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Domestic Systemically Important Banks: An Indicator-Based Measurement Approach for the Australian Banking System

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Abstract

This paper serves as a response to the assessment methodology of the Basel Committee on Banking Supervision to identify systemically important banks. Based on the official technique, which requires an extensive collection of bank data, our paper develops a practicable modification. Utilising readily available indicators, we determine the domestic systemic risk of each licensed bank in Australia in the period 2002-2011. Our quantitative results uncover not only high levels of systemic risk for the four major banks, but their rising dominance during the global financial crisis. Consequently, we introduce a regulatory proposal that enables authorities to reduce the systemic risk of individual institutions.

JEL classification: G01; G18; G21; L50

Keywords: Basel III; financial regulation; indicator-based measurement; systemic risk

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1. Introduction

Since the beginning of the Global Financial Crisis (GFC), a multitude of academic contributions has been devoted to questioning the state of regulation in the global banking systems and to demanding more rigid responses to the distortions major institutions had caused. In the debate on the necessary course of regulation after the GFC, Davis (2009, p. 455) concluded that the treatment of too-big-to-fail institutions, which might involve the granting of implicit and explicit government guarantees as well as negative effects on moral hazard and competition, will become a central matter in containing the crisis. In November 2011, the Basel Committee on Banking Supervision (BCBS) finalised its methodology to identify such so-called systemically important banks and the regulatory approach to reduce the economic impact of their default (BCBS 2011a). Our paper develops a practicable modification of the Basel approach and applies this technique to the Australian banking system. Additionally, it delivers a regulatory proposal to mitigate the vulnerability of the Australian financial system which arises from a failure of one of its Big Four banks.

The ‘indicator-based measurement approach’ of the BCBS (ibid.) provides an assessment methodology to define global systemically important banks (G-SIBs) and to calculate the additional Common Tier 1 capital that G-SIBs will be mandated to hold (on top of the minimum capital charges of Basel III). As a result, the regulators have classified 29 banks as G-SIBs, with none of them based in Australia. However, the Group of Twenty (2011, p. 6) considers the extension of the G-SIB requirements to domestic systemically important banks (D-SIBs). The respective methodology shall be developed by the BCBS together with the national authorities and is likely to be adapted from the G-SIB calculation. To date, neither the number of D-SIBs in national banking systems nor the official assessment approach has been announced. Hence, the extent of domestic systemic risk in the Australian banking system as well as its relative proportions among institutions remain unclear.

However, both the determination of G-SIBs and D-SIBs require an extensive collection of bank data. As most of the necessary figures are only disclosed to the regulatory authorities, a precise measure of systemic relevance is impractical to a bank’s stakeholders. A continuous investigation of the official indicators (including sensitive data such as ‘OTC derivatives notional value’ and ‘level 3 assets’ of every banking institution) appears to be infeasible for practitioners, which weakens the degree of transparency of the Basel methodology. Consequently, in order to predict the systemic risk of a bank and its potential additional equity needs, a practicable modification of the official approach is indispensable.

Computing the domestic systemic importance of banks in international comparison supposedly yields the most extreme results in the financial system of Australia. Throughout the Global Financial Crisis Australian banks proved to be more resilient than others although (or rather because?) the systemic relevance of its major banks has been presumably high and seemed to have increased even further during the turmoil. One aim of this paper is to quantitatively verify those assumptions. The Monthly Banking Statistics (MBS) published by the Australian Prudential Regulation Authority (APRA) offers a data collection that enables banks' stakeholders and the general public to modify the BCBS methodology to define G-SIBs (BCBS 2011a) for use as a measure to classify Australian D-SIBs. In summary, applying these publicly available statistics on a monthly basis, our empirical analysis pursues three major goals:

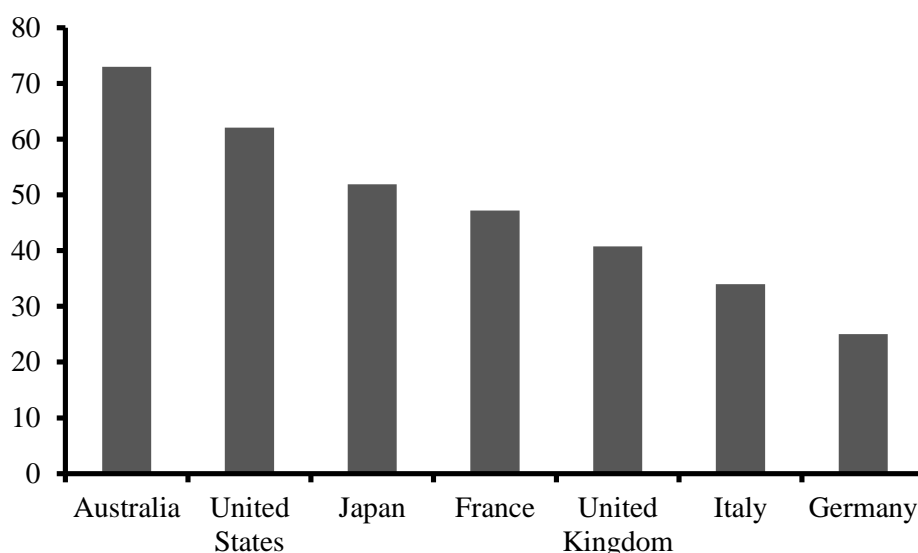
- (1) The first objective is to adjust the Basel approach by utilising readily available, well understood indicators and calculate the domestic systemic risk of every of the 58 licensed banks that submit to APRA. While the qualitative results might be obvious, we intend to highlight the quantitative differences and relative proportions of systemic importance. In doing so, we provide a practicable and transparent methodology to determine the level of systemic risk in the Australian banking market and present the likely results of the prospective D-SIB measure envisaged by the BCBS.
- (2) We analyse the development of domestic systemic relevance over time and bring to light whether there has been a change of the risk that originates from the four major banks. Has their systemic importance increased during the crisis?
- (3) Lastly, we examine the quantitative results for the Australian banking system and assess the incentives for banks which emanate from the BCBS regulation (ibid.). We are convinced that regulatory adjustments have to be made on a national level. Therefore, we introduce a regulatory scheme that enables Australian authorities to significantly reduce the systemic risk caused by the Big Four banks.

