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The Long Shadow of the Global Financial Crisis: Public Interventions in the Financial Sector

by Deniz Igan, Hala Moussawi, Alexander F. Tieman, Aleksandra Zdzienicka, Giovanni Dell'Ariccia, and Paolo Mauro

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The Long Shadow of the Global Financial Crisis:

Public Interventions in the Financial Sector[†]

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Abstract

We track direct public interventions and public holdings in 1,114 financial institutions over the period 2007–17 in 37 countries based on publicly available information. We use aggregate official data to validate this new dataset and estimate the fiscal impact of interventions, including the value of asset holdings remaining in state hands at end-2017. Direct public support to financial institutions amounted to $1.6 trillion ($3.5 trillion including guarantees), with larger amounts allocated to lower capitalized and less profitable banks. As of end-2017, only a few countries had fully divested the initial support they provided during the crisis. Public holdings were divested faster in better capitalized, more profitable, and more liquid banks, and in countries where the economy recovered faster. In countries where the government stake remained high relative to the initial intervention, private investment and credit growth were slower, financial access, depth, efficiency, and competition were worse, and financial stability improved less.

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I. INTRODUCTION

Substantial government interventions in financial institutions were a hallmark of the response to the Global Financial Crisis (GFC). In many countries, governments went beyond liquidity provision and took stakes in individual institutions through capital injections or purchased or guaranteed impaired assets. These interventions were necessary, but often unpopular. In large part, they accomplished what they intended to: stabilize markets and repair balance sheets to restart the economy. This, however, came at a cost: emerging public frustration against using taxpayers' money to rescue the financial institutions that many regarded as the culprits of the crisis. Frustration turned into resentment, especially where fiscal austerity followed because the costs of the interventions threatened the financial standing of the sovereign. While unlikely to change this sentiment, taking stock of the fiscal costs of government interventions in support of the financial sector, as well as of the remaining assets in the hands of the public sector, is important to let taxpayers know how their money has been used.

This paper reviews government interventions in the financial sector a decade after the GFC. It sheds light on the costs of these interventions on the public purse by focusing on the fiscal implications of direct government interventions.[1] To do so, we compile and present a new bank-level dataset on government interventions. The dataset allows us to track public asset holdings over the period 2007–17 and estimate intervened financial assets remaining in the hands of the public sector at end-2017. We then compare these data with official aggregate data specifically collected for this exercise and provide an update of the total fiscal impact of interventions, including the value of remaining public assets.

Our dataset improves transparency and can hence contribute to accountability. While most authorities publish data on their interventions in the financial sector, the presentation of the data is far from uniform and understanding the complex underlying transactions is often cumbersome. In addition, some countries have yet to publish intervention data, a decade after the GFC and despite the fact that significant public resources were involved. These issues make cross-country comparisons difficult, inhibiting accountability and hampering analysis geared at learning lessons. The uniform approach across countries which we pursue allows for such analysis and sheds a light on bank liabilities remaining in public hands.

[1] The fiscal implications of direct government interventions in support of the financial sector are only a part of the impact the crisis had on public finances. We do not consider, for instance, automatic or discretionary fiscal outlays mobilized in response to the macroeconomic recessions associated with the global financial crisis.

Such transparency is important because interventions may create both direct and indirect economic distortions. Not only do interventions may interfere with how markets function, but they also potentially affect the signaling value of asset prices and financial flows. The resulting resource misallocation could have significant long-term consequences for productivity, competition, and growth (Kane, 1990; Peek and Rosengren, 2005; Caballero et al., 2008; Richardson and Troost, 2009; Calderon and Schaeck, 2016; Storz et al., 2017). These misallocations are potentially sizeable as direct interventions mobilize a sizable volume of public funds, the recovery of which is not only highly uncertain, but also takes time (IMF, 2015; Laeven and Valencia, 2018). Stylized facts based on our new datasets are in line with such concerns.[2]

Moreover, prolonged state ownership of banks may not be desirable in its own right. State-owned banks often pursue objectives other than value maximization, sometimes driven by (in)direct political interference or explicit quasi-fiscal mandates. As a result, on average, they tend to be less profitable, hold less core capital, and exhibit greater credit risk than privately-owned banks (Cornett et al., 2010).[3] These patterns could explain the association between higher government ownership of banks and lower subsequent growth of productivity and per capita income (LaPorta et al., 2002). Moreover, lending decisions of state-owned banks may be influenced by political considerations, potentially leading these banks to take excessive risks without proper pricing (Sapienza, 2004; Claessens et al., 2008), with implications for both financial stability and the real economy (Carvalho, 2014; Coleman and Feler, 2015). The stylized facts derived from our dataset are in line with state-owned banks being less profitable and riskier than their privately-owned counterparts.

Our dataset consists of newly compiled bank-level data, cross-checked with aggregate country-level data. We gather data on the interventions into and the remaining public asset holdings in 1,114 financial institutions across 37 advanced economies and emerging markets (representing 62 percent of global GDP) from public records and other publicly available information. We validate these data at the country level with government and central bank sources for a smaller

[2] This is not to say that all interventions are necessarily harmful. The cost of distortions that may be generated by interventions should be weighed against the potential costs of inaction. Dell'Ariccia et al. (2018) provide an in-depth discussion of the trade-offs entailed in a policymaker's decision to intervene in a distressed financial institution.

[3] Lending by state banks can play a useful role in stabilizing credit over the business cycles and during financial crises (Bertay, Demirguc-Kunt, and Huizinga, 2015). Yet, this may come at the expense of poor credit allocation, resulting in low economic growth.

sample of the 28 European Union (EU) countries and the United States. Through the latter sources, we also complement the bank-level data with updated information on government acquisition of impaired assets and the financial costs and benefits stemming from government asset holdings.[4] Accordingly, we present a dataset with an unparalleled granularity on the accumulation and unwinding of financial interventions with the broadest possible coverage of countries, institutions, and types of intervention.

The benefits of our bank-level database lie in its granularity. We compile data at the level of specific transactions in individual banks. This allows us to gauge the association between bank characteristics and the amount of and the way in which support was provided, as well as the implications for bank-level outcomes—something that the literature that relies on aggregate country-level data cannot do. Furthermore, our database allows us to track the evolution of the assets acquired during the GFC and focus on those remaining in public hands today, comparing their value to the cost of intervention. The granularity of our data comes at a cost of a relatively narrow country and time coverage. We focus on 37 countries in the post-GFC period, whereas the Laeven-Valencia database covers 165 countries from 1970 onwards.

Our country-level dataset complements the existing literature on the costs of banking crises. Our data combines stock and flow data, akin to the approach adopted by EU countries in the Excessive Deficit Procedure (EDP) Supplementary Tables and Financial Assistance Measures Tables (EC 2018; ECB 2016). This *stock-flow* approach differs from *cash-flow* methods used, for instance, by Laeven and Valencia (2008, 2013, 2018) who do not distinguish between acquired assets and capital injections (transfers) provided to the financial institutions (Box 2 provides further details on the differences between the two approaches). Still, methodological challenges in recording interventions persist. These are mainly due to asset valuation, the classification of financial support, and the use of special purpose vehicles and defeasance structures to provide support.[5]

Encouragingly though, the correspondence between our bank-level data and the country-level data on gross direct interventions is close. The average (absolute value) difference between the two methodologies is 0.52 percentage point of 2017 GDP (see Appendix III for details).

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[4] Impaired assets can be acquired from financial institutions by the government or by a unit acting on its behalf, such as a defeasance structure—a legal entity specifically set up to take over the assets from the troubled bank.

[5] For instance, holdings of financial assets are estimated at nominal value, while ordinary shares are estimated at market value.

The main insights from our data can be summarized as follows:

- Since 2007, cumulative gross direct public interventions in financial institutions in the countries in our sample amounted to some $1.6 trillion. In addition, guarantees extended to these institutions amounted to some $1.9 trillion, bringing the total amount of support to $3.5 trillion.
- On average, governments recorded net cumulative indirect benefits from these interventions. That is, they received dividends and fees from asset holdings that exceeded interest payments on debt issued to finance these interventions. Even so, variations across countries are large, with only just over half the countries seeing such indirect benefits.
- The unwinding of direct support has been uneven with only a few countries fully divesting their financial sector holdings. At end-2017, public equity holdings remain sizable in Ukraine, Luxembourg, Portugal, Greece, and Belgium. Public holdings of impaired assets are still substantial in Austria, Slovenia, and Germany.

