

Estimating the Bridge Financing Needs of the Single Resolution Fund: How expensive is it to resolve a bank?

Willem Pieter De Groen and Daniel Gros

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Abstract

The Single Resolution Board (SRB) will be responsible for the resolution of banks in the euro area from 1 January 2016. However, the resources of the Single Resolution Fund (SRF) at the disposal of the SRB will only gradually be built up until 2023. This paper provides estimates of the potential financing needs of the SRF, based on the euro area bank resolutions that actually occurred between 2007 and 2014. We find that the SRF would have been asked to put a total amount of about €72 billion into these failing banks, which is more than the target for the SRF (€55 billion) but less than the amount the SRF could draw on, if the ex-post levies are also taken into account. As this sum would have been required over eight years the broad conclusion is that bridge financing, in addition to the existing alternative funding, would only have been needed in the early years of the transition.

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List of Abbreviations

CET1	Common Equity Tier I
DGS	Deposit Guarantee Schemes
DRI	Direct Recapitalisation Instrument
DTA	Deferred tax assets
ECB	European Central Bank
EFSF	European Financial Stability Facility
ELA	Emergency Liquidity Assistance
ESM	European Stability Mechanism
FDIC	Federal Deposit Insurance Corporation
GSIBs	Global Systemically Important Banks
MFIs	Monetary financial institutions
O-SIIs	Other Systemically Important Institutions
RWA	Risk weighted assets
SRB	Single Resolution Board
SRF	Single Resolution Fund
SRM	Single Resolution Mechanism
SSM	Single Supervisory Mechanism

Executive Summary

This study uses the experience of the restructuring of the 72 banks in the euro area that received capital support during the period 2007 to 2014 to provide a rough estimate of the funds required for bank resolution, should a crisis of a similar magnitude recur. The aided banks, representing approximately 45% of the total euro area bank assets, experienced losses totalling €313 billion. Most of these losses arose in significant banks.

About half of the banks that received state aid during the past crisis might have received public support under the new framework of the BRRD as well. Of the 62 banks for which there was data available, 17 banks did not report a single year in which the capital fell short, while for 14 banks a bail-in would have been sufficient to meet the minimum capital requirements during the sample period. The remaining 31 banks, accounting for only 6% or € 1.9 trillion of the total euro area bank assets, had losses requiring more funds than obtained through a minimum bail-in of 8% total liabilities, including own funds.

The SRF would have covered only a fraction of the losses given that its contribution is limited to 5% of the total liabilities. The reason is that there were many cases in which the total losses were relatively large (as a % of total liabilities). The banks that would have demanded funds from the SRF were responsible for about two-thirds of the total losses. Those banks could have asked the SRF to inject up to approximately €72 billion to cover resolution costs (this is an upper limit, there would have been no obligation for the SRF to do this). The contribution of the private sector through (excess) own funds and bail-in of creditors (totalling €153 billion) would have been much larger than the maximum contribution of the SRF (€72 billion).

Our estimates seem fairly robust. Changing the assumptions for the deleveraging of activities or alternative methods to calculate the losses only produces relatively small changes in total funds required. The key variable remains the level of capital demanded by the supervisor after re-capitalisation. If this level had been set systematically higher than 8%, say at 12% (of RWA) as in Cyprus, banks with moderate losses would have needed more funding (the SRF would anyway not have been able to put more funding into the banks where it would have hit the 5% of liabilities ceiling). In this case the SRF might have needed up to €101 billion.

The SRF will start collecting funds only from 2016. The target is 1.0% of insured deposits, which would yield a total of €55 billion, but that will be available only at the end of an eight-year transition. Moreover, the SRF could call on three years of advance payments, yielding a total potentially available to the SRF of about €76 billion, enough to cover, once fully contributed, the estimated needs for a 'normal' recapitalisation scenario.

Alternative funding (for restructuring), which in any case is difficult to quantify, would be borrowings from other resolution funds and third parties, such as potential contributions from deposit guarantee schemes.

Our estimate of the potential funding needs results from observations from a once-in-a-generation crisis and covers a period of eight years. This suggests that if another exceptional crisis occurred alternative funds might be called. The SRF is of a sufficient size to handle the failure of one or several small and medium sized banks, but it is insufficient to cope with the failure of the largest banks in the first two years of crisis. The SRF will probably not have sufficient funds to handle a general banking crisis, in such a situation bridge financing of up to €45 billion might have been needed. Taking into account some safety margins a bridge financing facility of a similar size to the €60 billion of the European Stability Mechanism's direct recapitalisation instrument seems appropriate.

Our broad conclusion is that a backstop facility, in addition to the existing alternative funding measures, might be required during the transition period, but only in extreme circumstances.

It needs to be borne in mind that the funding of the SRF would be an investment in the equity capital of the restructured banks. We have not been able to estimate the value of the equity the SRF would hold today if it had existed during the crisis. But the fact that most of the national rescue operations did not result in large losses suggests that a large part of the funding would have represented an investment, not a loss. The same might be the case for funds provided under a bridge financing facility.

Finally, in this paper it is assumed that the SRF will de facto only be used for solvency support, because its contribution is too restrictive and its size too small to deliver a credible contribution in the event of liquidity problems. For liquidity the SRF is likely to depend on the ECB, which may entail additional uncertainty in times of financial distress.

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1. Introduction

During the 2007-09 financial crisis and consecutive 2010-12 economic crisis in the euro area, the stability of the European banking sector was under threat. Monetary authorities and national governments therefore undertook emergency measures to stabilise the banking sector. As an unintended consequence, the liquidity and capital provided to banks meant that the financial position of both the monetary authorities and the national governments deteriorated and the incentives for banks to act prudently were distorted.

The new recovery and resolution framework must ensure that banks are resolved in an orderly manner. The main novelties of the framework are that the plans for recovery and resolution must be prepared before the bank's capital position deteriorates as well as that burden-sharing in the form of a 'bail-in' of shareholders and creditors has become a mandatory condition for the use of dedicated resolution funds.

The creation of the banking union has led to a far-reaching concentration of crisis management in euro area member states. The Single Supervisory Mechanism and Single Resolution Mechanism that comprise the two pillars of today's banking union were set up to prevent any instability in the banking sector endangering the fiscal position of individual euro area member states, and with it the stability of the entire monetary union. Since November 2014 the European Central Bank within the SSM has been responsible for the direct supervision of about 120 significant banking groups and the indirect supervision of all the less significant banks.

On the other hand, the Single Resolution Board and Single Resolution Fund are currently being created within the SRM. The SRB will be responsible for the resolution (-planning) of euro area banks from 1 January 2016. More specifically, the SRB will be responsible for the significant banks that are directly supervised by the SSM, but also the less significant cross-border banks and the less significant banks that need funds from the SRF.¹ The SRB estimates that it will initially be responsible for the resolution (-planning) of approximately 150 banks in total, but the final number will depend, among other factors, on the definition it uses for cross-border banks.

The SRB is also responsible for the management of the SRF. This fund will be used if private funds are insufficient to restructure banks of systemic relevance. During the transition period the own resources of the funds will be raised gradually to reach the envisaged size of 1.0% of covered deposits, or approximately €55 billion in 2023. Hence, in 2016 the SRF will only have

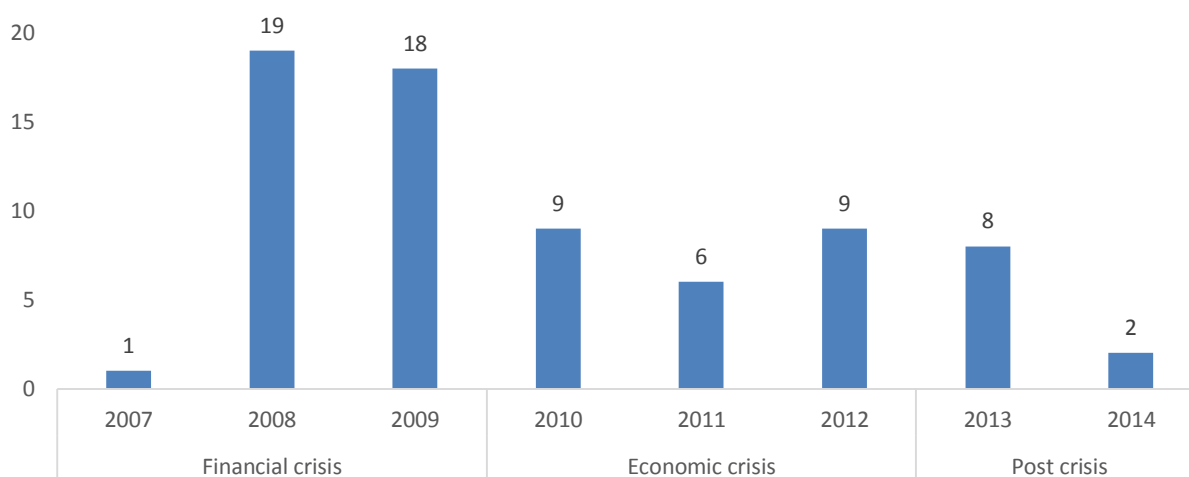
¹ Article 7, OJ L 225 of 15.7.2014

(<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

approximately €11.7 billion funds available to cover a maximum of €1,550 billion losses (i.e. 5% of total liabilities including own funds) that might be required in the worst case scenario. The actual amount of funds that will be required are fortunately only a fraction of this; i) it is unlikely that all banks in the system will fail at around the same time, ii) the bail-in tool might act as a shock-absorber to reduce the funds demanded from the SRF, iii) the losses do not necessarily exceed the maximum contribution of the fund, and iv) the fund is unlikely to contribute to the restructuring of all banks with substantial losses.

This paper provides an estimation of the required size of the SRF, and in particular whether there is a need for a so-called bridge facility to strengthen the firepower of the fund during the transition period. The amount potentially required for the resolution fund depends on many different factors that cannot be predicted with precision, including economic and market developments and the effectiveness of measures to make banks more resilient and the execution of recovery and resolution plans. This contribution starts from the state aid cases of the most recent years (2007-14). This exercise can only constitute a rough guide since these cases occurred during the most severe financial and economic crises in 70 years, which is unlikely to repeat itself in the early years of the SRF.

Figure 1. Number of aided euro area banks (2007-2014)



Note: See chapter 2 for a detailed description of the sample. The figure only shows the first year in which banks received capital support, i.e. banks that received state aid more than once are included only in the year they received the first capital support.

Source: Authors' own calculations based on European Commission (2014).

The past eight years have been turbulent for the banking sector. As shown in Figure 1, 72 banks in total, representing about 50% of the banking assets, received capital support in the period between 2007 and 2014. About half of these banks received their first state aid during the global financial crisis (2007-09), while roughly a third received the first capital support during the large economic crisis in the euro area (2010-12), and another 10 banks received the first support in the aftermath of the crises. Would the new legislation have been applied less banks would have received capital support.

Based on estimations for 62 of the 72 aided banks, only 31 banks might have received capital support from the SRF, had it been in place at that time. Assuming that the banks would not incur any further losses and no additional supervisory buffer would have been demanded, approximately €72 billion would have been sufficient for the fund to cover the 5% losses

beyond the bail-in threshold. The fund, once fully loaded, would have been able to cover the demands with the maximum of approximately €76 billion that it will have available in the future. If the same bank failures were to occur during the early transition years, additional funds, albeit temporary, might be needed. What might be more worrisome, however, are the large amounts of funds that would still need to be found if a minimum bail-in and a maximum re-capitalisation through the SRF had been undertaken.

The remainder of this paper provides an estimation of the funds required for the resolution of different banks, based on state aid cases during past crises. Moreover, it assesses the cumulative required funds under different assumptions. The third chapter uses this information to assess whether the funds available during the transition period are sufficient, and whether alternative facilities could be used to bridge the gap. In chapter four the main conclusions and policy implications are discussed.