The rest of this paper proceeds as follows. The next section illustrates particular characteristics of the Australian banking system. Section 3 outlines the methodology of our calculation in the style of the 'indicator-based measurement approach' of the BCBS. Thereby, the official indicators are explained first and the (publicly available) variables employed in our valuation are introduced subsequently. Section 4 presents the quantitative results, i.e. the current distribution of systemic risk in the Australian banking system as well as its development during the Global Financial Crisis. Section 5 is devoted to the regulatory implications that arise from our results. Section 6 concludes.

2. The Australian Banking System: Highly Concentrated, Highly Resilient

During the GFC the Australian banking system has received worldwide attention for its resilience and continuous profitability. In international comparison, noticeable characteristics can likewise be found in its peculiar market structure. While 58 licensed institutions operate in the Australian banking system, i.e. Australian-owned banks, foreign-owned subsidiary banks and branches of foreign banks, only four major institutions dominate the market. Before the financial crisis in September 2006, the Big Four alone controlled 66 per cent of total resident assets and granted about 75 per cent of personal housing loans to Australian homeowners. During the global turmoil, the takeovers of St. George Bank and Bank of Western Australia, by the majors Westpac and Commonwealth respectively, further increased the influence of the Big Four. By September 2011, the four majors held 76 per cent of resident assets and accounted for not less than 87 per cent of housing loan approvals.¹ To evaluate the degree of concentration by international standards, the common CR 5 indicator is applied in Figure 1. Focussing on the largest five institutions in selected banking systems, the extraordinary dominance of major banks in Australia becomes obvious. For the sake of simplicity, the CR 5 can certainly serve as a tentative indicator for the systemic importance of institutions.

Figure 1 Concentration Ratio of Top 5 Banks in Selected Countries
(market share in per cent of total assets, year-end 2009)



Source: APRA MBS, The Banker (July 2010), FDIC, Japanese Bankers Association, ECB; own calculations.

¹ All values are taken from the Monthly Banking Statistics of the APRA.

While the structure of the Australian banking market is undoubtedly remarkable in international comparison, the globally most noticeable characteristic is seen in its profitability during the worldwide crisis. Starting in 2007, Australian banks continuously generated the highest profits relative to banks of other leading economies. The numbers illustrated in Table 1 document the impact of the GFC on each of the selected banking systems and the relative stability of the Australian institutions.

Table 1 Pre-Tax Profits of Major Banks
(percentage of total assets)

	2003	2004	2005	2006	2007	2008	2009	2010
Australia	1.63	1.48	1.76	1.54	1.42	1.01	0.93	1.14
Canada	1.08	1.23	1.01	1.22	1.12	0.47	0.72	1.01
France	0.68	0.80	0.70	0.73	0.41	0.04	0.18	0.45
Germany	0.04	0.17	0.41	0.43	0.25	-0.46	-0.11	0.17
Italy	0.80	0.87	1.07	1.05	0.88	0.27	0.36	0.37
Japan	0.11	0.26	0.84	0.46	0.29	-0.16	0.29	0.30
Spain	1.61	1.37	1.46	1.37	1.44	1.07	0.88	0.95
United Kingdom	1.24	1.16	0.99	0.90	0.74	-0.05	-0.04	0.25
United States	2.20	1.81	2.06	1.71	0.98	0.28	0.42	1.02

Source: Bank for International Settlements, Annual Reports

Both the high extent of concentration as well as the outstanding performance of the Australian banking system have raised concerns about an exploitation of market power by the majors and about negative implications for the stability of the system as a whole. While the interdependency of market power and stability has been discussed extensively in the literature (s. Cetorelli 2001, Beck 2008, Schaeck et al. 2009), our contribution focuses on the extent of risk that is incorporated in highly concentrated banking systems. Precisely, we intend to measure the systemic risk of individual banks in Australia and to offer a regulatory response to our quantitative results.

3. Methodology

Next to the common Basel III framework (BCBS 2011b), which is supposed to target all banks of the BCBS member countries, the BCBS introduced an additional measure that is solely directed at global too-big-to-fail institutions (BCBS 2011a). As the systemic consequences of their failure are assumed to be dramatic but unpredictable, large banking institutions can expect to be bailed out by their respective governments. In response, the Basel

Committee intends to require systemically relevant banks to hold additional common equity on top of the general Basel III standards.

To identify those global systemically important banks, the BCBS selected five categories, which are to represent the many dimensions of systemic importance: size, interconnectedness, substitutability, complexity and the cross-jurisdictional activity of a bank.² The extent of systemic relevance is expressed by a score that is given to a bank as the sum of its sub-scores in the five categories. Thereby, each value is determined by dividing the individual bank amount by the aggregate amount for all banks in the sample. With all category scores having equal weights, the maximum total score (i.e. if there were only one bank in the system) would be 5. Eventually, banks will be grouped into four buckets based on their scores of systemic relevance (BCBS 2011a, p. 10 and p. 15). Depending upon the bucket it belongs to, a G-SIB will be demanded to hold additional Core Tier 1 capital on top of the minimum capital charges of Basel III, which currently varies from 1.0 per cent (lowest bucket) to 2.5 per cent (highest bucket) of risk weighted assets. In addition, the BCBS proposes an initially empty top bucket of 3.5 per cent surcharge to provide an incentive for banks not to become more systemically important. The new requirement will be implemented parallel with the Basel III capital conservation and countercyclical buffers, i.e. between 1 January 2016 and year end 2018, becoming fully effective on 1 January 2019.

