papers further developing the model-based approaches or applying them empirically to specific banking sectors is growing rapidly; however, several studies have also emerged recently which cast doubts on the practical usefulness or value added of some of the most popular model-based approaches (e.g., Berg, 2011, Danielsson et al., 2011, Idier et al., 2012, Löffler and Raupach, 2013, Jäger-Ambrozewicz, 2013), giving support to the premonition in BCBS (2012) that the model-based approaches may not be robust enough (yet) to be used as a basis for actual regulatory measures.

We would add that, moreover, many of these models tend to be based on specific types of data which may not be available for at least parts of banking sectors in some countries. For example, models based on bank equity prices cannot be used in countries where bank equity is traded insufficiently intensively or not at all.

For these reasons we will focus in this paper on the alternative – the indicator-based approach to identifying systemically important banks. In this approach, the assessment of systemic importance is based on a set of parameters of a given bank, focusing on those parameters which are likely to correlate with the bank's systemic importance.

2.2 BCBS Proposal for Regulation of Global Systemically Important Banks

The BCBS distinguishes two types of systemic importance of a bank: the degree to which it is systemically important to the global economy, that is, its G-SIB score, and the degree to which it is systemically important to the domestic economic system, that is, its D-SIB score. Theoretically,

various combinations of G-SIB scores and D-SIB scores can occur in different countries. In practice, though, it can be assumed that most globally important banks are also important in the context of the domestic financial sector. However, the opposite does not apply, i.e. most domestically important banks will be of low global systemic importance. If the distinction between the global and the domestic systemic view is not important, we will henceforth talk simply about the bank's "degree of systemic importance" (SIB score) in this article.

The BCBS concentrated initially on developing a proposal to regulate banks with high G-SIB scores. BCBS (2011) – in the slightly modified version which was published in BCBS (2013c) and which we will primarily work with – suggests using the above-mentioned indicator-based approach to assessing these scores. More specifically, to calculate G-SIB scores, the BCBS suggests the following five categories of indicators: (1) size, (2) interconnectedness, (3) substitutability, (4) complexity and (5) cross-jurisdictional activity. BCBS (2013c) also defines a specific method for calculating G-SIB scores so as to ensure that they are comparable and uniformly interpreted across the world. In particular, for each indicator, the value for a given bank is normalised by the value for the whole sample of banks under consideration and the G-SIB score of each bank is obtained as a weighted average of the bank's normalised values for all indicators. By implication, the G-SIB score of each bank is a score relative to the rest of the sample, and the sum of the G-SIB scores across all banks in the sample is 1.[1]

BCBS (2013c), in combination with another regulatory document FSB (2011), then defines two key regulatory requirements for banks based on their G-SIB scores. First, a resolution and recovery plan should be drawn up for banks whose G-SIB score exceeds a certain threshold. Second, each such bank should be subject to an additional capital requirement depending on which of several G-SIB score "buckets" it belongs to according to its particular score.[2]

This G-SIB capital buffer rate, in the form of an additional CET1 capital requirement relative to the bank's risk-weighted assets (RWA), should be derived from the bank's G-SIB score. From a political economy point of view it is fairly important for the identification of banks that should hold an additional buffer and the determination of the buffer rate not to be solely in the hands of individual banks' home regulators (who may not have adequate incentives for such a task). Instead, these decisions should be made jointly by home regulators and the FSB as a supranational regulatory authority.

2.3 BCBS Proposal for Regulation of Domestic Systemically Important Banks

After defining an approach to calculating G-SIB scores and related regulatory requirements, the BCBS turned its attention to the issue of determining banks' D-SIB scores and related requirements. The results are summarised in BCBS (2012), where it is proposed to calculate D-SIB scores in a similar way as G-SIB scores, with just a few modifications. The main difference is obviously that D-SIB scores relate to the domestic, not the international, financial sector and real economy. The other major modifications for calculating D-SIB scores are the following:

[1] The sample is determined by starting with the 75 largest global banks and then potentially adding or dropping one or more banks based on supervisory considerations.

[2] The assumption here is that a higher risk-based capital requirement imposed on banks will increase their stability and thus also the contribution of the banking sector to overall economic prosperity (for dissenting views see, e.g., Calomiris and Kahn, 1991, and Slovik, 2012).

- There is no explicitly defined method for calculating D-SIB scores, as international harmonisation is not necessary in this area (no specific indicators or weights are defined).[3]

- The D-SIB score calculation will not be based on the bank's cross-jurisdictional activity. It will thus be based only on the first four categories of indicators listed above, i.e. size, interconnectedness, substitutability and complexity. Specifically for complexity, however, BCBS (2012) states explicitly that this may arise partly from cross-border activity.

- The D-SIB score calculation may also be based on other indicators that the domestic regulator deems relevant. For example, the document allows national authorities to use the bank's size relative to domestic GDP and its wholesale funding ratio. However, these indicators must be set with regard to the specifics of the national economy and financial sector.

Another important modification in the approach to domestic institutions with different degrees of systemic importance is the absence of a requirement to draw up resolution and recovery plans for individual banks exceeding a certain D-SIB score. Instead it is sufficient to have a general (but practicable and effective) resolution plan enacted in the national legislation.

BCBS (2012) proposes to apply to any given bank an additional, D-SIB score-based capital requirement, i.e. a D-SIB buffer.[4] BCBS (2012) gives only a few general principles for the D-SIB buffer assessment methodology and expects domestic regulatory authorities to conduct their own analyses and to use them to tailor the methodology to national circumstances.

2.4 Regulation of Domestic Systemically Important Banks in Selected Countries

In recent years – and in some cases even prior to the BCBS's text on D-SIB buffers – regulators in a number of countries around the globe have started to look at how the idea of a capital buffer based on a bank's domestic systemic importance could be fleshed out within their local jurisdictions; see the results of the recent FSI survey (FSI, 2013). However, published documents on this topic have so far emerged in a handful of countries only, and these documents (with the exception of Skorepa and Seidler, 2013) tend not to be very specific about the methodology used to determine which banks should hold such a buffer and what the buffer rate should be for individual banks. Examples of the countries and the documents include:

- Austria (Austrian Financial Market Supervisory Authority and Austrian National Bank, 2012),
- Canada (Office of the Superintendent of Financial Institutions, 2013),
- Denmark (Committee on Systemically Important Financial Institutions in Denmark, 2013),
- Norway (Ministry of Finance of Norway, 2013),
- Sweden (Sveriges Riksbank, 2011),
- Switzerland (Swiss Financial Market Supervisory Authority, 2011).

[3] This does not mean, of course, that harmonisation will not occur anyway, whether as a result of pressure from large cross-border financial groups or for other reasons.

[4] If a G-SIB capital buffer also applies to the bank in question, the higher of the two values is used.

In the US, regulators have preferred to focus on a different type of loss absorbency-raising balance sheet requirement based on systemic importance: instead of an additional RWA-based capital buffer, they are focusing on a higher leverage ratio (see Office of the Comptroller of the Currency et al., 2013).

2.5 Regulation of Domestic Systemically Important Banks in the European Union

It may be noted that the list of countries where some steps have already been taken in the area of D-SIB buffers includes several members of the European Union. In the EU, a special regime applies: the BCBS suggestions in any given area of financial regulation have been enacted – sometimes with some adjustments – for all EU members to follow, while specifying where some room is left for national discretion. As the EU implementation of the BCBS guidance on D-SIB buffers was adopted in June 2013, all the above-listed initiatives occurred prior to that moment.

In terms of its basic logic, the EU implementation, namely the so-called Fourth Capital Requirements Directive (CRD IV), follows the BCBS's guidance on D-SIB buffers fairly closely. A major problem, however, is that CRD IV (Article 131/5) does not allow the EU's reflection of the D-SIB buffer, called the "Other Systemically Important Institution" (O-SII) buffer, to exceed 2% of the RWA, which is less than what some EU member countries intended to impose as their D-SIB buffers on at least some of the banks within their jurisdictions. Nevertheless, CRD IV (Article 133) introduces another type of capital buffer, the Systemic Risk Buffer. As this buffer is meant to be applied to a set of banks to limit possible non-cyclical systemic risks, its motivation is similar to the O-SII buffer and it is possible to use the systemic risk buffer as an "extension" of the O-SII buffer.[5]

3. Calculation of Systemic Importance

As indicated in the previous section, the additional capital requirement based on the systemic importance of a bank to the domestic economy is calculated in two steps:

(1) calculation of the D-SIB score for each bank,

(2) calculation of the D-SIB buffer for each bank.