We also observe interesting correlations between interventions and both individual bank characteristics and aggregate macro-financial indicators. While we do not establish the direction of causality, we highlight a few stylized facts that illustrate the long shadow the GFC has cast:

- *Bank characteristics.* The initial government support was higher in banks that had less capital and were less profitable. Public asset holdings were divested faster over time in better capitalized, more profitable, and more liquid banks.
- *Macro-financial indicators.* Public asset holdings were divested faster in countries where the economy recovered faster. Countries where the government stake remains high relative to the initial intervention display slower private investment and credit growth, as well as a deterioration in financial access, depth, efficiency, and competition, and less improvement in financial stability.

The remainder of this paper is organized as follows. Section II describes financial sector support since the GFC, focusing on gross direct interventions in individual financial institutions and depicting some stylized facts. Section III details the public asset holdings in these entities and discusses some patterns in the data. Section IV complements bank-level data by providing data on impaired asset holdings that were transferred to the public sector balance sheet and the fiscal impact of direct interventions at end-2017. Section V concludes with directions for potential future and forthcoming work.

II. Gross Direct Interventions in the Aftermath of the Crisis

A. Data Coverage

Our sample covers Australia, Brazil, Canada, Japan, New Zealand, Russia, Switzerland, Ukraine, the United States, and the 28 European Union (EU) countries. We focus on post-GFC interventions that result in an outright government stake in a financial institution.[6] These primarily involve asset purchases. In order to see whether the type of instrument used in asset purchases has a bearing on the outcomes (e.g., the speed of divestment), we distinguish three broad modes of such support: equity shares, hybrid securities, and debt.[7] We also gather information on extended guarantees and impaired asset relief.[8]

The collection of these data promotes transparency. The U.S. Department of the Treasury and the Japanese Deposit Insurance Corporation regularly publish the gross financial interventions into and the remaining stakes in institutions in the aftermath of the crisis. The British, Irish, and Spanish authorities are also comprehensive and transparent in their disclosure efforts. The data in the other countries covered in our sample, however, are not as easily accessible from a single

[6] We cover any intervention that falls between 2007 and 2017, and do not distinguish the source of distress (except when the source is not related to economic factors and is straightforward to identify, which was some cases in Japan and Russia, see country summaries in Appendix I). In some of the countries we cover, the interventions were not directly related to the GFC but to (additional) shocks that hit the economy or the banking sector later. Hence, they are not necessarily under the "shadow" of the GFC but we include them in the dataset purely because they fall in the sample period we cover.

[7] Equity includes ordinary shares and preference shares, as well as the Austrian *Partizipationskapital*,the German silent partnerships, and the Spanish *cuotas participativas.* Hybrid securities include contingent convertible bonds, mandatory convertible securities, and convertible core securities, as well as the Irish promissory notes and the Italian Tremonti bonds. Debt includes commercial paper, bonds, loan provisions, non-collateralized claims, state deposits, subordinated debt, and debt assumptions.

[8] Asset purchases cover the acquisition of financial assets and, in the EU cases, any capital injections that are not recognized by the European Commission as impaired asset relief. We do not include blanket guarantees and deposit insurance coverage. We record impaired asset relief whenever the transfer value of impaired assets onto governments' balance sheets exceeds their market value. Data on individual bank interventions do not allow us to track impaired assets once they are transferred onto the general government balance sheet and/or to asset management vehicles. We fill in this gap using information at the aggregate level in Section IV.

national source. As a result, our data sources are wide and varied, comprising, e.g., reports of legal counsels of national central banks, court rulings, public letters between national agencies, and numerous additional official sources. Throughout, a primary source comprises the European Commission's state aid reports and annual bank reports. We supplement this information with data from S&P Market Intelligence, which includes financial institution annual reports. A full list of data sources can be found in Appendix I.

The compilation of these data is challenging. First, numerous banks that existed in 2007 ceased operations during the crisis or were acquired by other (often public) entities. This makes tracking divestment and hence estimating the remaining public stake difficult. Second, gauging the specific nature of some interventions requires detailed analysis of the notes to banks' annual statements. Third, the way in which governments intervened in the financial sector often involved complex transactions among several parties, complicating the ownership structure of the public stake in intervened banks. In some cases, the state became a direct stakeholder, whereas in other cases one or more state-controlled entities were used.[9] Detailed descriptions of these methodological challenges and how we address them in the construction of the database are in Appendix I.

B. Bank-Level Interventions: A First Glance

We document total public support amounting to some $3.5 trillion, spread out broadly across the banking system and aiding more than a thousand banks (Table 1). Such support consisted of $1.6 trillion in gross direct interventions and $1.9 trillion in guarantees.

The support is driven neither by specific countries nor by specific big banks (defined as those with over $50 billion in total assets). This speaks to the global nature of both the crisis and our dataset. While US institutions comprise a majority of the banks in our sample (63 percent, or 707 out of 1,114 entities), they received less than 10 percent of the total support we document.[10] Big

[9] We focus on the financial support provided to the banking sector starting in 2007. The sample includes both private banks and banks that were (partially) state-owned bank at the time of first intervention. To control for the effect of state ownership on bank recapitalization, we include bank fixed effects in the regression analysis and control for state ownership in robustness checks. Results remain unchanged.

[10] Total aid received by US institutions amount to 7.1 percent of the total assistance extended to financial institutions, while asset purchases in US institutions come to 21.3 percent of total asset purchases in our sample. US government-sponsored enterprises (GSEs) are not covered in our sample. Specifically, Fannie Mae and Freddie Mac were placed

banks received two thirds of the documented aid over the whole 2007–17 period, even though they represent the vast majority of bank assets in our sample. The share of support going to big banks fluctuates between a high of 86 percent in 2008 and a low of 37 percent in 2011. This might be attributed to the systemic nature of these banks: being more closely interlinked and, hence, more exposed to global shocks, they received the lion's share of public support early in the crisis. After the initial shock, the macro-financial outlook progressively worsened in the years after 2008. As a result, the initial shock likely propagated to small and medium-sized banks that subsequently also faced liquidity and solvency issues. This transmission mechanism might have led to a more balanced allocation of gross direct interventions across banks of different size in the following years.

Table 1 further shows that both the number of banks receiving aid and the total extended aid peaked in 2009. While the former is driven by the Troubled Asset Relief Program (TARP) in the United States, the latter is not, reflecting that the crisis and the corresponding intervention wave quickly propagated across the globe. At the peak, 20 percent of the total financial assets in the countries covered in our sample belonged to banks that received government support.[11]

Table 1. Gross Direct Interventions by Year

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Number of banks	7	260	692	58	67	66	50	94	19	4	16	-
o/w US banks	0	214	497	0	0	0	0	0	0	0	0	-
o/w big banks	4	39	35	11	7	12	7	3	2	0	5	-
Percent of system assets	1.7	20.2	18.4	1.7	0.9	1.6	0.8	0.2	0.2	0	1.0	-
o/w US banks	0	7.7	3.7	0	0	0	0	0	0	0	0	-
o/w big banks	1.7	19.7	18.0	1.6	0.8	1.5	0.7	0.2	0.2	0	1.0	-
Total extended aid	$166	$827	$1,215	$516	$116	$300	$247	$38	$16	$5	$54	$3,499
o/w US banks	$0	$198	$52	$0	$0	$0	$0	$0	$0	$0	$0	$250
o/w big banks	$76	$710	$679	$400	$42	$202	$119	$14	$6	$0	$38	$2,287
o/w direct support	$73	$486	$336	$395	$62	$126	$58	$24	$14	$5	$21	$1,599

Sources: National authorities; European Commission; bank reports; IMF staff estimates.