Our adjusted methodology to define systemically relevant banking institutions employs the exact same technique as the official BCBS approach. The only difference lies in the choice of financial indicators which are used to reflect the five categories of systemic relevance. Instead of the official variables, which are often disclosed to the regulatory authorities only, we make use of publicly available indicators to establish a more practicable calculation. As there is no publicly accessible conjoint database for all global banks that incorporates the necessary information required by the BCBS, the implementation of such an approach on a global level appears to be virtually impossible. However, for the Australian national banking system the APRA provides a rich data collection that enables banks and stakeholders to continuously assess the (domestic) systemic relevance of institutions. It is our firm conviction that the quantitative determination of D-SIBs will become a central element of national banking regulation in Australia. By utilising information from the Monthly Banking Statistics we

² The Basel Committee utilises an indicator-based measurement approach. For regulatory purposes these are often favoured over model-based methods, which predominantly employ stock market data that are available for listed institutions only and might be subject to volatile expectations. Popular model-based calculations of systemic risk include the Conditional Value at Risk (Adrian and Brunnermeier 2010), Marginal Expected Shortfall (Acharya 2009) and Shapley-Value (Tarashev et al. 2010).

illustrate how a calculation of Australian D-SIBs, following the adjusted BCBS methodology, can be conducted.

The individual final score, which announces the systemic risk of a bank, shall be interpreted as the degree of distress which occurs in the Australian national banking system given a failure of that bank. Interestingly, the Basel Committee did not define a definite threshold value to differentiate between systemically important banks and non-systemically important ones. Therefore, as a working definition for our analysis, we define a category score value higher than 0.1 or a total score higher than 0.5 as tentative thresholds indicating ‘systemic importance’. In contrast to the BCBS methodology we put emphasis on the fact that the high importance of a bank in one category alone can pose a threat to the system as a whole.

The categories that constitute our measurement of Australian D-SIBs as well as the respective indicators necessary to calculate the individual category scores are presented as follows.

3.1 Size

The size of a financial institution can be regarded as the key measure of systemic risk.³ The larger a bank is, the higher is the potential damage that arises from its failure. In that case other banks are unlikely to be capable of fully replacing the activities of a major institution. Furthermore, the collapse of a well-known bank negatively impacts confidence in the banking system as a whole. Hence, the size category illustrates the too-big-to-fail problem, which has been theoretically described by Freixas (1999) and Goodhart and Huang (1999). In the BCBS method, it is the only category that is expressed by a single indicator. The definition for ‘total exposures’ of a bank (as used in the general Basel III framework) is to act as explanatory variable for the size of a bank.

However, the precise calculation of ‘total exposures’ requires both on-balance as well as off-balance sheet items, which impedes a practicable implementation of the official approach. Instead, a common and observable proxy to reflect the total activities of a bank can be found in the ‘total assets’ of its balance sheet. The APRA Monthly Banking Statistics, which discloses items of the domestic books of Australian banks, publishes the ‘total resident assets’ of every licensed institution. Focusing on the domestic business of Australian banks, this

³ Drehmann and Tarashev (2011) demonstrate that ‘size’ (measured by a bank’s liabilities to non-financial institutions) alone is a reliable proxy of systemic importance. The official measurement approach of the Basel Committee (BCBS 2011a), however, incorporates additional sources of systemic risk and shall instead serve as a reference to our proposal.

variable ($ASSETS_{ij}$, for every bank i and period j) serves as applicable indicator for our calculation.

3.2 *Interconnectedness*

The interconnectedness of banks can create substantial risks that threaten the stability of the financial system. As a troubled institution might not be able to repay its interbank liabilities (in full), the likelihood of distress at other institutions increases. Therefore the systemic impact of a bank greatly depends on its degree of interconnection with other banks (s. Kaufman 1994, as well as Allen and Gale 2000). To measure the score of this category the BCBS makes use of three indicators weighted equally. ‘Intra-financial system assets’ as well as ‘intra-financial system liabilities’ of a bank do not only report the volumes of loans and deposits vis-à-vis other financial institutions, but also the sum of net mark to market reverse repos, securities and OTC derivatives traded with other banks. In addition, BCBS includes the ‘wholesale funding ratio’ of a bank to differentiate between traditional funding by retail deposits and short-term refinancing by interbank and money market operations. However, we are not quite convinced that the official indicator to reflect wholesale funding, i.e. calculating total liabilities less retail funding, is qualified to distinguish between long-term and short-term wholesale funding. Besides, we are a bit sceptical that retail funding per se enhances financial stability. In periods of systemic distress long-term wholesale financing might be, from an economic perspective, more desirable than relying on deposits.

For the reasons named above, we focus on interbank transactions only. The respective items in the Monthly Banking Statistics include ‘loans to financial corporations’ ($LOANSFIN_{ij}$) and ‘deposits from financial corporations’ ($DEPFIN_{ij}$), which are adequate approximations to represent the involvement of banks in the Australian interbank activities.

3.3 *Non-Substitutability*

Moreover, the Basel Committee expects the systemic importance of a bank to be negatively related to the substitutability of its services.⁴ If an institution plays a dominant role in a specific business segment or as a provider of market infrastructure, for instance payment

⁴ The official category name (‘substitutability/financial institution infrastructure’) is somewhat misleading as it is the non-substitutability of a bank’s activities that raises the category score and, by this means, the systemic relevance of this institution.

systems, the substitution by alternative suppliers must be considered unrealistic. Consequently, a failure of that bank will not only cause inconvenience for customers in seeking the same service at another institution but also increase the degree of distress at other banks in terms of service gaps and reduced market liquidity. The respective category score introduced by the BCBS is made up of three indicators (equally weighted): ‘assets under custody’, ‘payments cleared and settled through payment systems’ and ‘values of underwritten transactions in debt and equity markets’.

‘Substitutability’ in the official approach is therefore supposed to reflect the importance of a bank as a service provider to other financial institutions. In our modification, the category ‘non-substitutability’ shall instead express a bank’s relevance to customers outside the financial industry with no direct access to money market or capital market funding instruments. A high share of loans to these economic sectors indicates a low substitutability of the bank and a negative impact on economic activity as alternative sources of funding are rare. To guarantee a practicable calculation of the category score, we utilise easily observable indicators to picture the dependency of economic sectors from bank capital, i.e. the credit volumes granted to households ($LOANSHH_{ij}$), non-financial corporations ($LOANSNF_{ij}$), the general government ($LOANSGOV_{ij}$) as well as community service organisations and non-profit institutions ($LOANSCOM_{ij}$) as published in the APRA Monthly Banking Statistics.