We will start by discussing the first step. The second step will be dealt with in the next section.

3.1 Some Possible Indicators Beyond the BCBS Guidance

In contrast to the G-SIB methodology, the BCBS does not go into detail on the indicators that belong to each category or on the method for calculating the D-SIB score itself. The only clear suggestion is that in the D-SIB framework cross-jurisdictional claims and liabilities should get less weight, such as by being subsumed under complexity rather than having a separate category as they do in the G-SIB framework. Given the general tone that the BCBS guidance on D-SIB indicators has, one possibility is to use the indicator list applied within the G-SIB methodology, summarised in Table 1, as a basis

[5] This is indirectly confirmed by the following statement in the FAQs on CRD IV published by the European Commission on its website: "The O-SII buffer is applicable from 2016 onwards but Member States wanting to set higher capital for certain banks earlier can use the systemic risk buffer". Similarly, the European Systemic Risk Board acknowledges that "some countries may apply the SRB to overcome...the legal cap on the O-SII buffer" (ESRB, 2014).

and modify it by dropping or, conversely, taking on board various indicators and adjusting the weights of the indicators and/or indicator categories (such as by moving cross-jurisdictional claims and liabilities under complexity) as deemed appropriate from the perspective of the domestic financial system or for other relevant reasons.

Table 1: List of Indicators Applied Within the G-SIB Methodology

Category (and weighting)	**Individual indicator**	**Indicator weighting**
Cross-jurisdictional activity (20%)	Cross-jurisdictional claims	10%
	Cross-jurisdictional liabilities	10%
Size (20%)	Total exposures as defined for use in the Basel III leverage ratio	20%
Interconnectedness (20%)	Intra-financial system assets	6.67%
	Intra-financial system liabilities	6.67%
	Securities outstanding	6.67%
Substitutability/financial institution infrastructure (20%)[6]	Assets under custody	6.67%
	Payment activity	6.67%
	Underwritten transactions in debt and equity markets	6.67%
Complexity (20%)	Notional amount of over-the-counter (OTC) derivatives	6.67%
	Level 3 assets	6.67%
	Trading and available-for-sale securities[7]	6.67%

Source: BCBS

For example, the list of indicators within the interconnectedness category might be augmented with a measure of **concentration of interbank connections** (measured, for example, as the ratio of the bank's top three interbank claims to its total interbank claims, and similarly for liabilities). The idea – which, by the way, seems relevant even at the G-SIB level – is that a higher concentration of assets or liabilities implies stronger contagion: the higher is the proportion of Bank A's assets that have been lent to Bank B, the lower is the probability that Bank A will survive Bank B's failure to repay the loan; an analogous proportionality holds for concentration of liabilities.

In countries where the banking sector is the dominant source of funding for the corporate sector, the substitutability category may, in turn, be augmented with the share of banks' total loans provided to non-financial corporations. This indicator reflects the importance of the particular bank from the perspective of providing funds to the real sector. The higher share the bank has, the more significant would be the problem caused to the real economy in the event of distress of the bank. Conversely, in some countries, the banking sector might be exposed to some sectors to such an extent that any bank distress and resulting fire sale of exposures might lead to a significant drop in prices of the instruments concerned, adversely affecting the whole sector. If this is the case, the list of indicators might be augmented in order to reflect this specificity of the domestic banking sector as well, e.g. a

[6] Following the publication of the original G-SIB guidance (BCBS, 2011), the contribution of this category was found to be disproportionately high (due to the category's indicators having relatively large cross-sectional variability) and so the updated G-SIB guidance (BCBS, 2013c) introduced a cap on it. Suggestions have recently emerged to solve the problem in a more appropriate way, namely by using standardised values of all the indicators (Hurlin and Pérignon, 2013).

[7] The updated G-SIB guidance (BCBS, 2013c) excludes from this indicator assets eligible to be classified as high-quality liquid assets (HQLA) for the purpose of the Basel III Liquidity Coverage Ratio (LCR).

high concentration of the domestic banking sector towards the sovereign bonds of domestic government.

In highly concentrated banking sectors, another possible substitutability indicator is the share in total insured deposits (or a proxy for this share where the data are not available), because bank failure and reimbursement of insured depositors may entail high costs for public finance. This risk is high in a number of situations: when there is no deposit guarantee fund, when it is small relative to the deposits paid back, or when it is of the ex post type and there are doubts about the possibility to collect enough contributions from banks sufficiently quickly ex post.[8] The share-of-insured-deposits indicator might therefore reflect the possible costs incurred by taxpayers if banks experience distress.

If it is decided that systemic importance will be measured on an individual basis (an issue to which we return below), then information on the relative size of the bank's group can still be included via a new complexity indicator which will express the group's assets as a multiple of the bank's solo assets. Our approximation of the level of complexity of a given bank's liquidation may be improved by means of data on its number of branches and number of employees, as this indirect information reflects the fragmentation of the bank's business and the increased difficulty of resolving this situation in the event of the bank's liquidation. Furthermore, data on the share of non-performing loans might also be a useful indicator from the perspective of the complexity of a bank's liquidation, as NPLs are typically harder to evaluate and sell than standard loans.

Taking the perspective of individual banks, investors or academia, that is, those observers who do not have access to confidential regulatory data on all the banks, Brämer and Gischer (2011) and Masciantonio (2013) suggest modifications to the list of indicators used such that the D-SIB scores are based purely on those data that, while still reflecting a bank's systemic importance, are publicly available.

Another issue as regards the selection of indicators is the problem of high correlations: should we rely on empirics, that is, discard all indicators that are highly correlated with others, or should we rely on theory/intuition, that is, include all indicators that are available and seem relevant? An argument in favour of the latter option is that the high correlation based on historical observations might decrease in the future. An argument in favour of the former option is that if two indicators are highly correlated because they convey the same aspect of systemic importance, including both such indicators in the calculation of the SIB score will increase the overall weight of that particular aspect, possibly above the level that would be appropriate. At this early stage of the SIB score debate, however, little is known about the appropriate weights of the various aspects of systemic importance, and so it seems prudent to include all relevant indicators, even if some of the correlations are very high.

3.2 More Fundamental Departures from the BCBS Guidance

Besides the new indicators mentioned above, there are also several other dimensions in which the D-SIB framework could (and in some cases should) depart from the G-SIB methodology more fundamentally.

[8] For example, according to FSB (2012), among the FSB members alone there were several which had no ex-ante deposit guarantee fund as of the end of 2011; two of these members (Australia and Switzerland) were reported not to be actively considering the introduction of such a fund in the future at all.

Firstly, as already hinted above, in the G-SIB framework systemic importance is measured as purely **relative**. This means that G-SIB scores express importance relative to the rest of the banking sector alone, rather than importance as such, that is, the **absolute** importance to the economy as a whole.[9] In the G-SIB framework, the G-SIB scores are calculated for the single purpose of being used as a basis for determining the appropriate G-SIB buffer rate. In that case, their relative nature is not a problem as long as the subsequent calculation of the buffer rate somehow also manages to incorporate the importance of the banking sector to the economy, so that even if G-SIB scores as such are relative, the ultimate buffer rates based on them are absolute. The issue of whether the D-SIB procedure for setting the buffer rates does manage to incorporate the importance of the banking sector to the economy will be tackled in the next section.