Note: This table shows the banks that received aid in a given year both in absolute numbers (*"number of banks"*) and in terms of their assets as a percent of total system assets (*"percent of system assets"*), as well as the total extended aid documented in the dataset in billion USD. The rows for the first two indicators cannot be summed over time as a bank would appear in more than one column if it was intervened multiple times (therefore, summing would lead to double-counting). Interventions include asset acquisitions, extended guarantees, and impaired asset relief. Big banks are those with over $50 billion in total assets. System assets are the total assets of the financial sector in the sample. Exchange rates are expressed at year end. Numbers may not add up due to rounding. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

under conservatorship on September 6, 2008 at a cost of nearly $200 billion and they remain in this status as of the time of writing, although their financial position has improved.

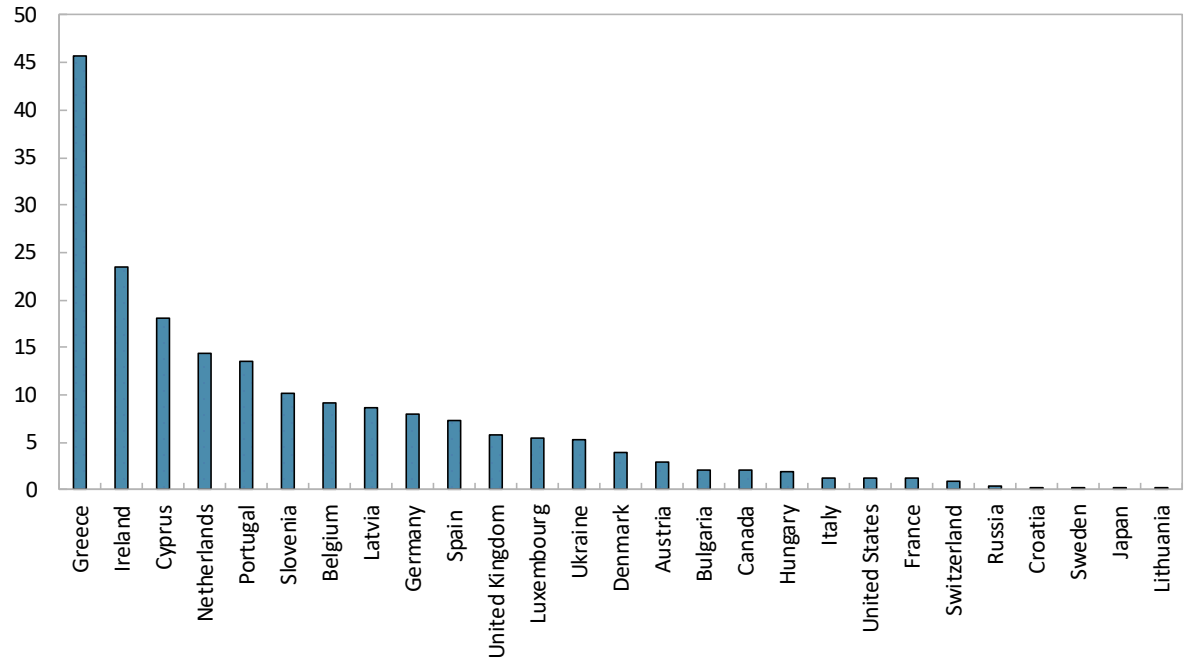
[11] Overall our sample of intervened banks account for 40 percent of system assets in the covered countries. This ratio varies from less than 1 percent in Russia to 96 percent in Greece.

Aggregated at the country level, our data reveal that the magnitudes vary widely across countries (Figure 1). Greece (45.6 percent of GDP), Ireland (23.5 percent of GDP), and Cyprus (18 percent of GDP) provided the largest support to their banks. At the opposite end of the spectrum, public support was lowest in Lithuania, Japan, and Sweden (all below 0.2 percent of GDP). These patterns are consistent with findings by previous studies, such as Laeven and Valencia (2018), on the relative magnitude of gross direct interventions.

Turning to the types of interventions, we focus our attention on asset purchases given that these arguably represent the most direct way we can capture the stake a government takes in a bank.[12]

Figure 1. Cumulative Direct Interventions by Country

(2007–17; in percent of 2017 GDP)



Sources: National authorities; European Commission; bank reports; IMF staff estimates.

Note: This figure shows the cumulative direct public interventions in banks from 2007 to 2017, expressed as a percent of 2017 GDP. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

[12] Guarantees, by contrast, are extended but not always incurred, while impaired asset relief is counted only when the transfer value exceeds the market value. Also worth noting is the fact that we do not include deferred tax assets. While sizeable at times, these assets primarily function through an accounting, rather than economic, channel. Some deferred tax assets have been converted to an irrevocable claim on the governments upon a bank's loss, liquidation, or insolvency in sol called deferred tax credits (DTCs). Although not included in our dataset, such DTCs could in principle be considered public support and recorded as contingent liabilities of the government.

Equity was the most frequently used instrument for bank recapitalization (Table 2). Next came hybrid instruments, while debt to individual institutions was used least frequently. Only eight countries in our sample used all three instruments and the choice of the primary instrument is far from uniform (see Figure 8 in Section III.B, where we discuss these patterns further). For instance, Belgium and Ireland acquired equity shares and hybrid securities with little use of debt. In contrast, Bulgaria, Denmark, Hungary, and the Netherlands heavily relied on debt instruments (see Figures A3–A5 in the Appendix for the full picture).

There is no comprehensive theoretical framework analyzing the choice of instrument and, arguably, this is another case where, by necessity, "regulatory practice has run somewhat ahead of theory" (Blanchard and Summers 2017). While riskier and more expensive, equity provides more control over the intervened bank's operations. Such control can be particularly desirable when managerial quality is a concern. It also allows the government to share the upside when the bank returns to profit. The patterns in our data suggest that many governments opted for intervening in banks this way. Notably, even though 86 percent of asset purchases over the sample period used equity (831 out of 966 banks in Table 2), the two earliest intervention cases of the crisis came in the form of debt: in 2007 to the German lender Sachsen LB and the British bank Northern Rock. This could be an indication that, when problems first appeared, their severity was not truly understood and support in a form that provided limited control over bank operations was deemed to be sufficient. Although most equity interventions occurred in the first five years after the crisis, we recorded equity interventions as late as 2017.[13,14]

[13] These late cases involved Italian Monte dei Paschi di Siena, Banca Marche, and Banca Etruria, the Lithuanian Central Credit Union, the Portuguese state-owned bank Caixa Geral de Depósitos, and the Ukrainian PrivatBank. The assistance the Portuguese government provided to Caixa Geral de Depósitos included hybrid instruments in addition to equity. Detailed information on all individual interventions can be found in Appendix I.

[14] In most of our analysis, we use a combined measure of asset purchases, defined as the sum of equity, hybrid securities, and debt instruments. Different types of instruments may, however, have different economic, prudential, and legal implications for the intervened bank's health (depending on their loss-absorbing capacity). Or, they may display differences in recovery patterns (sale of equity stakes to third parties, for example, would inherently prove more difficult than repayment of debt). While we document the different recovery patterns by the type of instrument in Section III.B, we leave a more in-depth analysis of different instruments for future research.

Table 2. Asset Purchases by Instrument

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Equity											
Number of banks	0	231	500	20	21	23	17	6	9	2	8
o/w US banks	0	211	446	0	0	0	0	0	0	0	0
Percent of system assets	0.0	17.2	13.7	1.2	0.8	1.3	0.5	0.1	0.2	0.0	0.2
o/w US banks	0.0	7.7	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hybrid securities											
Number of banks	0	8	63	5	4	8	2	0	2	0	1
o/w US banks	0	3	51	0	0	0	0	0	0	0	0
Percent of system assets	0.0	2.1	0.8	0.4	0.1	0.5	0.0	0.0	0.2	0.0	0.1
o/w US banks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Debt											
Number of banks	2	11	12	4	5	3	2	1	1	0	0
o/w US banks	0	0	0	0	0	0	0	0	0	0	0
Percent of system assets	0.1	0.3	0.1	0.0	0.2	0.3	0.5	0.0	0.0	0.0	0.0
o/w US banks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Sources: National authorities; European Commission; bank reports.