2. Estimation of the funds required for bank resolution

This chapter provides an overview of the capital that would have been required for the re-capitalisation of the aided banks, if the new SRM had been in place at that time. It looks at the distribution of losses across the layers of defence at both bank and sectoral level.

2.1 Funds required for bank resolution

2.1.1 Data description

In order to estimate the total funds required for SRF state aid, cases related to crises during the past eight years have been identified. The state aid cases are documented in the DG Competition's "State aid: Overview of decisions and on-going in-depth investigations in the context of the financial crisis". The latest list available at the time of writing contains about 440 decisions, taken between 4 June 2008 and 13 August 2014. These decisions were applicable to both capital and liquidity support and contained decisions on both individual and collective schemes for banks, insurers and credit enhancers in the European Union. Some of the financial institutions have been subject to multiple decisions. Using the gross-list, 72 institutions have been identified that could potentially have received funds from the SRF. Hence, this group of banks only includes banks with their home supervisor in the euro area that received public capital support at least once in the period from 2007 to 2014. Banks that merged or split after the first intervention are simply considered as consolidated/single institutions.²

The banks in the sample represent a significant part of the euro area banking sector. In total, the 72 banks in the sample had total assets of around €14.2 trillion at the end of the book year preceding the interventions, which is equivalent to approximately 45% of the total euro area

² For example, 21 of the Spanish 'cajas' that received state aid were merged into six new banks (i.e. BMN, BFA/Bankia, CatalunyaCaixa, CEISS, NCG Banco and Unnim Banc) and the French Groupe Caisse d'Épargne and Groupes Banques Populaires merged to BPCE. Dexia's subsidiary Dexia Belgium was split and rebranded to Belfius and Fortis' activities in the Netherlands and Belgium were split and rebranded to become, respectively, ASR Nederland/ABN Amro and BNP Paribas Fortis.

banking assets.³ Using the SSM/ECB's criteria⁴ two-thirds of the banks were significant at the end of the year preceding the first intervention (See also Table 2, Annex 2 for the list of institutions). The significant banks are responsible for around 98% of all the total assets of the aided banks.

The market shares and numbers of banks vary greatly between Member States. In 13 of the 19 countries that had the euro as their currency, banks received capital support. The domestic aided banks held more than 70% of the banking assets in Belgium (3 banks), France (6), Greece (12) and Portugal (7), followed by Cyprus (2), Ireland (6), the Netherlands (2) and Slovenia (5) where between 35 and 70% of the banking assets belonged to domestic aided banks. In both Germany (10) and Spain (13) many banks received state aid, but with less than 35% of the banking assets they represent a relatively small share of the market, as was the case for the aided banks in Austria (4), Italy (1) and Luxembourg (1).⁵ That said, many of the larger banks that received state aid also had activities outside their home countries, which means that countries' banking assets belonging to aided banks could be higher in practice (e.g. Austrian Volksbanken had substantial activities in East European countries as Belgium Fortis had in the Netherlands).

2.1.2 Estimation of capital shortfalls

Turning to the data required to estimate the capital needs: state aid decisions include a lot of information on the state aid received and the conditions with which banks have to comply. The published decisions and other documentation do not, however, disclose the estimated losses, total liabilities, own funds and risk-weighted assets at the moment of the resolution, which would be required to make estimates under the new resolution mechanism. Determining the 'bail-in' and recapitalisation through the SRF based on the state aid decisions is further complicated by the various methodologies that have been used to determine the losses, and by the fact that almost half of the banks received multiple recapitalisations. Public financial statements and banks' annual reports (2007-14) have been used to determine the main financial and regulatory indicators required for the estimations.

The exact procedure to determine the losses still needs to be announced by the SRB. The Single Resolution Mechanism regulation (1093/2010/EC)⁶ prescribes that the SRB should ensure a "fair, prudent and realistic valuation of the assets and liabilities" at the moment of the valuation and that it "shall include a buffer for additional losses". Looking at the current developments in Greece, where the largest banks are being recapitalised/resolved using a

³ The total banking assets (i.e. MFIs excl. euro area central banks) were on average €31.5 trillion (varying between €26.4 and €34.9 trillion) during the period from January 2007 to December 2014, see ECB Statistical Data Warehouse (2015)

https://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=117.BSI.M.U2.N.A.T00.A.1.Z5.0000.Z01.E.

⁴ Banks are considered significant if the assets are over €30 billion or over €5 billion and 20% of GDP or if the bank is one of the three largest banks in a country or has significant cross-border activities (ECB, 2014).

⁵ For the market shares of aided banks the bank is attributed to the country where the bank where its lead supervisor is located. The market shares are estimated using the total bank assets (i.e. MFIs excl. Euro area central banks) by country from the ECB Statistical Data Warehouse (2015) https://sdw.ecb.europa.eu/browseSelection.do?DATASET=0&BS_ITEM=T00&DATA_TYPE=1&node=2019180.

⁶ Article 20, OJ L 225 of 15.7.2014

(<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

similar approach to the one foreseen under the new SRM, it is likely that the losses will be determined using a comprehensive assessment-like exercise (Mourmouras, 2015). This includes a valuation of the assets at the moment of the valuation and a stress test to estimate potential losses in adverse economic conditions in the years after the valuation. The overarching objective is thus to estimate the amount of capital that is always likely to meet the capital requirements in the foreseeable future. Since the estimations for this paper are undertaken retrospectively we can make fairly accurate estimates of the capital that would have been required at the moment of the intervention.

Since the exact amounts at the moment of intervention are not disclosed, the own funds, total risk-weighted assets and total liabilities at the end of the last book year before the intervention are used to determine the own funds requirement, maximum bail-in and contribution from the SRF. The loss that the banks should have been able to absorb is the maximum cumulative extractions from capital between the first intervention up to the completion of the restructuring/resolution plan, the end of the sample period (i.e. 2014) or the moment it was acquired by another bank. The extractions/losses are calculated using the profit before tax minus the tax paid plus the write-downs of goodwill. Tax revenues have not been included in the returns since future profits mostly determine whether the tax credits can be cashed. In the new capital regulations these so-called Deferred Tax Assets (DTA) are in principle deducted from capital, as performed in this exercise.⁷ The write-downs of goodwill form a proxy for the write-downs in intangible assets, which are already deducted in total from the regulatory capital⁸ (see Annex 1 for an extensive list of assumptions).

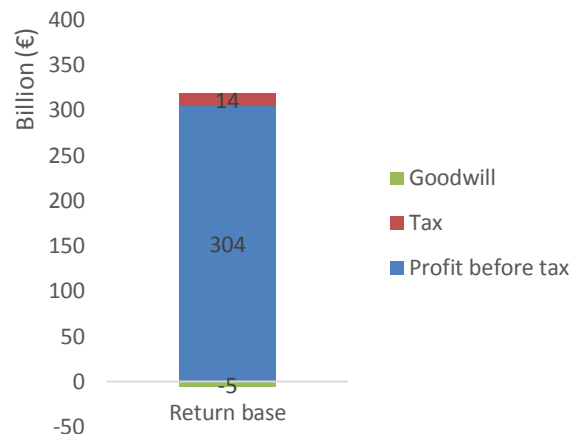
Figure 2 shows the net contribution of the different indicators to the peak losses. The maximum cumulative loss is €313 billion or 2.2% of total liabilities (including own funds). The profit before tax contributed approximately €304 billion to the total loss, while tax expenses added €14 billion and goodwill write-downs reduced the losses by €5 billion. The losses before tax are primarily due to high loan loss provisions and to a lesser extent to losses on other financial assets (i.e. trading losses) and discontinued operations.⁹ The total estimated losses plus capital shortfalls are around €32 billion below the €335 billion of total capital aid provided to euro area financial institutions (European Commission, 2015a). The difference can be partially explained through the banks for which no performance data was available; some banks which received more state aid than strictly necessary to meet the minimum capital requirements and some non-bank institutions which also received state aid.

⁷ Article 36 and 38, OJ L 176 of 27.6.2013
(<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R0575&from=EN>).

⁸ Article 36 and 37, OJ L 176 of 27.6.2013
(<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R0575&from=EN>).

⁹ See Annex Figure 12 for details on the aggregated underlying losses.

Figure 2. Breakdown of peak losses of aided banks (2007-2014)

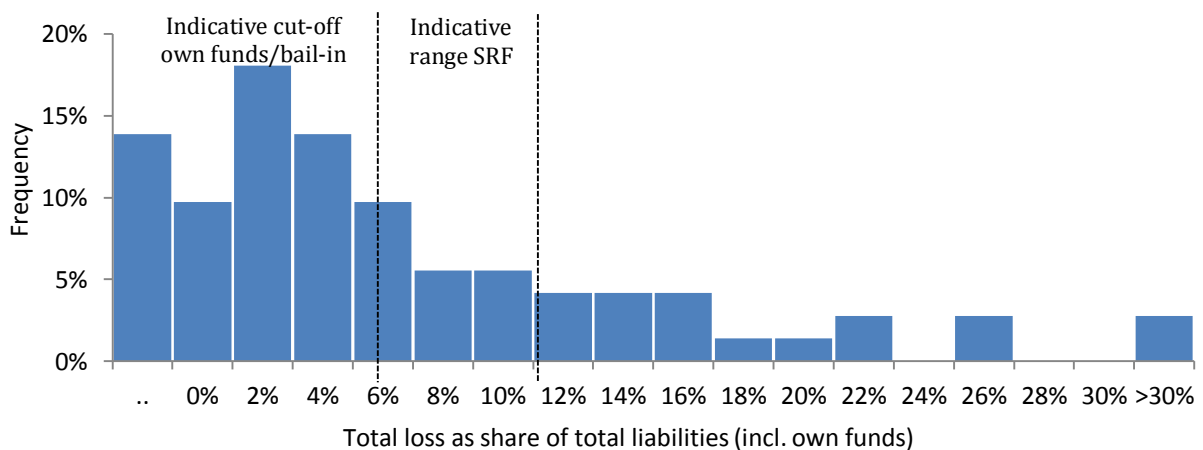


Source: Authors' own calculations based on banks' financial statements and annual reports.

The cumulative losses are unequally divided across the aided banks. Figure 3 shows the distribution of the losses expressed as a share of total liabilities, including own funds for 72 banks at the moment of the intervention. About 10% of the banks did not report any losses and about another 40% of the banks reported peak cumulative losses of up to 4% of total liabilities, including own funds. These banks are less likely to need any recapitalisation with SRF funds. Hence, with a minimum bail-in of 8% of total liabilities and capital requirement of 8% of risk-weighted assets and the risk-weighted assets to total liabilities of around 50% on average, the average maximum capital contribution of excess own funds and bail-in is expected to be around 4% of total liabilities including own funds. About a fifth of the banks reported peak losses of between 4 and 9%, the likely range in which the SRF will be most effective. The remaining quarter noted peak losses of 9% or more, with a maximum of 34.5%, for which minimum bail-in and the maximum contribution from the SRF are not to be sufficient to cover the losses.

The losses could not be calculated for ten banks because of a lack of data on their profitability. These banks are primarily less significant and absorbed or liquidated in the past few years. The total assets of these banks are around €54 billion in total. Assuming that the total liabilities are similar to the total assets, the maximum demand from the funds of these banks could never have been more than €2.7 billion.