If a bank's D-SIB score itself were to be used as a proxy for actual systemic importance (in order to determine, for instance, the set of banks which should develop their own resolution plans), then the calculation of the score should obviously be somehow extended, compared to the G-SIB framework, such that it becomes absolute in the above sense. The ambition to measure actual systemic importance in this absolute sense, i.e. as the absolute volume of costs of a given bank's failure to the economy, raises a number of issues, though. For example, we would need to specify exactly what state of affairs we mean by "failure of the bank", i.e. at what stage of a bank's process of failing (before insolvency or after it) do we measure the costs to the economy. The relative approach simply assumes that the stage is the same for all banks; it need not be specified explicitly.[10]

The relative nature of SIB scores (whether in the G-SIB context or the D-SIB context) may seem to be a problem not only because the scores fail to show the absolute systemic importance, but also for another reason: the relativeness implies that if Bank A changes its business model in order to reduce its SIB score (motivation for such changes is one of the intended consequences of SIB frameworks), the ultimate effect on its SIB score will be reduced (or neutral or even opposite) if the remaining banks take similar steps to a smaller (or comparable or bigger) extent. The reward, in the form of a fall in the D-SIB buffer rate, that Bank A will get for its effort to become less systemic may then end up being lower than proportional (or the rate may stay the same or it may rise). But here again, all that is needed is the incorporation of absolute importance via the buffer rates. If absolute importance does get incorporated, then Bank A's effort to reduce its SIB score will be rewarded: even if, for example, its SIB score as such does not change at all because the other banks take the same steps towards reducing their SIB scores, the systemic importance of the banking sector as a whole will fall and the SIB buffer rates of all the banks, including Bank A, will fall.[11]

[9] The relativeness of the scores must be distinguished from their conditionality, that is, from their purpose to measure the costs to the economy conditional on the bank getting into distress regardless of the probability that the bank will become distressed. The scores are conditional by design, of course, so that in the second step of the whole SIB procedure the probability of distress of a given bank can be adjusted as needed via imposition of an SIB buffer of an appropriate size.

[10] Obviously, leaving unspecified the stage (of a bank's process of failing) at which we measure systemic importance makes sense only if we assume that the relative systemic importance of individual banks is the same at all stages. If the relative systemic importance of two banks changes depending on whether we measure it, say, at the stage of first signs of distress or at the stage of the licence being withdrawn, then even the relative approach would need to specify the stage to which it refers.

[11] The sensitivity of a bank's SIB score to what other banks do may also be removed, for instance, if we calculate the SIB score from "standardised" values of the indicators. By "standardised" we mean that the value of a bank on a given individual indicator is measured as the bank's percentile position within a range whose lower and upper

A second direction in which we may want the D-SIB framework to depart from the G-SIB one is to give up the **cardinal** approach of calculating a bank's D-SIB score as a weighted average of the relevant indicators and to content ourselves with the **ordinal** approach of concluding that a bank is highly systemically important if it exceeds a certain threshold for at least one of the indicators. If we opt for this departure, however, either we end up imposing the same buffer rate on all those banks which we have found to be highly systemically important or, if we want the buffer to be commensurate with the systemic importance of banks in that "highly systemically important" group, we still need something akin to D-SIB scores and thus may be forced to return to a cardinal approach.

A third direction in which departure from the G-SIB framework may be considered concerns the question of whether systemic importance is judged at the level of **individual** banks or their groups **consolidated** for regulatory (rather than accounting) purposes. The BCBS suggests the consolidated approach (for both the G-SIB and D-SIB context). In principle, this suggestion is reasonable: if we use solo data for setting the D-SIB buffer, the bank may successfully reduce its D-SIB score artificially as regards, for instance, interconnectedness, by lending money to another bank via a non-bank SPV established within the lending bank's group as a subsidiary or an affiliate. In this way, the lending bank's resulting solo claim on the SPV does not get included in the lending bank's value score for interconnectedness (as long as it is bank-to-bank interconnectedness). Using the consolidated approach, and assuming that it also covers the SPV, the claim of the group on the borrowing bank does get recorded as a claim of the group on a bank and thus does increase the lending bank (group)'s interconnectedness score.[12]

In reality, however, consolidated data (in the regulatory sense) need not – and often will not – be a good basis for assessing the impact of the group's distress on the domestic economy, that is, of the group's domestic systemic importance. First, consolidated data usually exclude certain domestically operating entities (especially non-financial entities) whose distress may have sizeable impact on the domestic economy; in this regard, the use of consolidated data has no value added compared to solo data.[13] Second, consolidated data often include entities operating abroad, whose distress may have a negligible effective impact on the domestic economy, while foreign branches – which may often make the bank's resolution perceptibly more difficult – are already included in unconsolidated data.

Therefore, consolidated data, just like solo data, should be taken as a kind of proxy for the actual type of data needed to assess domestic systemic importance correctly. The choice between using solo or consolidated data should be made after considering relevant particular features of the relevant banking and financial system and the resulting risk of psychological or other contagion among members of the respective groups. Data availability and quality (especially as regards more distant history) may play a role, too.[14]

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bounds are fixed and the same for all banks. Under this approach, however, our choice of the bounds would have a clear impact on the effective weights of the individual indicators in the determination of the overall SIB score.

[12] There appears to be just one exception to the rule that the use of solo and consolidated data makes a difference: if we focus specifically on the size indicator and if the rest of a given bank's group is wholly owned and financed by the bank, then the full size of the other entities is visible on the asset side of the bank and gets cancelled in the process of consolidation, such that the bank is just as big in solo terms as the group in consolidated terms.

[13] Consolidated data will typically also exclude insurers. This exclusion will cease to be a major problem only after the framework for regulation of domestic systemically important insurers is activated in a given jurisdiction.

[14] For a treatment of the related but separate issue of the interaction of a G-SIB buffer on the group and a D-SIB buffer on a subsidiary, see Skorepa (2014).

One issue where the BCBS guidance leaves the decision fully to national authorities is the extent to which the national D-SIB regime covers not only banks and subsidiaries of foreign banks, but also foreign banks' branches. If the D-SIB scores are calculated solely for the purpose of determining the appropriate rate of the D-SIB buffers for individual banks, then inclusion of foreign banks' branches is not needed because the host regulator is not able to impose a capital buffer on them anyway. On the other hand, as long as the branches are not highly systemically important, their inclusion is not a problem since it will not change the banks' D-SIB scores much. Conversely, if at least some of the foreign banks' branches are likely to be highly systemically important for the domestic economy, then the calculation of D-SIB scores for the purpose of setting the D-SIB buffer rates should not include them; in that case, however, a separate calculation with the branches included may make sense in order to find out their systemic importance and to determine which of them – given that the host regulator does not regulate them – may require at least more intensive host supervision.[15] When communicating this type of calculation the host authorities must, of course, avoid giving the impression to markets and the public that they assume any responsibility for the stability of these branches.

4. Calculation of the D-SIB Buffer Rate

In this section we describe in detail the central procedure suggested by the BCBS for calculating the SIB buffer rate based on the principle of "equal expected impact" and we comment on selected aspects of this procedure.

4.1 Assumptions

In line with the BCBS publications, we start with the following assumptions set out in Basel III when determining the capital buffer based on the SIB score:

(i) Each bank must meet a minimum capital requirement for Common Equity Tier 1 capital (CET1) of k_{min} = 4.5% of risk-weighted assets. CET1 is composed of common stock and retained earnings, i.e. capital that can be used immediately and unconditionally to cover any losses of the bank.

(ii) In normal circumstances, each bank additionally holds the full basic component of the CET1 capital conservation buffer[16] of k_{basic} = 2.5% of risk-weighted assets.

[15] Specifically within the EU regulatory framework (see Article 158 of CRD IV), the concept of an "important branch" has already been defined explicitly (based on several criteria which partially resemble the suggested D-SIB criteria). The purpose is to give the host regulator the formal power to ask the home regulator for detailed data (and for a seat in the supervisory college) on the foreign bank whose domestic branch the host regulator designates as significant.

[16] We use the descriptor "basic" here because we take the "total" conservation buffer to include an SIB buffer and a countercyclical buffer (where introduced). Strictly speaking, in the Basel III framework, the term "capital conservation buffer" refers specifically to the Common Equity Tier 1 (CET1) buffer (2.5% of RWA) that all banks are expected to hold; if a bank holds less than this buffer, it is required to avoid steps (dividend payouts and the like) which would prevent it from rebuilding this buffer. These requirements get stricter as the size of the missing part of the buffer grows. Both the countercyclical buffer and the bank's systemic importance-based buffer that Basel III sets the stage for should work the same way as the capital conservation buffer. All in all, then, it seems more appropriate to talk about a total capital conservation buffer composed of three parts: (1) the basic part (2.5% for all banks), (2) the countercyclical part and (3) the systemic importance-based part.

(iii) In normal circumstances, a bank with an SIB score denoted by *sib* should comply not only with k_{min} and k_{basic}, but also with the SIB buffer, i.e. the full SIB component, $k(sib)$, of the CET1 conservation buffer.

Consequently, of the three components of the total CET1 capital requirements listed above, only $k(sib)$ is sensitive to the bank's SIB score.