Note: This table shows the banks that were subject to asset purchases by year in absolute numbers (*"number of banks"*) and in terms of their assets as a percent of total system assets (*"percent of system assets"*) by type of instrument (equity, hybrid instruments, and debt). System assets are the total assets of the financial sector in the sample. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

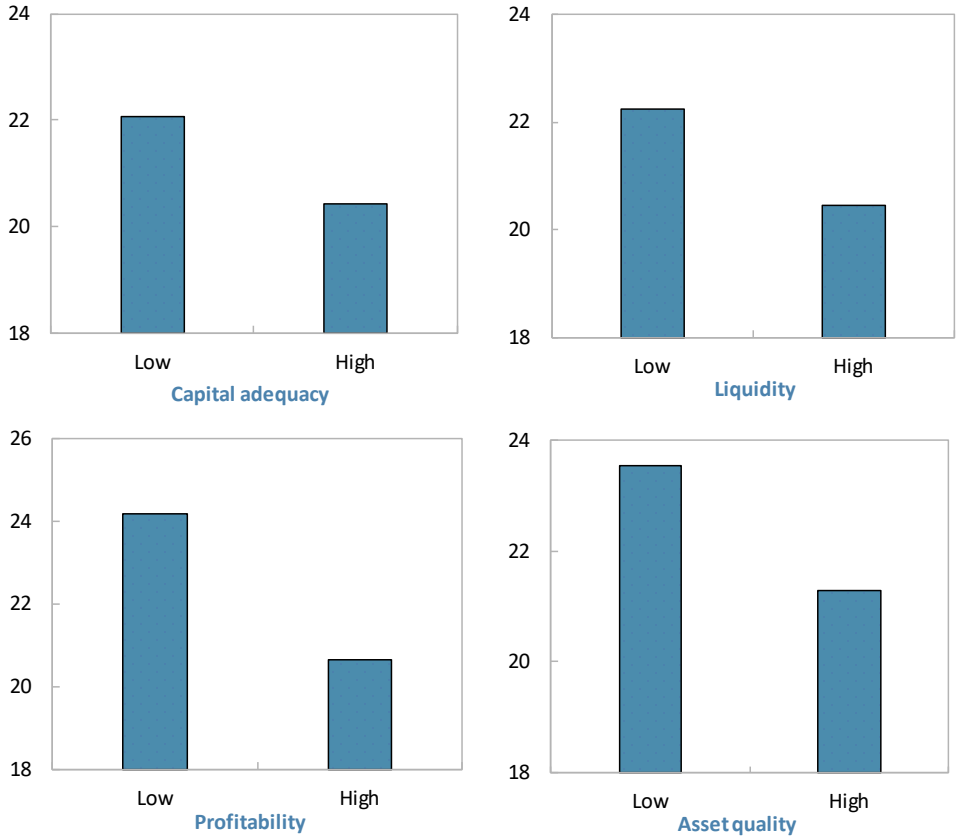
Bank characteristics may have determined the size of interventions, providing lessons for future bank resolutions. We see some patterns between individual bank characteristics and the initial government stakes taken in these banks. First, splitting the sample by key bank soundness indicators such as capital adequacy, liquidity, profitability, and asset quality, we examine the resulting summary statistics in Figure 2. The patterns reveal that the initial government stake tends to be higher in banks with weaker soundness indicators. Those differences, however, are not statistically significant at conventional levels—a result that speaks to the wide variation across these banks. A possible explanation for the lack of a statistically significant difference at this level is that, when systemic risk is high, governments may (preemptively) intervene in banks that may look fine based on the commonly used financial soundness indicators but could be fragile nonetheless. In addition, policymakers may employ moral suasion to get good banks (i.e., banks not prima facie in need of support) to accept support, in order to avoid stigma on bad banks (see, e.g., Johnson and Kwak, 2011, for further on such incentives on the policymakers' end).

We look at these patterns more in depth through simple regressions on both *initial* and *peak* interventions. In these, we analyze both bank characteristics and countries' macro-financial conditions. This analysis is for the purpose of confirming that the stylized facts we observe survive beyond bivariate relationships (while not claiming any causal interpretation). The generic specification we use is:

$$Stake_{bct}^{K} = \alpha + \beta X_{bc,t-1} + \gamma Y_{c,t} + \varepsilon_{bct}$$

Figure 2. Initial Public Holdings by Bank Characteristics

(in percent of total bank equity)



Sources: National authorities; European Commission; bank reports; S&P Market Intelligence, IMF staff estimates.
Note: This figure shows the average initial public holdings in a bank as a percent of the bank's total equity on the vertical axes by various levels of capital adequacy, liquidity, profitability, and asset quality on the horizontal axes. Public holdings are calculated as the winsorized total public holdings of equity, hybrid instruments, and debt divided by the bank's total equity. The initial stake is the first intervention the bank received. Bank variables (capital adequacy, liquidity, profitability, and asset quality) are measured during the year preceding the first intervention and are labeled high (low) relative to the sample mean. High (low) capital adequacy indicates above-(below-) average Tier 1 capital ratio. Liquidity is measured by the ratio of liquid assets to total assets. High (low) liquidity indicates above-(below-) average liquid assets to total assets. Profitability is measured by the return on assets. High (low) profitability indicates above-(below-) average return on assets. Asset quality is measured by the ratio of problem loans to gross customer loans. High (low) asset quality indicates below-(above-) average problem loans to gross customer loans. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

where the left-hand side variable is the government's stake in bank *b* in country *c* at time *t*. Here, *X* is a vector of lagged bank characteristics (capitalization, liquidity, profitability, and asset quality in the period before the intervention, as well as lagged total assets) and *Y* is a vector of macro-financial conditions (real GDP growth, credit growth, inflation, unemployment, public debt-to-GDP ratio, monetary policy rate, and the financial stress index). Bank characteristics are lagged by one year to allay potential endogeneity. Country-level macro-financial conditions are not lagged since it is less likely that a stake in a specific single bank would affect the overall conditions in the country. Also, it is arguably more relevant to explore the contemporaneous

relationship between the stake and macro-financial conditions given the feedback loops between the banking system and macroeconomic outcomes. Error terms are clustered at the country level. Given this possible endogeneity, we interpret the results as correlations rather than causal links.

The superscript *K* distinguishes whether we are looking at the *initial* stake (as measured by the first intervention a bank receives from a government in the form of asset purchase divided by the bank's total equity at the time) or the *peak* stake (the maximum cumulative level of public asset holdings reached during the period between the time of first intervention and 2017, again scaled by total equity of the bank). That is, we run two sets of cross-sectional regressions using ordinary least squares to understand if and how the size of the initial or peak stake relates to the bank and country conditions prevailing around that time. Note that *t* varies by bank and refers to the year in which a given bank was intervened for the first time when the dependent variable is the initial stake and to the year in which the government stake was at its maximum when the dependent variable is the peak stake.

The size of the government's first intervention is negatively correlated with capitalization (total equity divided by total assets) and profitability (net interest margin), albeit the latter association is statistically significant at a marginal level (Table 3). When we include all bank characteristics in the same regression, however, capitalization, liquidity, and profitability (return on average assets) all have negative and statistically significant coefficients[15]. This is also broadly true for peak government stake and the relationship with profitability (return on average assets) is stronger in this case, although the relationship with liquidity is not significant (Table 4).

These findings suggest that, broadly speaking, banks with weaker fundamentals need and are allocated larger public resources. By highlighting the potential cost differential (as indicated by the size of the intervention) between intervening in weaker and stronger banks, these patterns can help inform future bank resolutions and provide additional support for the role of strong prudential regulation in reducing the need for government support.

Among the variables capturing the macro-financial conditions in the country around the time of initial intervention, we note a negative relationship with GDP growth, credit growth, and public debt. In countries where GDP growth, credit growth, and public debt were lower, the average

[15] We choose between two measures of capitalization and two measures of profitability in the horse-race specification, given the potential collinearity when we include both. Our choice between the different proxies is informed by the number of observations: we choose equity-to-asset ratio over Tier 1 ratio for capitalization and return on average assets over net interest margin for profitability because they have better coverage.

intervention was higher. This is consistent with more severe macro-financial downturns being associated with larger initial interventions and governments with more ample fiscal room being able to provide more support to their financial institutions.