Figure 3. Distribution of peak cumulative losses of aided banks (2007-2014)



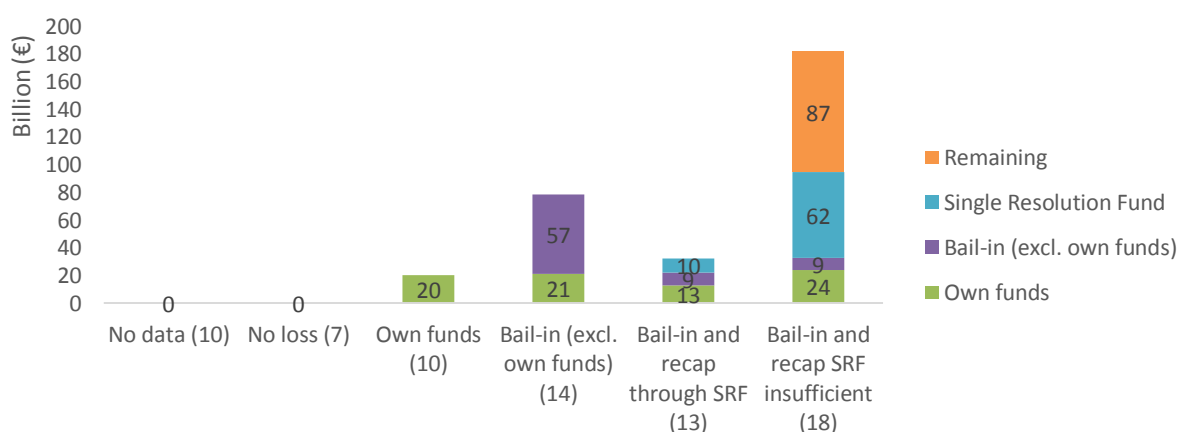
Note: The losses are based on the return methodology as explained in this paragraph plus the capital shortfall at the end of the year preceding the first State aid was received. For 10 banks that received State aid the financial information was (no longer) publically available in October 2015. These banks are indicated as “..” in the figure above.

Source: Authors’ own calculations based on banks’ financial statements and annual reports and European Commission (2014).

2.1.3 Coverage of losses across resolution tools

The distribution across resolution tools largely confirms the general assumption about the number of banks that would have required funds from the SRF. Figure 4 shows the amounts of the different layers of defence that would be needed for recapitalisation. Seven banks would not need any additional funds, because they did not note a loss and already had sufficient capital to comply with the capital requirements. Another ten banks would have needed €20 billion of their capital cushions to absorb the losses and 14 banks would only have required a combination of €21 billion of excess own funds and €57 billion from other creditors through a bail-in to finance their capital losses. The remaining 31 banks might have needed support from the SRF to successfully recapitalise.

Figure 4. Loss absorption tools to cover peak losses (2007-2014)



Note: The numbers in brackets depict the number of banks concerned.

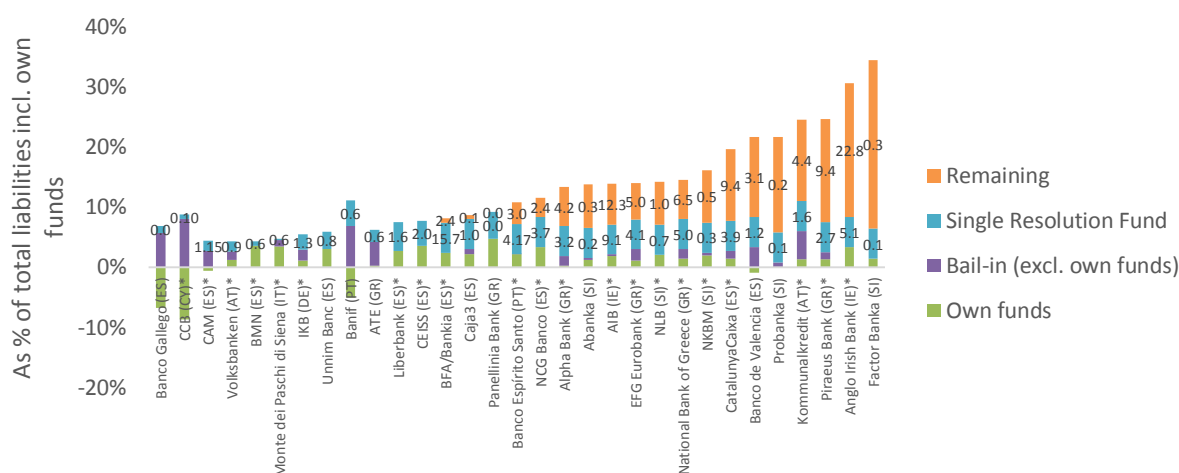
Source: Authors’ own calculations based on banks’ financial statements and annual reports and single resolution mechanism (1093/2010/EC). See OJ L 225 of 15.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

The banks in the range of the SRF would have demanded support of around €72 billion from the fund. Thirteen banks with an aggregated loss of around €32 billion would have needed around €10 billion from the fund, in combination with €13 billion own funds and €9 billion through the bail-in of creditors. The remaining 18 banks had to recuperate €182 billion, of which only €33 billion could have been absorbed through own funds and bail-in. On top of the minimum bail-in amount the banks would have required another €149 billion. The SRF might have contributed up to €62 billion, while the remaining €87 billion would need to be absorbed by other creditors and/or the deposit guarantee scheme(s).

The total assets of the banks that might have received support from the SRF account for around 6% of the total euro area banking assets, just a fraction of the 45% of the entire sample of aided banks. Besides Irish AIB, Spanish BFA/Bankia and Italian Monte dei Paschi di Siena the list only contains small and medium sized banks (i.e. less than €150 billion in total assets). In fact,

ten of the banks could be considered less significant following the SSM/ECB's classification. Figure 5 shows the distribution of losses across the various layers of defence for the different banks. It shows that especially some Greek, Irish and Spanish banks were faced with large losses, with 11 out of 13 Spanish banks in the sample among the banks that might have received funds from the SRF, all four largest Greek banks among the banks needing funds on top of the SRF contribution and two Irish banks among the banks with the largest absolute losses. In total the Spanish banks might have received almost half, Greek banks almost a quarter and Irish banks a fifth of the €72 billion that the SRF might have contributed to resolutions.

Figure 5. Loss absorption tools to cover peak losses of SRF-funded banks (2007-2014)



Note: The figure shows the aided banks that could have received capital support through the SRF, would it already have existed in the period from 2007 to 2014. The “*” after the name indicates that the bank could be considered as significant at the end of the year preceding the first state aid was received.

Source: Authors' own calculations based on banks' financial statements and annual reports and single resolution mechanism (1093/2010/EC). See OJ L 225 of 15.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

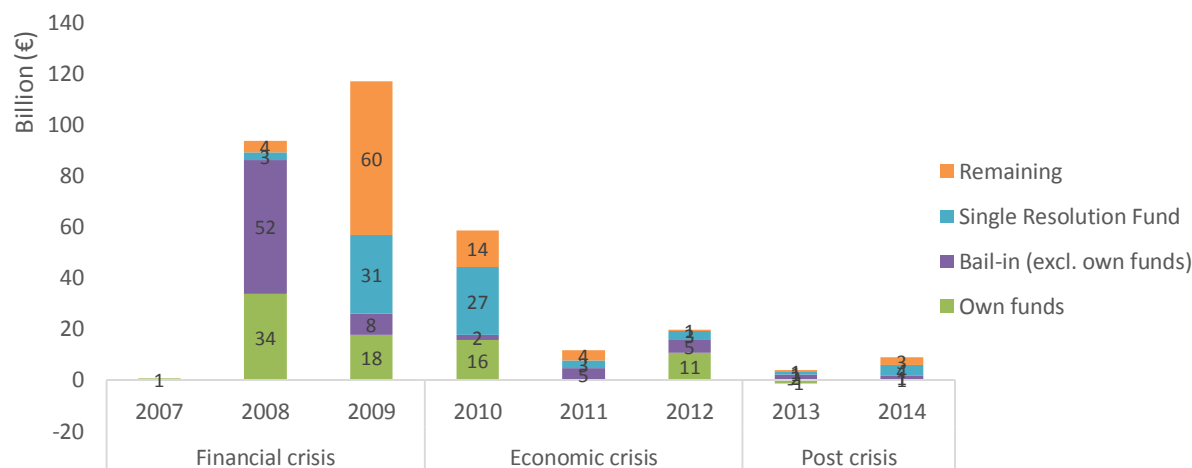
2.2 Total funds required for resolution of significant euro-area banks

2.2.1 Funds required for different levels of recapitalisation

Looking more closely at the aggregate results, the contributions from the SRF would have been very concentrated in time. Figure 6 shows the aggregated losses for banks that received their first state aid per year. The 19 banks that received state aid in 2008 quoted almost the largest losses after the intervention, however, most of the €94 billion in losses could have been absorbed through bail-in. Hence, two large Belgian banks were responsible for about half of the losses (i.e. Fortis and Dexia). These banks could have been recapitalised through a bail-in of €37 billion. The bail-in capacity of these banks was particularly large due to the size of the banks and to the relatively low capital as a share of the 8% bail-in threshold. At the moment of the intervention the minimum regulatory capital was just 2.1% of total liabilities for Dexia and 2.6% for Fortis, compared to around 4% on average for the entire sample. In fact, other creditors of Dexia and Fortis should have been bailed in up to respectively 5.9% and 5.4% of total liabilities and own funds before the SRF might have contributed, while for other banks this would be significantly lower, at around 4%. Moreover, despite the €3 billion capital

contributions in total from the SRF to German IKB and Austrian Kommunalkredit, the Austrian bank would have needed another €4 billion to cover the remaining losses.

Figure 6. Coverage losses across absorption tools and years



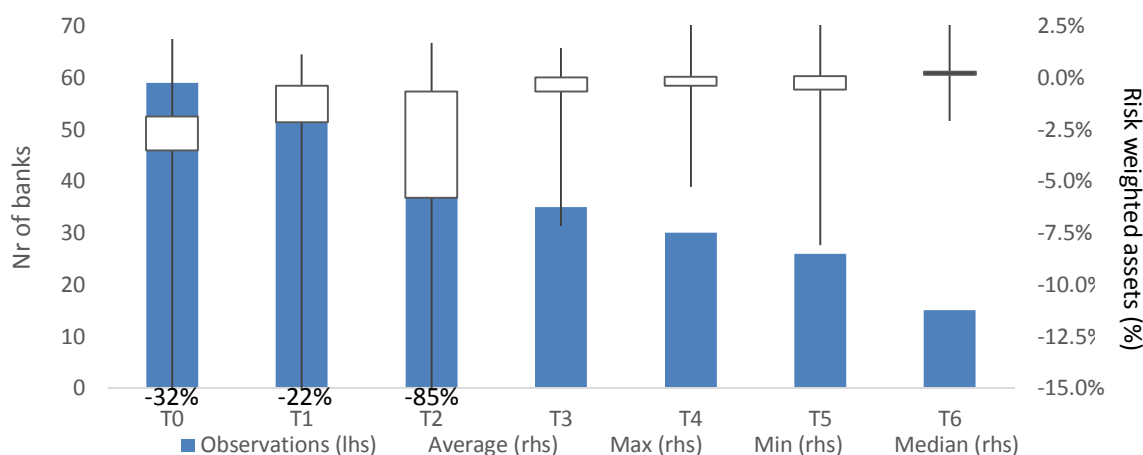
Source: Authors' own calculations based on banks' financial statements and annual reports and single resolution mechanism (1093/2010/EC). See OJ L 225 of 15.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

The largest capital contributions would have been made in 2009 and 2010, however. The SRF would have needed around €58 billion to contribute to the recapitalisation of 15 banks, of which nine, including Greek (4), Spanish (3) and Irish (2) banks would have needed almost two-and-a-half-times the amount required from the SRF to cover all losses. The bail-in capacity of most of these retail banks was relatively limited. In fact, for seven of the banks a minimum bail-in of creditors would not have delivered any contribution to capital, with own funds larger than the minimum bail-in requirement (8% of the total liabilities including own funds) at the moment of the intervention.

In the remaining four years €12 billion in total would have been requested from the SRF, which is fairly similar to the €13 billion that could be raised through the application of the bail-in tool. During the period 2011 to 2014 25 banks in total received state aid,¹⁰ of which 14 banks would have potentially received funds from the SRF. These banks, mostly located in Spain (5), Portugal (2) and Slovenia (5), were on average half the size of the banks that could have been saved by the SRF in 2009 and 2010. On top of the SRF funds eight banks would have needed another €8 billion.