If the capital of the bank falls below $k_{min} + k_{basic} + k(sib)$, the bank must take remedial action whose intensity (and thus also the costs to the economy arising from the situation) is proportional to the decline in capital. In what follows, the situation where, as a result of a large negative profit in the quarter, the bank's CET1 falls below the regulatory minimum k_{min}, i.e. it records a negative quarterly profit of $-[k_{basic} + k(sib)]$ or lower, will be referred to as distress (this need not mean a straightforward fall in the sense of a loss of licence).[17] The probability $P(sib)$ of distress for a bank with an SIB score of *sib* is obviously lower for a higher SIB capital buffer $k(sib)$, i.e. for a higher level of *sib*. The costs to the economy arising from the distress of a bank with an SIB score equal to *sib* will be denoted $C(sib)$.

The capital buffer is then determined on the basis of the "equal expected impact" principle (for early suggestions of this principle, see Bank of England, 2009, and Squam Lake Working Group, 2009). This principle can be generally expressed as follows: the expected costs to the economy resulting from distress of any bank that is systemically more important than a certain reference bank chosen by the regulator should be the same as the expected costs to the economy resulting from distress of the reference bank. Of course, one loose end of this principle is how the regulator selects the reference bank; we return to this question shortly.[18]

According to the expected impact principle, the point of the SIB buffer is to reduce the probability $P(sib)$ of distress of the bank such that the *expected* costs of this situation, i.e. $C(sib)*P(sib)$, are equal to the expected costs of distress of the reference bank, i.e. $C(sib^R)*P(sib^R)$. It is obvious that the SIB buffer will be zero for the reference bank and for every systemically less important bank.

4.2 Calculation

BCBS (2013c) uses two methods to determine the SIB buffer according to the expected impact principle. The first method uses a Merton model to estimate a bank's market-perceived probability of failure from the market prices of its equity. The second method is based on the historical frequency

[17] In determining whether the return (income) is positive or negative, we take zero profit as the benchmark, which seems in line with the approach used in BCBS (2010b, 2013c). In contrast, Kuritzkes and Schuerman (2010) argue that capital is to cover unexpected downside risk, that is, any negative deviation from expected profit, and so they take as the benchmark the bank's expected profit (proxied by its average historical profit). This alternative might be justified from a long-term point of view, where avoiding negative values of net income is not enough for the bank to survive, since the bank must actually meet its shareholders' expectations regarding dividends. These expected dividends can be viewed as an additional, special type of expected expense. This train of thought would imply that, for the purposes of the SIB buffer size assessment, net income should be calculated net of this special type of expected expense, that is, net of expected income. Here, however, we are concerned with the standard one-year horizon for the assessment of capital adequacy.

[18] Besides the expected impact approach, BCBS (2013c) uses the results of other approaches (models created by the Long-term Economic Impact Group and a method based on the implicit subsidies that some highly systemically important banks receive because the market considers them to be too big to fail, i.e. it expects public money to be spent on bailing them out if they get into difficulty). In many jurisdictions, however, these approaches will be difficult to apply due to a lack of relevant data and/or models.

distribution of the return on risk-weighted assets (RORWA – see Kuritzkes and Schuermann, 2010). Nevertheless, in many countries many of their domestic banks' shares are not traded on public markets (or not traded intensively enough to make the data sufficiently reliable), and so the Merton model has limited application. The same problem arises if we want to use for this purpose market prices or yield spreads of banks' bonds or other liabilities (such as uninsured deposits). For this reason, we focus in this article on the RORWA method.

The expected impact principle can be expressed formally as follows: for all $sib \geq sib^R$, $P(sib)$ should satisfy

$P(sib)*C(sib) = P(sib^R)*C(sib^R)$, i.e.

$$P(sib) = \mathrm{P}(sib^R)/[\mathrm{C}(sib)/\mathrm{C}(sib^R)]. \quad (1)$$

In order to derive the values of $P(sib)$ and subsequently also the capital buffer $k(sib)$ based on the bank's *sib*, we first need to determine the value of $P(sib^R)$. The first step is to choose the level of sib^R itself. While the *sib* for each bank is given by the empirically observed levels of the various indicators for that bank, there is no natural, obvious, objective way to set sib^R; it thus has to be determined on the basis of regulatory considerations.

One method which seems fairly acceptable and transparent is to set sib^R equal to q times sib^{aver}, where the latter is the average *sib* for the entire domestic banking sector and values of $q > 1$ are considered. The value of q is chosen at the discretion of the regulator depending on how weak and narrow it wants the effect of the SIB buffer regime to be: the higher q is, the lower the buffers will be; moreover, increasing q may reduce the set of banks to which the buffers will apply. Alternatively, sib^R can be set equal to the q-th percentile of the distribution of all SIB scores observed in the banking sector. Here again, q measures how weak and narrow the effect of the SIB regime is to be.[19]

Not surprisingly, the different methods for setting sib^R have somewhat different implications. For example, if the dispersion of SIB scores across the relevant banking sector falls below a certain level, then the q-times-the-average method will imply no SIB buffers, while the q-th percentile-based method will, by construction, always imply SIB buffers for the 1-q per cent of banks with the highest SIB scores (in regulatory practice, some or all of these buffers may be so small as to be rounded to zero). The intuitive appeal of the two methods may thus depend on the particular circumstances. Assumptions (i)–(iii) listed above and the assumption $k(sib^R) = 0$ imply that $P(sib^R)$ corresponds to the probability that the bank will make a negative profit of

$-[k_{basic} + k(sib)] = -(2.5 + 0) = -2.5\%$ of RWA

or lower. With the historical RORWA distribution, this is therefore the relative frequency of cases where RORWA ≤ -2.5%. If we simultaneously interpret the historical RORWA distribution as being the RORWA probability distribution in the future, then

$P(sib^R) = p(\mathrm{RORWA} \leq -2.5\%)$.

[19] Of course, both the q-times-the-average method and the q-th percentile-based method can be used analogously within the above-mentioned ordinal approach, that is, applied indicator by indicator rather than to the overall SIB score.

To calculate $P(sib)$ from equation (1) we now need to determine the value of $C(sib)/C(sib^R)$. In accordance with intuition and with a proposal contained in BCBS (2013c), we can assume for simplicity that this ratio can be approximated as sib/sib^R. Using the historical RORWA distribution we can then derive the minimum capital loss for each level of $P(sib)$.

The capital requirement $k_{basic} + k(sib) = 2.5 + k(sib)$ should be of an amount covering this loss. This gives us the SIB capital buffer $k(sib)$ based on the degree of systemic importance of the bank.

To close this section, a short note on determining the overall capital requirement for a bank may be in order. The SIB buffer is motivated by the potential losses that the bank may impose on the rest of the economy. In contrast, the existing capital requirements on banks, whether within Pillar 1 or Pillar 2, have all been motivated by the potential losses that the rest of the economy may impose on the bank. Given this fundamental difference in the motivation of the existing capital requirements and the SIB buffer, it seems natural to add the latter buffer on top of any existing Pillar 1 or Pillar 2 capital requirements.

4.3 Does the Banking Sector's Importance to the Economy Get Reflected in the Buffer Rate?

Now we return to the issue raised earlier of whether the above RORWA-based procedure for setting the D-SIB buffer rates ensures that while based on relative D-SIB scores, the buffer rates also encompass the importance of the banking sector to the economy. Alas, the procedure does not meet this criterion: the relative frequency of various levels of RORWA says nothing about the implications that these levels have for the economy.

As regards specifically the G-SIB buffers proposed in BCBS (2013c), a cross-check that the buffer rates suggested by the RORWA method are also absolutely adequate is provided by the confirmation (conducted in Appendix II of BCBS, 2013c) that capital buffers of similar rates seem roughly optimal according to the macroeconomic models used by the Long-term Macroeconomic Impact Working Group.

In principle, this "absoluteness cross-check" is possible also at the D-SIB level: after the national regulator has calculated the D-SIB buffers using the relative approach, she may verify that similar buffer rates are roughly optimal according to an appropriate macroeconomic model. The problem, especially for smaller or less advanced economies, is that significant parts of the data set required to estimate or calibrate such a model reliably may not be available. At the same time, direct application of the models used in BCBS (2013c) may not give a reliable answer either, since they have been developed to fit a handful of specific economies, most of them large and/or advanced (see BCBS, 2010a).

4.4 Dynamics of the SIB Regime

A special class of issues arises once we take a longer-term perspective and consider how the SIB scores and buffers may evolve over time. First, the shorter is the RORWA history on which the buffers are based, the more procyclical the buffers are bound to be: in boom times, the level of profit occurring with any given probability will rise and thus the implied buffer rate will fall, and vice versa. The obvious way to avoid this procyclicality is to work with an RORWA time series long enough to contain at least one full financial cycle – if such a long time series is available.