When we turn to the peak stakes, we find that high GDP growth and high financial stress tend to be associated with higher government support to banks. The first of these results may be due to reverse causality: where banks receive strong government support, adverse spillovers from the financial sector to the rest of the economy may remain limited. In other words, larger government interventions better shield growth. As for the latter result, if systemic risk keeps rising and remains elevated, further interventions may be needed to support individual financial institutions.

These findings suggest that the interventions in our sample were primarily driven by capital shortages in individual institutions at the beginning, whereas deteriorating macro-financial conditions played a role in later stages. A possible interpretation of these results is that supportive macroeconomic policies that rein in the decline in economic activity and efforts to restore confidence in the financial system (and ameliorate macro-financial stress) might limit the need to provide direct support to individual financial institutions.

Recall that the sample includes only those banks that experienced a government intervention. Therefore, the regression results should be interpreted as relationships observed *conditional* on a bank being intervened. A related concern is that the intervened banks may have different characteristics than a typical bank in a given country, considering that the government's decision to intervene is not random. To address this sample selection bias, we run Heckman regressions using a larger sample including banks that were not intervened but were located in the countries covered in our sample. The results remain broadly the same.[16]

[16] These regressions are not presented for the sake of brevity but are available upon request.

Table 3. Initial Government Stake and Bank/Country Conditions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bank variables							
Capitalization							
Tier 1	-0.12						
	[0.24]						
Equity/assets		-0.59***					-0.98***
		[0.06]					[0.11]
Liquidity							
Liquid/total assets			-0.03				-0.16***
			[0.09]				[0.02]
Profitability							
ROAA				-0.51			-4.47***
				[0.32]			[0.77]
NIM					-1.36*		
					[0.71]		
Asset quality							
NPL						0.15	-0.20
						[0.21]	[0.21]
Size							
Total assets, log	-1.23***	-1.35***	-1.10**	-0.87***	-1.21**	-0.73***	-0.19
	[0.20]	[0.36]	[0.45]	[0.26]	[0.45]	[0.24]	[0.28]
Country variables							
GDP growth	-4.02***	-3.71***	-3.86***	-3.93***	-3.60***	-2.99**	-2.41**
	[1.08]	[1.01]	[1.09]	[1.32]	[1.07]	[1.14]	[0.95]
Credit growth	-1.97***	-1.81***	-1.83***	-1.89***	-1.81***	-1.31*	-1.01
	[0.50]	[0.50]	[0.44]	[0.62]	[0.55]	[0.70]	[0.63]
Inflation	1.38	1.48	1.41	1.98*	1.59	1.86	2.04
	[1.12]	[1.01]	[1.07]	[1.07]	[1.04]	[1.47]	[1.31]
Unemployment	-0.42	0.10	-0.35	1.14	0.22	0.74	1.18
	[0.61]	[0.60]	[0.59]	[0.97]	[0.60]	[0.98]	[0.82]
Public debt	-0.29***	-0.26***	-0.29***	-0.33***	-0.26***	-0.24***	-0.23***
	[0.07]	[0.06]	[0.07]	[0.09]	[0.07]	[0.07]	[0.07]
Policy rate	-2.10	-2.02	-1.70	-2.36	-2.30	-1.96	-0.36
	[1.93]	[1.89]	[1.81]	[2.03]	[1.95]	[2.35]	[2.11]
Financial stress index	-0.04	0.05	-0.1	0.12	0.06	-0.01	0.16
	[0.23]	[0.23]	[0.20]	[0.26]	[0.24]	[0.26]	[0.22]
Observations	369	401	391	409	402	368	350
R^2	0.11	0.18	0.12	0.13	0.12	0.10	0.30

Sources: National authorities; European Commission; bank reports; S&P Market Intelligence, IMF staff estimates.

Note: This table shows the results of regressing the initial stake that a government holds in a bank on bank characteristics and country conditions. The initial stake is computed as the winsorized total public holdings of equity, hybrid instruments, and debt divided by the bank's total equity. Capitalization is measured by Tier 1 ratio or, alternatively, by total capital ratio. Liquidity is measured by the ratio of liquid assets to total assets. Profitability is measured by return on average assets or, alternatively, by net interest margin. Asset quality is measured by the ratio of problem loans to gross customer loans. All bank-level variables are lagged by one year. Robust standard errors are clustered at the country level.

Table 4. Peak Government Stake and Bank/Country Conditions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bank variables							
Capitalization							
Tier 1	0.26						
	[0.48]						
Equity/assets		-1.49**					-1.86**
		[0.65]					[0.67]
Liquidity							
Liquid/total assets			0.10				-0.10
			[0.19]				[0.07]
Profitability							
ROAA				-4.85***			-8.97***
				[1.47]			[2.80]
NIM					-5.26		
					[3.15]		
Asset quality							
NPL						-0.33	-0.99
						[0.57]	[0.58]
Size							
Total assets, log	1.51	0.26	0.75	1.25	0.29	1.28	1.70*
	[1.76]	[0.91]	[1.19]	[1.30]	[0.67]	[1.31]	[0.82]
Country variables							
GDP growth	7.56**	7.19**	7.15**	6.85**	7.60***	8.07**	7.90***
	[2.91]	[2.76]	[3.18]	[2.83]	[2.55]	[2.72]	[2.11]
Credit growth	-3.49	-3.70*	-3.65	-1.97	-3.26	-4.12**	-2.11
	[2.01]	[1.83]	[2.09]	[2.13]	[1.86]	[1.62]	[1.45]
Inflation	-2.20	-2.16	-3.07	0.33	-1.34	-2.74	2.81
	[9.98]	[8.74]	[9.78]	[8.42]	[8.64]	[10.42]	[7.90]
Unemployment	1.74	1.24	1.35	1.64	1.91	1.62	1.14
	[1.36]	[0.96]	[1.26]	[1.17]	[1.10]	[1.00]	[0.98]
Public debt	0.20	0.27	0.27	0.20	0.19	0.29	0.45*
	[0.29]	[0.27]	[0.32]	[0.26]	[0.25]	[0.22]	[0.22]
Policy rate	8.52	6.43	7.62	8.99	6.02	9.06	8.22
	[7.80]	[8.26]	[10.05]	[6.75]	[7.71]	[6.89]	[7.67]
Financial stress index	2.71**	2.80***	2.73**	2.15**	2.74***	3.05***	2.54***
	[0.98]	[0.89]	[0.97]	[0.99]	[0.87]	[0.74]	[0.51]
Observations	370	404	394	411	405	373	355
R^2	0.37	0.36	0.32	0.38	0.37	0.37	0.53

Sources: National authorities; European Commission; bank reports; S&P Market Intelligence, IMF staff estimates.

Note: This table shows the results of regressing the peak stake that a government holds in a bank on bank characteristics and country conditions. The peak stake is computed as the winsorized total public holdings of equity, hybrid instruments, and debt divided by the bank's total equity. Capitalization is measured by Tier 1 ratio or, alternatively, by total capital ratio. Liquidity is measured by the ratio of liquid assets to total assets. Profitability is measured by return on average assets or, alternatively, by net interest margin. Asset quality is measured by the ratio of problem loans to gross customer loans. All bank-level variables are lagged by one year. Robust standard errors are clustered at the country level.

III. Remaining Public Asset Holdings in Financial Institutions

In many countries, public asset holdings in individual intervened banks remain significant even a decade after the crisis. This section focuses on these financial asset holdings remaining in public hands and the patterns of their divestment.

The speed and extent of the unwinding of public asset holdings varied widely across countries. Some countries, like the United States, recovered the funds provided for recapitalization and other support programs within a few years. Others, like Cyprus, have only liquidated insolvent banks after the end-2017 cutoff date of our dataset. This reflects in part the different ways in which the crisis started in various countries and the different ways in which it affected their macroeconomic circumstances, as well as the cross-country differences in crisis management and resolution frameworks. It may also reflect the different characteristics of the banks that were intervened.