¹⁰ No performance data was available for five Greek banks that received their first capital support between 2011-2014.

Figure 7. Return as a share of risk-weighted assets after first intervention



Note: The risk weighted assets (RWA) are as of the end of the book-year preceding the intervention and kept constant over time. Only the returns in years that the restructuring was not completed are included. “T0” is the year in which the bank received the first capital support.

Source: Authors’ own calculations based on banks’ financial statements and annual reports.

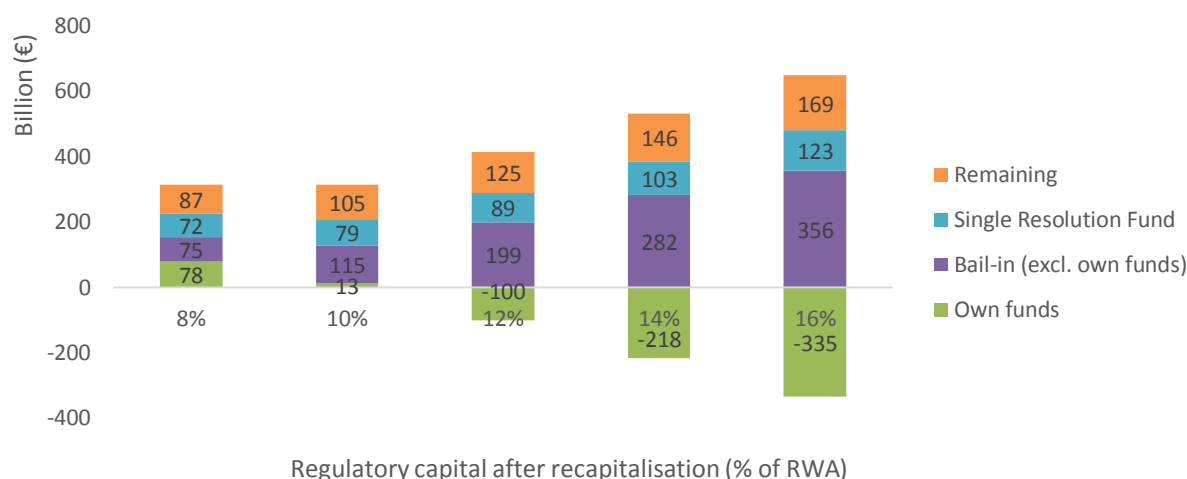
The predictability of losses is important to arrive at reliable estimates of the required bail-in and contribution of the SRF. The average loss expressed as a share of the total liabilities varied greatly over time, but there is no clear trend. The average cumulative peak losses were approximately 2%, but in 2007 and 2008 the average loss was just below 1% and in 2014 a high of 9% was reached. The variation in losses is supported by the analyses of the losses after the first interventions in Figure 7, which shows that in the first three years (T₀-T₂) of the intervention more than half of the banks are loss-making. Afterwards the median loss as a share of risk-weighted assets turns positive. A median at just around zero implies that up to 50% of the aided banks still report losses in particular years. These losses are generally much smaller, but can in extreme cases still be substantial enough to wipe out an amount equivalent to the minimum capital requirements of 8% of risk-weighted assets.¹¹ Predicting losses based on the past is also complicated. Looking at the relation between the profit/loss ratios over time, there is barely any correlation in the first two years after the intervention and only limited predictability of the profits/losses in the fourth year, based on the third year. From the fourth year onwards the ‘losses’ are strongly correlated, which suggests that they could be fairly well predicted based on past losses. In fact, the stress tests that have been used in recent years to determine the capital needs of banks only had a time-horizon of up to three years (Ayadi & De Groen, 2015).

Although the losses during the sample period were extreme and a reflection of the largest financial crisis in 70 years, the great variety in losses and the high costs in the event of a second resolution might spur the ECB to build in some safety margins in the form of additional capital buffers. Figure 8 shows the losses for different levels of capital. The lower level is identical to the minimum total regulatory capital of 8% of risk-weighted assets that formed the basis for the calculations in section 2.1. In the most recent resolution cases the ECB demanded capital levels above the minimum requirement. The Cypriot banks were required to have at least 12%

¹¹ Annex Figure 13 shows the same analysis as Figure 7, except that the losses are expressed as a share of total liabilities instead of risk-weighted assets.

of capital, for example (De Groen & Gros, 2015). If this Cypriot standard had been applied, the banks would have had a €100 billion shortfall in own funds and €413 billion in losses after the intervention, which would have been more than 30% above the €313 billion without buffers. Most of the recapitalisation would have been covered through a bail-in, while the SRF contribution would have increased with just a quarter, or €17 billion. The limited increase is partially due to the cap of 5% of total liabilities on the SRF contribution. The uncovered losses would have increased by €38 billion, or about 44%.

Figure 8. Absorption tools for different levels of capital (static balance sheet, € billion)



Source: Authors' own calculations based on banks' financial statements and annual reports and single resolution mechanism (1093/2010/EC). See OJ L 225 of 15.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

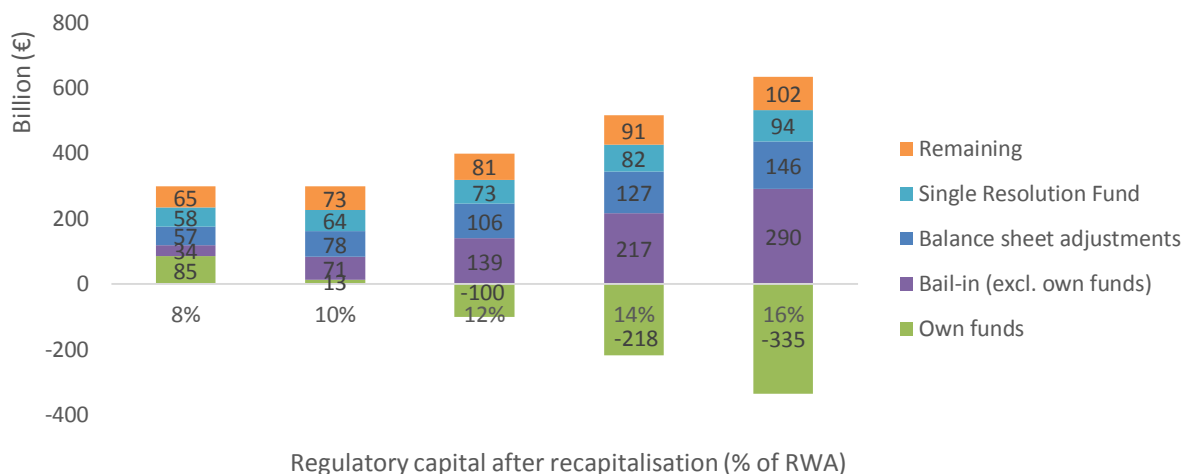
2.2.2 Funds required under alternative assumptions

Besides the bail-in tool there are also alternative measures to improve the capital position of banks. The SRB can use several capital relief measures to improve the capital position; potential measures include sale of business, bridge institution and/or asset separation.¹² Several forms of capital relief measures have been used for the resolution of banks during the sample period. Assuming that the extent that these measures will be used is similar and do not require any funds from the SRF, and the measures are reflected by the risk weighted assets, the results for a dynamic balance sheet across different capital levels are presented in Figure 9. Compared to the resolution for a static balance sheet in Figure 8 the total losses slightly decrease due to a change in the year in which the maximum loss or in this case minimum capital would be reached without re-capitalisation. The balance sheet adjustments contribute €57 billion to the capital increase, which reduces both the SRF contribution and the need for additional measures. The SRF contribution reduces by around €14 billion or one-fifth to €58 billion, while the remaining losses decrease by €22 billion or a quarter to €65 billion. Since some of the capital relief measures might cost some capital or liquidity from the SRF, the contribution from balance sheet adjustments might be considered the upper bound of the impact of these kinds of measures. In the case of higher capital buffers the balance sheet

¹² See Article 22, OJ L 225 of 15.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

adjustments have relatively more impact. The SRF contribution decreases by up to a quarter if 16% capital had been demanded.

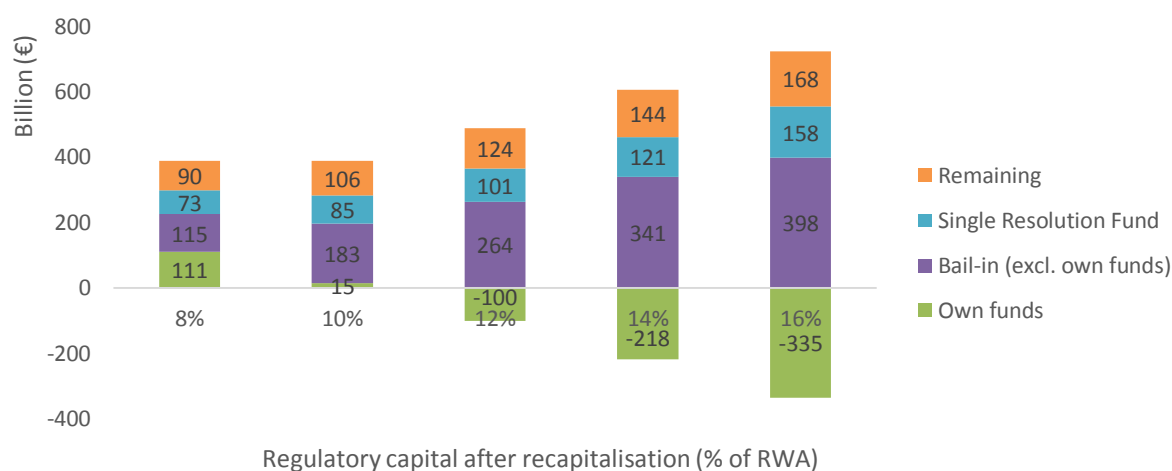
Figure 9. Loss absorption tools for different levels of capital (dynamic balance sheet, € billion)



Source: Authors' own calculations based on banks' financial statements and annual reports and single resolution mechanism (1093/2010/EC). See OJ L 225 of 15.7.2014 (See <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

The return-based methodology chosen to estimate the losses in this paper assumes that the banks will be able to benefit from net interest income and other operational income. Future developments in the banking sector (e.g. pressure on margins, digitalisation, etc.) might put pressure on the operational performance of banks. In order to estimate the impact of what the SRF contribution would have been if the banks had not benefited from operational income, the losses have been estimated based on the total loan loss provisions, gains/losses on other financial assets and discontinued operations. Figure 10 shows that the total loss would have been around €389 billion, or around a quarter higher than using the return-based methodology. The contribution of the SRF, however, remains more or less the same at €73 billion, while most of the additional losses would have been wound-down on the shareholders (€+33 billion), other creditors (€+40 billion) and only for a small part to the 'remaining' losses (€+3 billion). The larger losses lead to a saturation of the burden-sharing tools, which is noticeable in the amounts that the SRF would have had to contribute if the supervisor had required a capital buffer. If they were to apply the Cypriot standard of 12% of risk-weighted assets the total amount that the SRF would contribute would increase by roughly €12 billion to €96 billion, compared to the €1 billion increase if the minimum total capital ratio of 8% had been requested.

Figure 10. Layers of defence for different levels of capital (financial asset losses, € billion)



Note: The estimated losses include loan loss provisions as well as gains and losses on other financial assets (i.e. trading and investment income) and discontinued operations. The total losses are based on the maximum cumulative loss during the restructuring and include shortfalls at the time of the intervention.

Source: Authors' own calculations based on banks' financial statements and annual reports and single resolution mechanism (1093/2010/EC). See OJ L 225 of 15.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

3. Bridge financing required for Single Resolution Fund

Based on the costs for the SRF of resolving banks presented in the previous section, the need and size of the bridge facility are estimated below, taking into account the funds collected and risk-sharing/mutualisation during the transition, as well as alternatives and leveraging possibilities for the SRF.