Second, assume that the introduction of the SIB buffers and other regulatory measures aimed at reducing the probability of distress of individual banks does achieve this aim. Then, the histogram of the new RORWA data (recorded after the buffers were imposed) can be expected to lie on average to the right of the old data histogram, that is, the frequency of losses of a given extent should be lower than it used to be before the buffers were introduced. The reason for this effect is that higher capital buffers held by the bank's counterparties in the interbank market imply lower incidence of distress among those counterparties and thus fewer credit or similar losses for the bank in question.[20] This consideration leads to the expectation that at the first point of SIB buffer rate re-assessment, the RORWA data are more likely to suggest that the buffers should be lowered by some amount. When re-assessing the buffer rates for the second time, the RORWA data are more likely to suggest that the buffers should be increased but by a smaller amount, and so on

4.5 Data Issues

On a practical level, in this second stage of the D-SIB procedure, in which the D-SIB buffer rates are determined, the issue of including or excluding branches resurfaces. The host regulator cannot impose this buffer on a branch of a foreign bank and so it makes no sense to bother calculating the buffer for such branches. Nevertheless, there is still the question of whether we want to include branches in the pool of historical RORWA data used to determine the D-SIB buffer rates for domestic banks which are not branches. At first sight, it seems preferable not to include branches on the grounds that their financial results may be tilted by the fact that they are not "complete banks" as they share or outsource some of their operations within the bank they are part of. This train of thought, however, loses steam as soon as we realise that even subsidiaries often share or outsource some of their operations within their groups such that even many subsidiaries are not "complete banks". More pragmatically, it may be necessary to collect RORWA data also from branches for the simple reason that domestic banks that are not branches are too few or exist for too short a time.

A similar issue is whether to include in the pool of RORWA data also the starting periods of new entrants in the domestic banking sector. Indeed, the first several quarters or even years of their existence may be viewed as a special "start-up" regime with higher-than-usual investment expenditures on brand recognition and fight for a satisfactory market share. But again, this fine consideration may have to be disregarded and most of the new entrant data (except, perhaps, for a few periods at the very start) may have to be used in order to obtain a sufficiently rich historical RORWA data set.

Nevertheless, the pool of historical RORWA data provided by domestic banks may be too small even after including acceptable data for branches and new entrants. Or we may fear that a major part of the past time period from which the pool originates was too non-representative of the way the domestic banking sector is expected to work in the future (for which we want the D-SIB buffers to be adequate) – perhaps the sector or its economic and/or legal environment underwent a transition period or a substantial structural break. In these cases, data pertaining to the domestic banking history may actually be a poorer guide for assessing the future than data pertaining to foreign banking history. Under such circumstances, it may be preferable to determine the overall level of D-SIB buffers based on foreign data. Of course, various adjustments are possible in order to reflect, for example, the

[20] Here we assume away the possibility that a change in a bank's systemic importance changes directly that bank's expected RORWA.

difference in business models (and thus in riskiness) of domestic banks relative to foreign ones (determinants of banks' riskiness are studied, for example, by Altunbas et al., 2011) or the difference in the amplitude of financial cycles in emerging markets relative to developed economies (as documented by, for example, Terrones et al., 2011).

5. Example: The Czech Banking Sector

In this section we will, by way of example, apply the above procedures to the Czech banking sector in order to determine specific D-SIB buffer rates. We will summarise the approach presented in Skorepa and Seidler (2013) and currently used by the Czech National Bank as an analytical basis for its decision-making on additional capital requirements for individual banks in the Czech Republic based on the banks' systemic importance. Nevertheless, final CNB decision-making on these issues may also take into account other indicators and approaches than those mentioned here.

The Czech banking sector has a dominant role in the Czech financial system and represents the most relevant channel of financial intermediation. As of the end of 2012, the Czech banking sector comprised 43 banks and foreign bank branches with total assets of around EUR 184 billion (around 120% of GDP). Furthermore, the Czech banking sector is one of the very few in the Central and East European (CEE) region that has neither experienced a boom in foreign currency lending nor relies on external (foreign) funding, as its loan-to-deposit ratio is roughly 80%. For more details, see, for example, CNB (2013, p. 152).

The list of indicators that we will use in our example to calculate the D-SIB scores of individual banks is given in Table 2. The list differs from the G-SIB methodology to some extent; there are ten non-BCBS indicators (marked with an asterisk) which we think are relevant to the Czech banking sector in particular, while three BCBS indicators were dropped as irrelevant. The motivation behind some of the added indicators is discussed in detail in section 3.1.

Table 2: Categories and Indicators of Systemic Importance Used in the Example

Category	Indicator	Shortcut
Size	Total exposures	1a
Interconnectedness	Claims on FIs	2a
	Liabilities to FIs	2b
	Wholesale funding ratio*	2c
	Concentration of claims on FIs*	2d
	Concentration of liabilities to FIs*	2e
Substitutability	Assets under custody	3a
	Volume of payments cleared and settled through payment system	3b
	Number of payments cleared and settled through payment system*	3c
	Primary deposits*	3d
	Loans provided to non-financial corporations*	3e
	Size of Czech government bond portfolio*	3f
Complexity	OTC derivatives notional value	4a
	Held for trading and available for sale value	4b
	Claims on non-residents	4c
	Liabilities to non-residents	4d
	Assets in regulated consolidated group*	4e
	Number of organisational units*	4f
	Number of employees*	4g
	NPL-to-asset ratio*	4h

Note: * denotes indicators not mentioned in BCBS (2013c). The wholesale funding ratio was included in the original BCBS guidance (BCBS, 2011), but in the update (BCBS, 2013c) it was replaced with "Securities outstanding". Because of the even smaller relevance of this indicator compared to the initial one for the Czech banking sector, we keep the initial one.

Source: BCBS (2012, 2013c), authors.

As in the G-SIB methodology, an equal weight of 25% is given to each of the categories of indicators, with each indicator equally weighted within its category, so our scores are of the cardinal type as discussed above. The structure of the selected indicators might lead to a situation where the correlation of some indicators is relatively high. However, as we discussed at the end of section 3.1, it might be preferable to include more indicators rather than fewer. A correlation matrix of selected indicators used in Table 2 for the Czech banking sector is provided in Table 1A in the Appendix.

For each bank, the score for a particular indicator is calculated by dividing the relevant accounting value for the bank by the accounting value for the banking sector as a whole, so our scores are of the relative type as discussed above. For indicators that are ratios we calculate the score for a particular bank by dividing the individual bank ratio by the aggregate ratio summed across all banks. Given the structure of the Czech financial system, sub-consolidated data for Czech banks do not seem better proxies for systemic importance than data on an individual basis (recall the earlier discussion of this issue) and so we use individual data.

We include all banks active in the Czech Republic since the start of 2002 (including building societies and foreign banks' branches located in the Czech Republic) in the sample of banks for which we are determining D-SIB scores and D-SIB buffers. The sample therefore contains both "original banks" which entered the Czech market before 2002 and "new banks" which entered this market after 2002 Q1.

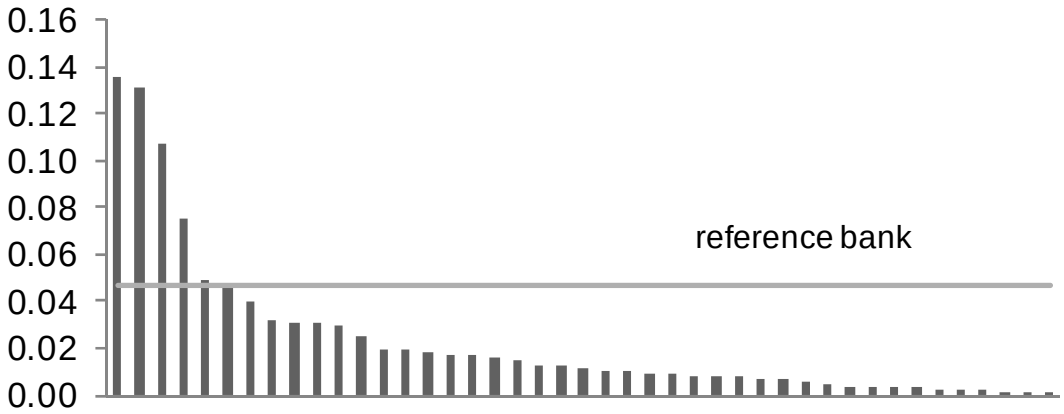
We chose 2002 as the start of the data sample. For pre-2002 data there is a risk that the figures are too distorted by the previous privatisation of banks, the related clean-up of their balance sheets and similar transformation processes, which cannot be considered standard bank finance factors. On the other hand, 2002 saw the last two cases of traditional banks having their licences revoked (Union banka and Plzeňská banka), so the data sample will not be distorted by not containing any cases of adverse changes in banks' finances.