3.4 Complexity

The next of the official categories accounts for the ‘too-complex-to-fail’ theory, which is thoroughly discussed in Herring (2003). The BCBS rightly argues that the systemic risk following a bank’s failure is likely to be greater, the more complex its business, structure, and operations are. The category score is officially measured by ‘notional value of OTC derivatives’, size of assets valued using non-observable data (‘level 3’) and ‘held for trading and available for sale value’. These indicators are to illustrate the number of complex agreements a bank has created with different customers, which increase the costs and time needed to resolve the bank.

The use of notional values of non-centrally cleared OTC derivatives and not objectively priced level 3 assets conflicts with the purpose of our transparent methodology. Instead, readily available indicators of every licensed Australian bank can be found in the ‘trading securities’, $TRADSEC_{ij}$, and ‘investment securities’, $INVSEC_{ij}$, as published in the Monthly Banking Statistics of APRA. The speculative, short-term assets which are held for trading are

subsumed in the ‘trading securities’ of Australian banks. The ‘investment securities’ include both ‘financial assets available for sale’ and ‘assets held to maturity’ and can therefore be regarded as a more conservative indicator than the official equivalent. However, not only trading but also investment securities could come into consideration for fire sales in case an institution experiences severe stress. Implicitly, market prices of these securities would decline and other banks would be forced to write-down their respective holdings.

In summary, the larger a troubled bank’s portfolio of trading and investment securities is, the more likely financial contagion takes place in the total system. The complexity of those contracts eventually complicates the final liquidation of that bank. In our calculation, ‘trading securities’ and ‘investment securities’ are to represent the complexity of Australian bank assets and shall be weighted equally within this category.⁵

3.5 Domestic Sentiment

The last of the official categories (‘cross-jurisdictional activity’) has been created to express the global reach of a bank. In contrast to the BCBS approach, the goal of this paper is to define domestic systemically important banks. Hence, we replace the official category by a proxy that is to emphasise the domestic relevance of an institution. By choosing ‘deposits from households’, $DEPHH_{ij}$, we capture the public perception of the domestic impact that is caused by a bank’s failure. The more deposits of households are at risk, the more likely worriedness spreads across country, which might involve a general reduction of national savings or even bank runs.

Table 2 opposes the official methodology to identify G-SIBs to our adjusted and practicable approach that aims at determining Australian D-SIBs. Whereas the valuation of the five categories and of the overall score of a bank is identical, the choice of indicators differs.

Our study covers the period from June 2002 to September 2011 and 98 periodical observations accordingly.⁶ We measure the systemic risk of every licensed Australian bank during that period. In summary, the total score ($SCORE_{ij}$) which documents the domestic systemic importance of a bank i is calculated as follows:

⁵ Pertaining to ‘trading securities’, absolute values are employed because negative volumes indicate short positions that as well raise the number of agreements which need to be dealt with in case of a failure.

⁶ We employ monthly data starting in March 2004. Before, the APRA published data on a quarterly basis only.

$$\begin{aligned}
SCORE_{ij} = & \frac{ASSETS_{ij}}{\sum_i^n ASSETS_{ij}} + 0.5 \left(\frac{LOANSFIN_{ij}}{\sum_i^n LOANSFIN_{ij}} + \frac{DEPFIN_{ij}}{\sum_i^n DEPFIN_{ij}} \right) \\
& + 0.25 \left(\frac{LOANSHH_{ij}}{\sum_i^n LOANSHH_{ij}} + \frac{LOANSNF_{ij}}{\sum_i^n LOANSNF_{ij}} + \frac{LOANSGOV_{ij}}{\sum_i^n LOANSGOV_{ij}} + \frac{LOANSCOM_{ij}}{\sum_i^n LOANSCOM_{ij}} \right) \\
& + 0.5 \left(\frac{TRADSEC_{ij}}{\sum_i^n TRADSEC_{ij}} + \frac{INVSEC_{ij}}{\sum_i^n INVSEC_{ij}} \right) + \frac{DEPHH_{ij}}{\sum_i^n DEPHH_{ij}}
\end{aligned} \tag{1}$$

where n denotes the total number of banks during that period j .

Table 2 Indicators of the Official and Adjusted Approach

Category (and weighting)	Individual indicator	
	BCBS approach (G-SIBs)	Adjusted BCBS approach (D-SIBs)
Size (20 %)	Total exposures as defined for use in the Basel III leverage ratio	Total resident assets
Interconnectedness (20 %)	Intra-financial system assets Intra-financial system liabilities Wholesale funding ratio	Loans to fin. corporations Deposits from fin. corporations
Non-Substitutability (20 %)	Assets under custody Payments cleared and settled through payment systems Values of underwritten transactions in debt and equity markets	Loans to households Loans to non-fin. corporations Loans to the general government Loans to community service and non-profit organisations
Complexity (20 %)	OTC derivatives notional value Level 3 assets Held for trading and available for sale	Investment securities Trading securities
Cross-jurisdictional activity (20 %)	Cross-jurisdictional claims Cross-jurisdictional liabilities	<i>not included</i>
Domestic sentiment (20 %)	<i>not included</i>	Deposits from households

4. Results

Our key results are presented in two parts. Subsection 4.1 will document the current levels of systemic risk in the Australian banking system. To the best of our knowledge, this paper is the first contribution which is able to display quantitative values of domestic systemic importance in Australia. Subsection 4.2 focuses on the major banks and illustrates how their systemic relevance has developed before and during the Global Financial Crisis.

4.1 Current Distribution of Systemic Importance

Our calculation of systemic importance in the Australian banking system validated the public perception: Due to their final scores, the 58 banks that submitted to the APRA in September 2011 can be classified into two groups: 4 major banks with high systemic impact and 54 minor institutions with hardly any systemic relevance (see Table 3). Our analysis demonstrates that the highest systemic risk originates from the Westpac Banking Corporation illustrated by a total score of 1.18. Thus, this single institution accounts for about 23.6 per cent of the total system. Likewise, the four major banks show a cumulated total score of 3.81 and represent not less than 76.2 per cent of the Australian banking system.