3.1 Size of the SRF during transition

The SRF will collect the funds for the recapitalisation of euro area banks from 2016 onwards. The fund has a target level of 1% of covered deposits. The European Commission estimated that this is equivalent to about €55 billion for the entire euro area. The funds to reach the target level for the first time will be collected during a transition period, which will take eight years starting from 2016, if no funds are withdrawn in the meantime. At the start of the fund, in January 2016, it will receive the funds already collected under the BRRD, which is expected to be approximately 10% of the target size or €5.5 billion.¹³ In addition, the euro area banks will have to pay an annual risk-adjusted premium of on average 12.5% of the remaining funds required to reach the target level. In the period from 2016 to 2023 the fund will raise

¹³ The participating countries agreed in Article 3 of the Intergovernmental Agreement, 8457/14, 14 May 2014 to transfer the funds collected under BRRD by January 2016 to the SRF. Based on Articles 103 and 104, OJ L 173 of 12.6.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32014L0059>) the countries were expected to collect the funds evenly during the transition period from 2015 to 2024, i.e. approximately 10% of the target size per year.

approximately €6.2 billion per annum.¹⁴ The ex-ante contributions can be complemented with ex-post contributions. These can be up to three times 12.5% of the target size of the fund. This would potentially increase the maximum firepower of the fund by €20.6 billion to €75.6 billion.

Not all funds collected for the SRF can initially be used for any resolution. Euro countries agreed in an Intergovernmental Agreement¹⁵ that the fund would be split into national compartments for each Member State that would gradually be phased out, starting at 100% in 2016 and reaching 0% in 2023. The share of the fund that is mutualised would in turn gradually increase, starting at 40% in 2016 and reaching 100% in 2023.

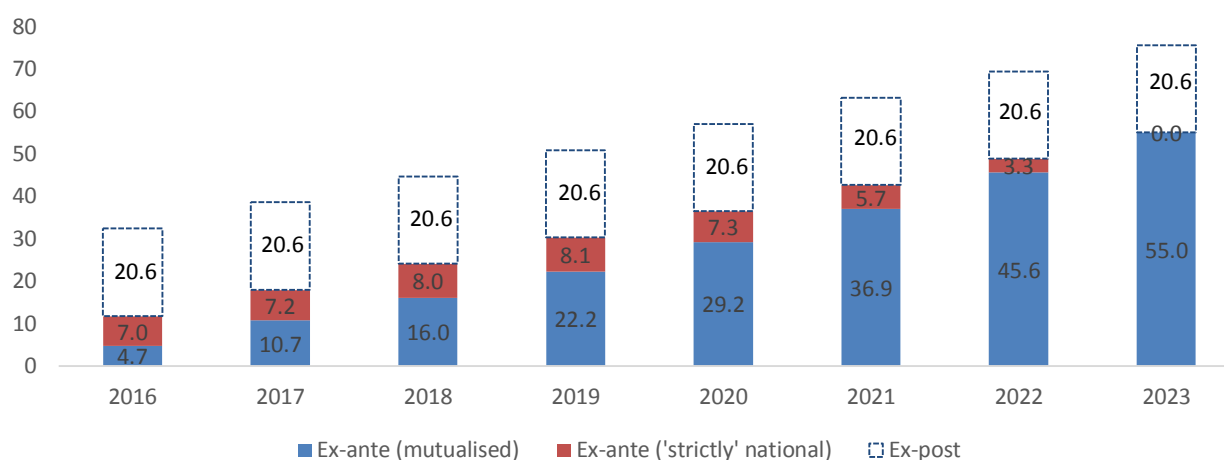
During the transition the fund should first exhaust the national compartment(s) of the Member State(s), up to the maximum percentage for national compartments, where the failing bank is established or authorised. If the national compartment(s) provide insufficient funds for the resolution, the mutualised part of all national compartments can be used. If that is still insufficient, the fund can use the remaining funds available in the national compartment(s) of the concerned Member State(s). The ex-ante funds could be complemented with ex-post contributions, temporary transfers between compartments and alternative funding (Zavvos and Kaltsouni, 2015).

Figure 11 shows the cumulative total funds available to the SRF. The exact amount of funds available for the resolution depends on the year in which the resolution takes place and in which country or, in the case of a bank with cross-border activities, the countries in which the bank is established or authorised. The ex-ante (mutualised) funds can be used for all banks, while the ex-ante ('strictly' national) funds can only be used for the resolution in the specific country. The ex-post contributions are further only raised in the countries where the bank is established or authorised. The fund is de facto unlikely to fully exploit the potential funds available during the transition period. This might lead to some shortages during the early years of the transition, when the total funds are limited and the national compartments substantial. During the financial and economic crises the losses were often concentrated in location and time, which might make it difficult to raise the ex-post contributions. Hence, when multiple banks in the same country fail it is unlikely that these banks can contribute (immediately) to the resolution with ex-post contributions, reducing the total available resolution funds. In this case, the available deployable funds would be substantially lower. The total ex-ante funds available for the resolution of banks in a single country are, in 2016, significantly below the total available ex-ante funds of €11.7 billion, for example, with between €4.7 billion in Estonia and €6.8 billion in Germany (See Annex 2, Figure 14).

¹⁴ Up to 30% of the contributions may take the form of irrevocable payment commitments backed by low-risk assets at free disposal of the board. Given the later conditions it is assumed in this exercise that these irrevocable payments are like cash commitments. Article 70, OJ L 225 of 30.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

¹⁵ Agreement on the transfer and mutualisation of contributions to the Single Resolution Fund, 8457/14, 14 May 2014.

Figure 11. Cumulative contributions to Single Resolution Fund during transition (2016-2023)



Source: Authors' own calculations based on BBVA (2014) and Single Resolution Fund regulation (1093/2010/EC). See chapter 2, OJ L 225 of 15.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

3.2 Alternative (public) funds available for resolution

During the transition period there are several arrangements in place that can increase the firepower of the SRF or complement the funds for resolution. Table 1 provides an overview of the estimated alternative funds available during the transition period for recapitalisation. The conditions vary across the tools and make it very unlikely that the maximum total amount of additional funds ranging from approximately €39 billion in 2016 to €81 billion in 2023 can actually be used.

Table 1 Potential alternative funds available for resolution during transition (€ billion, 2016-2023)

Measures	2016	2017	2018	2019	2020	2021	2022	2023
Temporary transfer	2.4-3.5	2.5-3.6	2.8-4.0	2.8-4.0	2.5-3.6	2.0-2.8	1.1-1.6	0
Borrowing from third parties	21	21	21	21	21	21	21	21
Sales of shares	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Borrowing from other resolution schemes	3.6	5.4	7.2	9.0	10.8	12.6	14.4	16.2
Deposit Guarantee Schemes	0.0-3.3 (12)	0.0-4.4 (17)	0.0-5.6 (22)	0.0-6.8 (27)	0.0-8.3 (32)	0.0-10.0 (36)	0.0-11.6 (40)	0.0-13.3 (44)
Total	39	46	53	60	67	73	77	81

Note: The table shows the maximum amounts that could be available in any given year. For the temporary transfers and DGS the figures show the estimated range of maximum funds available from, respectively, the individual national DGSs and national compartments. For the DGSs the aggregate amount of funds collected is presented in brackets. It is assumed that the DGSs start with the funds that were available for deposit insurance as of December 2012 and that during the transition period towards a harmonised ex-ante funded system of DGSs (2016-2023) annually 0.1% of covered deposits is collected until the target size of 0.8% is reached and that only the funds up to the target level are used to contribute to resolutions. The total includes

the average amount and the aggregate amount for the deposit guarantee schemes for the amount of temporary transfers. See text for additional assumptions as well as conditions to obtain the funds.

Source: Authors' own calculations based on JRC (2014) and Single Resolution Fund regulation (1093/2010/EC). See OJ L 225 of 15.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

3.2.1 Temporary transfer

During the transition period the SRF funds deployable in a single country can be extended. Half of the funds that are not mutualised can be temporarily transferred, on condition that they are repaid before the end of the transition.¹⁶ The transfer of funds can potentially deliver a substantial contribution to the amount available for the resolution in the early years of the SRF. On average it will add approximately €3.3 billion in 2016 up to €3.8 billion in 2019 to the deployable funds for resolutions in a particular country.

3.2.2 Borrowing from third parties

The SRF also has several options to increase ex-ante and ex-post funds available for resolution. The first option would be to leverage the fund. The SRB has the possibility to borrow or obtain support in other forms from third parties when the ex-ante and ex-post funds are not immediately available or insufficient to cover the resolution losses.¹⁷ The potential additional funds this option could generate for the SRF remain to be seen. On the one hand the fund has the future commitments from banks to use as collateral to borrow funds, on the other the SRB might be reluctant to leverage the fund too heavily because it might hamper the fund's capacity to contribute to resolutions in the future. However, it will at least give the SRF the possibility to borrow funds equivalent to the €21 billion of ex-post contributions if they are not immediately available.

3.2.3 Sales of shares

The SRF might also be able to generate funds through the sale of the shares it obtains.¹⁸ The SRF tools will primarily be used for the recapitalisation of banks, and the fund will receive shares in the respective banks in return. The shares can be sold to recover part or potentially all the funds. In order to receive a higher price for the bank it is often better not to sell the shares in the bank immediately. At the moment a bank is recapitalised in the midst of a financial or economic crisis capital markets might value banks at a discount, and building a track record after the intervention will be important to dispel some of the uncertainty regarding the performance, which allows investors to better price the bank. The sale of this business tool might thus over time generate substantial funds for the SRF, but additional analysis is required to assess what the contribution of this tool could be and in what timeframe.

¹⁶ Article 7, Agreement on the transfer and mutualisation of contributions to the Single Resolution Fund, 8457/14, 14 May 2014.

¹⁷ Article 73, OJ L 225 of 15.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

¹⁸ Article 24, OJ L 225 of 15.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

3.2.4 *Borrowing from other resolution schemes*

Another option is to borrow funds from other resolution funds in non-participating Member States. This can be done at the moment that the ex-ante funds are insufficient, the ex-post funds and alternative funding means not immediately available at reasonable rates.¹⁹ The contribution that this option can deliver is likely to be fairly limited. In addition, most of the other resolution funds might want to keep their funds in a liquid form to allow it to be deployed. Moreover, the other funds in the European Union that focus on individual Member States have even fewer funds available. Hence, the non-euro countries have covered deposits of approximately one-third of the euro area countries (JRC, 2014) and are during the same period in transition to reach the target level.²⁰ The aggregate ex-ante contributions available to the non-euro area resolution funds are estimated to be around €18 billion in 2024, if there are no claims in the meantime.²¹

3.2.5 *Deposit Guarantee Schemes*

The Deposit Guarantee Schemes can also cover part of the resolution losses. The resolution funds' contribution is limited to the size of the losses attributable to the covered deposits had the bank been put in liquidation and capped at 0.4% of covered deposits in the country per resolution.²² The losses given default of covered deposits depend primarily on the seniority, which varies across Member States. The 0.4% cap puts a maximum on the funds that could be extracted from the DGSs. The DGSs are still organised at national level, which limits the available funds from the DGS for resolution ranging from approximately €22 million in Estonia to € 6.6 billion in Germany.²³ Not all DGSs will possess these funds at the start of the SRF. The new DGS that obliges Member States to have an ex-ante funded scheme. The Member States have until July 2024 to reach the target level of 0.8% of covered deposits or about € 44 billion in aggregate.²⁴ The consolidation of these funds in a single resolution fund into a single or re-insured scheme could deliver an important contribution to enhance the firepower of the resolution framework (Gros, 2013). The Five Presidents' Report considered the launch of a European Deposit Insurance Scheme (EDIS) as one of the main initiatives to complete the Banking Union (Juncker, 2015). The European Commission has announced that it will launch a legislative proposal before the end of the year (European Commission, 2015b).