To determine the D-SIB buffer, we use the quarterly RORWA time series pooled across all banks active in the Czech Republic in the period beginning in 2002 Q1 (or later, if a given bank is a "new" one) and ending in 2011 Q4, calculated as the bank's after-tax profit divided by the value of its risk-weighted exposures.

The resulting D-SIB scores of the individual (anonymised) banks for the relevant indicator values at the end of 2011 are shown in Figure 1. The horizontal line in the figure indicates the D-SIB score of the hypothetical reference bank (i.e. sib^R), which we need to determine in order to be able to set the D-SIB buffer. The set of banks for which $sib > sib^R$, and therefore to which a non-zero D-SIB buffer should apply, has six members.

Figure 1: D-SIB Scores of Individual Banks in the Czech Republic

(x-axis, ranking of banks by D-SIB score; y-axis: D-SIB score)



Note: The "reference bank" line indicates a D-SIB score of double the sector average.
Source: Authors' calculations

Table 3 summarises the resulting value of $P(sib^R)$, i.e. $P(sib)$ for the reference bank, and subsequently $P(sib)$ and the corresponding D-SIB buffer [i.e. $k(sib)$] for the bank that had the highest D-SIB score in the Czech banking sector according to the end-2011 data.

As explained above, the calculation needs to strike a balance between discarding the first several quarters of data for newly established banks (whose finances can initially be significantly distorted by specific "start-up" costs) and retaining a sufficiently rich data set. In what follows, the calculations ignoring the first four quarters after banks enter the market are regarded as the baseline (while we present in Table 3 also results for the case where no data are discarded). The D-SIB buffer for the bank with the highest D-SIB score comes out to be 3.87% of risk-weighted assets. In regulatory practice, however, it is more appropriate to categorise banks into "buckets" by rounding up their

exactly calculated D-SIB buffers, such as to the nearest half per cent, for example. An exact D-SIB buffer of 3.87% will thus be rounded to 4.0%.

Table 3: Categories and Indicators of Systemic Importance

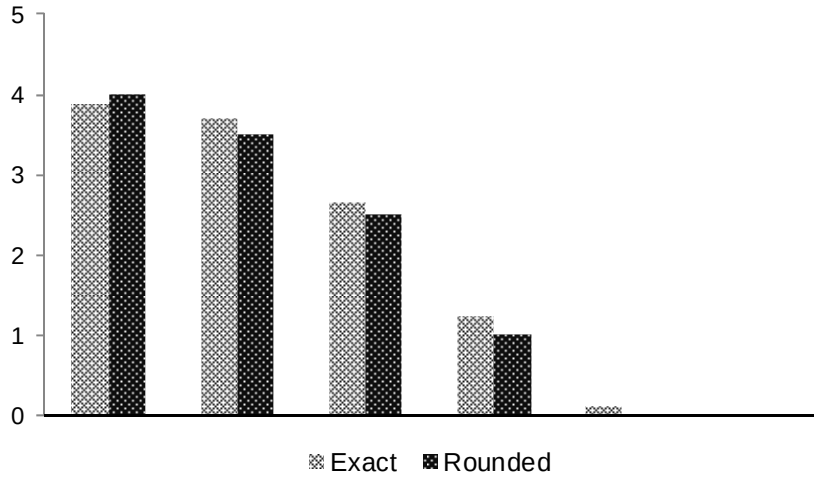
Excluding first:	**Parameter**	
0 quarters	$P(sib^R)$	0.016
	$P(sib)$ for highest *sib*	0.005
	Exact D-SIB buffer for highest *sib* (% of RWA)	5.48%
4 quarters	$P(sib^R)$	0.006
	$P(sib)$ for highest *sib*	0.002
	Exact D-SIB buffer for highest *sib* (% of RWA)	3.87%

Source: Authors' calculations

Figure 2 shows the exact and rounded results of the D-SIB buffer calculation for all banks in the Czech Republic whose D-SIB scores are higher than sib^R and whose D-SIB buffers are therefore above zero. Each pair of columns in this figure corresponds to a single bank and illustrates its exact capital buffer and its buffer rounded to the nearest half per cent. Banks are ranked in descending order of D-SIB score (and thus also exact D-SIB buffer).[21]

Figure 2: D-SIB Buffers of Individual Banks in the Czech Republic

(x-axis, ranking of banks by D-SIB score; y-axis: D-SIB buffer in % of risk-weighted assets)



Source: Authors' calculations

As mentioned above, $q = 2$ implies that the D-SIB buffer regime should apply to six banks. However, it is clear from Figure 2 that due to rounding the resulting D-SIB buffer of banks five and six is zero (even though their D-SIB scores slightly exceed that of the reference bank).

The given specific D-SIB scores and also the D-SIB buffers are based on the parameters of individual banks and the banking sector as a whole as of the end of 2011 and on the financial results of all banks since the start of 2002. In the future, therefore, they may change depending on how the parameters of

[21] It should be noted that the horizontal axis in Figure 2 presents the ranks of the banks, not their D-SIB scores, and so the overall shape created by the columns has no relevant interpretation and no relation (obviously except for the descending trend) to the convex pattern in Figure 1.

individual banks and the whole banking sector evolve and on how the banks' financial results develop.

Buffer rounding is a stabilising factor in the sense that it reduces the frequency of change in the D-SIB buffer level. The resilience of buffers to excessive volatility can be further enhanced by calculating D-SIB scores not from the values of source indicators as of a single date, but from longer-term averages. On the other hand, the stability of D-SIB buffers must not be so strong as to limit their "motivational" effect: it must not lead to a situation where a bank's efforts to reduce its D-SIB buffer by reducing its systemic importance take too long to bear fruit.

6. Communication of SIB Buffers

Any regulatory measure requires not only an analysis of the problem and a decision on an appropriate way to tackle it, but also an announcement and explanation of the measure to the regulated entities and, where needed, to the public in general. This is why, after having discussed the calculation of SIB scores and SIB buffer rates, we now focus our attention on the crucial issue of how the introduction of SIB buffers is communicated by the regulatory authority. In order to see clearly the pitfalls of ill-considered communication, it will be useful to start by spelling out two related but somewhat distinct ways of seeing the very purpose of SIB buffers. First, there is what we might call the **TBTF** approach, which can be summarised as follows:

If, within a given banking sector, there is a group of banks, each of which is viewed as too big to fail, then each is likely to produce well-known negative externalities that need to be internalised by imposing an SIB buffer on each of them.

The second approach, which we might designate as based on **expected impact**, builds on the following consideration:

Within the Basel II Pillar 1 requirements, the same minimum capital requirement is imposed on each bank in terms of its RWA (such as 8% for Tier 2 capital). Assume that the calculation of RWA achieves its aim of normalising the risks of all banks to the same numeraire, so that two banks with the same risk-weighted assets (per unit of exposure at default) have the same probability of distress.[22] Then, equality of the minimum capital requirement across all banks implies equality of the distress probability across all banks. However, the parameter that bank regulation should equalise across all banks is not the probability of bank distress alone, but rather the expected impact (of bank failure or distress) on the economy. This is why the total amount of capital required of a given bank must equal the traditional requirement intended to equalise the probability of distress across all banks plus a requirement reflecting the bank's systemic importance.[23]

[22] Needless to say, this assumption is a dramatic simplification of reality. For example, some commentators voice the suspicion that in applying the internal ratings-based approach, banks may resort to various subtle deviations from Basel II and III in order to reduce the resulting capital requirement (Le Leslé and Avramova, 2012; BCBS, 2013a, b).