Table 3 Systemic Importance of Australian Banks (September 2011)

<i>Rank</i>	<i>Institution Name</i>	<i>Size</i>	<i>Intercon- nectedness</i>	<i>Non- Substitut- ability</i>	<i>Complexity</i>	<i>Domestic sentiment</i>	<i>TOTAL SCORE</i>
1	Westpac Banking Corp.	0.22	0.21	0.23	0.29	0.23	1.18
2	Commonwealth Bank	0.22	0.22	0.22	0.16	0.27	1.07
3	National Australia Bank	0.17	0.18	0.19	0.16	0.14	0.84
4	ANZ Banking Group	0.15	0.17	0.16	0.10	0.15	0.72
5	Bank of Western Australia	0.03	0.02	0.04	0.02	0.03	0.14
6	Macquarie Bank	0.02	0.03	0.01	0.05	0.01	0.13
7	Suncorp-Metway	0.02	0.01	0.03	0.03	0.03	0.12
8	ING Bank (Australia)	0.02	0.00	0.02	0.02	0.04	0.10
9	Bendigo and Adelaide Bank	0.02	0.00	0.02	0.01	0.04	0.09
10	Bank of Queensland	0.01	0.00	0.02	0.01	0.03	0.08
	Other	0.12	0.16	0.07	0.16	0.04	0.54
	Total sum	1.00	1.00	1.00	1.00	1.00	5.00

Between the two groups, significant differences in levels can be observed not only pertaining to the total scores but also regarding each of the five category scores. The ‘smallest’ major bank, the Australia and New Zealand Banking Group, yields a score of systemic relevance that is five times as high as the one of the ‘largest’ minor bank, the Bank of Western Australia.

Interestingly, the two systemically most important institutions, Westpac and Commonwealth, reached almost identical scores in the categories ‘size’, ‘interconnectedness’ and ‘non-substitutability’. Yet our study reveals that the higher systemic risk of Westpac stems from its extraordinarily large activity in the trading and investment business, i.e. a higher score of ‘complexity’. Therefore, it is important to note that the ‘size’ category alone, although

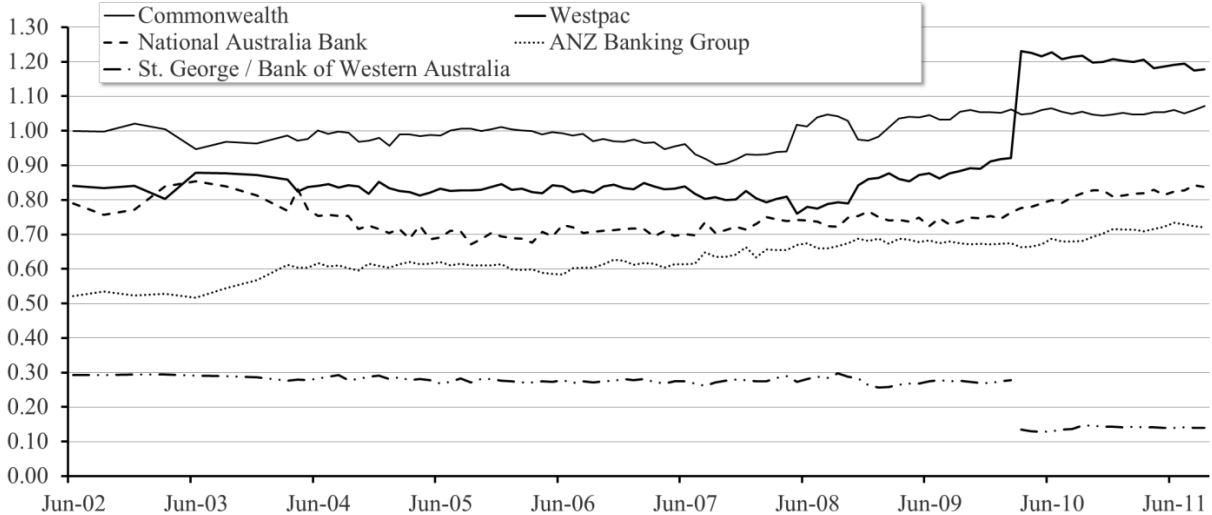
commonly utilised, is not an adequate proxy of systemic risk, as it is not capable of detecting such disparities. The last category (‘domestic sentiment’) shows that 50 per cent of deposits provided by households are placed at those two major banks. Only about 20 per cent of Australian household deposits are given to banks other than the Big Four.

It is imperative to emphasise that the already enormous disparity between major and minor banks as illustrated in Table 3 actually understates the current proportions in the Australian banking system. Although Bank of Western Australia still operates under its own banking license, it is a wholly owned subsidiary of Commonwealth Bank of Australia. As a consequence, not only the gap between major and minor institutions is in fact larger, but the relative systemic importance of the Big Four banks must be regarded even higher in reality than displayed in Table 3.

4.2 *Development of Domestic Systemic Risk Over Time*

Focussing on the major banks, the time series displayed in Figure 2 reveals vital information both about the levels and the change of domestic systemic importance in the Australian banking system.

Figure 2 Domestic Systemic Importance of the Australian Major Banks



The most noticeable event is the Westpac takeover of St. George Bank, which was announced in May 2008. As the two institutions did not operate with one banking license ab initio, the adjustment of the total scores takes place not until March 2010. The takeover of St. George, until then ranked no. 5, considerably increased the systemic risk of Westpac and the aggregate

domestic importance of the Big Four. Again, it becomes apparent that the size category, expressed by the amount of ‘total resident assets’ of a bank, cannot fully reflect the systemic relevance of an institution. According to its ‘total resident assets’ Westpac had been regarded the fourth largest Australian bank before the takeover took place in 2008. However, our investigation brings to light that its systemic importance ranked second at that time already. The buy-out of St. George escalated the systemic impact of a potential default of Westpac severely. Creating a new maximum value of systemic risk in the Australian banking system, the approval of the regulatory authorities seems even more disputable in retrospect.

Regarding the levels of domestic systemic risk, the time series demonstrates that the disparity between the four major banks and the ‘largest’ minor bank (i.e. St. George Bank until March 2010 and Bank of Western Australia thereafter) has been persistently high and even increased throughout the full time span. However, the most fundamental result of our empirical analysis can be found in the development of systemic importance of the Big Four.