¹⁹ Article 72, OJ L 225 of 15.7.2014
(<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

²⁰ Article 102, OJ. L 176 of 12.6.2014
(<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0059&from=EN>).

²¹ Assuming that the covered deposits in the non-euro area countries remain one-third of the euro area covered deposits. The resolution funds will have an aggregate size equal to one-third of the €55 billion estimated for the SRF.

²² Article 79, OJ L 225 of 15.7.2014
(<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

²³ The funds are calculated on the relative size of covered deposits at the end of 2012 and the relative size of the DGS (0.8% covered deposits) compared to the SRF (1.0%).

²⁴ Article 10, OJ, L 173 of 12.6.2014
(<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0049&from=EN>)

3.2.6 ESM Direct Recapitalisation Instrument

In the current system the European Stability Mechanism functions as a last line of defence. It is, however, no alternative to the SRF as it can only contribute to the recapitalisation of institutions under strict conditions, and, in any case, only after the SRF has contributed the maximum of 5% of the total liabilities including own funds. During the financial and economic crisis the ESM and its predecessor the EFSF already provided indirect support to the banking sectors in five euro area countries, i.e. the governments of Cyprus, Greece, Ireland, Spain and Portugal used part of the funds they borrowed from the EFSF/ESM to recapitalise their banking sector. In order to break the link between the national governments and the domestic banks the ESM has adopted an instrument that allows direct recapitalisation. The so-called ESM Direct Recapitalisation Instrument has €60 billion available for the recapitalisation of systemic euro area banks and banks that pose a threat to financial stability at the point when the SRF has contributed the maximum of 5% of total liabilities and alternative funds are not feasible. The DRI funds are further in principle only employed to contribute to the capital above the minimum CET1 of 4.5%. Only in exceptional cases does the ESM Board of Governors have the possibility to diverge from the obligation of Member States to provide the funds to reach the minimum capital level as well as share 10-20% of the risk of the capital injection (ESM, 2014).

3.3 Need for additional resources SRF

Combining both the estimations of the funds required and the availability of funds, this section will discuss the need for additional financing for the SRF funding under various scenarios; i) the failure of a single bank, ii) a small group of banks, as during the period from 2011 to 2014, and iii) a large number of failing banks, as during the last financial and economic crisis. Table 2 shows the shortfalls on the ex-ante funds collected during the transition under the three scenarios.

Table 2. Shortfalls on SRF-funds during transition under scenarios (€ billion, 2016-2023)

	Required funds	Shortfall on SRF funds							
		2016	2017	2018	2019	2020	2021	2022	2023
Failure of a single bank (i.e. Bankia)	8.6-15.7	0.0-4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Failure of a small group of banks (i.e. 2012)	2.3-13.3	0.0-1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Failure of a large number of failing banks (i.e. 2009 plus 2010)	48.5-71.1	31.9-53.5	25.2-46.8	19.3-40.8	12.9-34.5	6.1-27.8	0.0-21.2	0.0-14.8	0.0-0.0

Note: The estimations in the table show the range of the shortfalls on the ex-ante and ex-post funds under the various scenarios. The minimum amount required is estimated on the return losses base, dynamic balance sheet and re-capitalisation up to the regulatory minimum of 8%. The maximum is estimated on the asset loss base, static balance sheet and recapitalisation up to the Cypriot standard of 12%. The losses for the large number of failing banks are the cumulative losses for the two consecutive years of large losses.

Source: Authors' own calculations based on banks' financial statements and annual reports and single resolution mechanism (1093/2010/EC). See OJ L 225 of 15.7.2014 (<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

3.3.1 *Failure of a single bank*

If a bank failure occurs in isolation, in most cases the fund is already large enough from the start. Analysis of the 2007-14 state aid cases identified 31 banks as needing capital support from the SRF in excess of the minimum bail-in requirement under BRRD, including 21 significant banks. Assuming that the balance sheet remains static and the recapitalisation target is 8% of risk-weighted assets, the total demanded funds would vary between €37 million for the Greek Panellinia Bank and €15.7 billion for the Spanish BFA/Bankia. Although the SRF will not be able to employ all its funds, only Bankia and Irish AIB would have needed more funds than available ex-ante in the first two years of the transition. Bankia would have needed approximately €4.4 billion on top of the ex-ante funded national compartment (€1.5 billion) and mutualised compartment (€4.1 billion), ex-post contributions by Spanish banks (€2.7 billion) and temporary transfer between compartments (€ 3.1 billion) if it had failed in the first year of the transition. In the case of AIB the total shortfall in the first year would have been €0.8 billion based on ex-ante funds and € 0.5 billion taking into account the maximum ex-post contributions. Applying the Cypriot standard would not have made a difference to either bank, since they already had losses beyond the minimum bail-in and maximum SRF contribution. Taking the deleveraging of Bankia after the intervention into account, the required alternative funds for Bankia would have decreased to €7.1 billion, bringing it just within the reach of the maximum available ex-ante funds. Moreover, if the Cypriot standard had been requested for capital, the SRF would have needed € 4.2 billion more than the available ex-ante funds and €1.5 billion more if the ex-post contributions had been taken into account. For AIB the increase changes in the conditions do not have an impact on the contribution from the SRF, since the losses exceed the maximum SRF threshold under all conditions. The shortfall could not be covered entirely through the deposit guarantee schemes, which are also in transition and in Ireland and Spain have respectively €500 and €700 million, of which only half could be used. Leveraging the fund will also be difficult without deteriorating the credit rating of the fund and the capacity in the years that follow. The fund might thus need a bridge facility for the recapitalisation of some individual banks. Overall, the SRF seems to have sufficient funds from the start to deal with the failure of individual small banks and from the third year of its existence could also deal with the failure of large single banks.

3.3.2 *Failure of a small group of banks*

Nevertheless, in the past four years a number of banks failed every year. If a small number of banks fail the characteristics of these banks largely determine whether the SRF will have sufficient funds. The losses, size, capital adequacy and location seem to be the main determinants of required resolution funds during the transition period. In the period 2011-14, 25 primarily small and medium sized banks in total failed ranging from two failures in 2014 to nine in 2012. Although the analysis missed data on five less significant banks, which could have added up to €1 billion a year to the bill of the SRF, the fund would even have sufficient means to recapitalise the banks up to the Cypriot standard. The required funds varied between €1.4 billion in 2013 and €9.7 billion in 2012. Hence, if the trend of only a limited number of primarily small failing banks located in a number of countries continues the SRF might have sufficient funds from January 2016 to cover up to 5% of total liabilities. The continuous demand for new funds could in effect hamper the fund. If it is not able to recover the funds within a couple of years, the SRF would remain fragile in the event of another financial/banking crisis.

For the fund to work, also with several banks failing in the early years of the transition, it is important to spread the failures across several countries. The effective size of the fund is larger during the early phase of the transition compared to a single bank authorised in a single country failing. Taking 2012 as an example, six banks in total, located in Cyprus, Italy, Portugal, Slovenia and Spain would have required €9.7 billion from the SRF. If this loss is projected onto the first year of transition, the effective amount of ex-ante and ex-post funds that can be used for resolution is €3.1 billion more than it would have been for a single Spanish bank with the same demand and even €6.1 billion more than would it have been a single Slovenian bank. The difference between the two countries is due to the difference in domestic covered deposits. The smaller the amount of covered deposits, the smaller the size of the national compartment and funds available for bank resolution in the early years of the transition. Looking at the distribution of the additional funds across the different measures, the ex-ante funds (i.e. national compartments' contribution) increase in the first transition year between €0.9 billion for Spain and up to €1.8 billion for Slovenia. The available mutualised funds decreased when several countries' national compartments are exhausted, reducing the mutual funds available for temporary transfer. In this example the funds would decrease by €0.5 billion for Spain and by €0.9 billion for Slovenia. The main difference will, however, be made through ex-post contributions to the fund, which would be €2.6 billion larger than if it had been a single bank in Spain or €5.3 larger for a single bank in Slovenia.

3.3.3 *Failure of a large number of banks*

During the early years of the transition period the fund is not ready to withstand a major banking crisis like the one that hit the euro area banking sector in 2009 and 2010. For two consecutive years the fund itself would have received demands of between €18 and €35 billion, depending on the assumed deleveraging and capital level, which is equivalent to between 2.5 and 5 times the annual contributions during the transition. At first sight the amount seems bridgeable with the ex-ante and ex-post contributions, which can accumulate to four times the amount of annual contributions. The fund is unlikely to be able to use its maximum capacity with the failures being spread unevenly across the euro area countries during the transition. Also, the supervisor might not want to raise the funds immediately. The ex-post contribution can therefore only be obtained from the countries concerned. During a banking crisis several banks are likely to be on the brink of collapse. Besides the fact that several banks would demand funds from the SRF, many others would need to be bailed in, raise new capital or use their own funds to withstand the shock. In such a stress situation supervisors would not be advised to call banks to request a large contribution to the fund that might immediately hamper the solvency of the banks concerned. This can be solved through postponing the obligation and borrowing the required funds during the transition. Taking the country restriction into account, the firepower of the SRF is restricted during the first years of the transition.

If 2016 is comparable to the banking crisis of 2009, the SRF would need approximately €34.8 billion to finance the failing banks up to the Cypriot standard or the maximum contribution. The SRF demands would originate from losses of banks based in four countries: Austria (€2.3 billion), Greece (€16.2), Ireland (€16.0 billion) and Spain (€0.3 billion). Only in Spain would the national compartment be large enough to absorb the losses (€1.5 billion). The other funds would come from the mutualised part (€4.4 billion) and ex-post contributions (€1.4 billion). This means that the SRF can only contribute €5.4 billion of the €11.7 billion in the fund for the resolutions. Half of the remaining funds can be used indirectly due to internal borrowing from national compartments (€3.1 billion). The remaining €24.8 billion needs to be obtained from

alternative sources (i.e. deposit guarantee schemes [up to €1.6 billion] and other resolution funds [up to €3.6 billion]). It is, however, uncertain whether the SRF can obtain these funds; a bridge facility up to €24.8 billion might thus be required.

And if 2017 happened to be comparable to the banking crisis of 2010, the SRF would need another €29.7 billion to finance the failing banks up to the Cypriot standard or the maximum contribution. The SRF demands would originate from losses of banks based in Ireland (€0.1 billion) and Spain (€29.6 billion). The losses could only partially be absorbed through the ex-ante collected funds remaining from the first year and collected in the second year (€6.4 billion) and ex-post contributions (€2.7 billion). The ex-post contributions are fairly limited because the losses were concentrated in a single country. The possibility for internal transfers is also limited due to the legacy transfers. The shortfall of around €20.6 billion would remain. Since most alternative funds are already largely exhausted in the first year, most of it might have to come from a bridge facility. The total maximum funds obtained through a bridge facility would, in the worst case, amount to around €45 billion; a bridge facility of a similar size to the DRI (€60 billion), would thus be sufficient even if some of the banks for which there is no data required additional SRF funds.

Overall, the fund would thus not be sufficient to cover demands during a banking crisis as big as that in 2009-10. These shortfalls could partially be covered by the alternative funds, but a bridge facility might be needed. The bridge facility could be made part of a permanent facility to provide liquidity assistance for resolution. The need for a bridge facility becomes less apparent if a banking crisis were to emerge at a later stage. The SRF-funds might even be sufficient at the end of the transition period.