[23] This approach has been articulated before, for example in Haldane and May (2011): "as conventionally calibrated, capital regulation seeks to equalise failure probabilities across individual institutions to a given tolerance threshold—such as a 0.1% probability of failure. Approaching this problem from a system-wide angle indicates a rather different calibration. Instead, the objective would be to set firms' capital requirements to equalise the marginal cost to the system as a whole of their failure. In other words, regulatory requirements would be set higher for those banks bringing greatest risk to the system."

The basic difference between these two approaches is as follows: the TBTF approach starts with the assumption that there are certain banks viewed as too big to fail and it ties the SIB buffer to the existence of such banks, leaving all the other banks with the traditional requirement that does not take systemic importance into account.[24] In contrast, the expected impact approach is completely agnostic as regards the current existence of too-big-to-fail banks; instead it changes the philosophy of capital requirements from the "principle of equal probability (of bank failure or distress)" to the "principle of equal expected impact" and it does so for all banks whose systemic importance exceeds a certain threshold determined by the regulator.

The logic of the expected impact approach (and its interaction with resolution planning) can be illustrated, in a very simplified form, with Figure 3, where any given bank is characterised by four parameters:

(1) the social cost of its liquidation (as proxied in relative terms by its SIB score); in the figure, this cost is measured along the left-hand-side part of the horizontal axis;

(2) the social cost of its resolution conditional on the relevant authorities' decision to resolve the bank (in the least costly way available) rather than liquidate it and assuming that the resolution will imply no or negligible fiscal costs; this cost is measured along the upper part of the vertical axis;

(3) the social cost of providing public support to that bank; this cost is measured along the right-hand-side part of the horizontal axis; and

(4) the (unconditional) *expected* social cost of the bank's resolution; this cost is measured along the lower part of the vertical axis.

If we pick a bank with a certain position on one axis, the bold solid lines show us where that bank is positioned on the other axes.

The upper-right quadrant captures symbolically the fact that a given bank should obtain public support if the social cost of such support is lower than the social cost of resolution. This inequality is met for all banks positioned on the vertical axis above point S (for "support"): any bank located above point S will, in the event of distress, receive public support. The bold line in the upper-right quadrant is drawn on the assumption that if we order banks by increasing social cost of public support and of resolution, the latter rises faster.

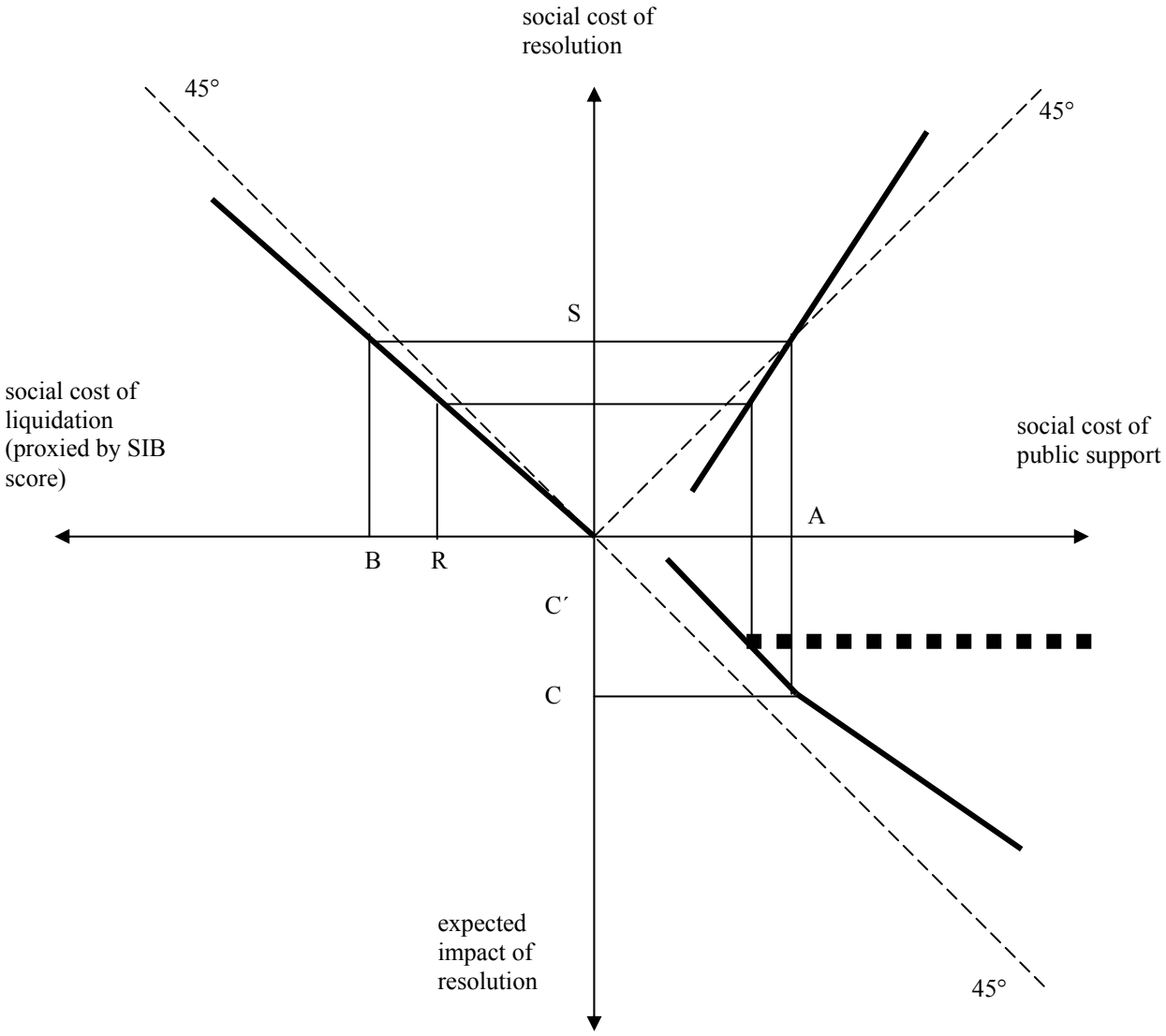
The bold solid line in the upper-left quadrant indicates that the social costs of resolution and those of liquidation can be expected to rise together. Better resolution plans would decrease the slope of the line, that is, they would reduce the social cost of a given bank's resolution for a given level of social cost of that bank's liquidation. Connecting this relationship with that in the upper-right quadrant, better resolution plans would raise the level of the SIB score (from B) that a bank must exceed in order for its resolution to be so costly that it should get public support.

Finally, the bold solid line in the lower-right quadrant reflects the expected impact of bank distress, that is, the social cost of resolution or of public support (for banks lying left and right of point A,

[24] Here we ignore, of course, new but systemic importance-unrelated buffers such as the basic conservation one and the countercyclical one.

respectively) multiplied by the probability that one or the other will take place. The line assumes a traditional capital requirement which does not contain the SIB buffer, so that the probability of distress is constant and, in particular, insensitive to the bank's SIB score. The kink in the line occurs at the point where, if we keep moving from the origin, the decision on public support changes from negative to positive, based on the analysis in the upper-right quadrant. A lower no-buffer capital requirement would imply a higher probability of distress and thus a higher expected impact of distress – that is, a line steeper in both its segments.

Figure 3: Principle of Equal Expected Impact and the Role of Resolution Plans



Source: Authors

Now, assume that the regulator decides to introduce SIB buffers. The dotted line in the lower-right quadrant graphically expresses the principle of equal expected impact in the following way. If we start from the origin and keep moving away from it towards banks with a higher SIB score (and thus a higher social cost of liquidation, of resolution and of public support), then at point R (for "reference") determined by the regulator, the SIB buffer kicks in, that is, the total capital requirement starts to rise with the SIB score. While the expected social cost of resolution or public support if there were no SIB buffer (shown by the solid line in the lower-right quadrant) would keep rising as we move further away from the origin, imposition of the SIB buffer makes the requirements rise such that the expected social cost of resolution or public support (shown by the dotted line in the lower-right quadrant) remains constant. In this way, the principle of equal expected impact is realised.

The TBTF approach as we described it above does not, in itself, specify exactly how (if at all) the SIB buffer rate should depend on the bank's SIB score. One natural possibility is that it also requires the buffer rate to imply an unchanging expected impact. The only remaining – but crucial – difference from the expected impact approach to SIB buffers then is that the TBTF approach starts from point S and asks that point R is set at point B, that is, SIB buffers should be imposed on those banks which will be saved. In contrast, the expected impact approach makes no such connection between the position of points R and B.