We prove for every of the major banks that its systemic relevance has increased relative to its initial amount in June 2002. Moreover, even compared to the scores of September 2008, which is often referred to as the onset of the Global Financial Crisis, the systemic risk of every Big Four bank has risen.⁷ The absolute gain during the GFC ranges from 0.04 points (Commonwealth Bank) to 0.39 points (Westpac) of the total score. Interestingly, the acquisition of St. George, having a total score of 0.29 in September 2008, cannot entirely explain the total increase in Westpac’s systemic importance. It becomes obvious that the actual developments in the Australian banking system run contrary to the goals of the international financial regulators, which identified systemic risk as an essential cause of the current crisis.

While the general trend towards a higher systemic importance of the major banks is readily identifiable during the GFC, the movements before the global crisis require a closer examination. Only one year before the collapse of Lehman Brothers the crisis seemed to be a national issue of the United States with hardly any impact on the Australian financial system. Investigating the period from June 2002 to September 2007, the data seem to indicate a reduction of domestic systemic risk among Australian major banks. In the period ex ante the GFC, the Commonwealth Bank (-0.09), Westpac (-0.04) as well as the National Australia Bank (-0.07) reduced their total score of systemic risk. Only the ANZ Banking Group

⁷ We interpret the bankruptcy of US investment bank Lehman Brothers, declared in September 2008, as the beginning of the Global Financial Crisis. Alternatively, the collapse of the US subprime mortgage industry in spring 2007 could be utilised as reference value. In both cases Figure 2 documents the increase in systemic risk of Australia’s major banks.

constantly raised its systemic impact from 2002 to 2007 by 0.11 points. Apparently, the relative importance of the majors has decreased before the GFC and began to increase during the crisis.

5. Regulatory Implications

Our findings uncovered at least two peculiarities of the Australian banking system that are widely recognised as likely causes of systemic distress. First, we observe persistently high levels of systemic importance. Four out of 58 banks represent almost 80 per cent of the total system. Second, during the Global Financial Crisis, which can be characterised by strong public resistance to the operations of too-big-to-fail institutions, our empirical analysis reveals a trend towards even higher levels of systemic relevance in Australia.

To make matters worse, for two reasons these results still understate the real extent of domestic systemic risk in the Australian banking system. The systemically most important institution of the minor banks, Bank of Western Australia, is a wholly owned subsidiary of Commonwealth Bank. As a result, its total score of 0.14 further increases the actual systemic importance of the Big Four.⁸ Apart from that, the scores published in this paper define the degree of distress in a banking system given the default of (exactly) one bank. Hence, the BCBS methodology does not account for the problem of ‘too-many-to-fail’, which was introduced by Acharya and Yorulmazer (2007): In case of few bank failures, an acquisition by surviving institutions is likely. However, when the number of bank failures is large, regulatory authorities feel obliged to bail out some or all of the troubled banks. Therefore, banks tend to follow similar business models and to build up comparable portfolios of securities. Thus, the default of an Australian major bank might likely be accompanied by the distress of one or more others. Such herding behaviour cannot be reflected in the scores of our underlying approach. In summary, the already alarming results of our empirical investigation need to be interpreted as lower limits of domestic systemic risk and are presumably higher in reality.

As a consequence of the growing disparity between major and minor banks, the question of too-big-to-fail might soon turn into a question of too-big-to-save. The aggregate balance sheet

⁸ To be correct, the total score of Bank of Western Australia (BWA) cannot be fully added to the score of the majors. In our calculation, loans between BWA and Commonwealth are incorporated as loans (of one bank) and deposits (of the other) and increase the ‘total assets’ value in both cases. Consequently, the consolidated scores of ‘size’, ‘interconnectedness’ and ‘non-substitutability’ would certainly be somewhat lower than the respective sum of the two banks.

total of the Big Four alone has rapidly increased from 94 per cent of Australian GDP in 1995 to enormous 193 per cent in 2010.⁹ With the exception of the United Kingdom, no other national banking system in major economies has experienced a comparable expansion of banks' importance.¹⁰ We believe that the primary goal of Australian financial regulation needs to be a reduction of the systemic importance of the Big Four banks. Next to general measures applicable to all licensed banks, such as an intensified competition policy and the potential creation of a so-called fifth-pillar bank formed by building societies and credit unions, a specific requirement for Australian D-SIBs has to be introduced.

Edgar (2009) notes that regulatory authorities almost exclusively monitor previously identified sources of instability, instead of current or potential future indicators. We agree to his comment that this course of action is inevitable. The prediction of future crises and its likely causes is a challenge authorities cannot overcome. For this reason, we are convinced that regulatory adjustments after the GFC have to target the risk of total banking business instead of specific (previously harmful) activities. In subsuming the regulatory responses to the GFC in the United States, the European Union and the United Kingdom, Eisenbeis (2009) highlights the general consensus that higher capital requirements are needed, which are to target large and complex rather than smaller institutions. Subsequently, he demands a methodology to define such systemically important institutions. Our paper serves in a way as a response to Eisenbeis' contribution as we deliver the technique to determine Australian D-SIBs and include an additional capital requirement for those large and complex institutions in our regulatory proposal.

An increase in the minimum equity ratio is a simple measure that is directed at all types of potential bank distress and can be easily applied to a specific group of the banking system only. The official BCBS approach to calculate the additional Common Tier 1 capital, which G-SIBs will be required to hold, provides a template that could be employed for domestic regulatory adjustments in Australia. In fact, the BCBS document advocates additional national actions: 'The Basel Committee emphasises that the additional loss absorbency requirement set out above is the minimum level. If national jurisdictions wish to impose a higher requirement to their banks, they are free to do so.' (BCBS 2011a, p. 15). Against the background of no Australian major bank being subject to the G-SIBs requirements, we propose a domestic

⁹ The respective data are taken from the annual reports of the four major banks, while the gross domestic product (GDP, current prices) of Australia is obtained from the Australian Bureau of Statistics.