3.3.4 Additional funds for liquidity assistance

Turning to liquidity, the SRF might have to rely on implicit support from monetary authorities. The SRF can provide liquidity support, but is unlikely to be an effective tool to address liquidity support, given the cap on its contribution. During the crisis almost three-quarters of the commitments concerned liquidity support. The Member States committed guarantees of around €3.9 trillion, of which less than a quarter was actually used and only €3.1 billion was called (European Commission, 2015a). In addition, many banks used the funds monetary authorities provided. The ECB and the national central banks in the euro area provided up to €1.4 trillion loans to euro area credit institutions, of which part concerned emergency liquidity assistance (ELA). The liquidity needs of individual distressed banks can easily go beyond the maximum threshold of the SRF. The specific amounts of liquidity support received by banks are often not at all or only partially disclosed. But the figures that are available show that significant shares of the funding of some banks were either guaranteed or provided by governments and/or monetary authorities. For example, Belgium Dexia and German Hypo Real Estate both received guarantees of around €100 billion of their liabilities each and the Greek banks around €135 billion in ELA, which in all cases means that more than 15%, but in some cases as much as 30% of the funding must have been obtained with the support of the government or monetary authorities.

The introduction of binding liquidity requirements in the form of liquidity coverage ratio and net stable funding ratio in coming years might reduce banks' reliance on short-term funding. It is nevertheless unlikely that the SRF will be able to deal with the liquidity problems on its own in the event of a banking crisis, given the large amount of funds that are required. The resolution plan should further assume that no extraordinary public support and central bank funds are obtained under non-standard terms. The plan, however, can include provisions for

the usage of central bank funds under standard terms.²⁵ But obtaining funding from central banks is no option for all the resolution tools available to the SRB, i.e. the asset separation tool might require additional liquidity support from the SRF. Under that tool assets are transferred to an asset management vehicle without banking license and thus access to the central bank funding. The main advantage of this tool is that it lowers the bank's minimum required capital. The usage of funds from the bank in resolution might be an option to fill the funding gap, although transferring creditors' obligations might be difficult and the possibility to provide loans to the 'asset management'-vehicle is restricted by the large exposure requirement. In order to allow the SRB to use this tool and to provide (short-term) liquidity assistance a credit line and exemption to the maximum SRF-contribution threshold of 5% could be considered.

The resolution authority in the US can count on additional arrangements for liquidity. The SRF does not have a common fiscal backstop, unlike its counterpart in the US. The Federal Deposit Insurance Corporation (FDIC), which is a combined deposit guarantee scheme and resolution fund has a long-term soft target size of 2.0%, slightly above the combined deposit and resolution funds target of 1.8% in the EU. The FDIC, however, can count on an arrangement to borrow working capital from the US Treasury as well as a standing credit line of \$100 billion (€88 billion) to cover insurance losses immediately and recover them through bank levies (Ellis, 2013). The Five Presidents' Report calls for a similar "credible common backstop" to be set up in the euro area as well, which might take the form of a credit line of the ESM to the SRF.

4. Conclusions

The Single Resolution Fund will start collecting funds from January 2016 onwards. It forms part of a new resolution mechanism that is as yet untested. In this paper we estimated what would have been requested from the fund if the SRM had already been in place during the period from 2007 to 2014, in which the most severe financial crises in 70 years took place.

Our finding is that the SRF would have needed between €58 and €101 billion. The lower figure is based on the assumption that the SRF would have required banks to be recapitalised only up to the minimum capital requirement (8% of RWA assets) and takes into account measures to reduce the RWA. If the supervisor had demanded capital buffers on top of the minimum capital requirements, as in the case of Cyprus (12%) the required funds would need to increase to €101 billion.

These estimates suggest that the SRF would have been able to withstand the past crises provided its full financing capacity had been available. The 62 euro area aided banks for which data is available reported peak losses of €313 billion. Most of these losses could, however, have been absorbed by shareholders and creditors, or passed the ceiling of 5% of total liabilities. This is why the funds needed from the SRF would only have been a fraction of the €335 billion in capital support provided by governments during the crises.

In order to estimate the SRF funding required in less stressed times, estimations were also made for only a few banks or for a single bank failure.

The SRF would thus most likely have withstood the crisis, provided its full financing capacity had been available, which would have been €76 billion. The reference period taken into

²⁵ Article 8, OJ L 225 of 15.7.2014

(<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0806&from=EN>).

account by our study covers eight years, the same as the transition period for the fund. The SRF would most likely have had sufficient funds to operate as expected during a protracted crisis.

When considering the transition period (especially the next two years) one has to keep in mind that financial crises that lead to a bunching of bank failures do not occur instantaneously, but develop over a period of several years. The cumulative losses of over €300 billion arose over eight years. However, problems might arise if any future crisis were to be concentrated during the next two years. A major challenge would arise if losses similar to the two worst crisis years were to materialise in the first two years of the transition. In such a case additional standing funding sources, such as contributions from a national deposit insurance fund, might be needed, but are insufficient to cover all demands. A bridge facility might be required. The size of such financing needs, based on the past state aid cases, should be around €45 billion. Taking into account some safety margins, a size similar to the €60 billion of the direct recapitalisation instrument of the ESM would be appropriate.

After the first two years, the SRF should have sufficient funds to deal with foreseeable scenarios, based on the reference period 2007-14. Four factors underpin this finding:

First, the BRRD and its bail-in rules should ensure that the costs of a bank failure are borne by private investors, not by the public. For bank losses far above what could easily be absorbed by capital the contribution from the SRF would anyway be limited to 5% of liabilities, but contributions from (national) deposit guarantee schemes might be needed.

Second, the new resolution mechanism assumes that creditors rather than taxpayers are first in line to cover the losses from bank failures. In the estimations it is assumed that this does not increase contagion risk. This might, however, be questioned if banks were to hold each other's 'bail-inable' debt and capital instruments. In order to prevent aggravation of the contagion risk, the holdings of 'bail-inable' debt instruments by banks should be discouraged.

Third, the estimation of losses. During the crisis many banks needed capital support more than once because the initial losses were not accurately estimated or the resolution required more money. In the estimations it is assumed that the banks would be resolved only once. In order to make this credible the supervisor might have to foster larger capital cushions and improve the calculation of losses. The capital cushions could consist of common stock, but could also include callable instruments that absorb less of the available SRF funds.

Fourth, there might be a need for liquidity provisioning during the resolution and restructuring. The SRF would certainly not have been able to provide the kind of liquidity support – running into hundreds of billions – that the ECB provided during the crisis. The new liquidity requirements for banks should lessen the problem, as would earlier interventions. But the liquidity position might nevertheless deteriorate if the resolution and recovery last longer. This is a task for the ECB. But the central bank can only provide liquidity to a credit institution, which makes it more difficult to undertake asset relief measures because restructuring might take the form of a new non-banking entity that acquires part of the banks' assets. But for the acquisition of the bank assets the new entity requires financing, which the SRF could only provide up to the 5% limit. A credit line with, for example, the ECB or the ESM in combination with an exemption to the maximum contribution of 5% of total liabilities for liquidity purposes might be needed under these circumstances.

Finally, there is a need for additional research and monitoring. History is unlikely to repeat itself in quite the same way. In order to ensure that the SRF will also have sufficient funds in the future it is important to monitor developments in the banking sector closely (i.e. bail-in

capacity); to identify banks' business models (i.e. stand-alone and contagion risk); and to estimate potential losses (e.g. stress testing). Other issues that remain are the contribution from the deposit guarantee schemes and the optimal strategy to sell shares in recapitalised banks. In order to enhance the learning effect from resolution cases it is important to improve public disclosure practices, in particular information on liquidated banks and their losses.

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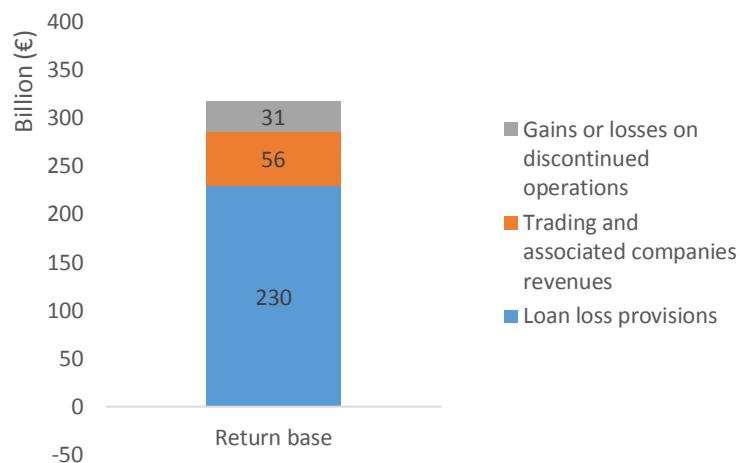
Annex 1. Assumptions for estimations of SRF contributions

The following assumptions have been made for the estimation of losses and distribution across resolution tools:

- The resolution will be triggered at the same moment that the State aid was received.
- The SRB will resolve all banks using the bail-in-tool up to the minimum of 8% of total liabilities (incl. own funds) and recapitalisation through the SRF up to the maximum of 5% of total liabilities (incl. own funds).
- Except for the bail-in, the banks will not receive any additional capital from private sources after the intervention.
- There are sufficient own funds and unsecured debt available for the bail-in.
- The SRB makes no mistake in making bailed-in creditors worse-off than in the case of liquidation, which would result in damages to be paid by the SRF.
- The SRF will only be used for capital support, i.e. not for loans, guarantees or other liquidity support.
- The minimum capital requirement after re-capitalisation is equal to 8% of the risk-weighted assets. The capital conservation buffer (2.5% CET1), countercyclical capital buffer (0-2.5% CET1) and systemic risk buffer (>1% risk-weight) as well as the add-on for GSIBs (up to 3.5%) and O-SIIs are omitted from the analyses of the regulatory capital ratios since they are either not (yet) legally binding or the exact rates are still unknown.
- The balance sheet and total risk-weighted assets at the moment of the first intervention are identical to the figures at the end of the last book year before the intervention.
- The balance sheet and risk-weighted assets do not change after the first intervention. Hence, the impact that the application of 'sale of business tool', 'bridge institution tool', 'asset separation tool' could have on the risk-weighted assets is ignored (i.e. static balance sheet assumption).
- The losses estimated by supervisors are identical to the losses that materialise.
- The banks do not pay dividends until the resolution plan is completed.
- Tax credits created due to losses do not increase the capital.
- The banks are assumed not to make any additional losses after the restructuring is finished (i.e. a bank is sold to another bank or the restructuring plan is completed) or the sample period (i.e. 2014).
- The losses wind-down on creditors through a bail-in do not create any contagion effect.
- The losses do not include the losses and gains made on assets that are transferred to entities once they are no longer included in the profit-and-loss account of the aided bank. It is assumed that the losses are included in the accounts at the moment the assets are transferred.
- To estimate the total amounts for the banks that were merged during the resolution process, the amounts for the consolidated banks were merged.
- To estimate missing data on total own funds, it is assumed that the total own funds as a share of total equity plus subordinated debt instruments to total own funds is equal to the weighted average of the other observations.
- To estimate missing data on risk-weighted assets, it is assumed that the risk-weighted assets as a share of total assets is equal to the weighted average of the observations for the banks for which there are data on the risk-weighted assets-to-total assets ratio.