The expected impact approach has one clear disadvantage: a pivotal role in it is played by the "reference" level of systemic importance, a level which needs to be determined by regulatory judgment and is thus open to allegations of subjectivity.

The TBTF approach, however, has three disadvantages which seem much more serious. First, the group of banks that will be provided with public support (i.e. the position of point S, and thus of points B and A) is hard to determine until shortly before actual distress arises. Second, it is primarily up to the fiscal authorities, rather than the regulator, to decide where this point should or will lie: the decision on which banks to support with public funds is a deeply political one (Buiter, 2009). Third, if such a link is made between SIB buffers and too-big-to-fail status, the moral hazard problems that the SIB regime is trying to mitigate may actually increase (Elliot and Littan, 2011; Weistroffer, 2011). And this is why communication accompanying the introduction of SIB buffers becomes crucial.

On the face of it, the result of the SIB buffer calculation can be regarded as a distribution of all banks into those with a zero SIB buffer (an SIB score lower than the reference bank's) and those with a positive buffer, which rises as a function of the bank's SIB score. This binary distribution of banks into "banks without a buffer" and "banks with a buffer" may imply what Thomson (2009) calls a "certification effect". Specifically, the above binary distribution of banks may be interpreted by the markets in the sense of the TBTF approach, that is, as a signal that removes the uncertainty about public bail-outs in the following sense: "If a non-zero SIB buffer is imposed on a bank, the bank is so important that the state will want to rescue it, i.e. it enjoys absolute too-big-to-fail status; by contrast, a bank with a zero SIB buffer is relatively unimportant and will thus not be rescued".

Many texts on the determination of SIB buffers as well as media reports indirectly support this inference, giving the impression that the TBTF approach to the SIB regime is the appropriate and/or actually applied one. As hinted above, however, if we accept this approach, the SIB buffer regime may ultimately be counter-productive: it may exacerbate the problem of moral hazard linked with too-big-to-fail status.

So if a regulator does not subscribe to the TBTF approach and is of the view that the SIB scores it has calculated and the SIB buffers it has set do not in themselves preordain a public bank bail-out, she should emphasise this fact in her external communication on SIB buffers. At the same time, however, it is clearly also necessary to suppress the too-big-to-fail status directly by putting in place mechanisms (legislation and possibly also resolution plans) that will allow the relevant authorities to solve the problems of any bank, where possible with limited impacts on the economy and without significant public spending. The reforms currently going on at national and international level are aimed squarely at bolstering such mechanisms.

7. Summary and Conclusions

This article discusses some of the issues that arise when a regulatory authority intends to impose capital buffers on domestic banks based on their domestic systemic importance. First, we analyse the calculation of systemic importance and the determination of the group of banks on which the buffer is to be imposed. In line with both Basel III and CRD IV, we concentrate on the use of a set of balance-sheet and other indicators, rather than any of the several model-based systemic risk measures that have recently been suggested (CoVaR, MES, etc.).

We consider several specific indicators that, while not used in the BCBS guidance for capital buffers based on banks' global systemic importance, might be relevant for identification on the domestic level. Furthermore, the usual assumption that systemic importance should be calculated at the sub-consolidated (rather than solo) basis is pointed out as being debatable whenever domestic banks control large non-financial undertakings or their foreign subsidiaries operate mostly in very distant economies. We then explain the advantages of calculating an overall SIB score (rather than judging whether a bank exceeds thresholds for several indicators individually). We also document the fact that the BCBS guidance results in systemic importance scores which, in themselves, are only relative, in the sense that they capture the internal structure of the banking sector but do not reflect the importance of the sector to the whole economy.

As regards the calculation of the buffer rate, we focus on the equal expected impact approach and discuss the pros and cons of several distinct methods of arriving at the cut-off point above which the buffer should be imposed on a bank – methods such as clustering, a fixed multiple of the average systemic importance score and a fixed percentile of the systemic score distribution. We also point out certain longer-term implications of the SIB buffer regime. For example, the introduction of buffers may gradually shift the observed frequency distribution of RORWA figures and thus have an impact on the future reassessment of the appropriate buffer rates.

As an illustrative example of the practical use of the procedures presented, we calculate specific systemic importance scores for individual Czech banks based on end-2011 data. We then derive additional capital requirements based on the systemic importance of individual banks using historical time series on the return on risk-weighted assets of banks.

Last but not least, we emphasise the crucial signalling effects of public communication of the SIB regulation: the macroprudential authority should make every effort to explain that the imposition of an SIB capital buffer on a bank does not signal a guarantee of government bail-out. If this communication fails (or if it actually equates TBTF banks with banks with an SIB buffer, as is often

the case in the media and some financial publications), then the introduction of the SIB regime might make the too-big-to-fail problem even more pressing.

A more general message of the paper is that while the debate on the appropriate design of the indicator-based regime of SIB capital buffers is still at an early stage, it seems a promising topic on the border between research and practical macroprudential policy.

As regards avenues for further research, we propose to focus, for example, on confirming empirically (using case studies, from various countries, of banks in distress) the link between various indicators and systemic importance, on looking for ways of making the relative SIB scores absolute and on studying empirically the impact of introducing SIB buffers on measures of TBTF status to verify that the buffers were communicated properly and have not actually exacerbated the TBTF problem. Other potentially promising topics are the differential impact of D-SIB buffers on bank behaviour in a fully developed banking sector versus a developing one and the application of more sophisticated weights to extract maximum information from indicators (e.g. principal components analysis). Also, it might be useful to study the extent to which the determination of D-SIB buffer rates would benefit from using stress tests applied to individual banks.

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Appendix

Table A1: Correlation Matrix of the Indicators Listed in Table 2

	1a	*2a*	*2b*	*2c*	*2d*	*2e*	*3a*	*3b*	*3c*	*3d*	*3e*	*3f*	*4a*	*4b*	*4c*	*4d*	*4e*	*4f*	*4g*	*4h*
1a	1.00																			
2a	0.47	1.00																		
2b	0.64	0.68	1.00																	
2c	0.31	0.30	0.79	1.00																
2d	0.26	0.18	0.18	0.23	1.00															
2e	0.40	0.17	0.33	0.38	0.42	1.00														
3a	0.76	0.60	0.61	0.12	0.18	0.30	1.00													
3b	0.60	0.61	0.53	0.15	0.18	0.35	**0.91**	1.00												
3c	**0.91**	0.47	0.52	0.07	0.20	0.31	0.88	0.75	1.00											
3d	0.89	0.36	0.48	0.09	0.21	0.38	0.88	0.74	**0.94**	1.00										
3e	**0.91**	0.58	0.54	0.05	0.20	0.33	0.90	0.76	**0.97**	**0.91**	1.00									
3f	0.84	0.57	0.61	0.10	0.17	0.29	**0.92**	0.74	**0.92**	0.87	**0.95**	1.00								
4a	0.72	0.42	0.44	0.06	0.06	0.32	0.85	0.86	0.83	0.81	0.84	0.76	1.00							
4b	0.77	0.66	0.59	0.10	0.19	0.29	**0.95**	**0.91**	0.88	0.85	**0.91**	0.89	0.85	1.00						
4c	0.47	0.09	0.22	0.03	0.03	0.35	0.52	0.46	0.53	0.55	0.55	0.50	0.71	0.50	1.00					
4d	0.62	0.17	0.33	0.15	0.23	0.49	0.73	0.71	0.68	0.79	0.68	0.68	0.70	0.67	0.60	1.00				
4e	-0.04	-0.02	-0.04	-0.07	0.08	-0.07	-0.03	-0.04	-0.01	-0.02	-0.02	-0.02	-0.03	-0.02	-0.02	-0.01	1.00			
4f	**0.91**	0.33	0.50	0.10	0.19	0.31	0.76	0.56	**0.95**	0.87	0.90	0.88	0.70	0.73	0.50	0.61	-0.01	1.00		
4g	**0.93**	0.41	0.51	0.09	0.20	0.34	0.83	0.67	**0.98**	**0.92**	**0.95**	**0.91**	0.78	0.82	0.54	0.67	0.00	**0.98**	1.00	
4h	0.87	0.27	0.45	0.18	0.28	0.46	0.63	0.47	0.84	0.82	0.79	0.72	0.61	0.64	0.60	0.58	-0.03	0.90	0.88	1.00

Note: The marking of the indicators corresponds to Table 2. Correlations higher than 90% are shaded.
Source: Authors' calculations.

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