¹⁰ For the period 1995-2010, we analysed the ratio of total bank assets to GDP in the Group of Seven countries and Australia. Employing the 'Annual National Accounts' and 'Bank Profitability Statistics' of the OECD, the increase of the Australian ratio during the period is only exceeded by the UK equivalent.

regulatory approach. By adopting the technique of the official G-SIBs regulation and applying the data of our D-SIBs calculation, our recommendation consists of two crucial elements:

- (1) To lower the enormous systemic risk arising from single institutions, Australian D-SIBs need to hold additional Common Tier 1 capital on top of the standards set by Basel III. Furthermore, in case there will be Australian G-SIBs in the future, our proposals shall be implemented in addition to the international capital requirements. The total scores measured to define D-SIBs in the Australian banking system can be utilised to determine the extent of additional capital the respective bank is subject to. As our results indicate a maximum value of 1.18 (i.e. Westpac), institutions shall be given an incentive not to exceed higher levels. Banks with individual scores beyond 1.20 could be mandated to hold additional Common Equity of 2.0 per cent of risk-weighted assets. An incentive to lower the current domestic score of a bank in the long run is established by a threshold value of 0.50 and a respective capital requirement of 1.0 per cent. In contrast to the static surcharges of the BCBS proposal, we prefer a proportional obligation as a function of the individual D-SIB score to generate realistic incentives in the short run. Within the range of 0.50 to 1.20 higher scores imply higher capital needs, while lower values require lower amounts of equity. For instance, a total score of 0.85 would indicate 1.5 per cent of additional equity, a value of 0.84 signifies a surcharge of 1.49 per cent etc.
- (2) In order to put emphasis on the long-term goal of 0.50, the threshold values need to be decreased over time. The degree of reduction is not to represent an additional penalty and shall reflect a realistic process of adjustment. As three major banks lowered their scores between 2002 and 2007 by 0.09 (Commonwealth), 0.04 (Westpac) and 0.07 points (NAB) on their own accord, a decrease of 0.05 points every 5 years seems to be an adequate modification of threshold values.

6. Conclusion

This article is to introduce a practicable methodology to determine domestic systemically important banks in Australia. Based on the official BCBS approach to define global systemic important institutions, our technique enables banks and its stakeholders to approximate the quantitative levels and the relative proportions of systemic risk in the Australian banking system. The results of our analysis do not only uncover high current levels of domestic systemic risk for the four major banks, but also a trend towards even higher levels in the

future. Thus, we believe that the problem of banks being too-big-to-fail will soon turn into a question of too-big-to-save. As we found indications that the systemic risk of the Big Four actually declined before the global crisis, future research should clarify to what extent the GFC had caused the major banks to become even more dominant.

Although the probability of a default of a Big Four bank appears to be low at this time, the potential consequences are very likely to be ruinous. Our quantitative results indicate the dependency of the Australian economy from four financial institutions and the obvious necessity of additional national regulatory measures.

We regard an increase in the minimum equity ratio as the essential requirement of future regulation as it affects the risk of total banking business instead of specific, supposedly harmful, activities. Certainly, the exact threshold values of systemic relevance as well as the recommended timeline of their modifications are debatable. However, the message of regulatory adjustments in the Australian banking system has to be unambiguous, i.e. an obvious ambition to lower the systemic relevance of single institutions. The public discontent with major bank dominance and the encouragement by the BCBS to impose additional national standards represent an opportunity to finally target the might of the Big Four. Responding during the next post-boom crisis might be too late.

References

- Acharya, V. and Yorulmazer, T. 2007, 'Too many to fail – an analysis of time-inconsistency in bank closure policies', Bank of England Working Paper no. 319, London.
- Acharya, V. 2009, 'A theory of systemic risk and design of prudential bank regulation', *Journal of Financial Stability*, vol. 5, pp. 224-55.
- Adrian, T. and Brunnermeier, M. K. 2011, 'CoVar', National Bureau of Economic Research Working Paper no. 17454, Cambridge, Massachusetts.
- Allen, F. and Gale, D. 2000, 'Financial Contagion', *Journal of Political Economy*, vol. 108, no. 1, pp. 1-33.
- Basel Committee on Banking Supervision 2011a, 'Global systemically important banks: Assessment methodology and the additional loss absorbency requirement', Rules Text, November, Bank for International Settlements, Basel.
- Basel Committee on Banking Supervision 2011b, 'Basel III: A global regulatory framework for more resilient banks and banking systems', December 2010 (rev. June 2011), Bank for International Settlements, Basel.
- Beck, T. 2008, 'Bank Competition and Financial Stability: Friends or Foes?', The World Bank Policy Research Working Paper no. 4656, June, Washington, DC.
- Cetorelli, N. 2001, 'Competition among banks: Good or bad?', *Economic Perspectives*, vol. 15, no. 2, pp. 38-48.
- Davis, K. 2009, 'Financial Regulation after the Global Financial Crisis', *The Australian Economic Review*, vol. 42, no. 4, pp. 453-6.
- Drehmann, M. and Tarashev, N. 2011, 'Systemic Importance: Some Simple Indicators', in *BIS Quarterly Review: International Banking and Financial Market Developments*, March, Basel, pp. 25-37.
- Edgar, R. J. 2009, 'The Future of Financial Regulation: Lessons from the Global Financial Crisis', *The Australian Economic Review*, vol. 42, no. 4, pp. 470-6.
- Eisenbeis, R. A. 2009, 'What We Have Learned and Not Learned from the Current Crisis about Financial Reform', *The Australian Economic Review*, vol. 42, no. 4, pp. 457-69.
- Freixas, X. 1999, 'Optimal bailout policy, conditionality and constructive ambiguity', London School of Economics Financial Markets Group, Discussion Paper no. 237, London.
- Goodhart, C. A. E. and Huang, H. 1999, 'A model of the lender of last resort', IMF Working Paper no. 99/39, Washington, DC.

- Group of Twenty 2011, 'Building our Common Future: Renewed Collective Action for the Benefit of All', Cannes Summit Final Declaration, Communiqué, November, Cannes.
- Herring, R. 2003, 'International Financial Conglomerates: Implications for Bank Insolvency Regimes', in *Market Discipline in Banking: Theory and Evidence*, vol. 15, ed G. G. Kaufman, Elsevier, Oxford, pp. 99-129.
- Kaufman, G. G. 1994, 'Bank Contagion: A Review of the Theory and Evidence', *Journal of Financial Services Research*, vol. 22, pp. 123-50.
- Schaeck, K., Čihák, M. and Wolfe, S. 2009, 'Are competitive banking systems more stable?', *Journal of Money, Credit and Banking*, vol. 41, no. 4, pp. 711-34.
- Tarashev, N., Borio, C. and Tsatsaronis, K. 2010, 'Attributing systemic risk to individual institutions', BIS Working Paper no. 308, Basel.