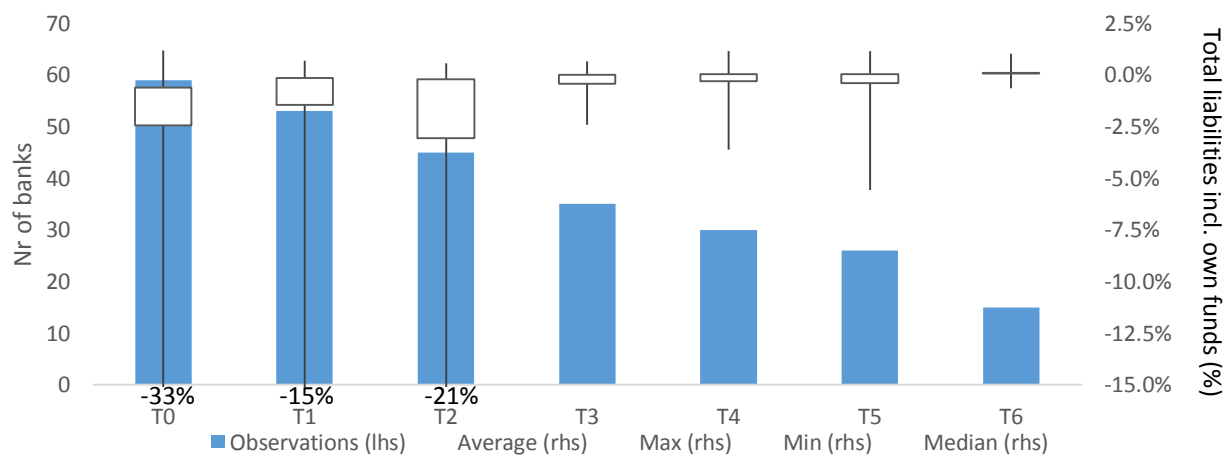
Annex 2. Supporting tables and figures

Figure 12. Losses on financial assets of aided banks (2007-2014)



Source: Authors' own calculations based on banks' financial statements and annual reports.

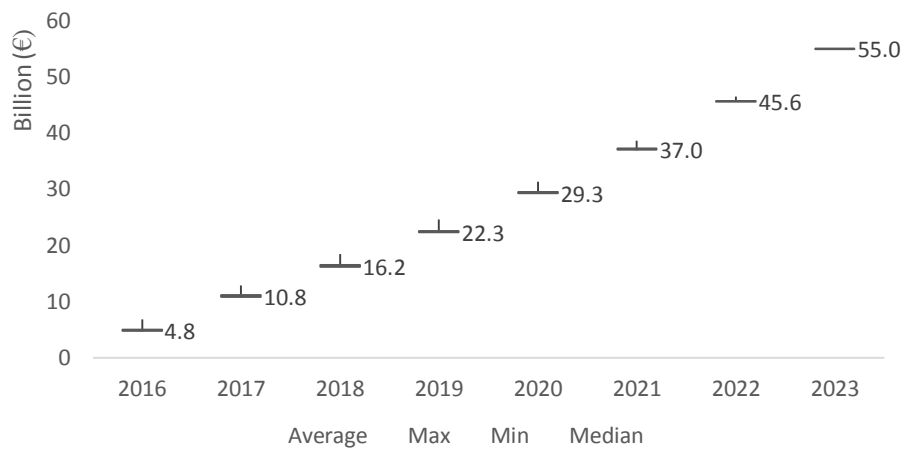
Figure 13. Return as share of total liabilities after first intervention



Notes: The total liabilities include own funds. Only the returns in restructuring years were included. "T0" is the year in which the bank received the first capital support.

Source: Authors' own calculations based on banks' financial statements and annual reports.

Figure 14. Maximum SRF contributions in a single country during transition (2016-2023)



Note: The calculations are based on shares in covered deposits at the end of 2012.

Source: Authors' own calculations based on JRC (2014).

Table 3. Estimated contributions by Single Resolution Fund to bank resolution (€ billion)

NR	Bank name	Country code	Significant ¹	Total liab. (incl. own funds)	Return base (static balance sheet)				
					Est. loss	Own funds	Bail-in (Excl. own funds)	SRF	Remaining
1	BAWAG	AT	YES	42	0.0	0.0	0.0	0.0	0.0
2	Hypo Tirol Bank AG	AT	NO	13	0.1	0.1	0.0	0.0	0.0
3	Kommunalkredit	AT	YES	33	8.0	0.4	1.6	1.6	4.4
4	Österreichische Volksbanken AG	AT	YES	52	2.2	0.6	0.7	0.9	0.0
5	Dexia	BE	YES	599	17.6	2.6	15.0	0.0	0.0
6	Fortis (Current: Ageas)	BE	YES	842	28.0	5.6	22.4	0.0	0.0
7	KBC Group	BE	YES	354	5.3	5.3	0.0	0.0	0.0
8	Cypriot cooperative credit institutions ⁽⁶⁾	CY	YES	14	0.0	-1.2	1.1	0.1	0.0
9	Cyprus Popular Bank	CY	YES	33	0.0	-1.0	1.0	0.0	0.0
10	BayernLB (incl. Hypo Group Alpe Adria)	DE	YES	412	8.4	6.4	2.1	0.0	0.0
11	Commerzbank	DE	YES	611	4.3	4.3	0.0	0.0	0.0
12	HSH Nordbank	DE	YES	209	2.3	2.3	0.0	0.0	0.0
13	Hypo Real Estate Holding	DE	YES	398	6.7	1.9	4.8	0.0	0.0
14	IKB	DE	YES	50	2.8	0.6	0.9	1.3	0.0
15	Landesbank Baden Württemberg	DE	YES	447	1.3	1.3	0.0	0.0	0.0
16	NordLB	DE	YES	199	0.1	0.1	0.0	0.0	0.0
17	Sachsen LB	DE	YES	68	0.6	0.6	0.0	0.0	0.0
18	Sparkasse KölnBonn	DE	YES	31	0.0	0.0	0.0	0.0	0.0
19	WestLB (Current: Portigon)	DE	YES	284	0.8	0.6	0.2	0.0	0.0
20	Banco de Valencia ⁽²⁾⁽⁴⁾	ES	NO	23	4.9	0.0	0.6	1.2	3.1
21	Banco Gallego	ES	NO	4	0.0	-0.3	0.2	0.05	0.0
22	Banco Mare Nostrum (BMN)	ES	YES	72	3.1	2.5	0.0	0.6	0.0
23	BFA/Bankia	ES	YES	314	25.6	7.4	0.0	15.7	2.4
24	Caja Castilla La Mancha (CCM) ⁽³⁾⁽⁴⁾	ES	NO	26	0.6	-0.2	0.8	0.0	0.0
25	Caja de Ahorros de Mediterraneo (CAM) ⁽⁴⁾⁽⁵⁾	ES	YES	70	2.7	-0.4	1.9	1.2	0.0
26	Caja3 ⁽⁴⁾	ES	NO	21	1.8	0.4	0.2	1.0	0.1
27	CajaSur	ES	NO	18	0.0	-0.5	0.5	0.0	0.0
28	CatalunyaCaixa	ES	YES	79	15.5	1.1	1.0	3.9	9.4
29	CEISS	ES	YES	47	3.6	1.6	0.0	2.0	0.0

NR	Bank name	Country code	Significant ¹	Total liab. (incl. own funds)	Return base (static balance sheet)				
					Est. loss	Own funds	Bail-in (Excl. own funds)	SRF	Remaining
30	Liberbank ⁽⁴⁾	ES	YES	34	2.5	0.9	0.0	1.6	0.0
31	NCG Banco	ES	YES	79	8.6	2.5	0.0	3.7	2.4
32	Unnim Banc	ES	NO	29	1.7	0.8	0.0	0.8	0.0
33	BNP Paribas	FR	YES	1,670	0.0	0.0	0.0	0.0	0.0
34	BPCE	FR	YES	932	2.1	2.1	0.0	0.0	0.0
35	Crédit Agricole	FR	YES	1,509	0.0	0.0	0.0	0.0	0.0
36	Crédit Immobilier de France (CIFD) ⁽³⁾⁽⁴⁾	FR	YES	41	0.7	-0.3	1.0	0.0	0.0
37	Crédit Mutuel	FR	YES	548	0.0	0.0	0.0	0.0	0.0
38	Société Générale	FR	YES	1,058	0.0	0.0	0.0	0.0	0.0
39	Agricultural Bank of Greece (ATE)	GR	NO	28	1.7	0.1	1.1	0.6	0.0
40	Alpha Bank	GR	YES	64	8.6	0.1	1.0	3.2	4.2
41	EFG Eurobank	GR	YES	82	11.5	0.9	1.5	4.1	5.0
42	First Business Bank S.A.	GR	NO	..	..	..	..	..	..
43	Greek cooperative banks	GR	NO	..	..	..	..	..	..
44	Hellenic Postbank	GR	NO	..	..	..	..	..	..
45	National Bank of Greece	GR	YES	100	14.4	1.4	1.5	5.0	6.5
46	Panellinia Bank	GR	NO	1	0.1	0.0	0.0	0.04	0.0
47	Piraeus Bank	GR	YES	55	13.5	0.7	0.7	2.7	9.4
48	PROBANK S.A	GR	NO	..	..	..	..	..	..
49	Proton Bank	GR	NO	..	..	..	..	..	..
50	T-Bank	GR	NO	..	..	..	..	..	..
51	Allied Irish Bank (AIB)	IE	YES	181	25.2	3.3	0.5	9.1	12.3
52	Educational Building Society (EBS)	IE	NO	22	0.6	0.2	0.4	0.0	0.0
53	Bank of Ireland	IE	YES	204	4.1	3.7	0.4	0.0	0.0
54	Anglo Irish Bank (Current IBRC) ⁽⁶⁾	IE	YES	103	31.4	3.5	0	5.1	22.8
55	Irish Nationwide Building Society (Current IBRC)	IE	NO	..	..	..	..	..	..
56	Irish Life & Permanent Group Holdings (Current: permanent tsb Group)	IE	YES	74	2.3	0.4	1.9	0.0	0.0
57	Monte dei Paschi di Siena S.p.A.	IT	YES	239	11.3	8.1	2.6	0.6	0.0

NR	Bank name	Country code	Significant ¹	Total liab. (incl. own funds)	Return base (static balance sheet)				
					Est. loss	Own funds	Bail-in (Excl. own funds)	SRF	Remaining
58	Kaupthing Bank Luxembourg	LU	NO	..	..	..	..	..	..
59	ING	NL	YES	1,307	2.9	2.9	0.0	0.0	0.0
60	SNS REAAL	NL	YES	101	4.2	1.1	3.1	0.0	0.0
61	Banco Espírito Santo	PT	YES	83	8.9	1.7	0.1	4.2	3.0
62	Banco Português de Negócios	PT	NO	..	..	..	..	..	..
63	Banco Privado Português	PT	NO	..	..	..	..	..	..
64	Banif	PT	NO	14	0.8	-0.7	0.9	0.6	0.0
65	BPI	PT	YES	44	0.0	0.0	0.0	0.0	0.0
66	Caixa Geral de Depósitos, S.A. (CGD)	PT	YES	121	1.3	1.3	0.0	0.0	0.0
67	Millennium BCP	PT	YES	93	2.1	0.8	1.3	0.0	0.0
68	Abanka	SI	NO	4	0.5	0.0	0.0	0.2	0.3
69	Factor Banka	SI	NO	1	0.4	0.0	0.0	0.1	0.3
70	NKBM	SI	YES	6	0.9	0.1	0.0	0.3	0.5
71	Nova Ljubljanska Banka (NLB)	SI	YES	14	2.0	0.3	0.0	0.7	1.0
72	Probanka	SI	NO	1	0.2	0.0	0.0	0.1	0.2
Total			72	14,202	312.9	78.1	75.5	72.0	87.2
Total significant banks			48	13,999	299.6	78.3	70.5	67.6	83.3

¹ Banks are considered significant if they have more than €30 billion total assets, total assets of more than €5 billion and 20% of GDP, or are one of the three largest banks measured on the basis of total assets at the end of the year preceding the first State aid received.

² Estimations are based on the risk-weighted assets at the end of the year in which the State aid was received.

³ Estimations are based on estimated risk-weighted assets (i.e. based on weighted average risk-weighted assets as a share of total assets for the other banks that received State aid).

⁴ Estimations are based on estimated total own funds (i.e. based on weighted average own funds as a share of total equity plus subordinated debt instruments for the other banks that received State aid).

⁵ Estimations are based on the risk-weighted assets two years preceding the year in which the State aid was received.

⁶ Only partial performance information is available for the period after the intervention.

Sources: Authors' own calculations based on banks' financial statements and annual reports, AMECO, Oliver Wyman (2012), and the Slovenian banking association (Združenje bank Slovenije).