To better understand these patterns, we construct current stocks of public holdings in individual banks by tracking the flows of asset purchases and sales in each bank by instrument from the time of the first intervention until end-2017. Because of data availability constraints, we are not able to examine public holdings of special purpose vehicles, impaired assets, or bad banks using our bank-level data (this is done at the country level in Section IV). We also cannot track impaired asset relief and the triggering of guarantees through time, because these data are not available at the bank level.

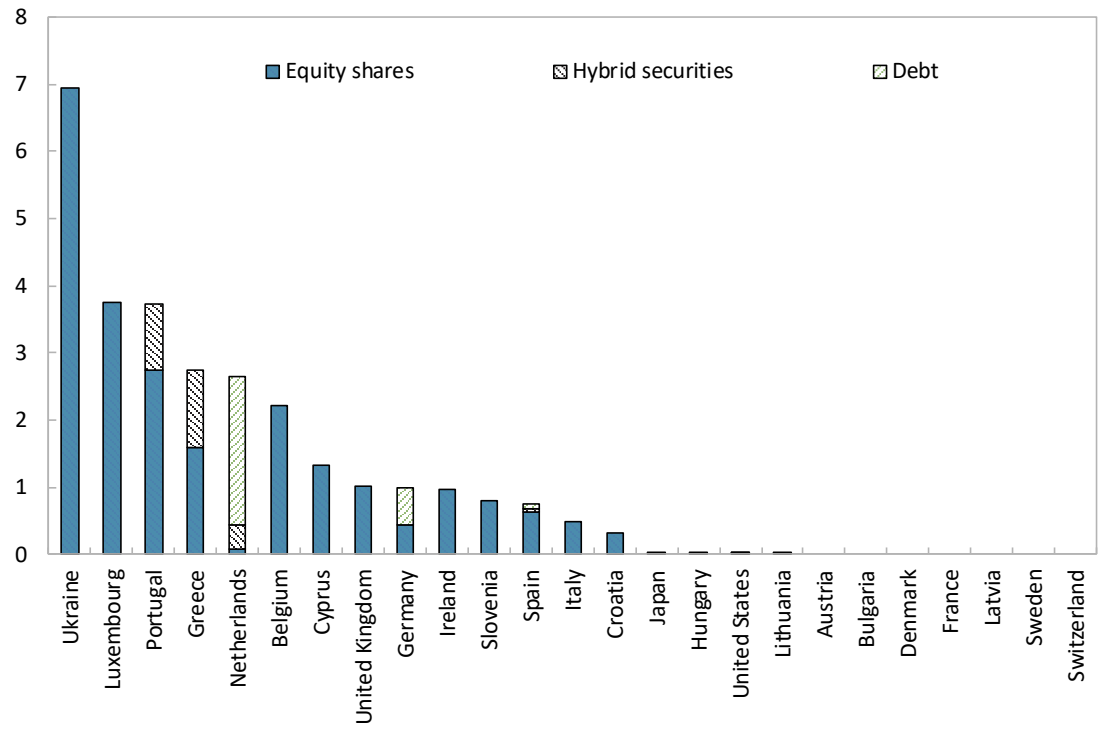
A. Remaining Asset Holdings in 2017

Public asset holdings in individual banks at end-2017 amount to US$ 135.3 billion, or 1.15 percent of GDP on average in the countries in our sample (Figure 3). This average, however, does not adequately reflect the considerable variation across countries.

The largest asset holdings relative to GDP can be found in Ukraine, where the government holdings amount to 7 percent of GDP following the nationalization of PrivatBank in December 2016; Luxembourg, with its holding of 34 percent of ordinary stock in BGL BNP Paribas (unchanged since 2009); Portugal given its ownership of Novo Banco—the good bank that emerged from the resolution of Banco Espirito Santo—and its capital injections in 2017 in Caixa Geral de Depósitos; and Greece, with its remaining stakes in the four large Greek banks (Piraeus, National Bank of Greece, Eurobank, and Alpha Bank). Germany and the Netherlands display a

Figure 3. Public Asset Holdings by Instrument

(2017; in percent of GDP)



Sources: National authorities; European Commission; bank reports; IMF staff estimates.

Note: This figure shows public asset holdings in banks in 2017, expressed as a percent of 2017 GDP. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

large outstanding asset holding of debt securities due to the novation of Sachsen LB's commercial paper facilities of €17.1 billion and of Fortis Bank Nederland's loan obligations of €16.1 billion.[17]

Overall, of the governments that intervened in their financial sectors, less than a third fully unwound their public stake positions by end-2017. Those are Austria, Bulgaria, Denmark, France, Latvia, Sweden, and Switzerland. Some of these public stakes were transferred to (special purpose vehicles inside) the general government, which we cannot track due to data availability. As such, our bank-level data may underestimate the actual remaining asset holdings on the balance sheets of governments.[18]

[17] Novation is the act of replacing one contractual obligation with another, with the consent of all parties involved. Given the characteristics of the novations and the lack of further disclosed information, we treat these as outstanding.

[18] In the United States, Fannie Mae and Freddie Mac, two government-sponsored enterprises, remain in government conservatorship—see Section IV. In addition, the United States—where the macro-financial recovery has been

Of course, the timing of the crisis (including its aftershocks as well as the pattern of separate shocks hitting the economy and the financial sector) has not been uniform across countries and, consequently, neither has the timing of the interventions. Therefore, comparisons of remaining assets in public hands at a given point in time—at end-2017, as we do here—may be distorted by when a country was hit and when its government intervened. To address this, we replicate Figure 3 at the 5-year mark from the first intervention (Figure A2 in the Appendix). While the order of countries changes, the observation that divestment pace has been different across countries remains valid.

Looking at individual bank characteristics, we find that remaining public asset holdings are higher in banks with lower capitalization, profitability, and asset quality. The average direct intervention saw governments take a stake of 26 percent in financial institutions, of which an average of 2.6 percent of total bank equity remained at end-2017. Dividing the sample of banks by financial soundness measures, we see that the remaining public asset stake is higher for banks with lower capital adequacy, profitability, and asset quality (Figure 4). Stakes in these weaker banks may be harder to divest to the private sector. Interestingly, we find that the public asset stake is also lower in banks with lower liquidity, although this result does not hold in multivariate regression analysis.[19]

To further explore these patterns, we regress the remaining stake on bank characteristics and country macro-financial conditions, as well as bank and year fixed effects:

$$Stake_{bct} = \alpha + \beta X_{b,t-1} + \gamma Y_{c,t} + InitialIntervention_{b,t} + \varphi_b + \delta_t + \varepsilon_{bct}.$$

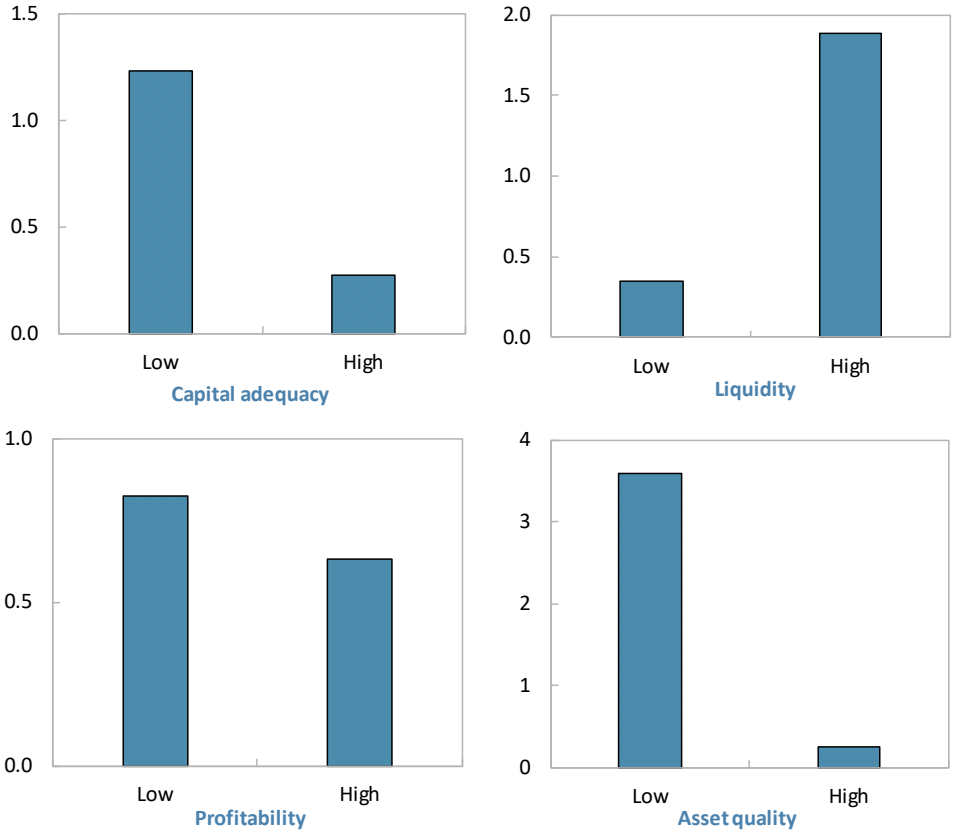
The left-hand side variable is the government stake in bank *b* in country *c* in year *t*, measured as the winsorized total public holdings of equity, hybrid instruments, and debt divided by the bank's