Appendix

Table A1 Systemic Importance of Australian Banks (Total Sample, September 2011)

<i>Rank</i>	<i>Institution Name</i>	<i>Size</i>	<i>Intercon- nectedness</i>	<i>Non- Substitut- ability</i>	<i>Complexity</i>	<i>Domestic sentiment</i>	<i>TOTAL SCORE</i>
1	Westpac Banking Corp.	0.22	0.21	0.23	0.29	0.23	1.18
2	Commonwealth Bank	0.22	0.22	0.22	0.16	0.27	1.07
3	National Australia Bank	0.17	0.18	0.19	0.16	0.14	0.84
4	ANZ Banking Group	0.15	0.17	0.16	0.10	0.15	0.72
5	Bank of Western Australia	0.03	0.02	0.04	0.02	0.03	0.14
6	Macquarie Bank	0.02	0.03	0.01	0.05	0.01	0.13
7	Suncorp-Metway	0.02	0.01	0.03	0.03	0.03	0.12
8	ING Bank (Australia)	0.02	0.00	0.02	0.02	0.04	0.10
9	Bendigo and Adelaide Bank	0.02	0.00	0.02	0.01	0.04	0.09
10	Bank of Queensland	0.01	0.00	0.02	0.01	0.03	0.08
11	JPMorgan Chase Bank, NA	0.01	0.02	0.00	0.02	0.00	0.04
12	UBS AG	0.01	0.02	0.00	0.01	0.00	0.04
13	HSBC Bank Australia Limited	0.01	0.00	0.01	0.01	0.01	0.04
14	Deutsche Bank AG	0.01	0.01	0.00	0.01	0.00	0.03
15	Citigroup Pty Limited	0.01	0.00	0.01	0.00	0.01	0.03
16	The Royal Bank of Scotland	0.00	0.01	0.00	0.01	0.00	0.03
17	Rabobank Australia Limited	0.01	0.00	0.01	0.00	0.00	0.02
18	Citibank, N.A.	0.01	0.01	0.00	0.01	0.00	0.02
19	Royal Bank of Canada	0.00	0.01	0.00	0.01	0.00	0.02
20	State Street Bank and Trust	0.00	0.01	0.00	0.00	0.00	0.02
21	BNP Paribas	0.00	0.00	0.00	0.01	0.00	0.02
22	Mizuho Corporate Bank, Ltd.	0.00	0.01	0.00	0.00	0.00	0.02
23	Bank of China Limited	0.00	0.01	0.00	0.00	0.00	0.02
24	Bank of Tokyo-Mitsubishi UFJ	0.00	0.00	0.00	0.00	0.00	0.02
25	AMP Bank Limited	0.00	0.00	0.00	0.00	0.00	0.02
26	Members Equity Bank Pty Ltd.	0.00	0.00	0.00	0.00	0.00	0.02
27	Bank of America, NA	0.00	0.01	0.00	0.00	0.00	0.01
28	Sumitomo Mitsui Banking Corp.	0.00	0.00	0.00	0.00	0.00	0.01
29	The HSBC Limited	0.00	0.00	0.00	0.00	0.00	0.01
30	Lloyds TSB Bank plc	0.01	0.00	0.00	0.01	0.00	0.01
31	United Overseas Bank Limited	0.00	0.00	0.00	0.00	0.00	0.01
32	C. C. Raiffeisen-Boerenleenbank	0.01	0.00	0.00	0.00	0.00	0.01
33	Oversea-Chinese Banking Corp.	0.00	0.00	0.00	0.00	0.00	0.01
34	ING Bank N.V.	0.00	0.00	0.00	0.00	0.00	0.01
35	MECU Limited	0.00	0.00	0.00	0.00	0.00	0.01
36	Rural Bank Limited	0.00	0.00	0.00	0.00	0.00	0.01
37	The Royal Bank of Scotland NV	0.00	0.00	0.00	0.00	0.00	0.01
38	Investec Bank (Australia) Ltd.	0.00	0.00	0.00	0.00	0.00	0.01
39	Barclays Bank PLC	0.00	0.00	0.00	0.00	0.00	0.01
40	Credit Suisse AG	0.00	0.00	0.00	0.00	0.00	0.00

41	Bank of Cyprus Australia Ltd.	0.00	0.00	0.00	0.00	0.00	0.00
42	Beirut Hellenic Bank Ltd	0.00	0.00	0.00	0.00	0.00	0.00
43	Arab Bank Australia Limited	0.00	0.00	0.00	0.00	0.00	0.00
44	Bank of Scotland plc	0.00	0.00	0.00	0.00	0.00	0.00
45	WestLB AG	0.00	0.00	0.00	0.00	0.00	0.00
46	China Construction Bank	0.00	0.00	0.00	0.00	0.00	0.00
47	Mega International Commercial	0.00	0.00	0.00	0.00	0.00	0.00
48	Ind. and Comm. Bank of China	0.00	0.00	0.00	0.00	0.00	0.00
49	Bank of China (Australia) Ltd.	0.00	0.00	0.00	0.00	0.00	0.00
50	The Northern Trust Company	0.00	0.00	0.00	0.00	0.00	0.00
51	State Bank of India	0.00	0.00	0.00	0.00	0.00	0.00
52	Taiwan Business Bank	0.00	0.00	0.00	0.00	0.00	0.00
53	First Commercial Bank	0.00	0.00	0.00	0.00	0.00	0.00
54	Taiwan Cooperative Bank, Ltd	0.00	0.00	0.00	0.00	0.00	0.00
55	Societe Generale	0.00	0.00	0.00	0.00	0.00	0.00
56	Standard Chartered Bank	0.00	0.00	0.00	0.00	0.00	0.00
57	The Bank of New York Mellon	0.00	0.00	0.00	0.00	0.00	0.00
58	BNP Paribas Securities Services	0.00	0.00	0.00	0.00	0.00	0.00

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