stronger and unwinding of investments rather methodical—still holds a minor $47 million in outstanding TARP investments at end-2017.

[19] This may be because big banks are generally more liquid and divestments in big banks may occur more slowly given their systemic importance. Alternatively, intervened banks may rely more on liquidity support provided by central banks and may have stronger incentives to hold sovereign bonds—which are classified as liquid assets and are often used as collateral to access central bank liquidity assistance. Moral suasion or an incentive to align their fate with that of the sovereign may also incentivize these banks to hold more sovereign bonds.

Figure 4. Remaining Public Holdings by Bank Characteristics

(in percent of total bank equity)



Sources: National authorities; European Commission; bank reports; S&P Market Intelligence, IMF staff estimates.
Note: This figure shows the average remaining public holdings in a bank as a percent of the bank's total equity on the vertical axes by various levels of capital adequacy, liquidity, profitability, and asset quality on the horizontal axes. Public holdings are calculated the winsorized total public holdings of equity, hybrid instruments, and debt divided by the bank's total equity. The remaining stake is as of 2017. Bank variables [profitability, capitalization, liquidity, and asset quality] are measured in 2016 and are labeled high [low] relative to the mean. Capitalization is measured by the Tier 1 ratio. High [low] capitalization indicates above-[below-] average Tier 1 capital ratio. Liquidity is measured by the ratio of liquid assets to total assets. High [low] liquidity indicates above-[below-] average liquid assets to total assets. Profitability is measured by the return on assets. High [low] profitability indicates above-[below-] average return on assets. Asset quality is measured by the ratio of problem loans to gross customer loans. High [low] asset quality indicates below-[above-] average problem loans to gross customer loans. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

total equity.[20] X is a vector of lagged bank characteristics (capitalization, liquidity, profitability, and asset quality in the previous period; as well as lagged size), Y is a vector of macro-financial conditions (real GDP growth, credit growth, inflation, unemployment, public debt-to-GDP ratio, the monetary policy rate, and the financial stress index), $InitialIntervention$ is the bank-specific initial intervention at time t (equal to zero for $t<T$ and to the first intervention for

[20] Winsorization deals with outliers by bunching all datapoints below the 1st (above the 99th) percentile at the 1st (99th) percentile value.

$t \geq T$,where T is the year during which the first intervention took place in bank b), and φ_b and δ_t are bank and year fixed effects, respectively. Error terms are clustered at the country level.

The results suggest that, conditional on being intervened, better-capitalized banks and those with higher liquidity and profitability. see bigger declines in the stakes the government has taken in them (Table 5). There is also some indication that higher unemployment and lower public debt tend to be associated with a higher government stake.

The correlation between remaining public holdings and bank characteristics is much stronger for smaller banks. We split the sample between big banks and smaller (i.e., small and medium-sized) banks at a threshold of $50 billion (Tables 6 and 7). We find that the coefficient estimates on capitalization, liquidity, and profitability are negative and significant for small and medium-sized banks, whereas for big banks the coefficient estimates are not significant, even though the exhibit the expected sign. The difference in the regression results for big and small banks is in line with big (systemic) banks receiving public support even when they are not facing capitalization issues, possibly because authorities act preemptively to prevent liquidity and profitability issues in these banks from leading to systemic distress. This interpretation is also in line with the evidence suggesting that the overall financial system stress level seems to matter more for the evolution of the public stake in big banks over time: a higher stake in big banks tends to be associated with higher levels of financial distress (Table 6). By contrast, it is credit growth, inflation, and policy rates that matter for the evolution of public stakes in small and medium-sized banks (Table 7).

Table 5. Public Asset Holdings and Bank/Country Conditions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bank variables							
Capitalization							
Tier 1	-0.13***						
	[0.03]						
Equity/assets		-0.02					-0.06
		[0.06]					[0.07]
Liquidity							
Liquid/total assets			-0.11***				-0.10***
			[0.03]				[0.03]
Profitability							
ROAA				-1.22***			-1.28***
				[0.21]			[0.22]
NIM					-1.79***		
					[0.15]		
Asset quality							
NPL						0.16	0.13
						[0.12]	[0.10]
Size							
Total assets, log	3.47***	4.01***	3.91***	3.80***	3.73***	3.87***	4.67***
	[0.67]	[0.68]	[0.66]	[0.85]	[0.59]	[0.57]	[0.93]
Initial intervention	0.78***	0.78***	0.77***	0.79***	0.77***	0.75***	0.75***
	[0.09]	[0.10]	[0.09]	[0.10]	[0.09]	[0.09]	[0.09]
Country variables							
GDP growth	-0.13	-0.15	-0.12	0.07	-0.04	0.04	0.00
	[0.13]	[0.17]	[0.13]	[0.10]	[0.14]	[0.08]	[0.18]
Credit growth	0.12	0.19	0.18	0.30**	0.18	0.21	0.17
	[0.12]	[0.13]	[0.14]	[0.13]	[0.13]	[0.13]	[0.12]
Inflation	-0.14	-0.16	-0.11	-0.07	-0.14	0.06	0.01
	[0.61]	[0.68]	[0.61]	[0.76]	[0.71]	[0.69]	[0.69]
Unemployment	1.82***	1.87***	1.73***	1.79***	1.76***	1.79***	1.49***
	[0.32]	[0.36]	[0.33]	[0.34]	[0.36]	[0.31]	[0.30]
Public debt	-0.22**	-0.22**	-0.18*	-0.23**	-0.25***	-0.26***	-0.16**
	[0.09]	[0.09]	[0.09]	[0.08]	[0.08]	[0.07]	[0.07]
Policy rate	0.71	0.53	0.21	0.52	0.66	0.91	0.63
	[0.56]	[0.46]	[0.46]	[0.46]	[0.43]	[0.54]	[0.60]
Financial stress index	0.29	0.24	0.24	0.19	0.25	0.24	0.19
	[0.18]	[0.25]	[0.20]	[0.22]	[0.24]	[0.25]	[0.20]
Observations	2,868	3,233	3,164	3,251	3,176	3,022	2,930
R^2	0.70	0.69	0.70	0.70	0.70	0.70	0.72

Sources: National authorities; European Commission; bank reports; S&P Market Intelligence, IMF staff estimates.

Note: This table shows the results of regressing the evolving government holdings in a bank on bank characteristics and country conditions. The government holdings and initial intervention are computed as the winsorized total public holdings of equity, hybrid instruments, and debt divided by the bank's total equity. Capitalization is measured by Tier 1 ratio or, alternatively, by total capital ratio. Liquidity is measured by the ratio of liquid assets to total assets. Profitability is measured by return on assets or, alternatively, by net interest margin. Asset quality is measured by the ratio of problem loans to gross customer loans. All bank-level variables are lagged by one year. All regressions include bank and year fixed effects. Robust standard errors are clustered at the country level.

Table 6. Public Asset Holdings and Bank/Country Conditions: Big Banks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bank variables							
Capitalization							
Tier 1	-0.03						
	[0.19]						
Equity/assets		-0.63					-0.84
		[0.50]					[0.62]
Liquidity							
Liquid/total assets			-0.19				-0.16
			[0.11]				[0.15]
Profitability							
ROAA				-0.5			-0.47
				[1.13]			[1.08]
NIM					-0.84		
					[0.95]		
Asset quality							
NPL						-0.05	-0.10
						[0.13]	[0.11]
Size							
Total assets, log	4.50	2.75	5.26	3.93	5.35	3.94	3.99
	[4.89]	[3.80]	[4.87]	[3.51]	[4.93]	[4.35]	[5.54]
Initial intervention	0.59***	0.64***	0.56***	0.65***	0.60***	0.62***	0.56***
	[0.14]	[0.16]	[0.15]	[0.16]	[0.14]	[0.15]	[0.13]
Country variables							
GDP growth	0.26	0.29	0.27	0.25	0.25	0.34	0.41
	[0.36]	[0.35]	[0.34]	[0.36]	[0.36]	[0.37]	[0.32]
Credit growth	0.27	0.33*	0.24	0.35*	0.29	0.26	0.16
	[0.17]	[0.17]	[0.16]	[0.17]	[0.16]	[0.16]	[0.16]
Inflation	-0.42	-0.34	-0.33	-0.45	-0.52	-0.37	-0.46
	[0.54]	[0.49]	[0.44]	[0.52]	[0.54]	[0.52]	[0.44]
Unemployment	1.06**	0.99**	1.00**	0.99**	1.00**	1.14**	0.88*
	[0.39]	[0.35]	[0.34]	[0.43]	[0.37]	[0.45]	[0.47]
Public debt	0.03	0.07	0.04	0.05	0.03	0.06	0.04
	[0.08]	[0.08]	[0.08]	[0.07]	[0.09]	[0.10]	[0.10]
Policy rate	-0.51	0.23	-0.20	0.21	-0.32	-0.26	-0.67
	[0.87]	[0.74]	[0.76]	[0.79]	[0.89]	[0.71]	[0.90]
Financial stress index	0.66**	0.62**	0.51**	0.64**	0.67**	0.67***	0.56**
	[0.23]	[0.21]	[0.22]	[0.22]	[0.22]	[0.21]	[0.24]
Observations	377	433	420	447	395	372	354
R^2	0.71	0.71	0.71	0.71	0.71	0.72	0.73

Sources: National authorities; European Commission; bank reports; S&P Market Intelligence, IMF staff estimates.

Note: This table shows the results of regressing the evolving government holdings in a bank on bank characteristics and country conditions. Big banks are those with more than $50 billion in total assets. The government holdings and initial intervention are computed as the winsorized total public holdings of equity, hybrid instruments, and debt divided by the bank's total equity. Capitalization is measured by Tier 1 ratio or, alternatively, by total capital ratio. Liquidity is measured by the ratio of liquid assets to total assets. Profitability is measured by return on assets or, alternatively, by net interest margin. Asset quality is measured by the ratio of problem loans to gross customer loans. All bank-level variables are lagged by one year. All regressions include bank and year fixed effects. Robust standard errors are clustered at the country level.

Table 7. Public Asset Holdings and Bank/Country Conditions: Small/Medium Banks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bank variables							
Capitalization							
Tier 1	-0.13***						
	[0.03]						
Equity/assets		-0.01					-0.02
		[0.04]					[0.05]
Liquidity							
Liquid/total assets			-0.07***				-0.07***
			[0.02]				[0.01]
Profitability							
ROAA				-1.29***			-1.37***
				[0.18]			[0.19]
NIM					-1.85***		
					[0.09]		
Asset quality							
NPL						0.19	0.15
						[0.15]	[0.13]
Size							
Total assets, log	3.92***	4.63***	4.54***	4.39***	4.07***	4.32***	5.42***
	[0.16]	[0.11]	[0.14]	[0.70]	[0.13]	[0.12]	[0.17]
Initial intervention	0.80***	0.81***	0.80***	0.82***	0.80***	0.77***	0.79***
	[0.07]	[0.07]	[0.06]	[0.07]	[0.06]	[0.06]	[0.06]
Country variables							
GDP growth	-0.11	-0.03	-0.03	0.13	-0.01	0.34*	0.29
	[0.16]	[0.21]	[0.26]	[0.17]	[0.22]	[0.17]	[0.18]
Credit growth	-0.43**	-0.45**	-0.44*	-0.24	-0.54**	-0.50**	-0.02
	[0.18]	[0.19]	[0.20]	[0.20]	[0.23]	[0.22]	[0.10]
Inflation	-1.82*	-2.64**	-2.46*	-2.14**	-2.32**	-1.64*	-1.63*
	[0.82]	[1.01]	[1.09]	[0.86]	[0.95]	[0.85]	[0.86]
Unemployment	0.67	0.80	0.72	0.31	0.09	0.28	0.67
	[0.64]	[0.78]	[0.69]	[0.66]	[0.56]	[0.54]	[0.54]
Public debt	-0.22	-0.29	-0.20	-0.35*	-0.29*	-0.34**	-0.18
	[0.14]	[0.16]	[0.14]	[0.16]	[0.14]	[0.12]	[0.12]
Policy rate	1.45**	1.94**	1.53**	2.06***	2.17***	2.83**	1.67**
	[0.48]	[0.61]	[0.62]	[0.58]	[0.57]	[0.96]	[0.73]
Financial stress index	-0.18	-0.28	-0.38	-0.01	-0.01	0.21	-0.09
	[0.13]	[0.16]	[0.32]	[0.13]	[0.12]	[0.23]	[0.30]
Observations	2,480	2,788	2,730	2,796	2,772	2,640	2,563
R^2	0.72	0.71	0.72	0.72	0.71	0.71	0.73

Sources: National authorities; European Commission; bank reports; S&P Market Intelligence, IMF staff estimates.

Note: This table shows the results of regressing the evolving government holdings in small and medium-sized banks on bank characteristics and country conditions. Small and medium-sized banks are those with less than $50 billion in total assets. The government holdings and initial intervention are computed as the winsorized total public holdings of equity, hybrid instruments, and debt divided by the bank's total equity. Capitalization is measured by Tier 1 ratio or, alternatively, by total capital ratio. Liquidity is measured by the ratio of liquid assets to total assets. Profitability is measured by return on assets or, alternatively, by net interest margin. Asset quality is measured by the ratio of problem loans to gross customer loans. All bank-level variables are lagged by one year. All regressions include bank and year fixed effects. Robust standard errors are clustered at the country level.

B. Pace of Intervention, Recovery, and Instruments

Country experiences differed widely by date of intervention and speed of resolution. The scale of the interventions differed markedly—we group countries into four categories: large, medium, small, and minimal interventionists (Figure 5).[21] But even within each of the groups, the speed of interventions and resolutions was different. For example, interventions in the United States, Denmark, and Ireland reached their peak level shortly after the start of interventions and gradually declined thereafter. In other countries, interventions started modestly but later increased in size.[22]

The difference may be attributable to the fact that some of these countries were hit twice: first by the GFC, and later by the euro area crisis and, in some cases, more idiosyncratic national crises. The patterns observed in Cyprus, Greece, Italy, and Portugal particularly fit this more complex narrative. The divestment or recovery of the interventions also follows different paths. In several countries, the government stake starts dwindling within a year after the initial intervention and is almost entirely unwound by the fourth or fifth year. For instance, in the United States, nearly all funds for recapitalization provided through the TARP were repaid as early as 2013. In other countries, divestment stops or slows down after a few years. As a result, substantial public stakes remain even after a decade. For instance, in the United Kingdom, some £20 billion remained outstanding at end-2017, primarily in the form of a 71 percent stake in Royal Bank of Scotland.

Slow recovery of provided support is associated with worse macroeconomic outcomes. We relate the divestment patterns underlying the remaining asset holdings to country-level macro-financial conditions. Notably, we see that relatively small unwinding of the government stake—defined as below-median recovery of assets as of 2017—is associated with lower private investment growth and lower bank credit growth (Figure 6), and to a lesser extent with lower overall GDP growth.[23]

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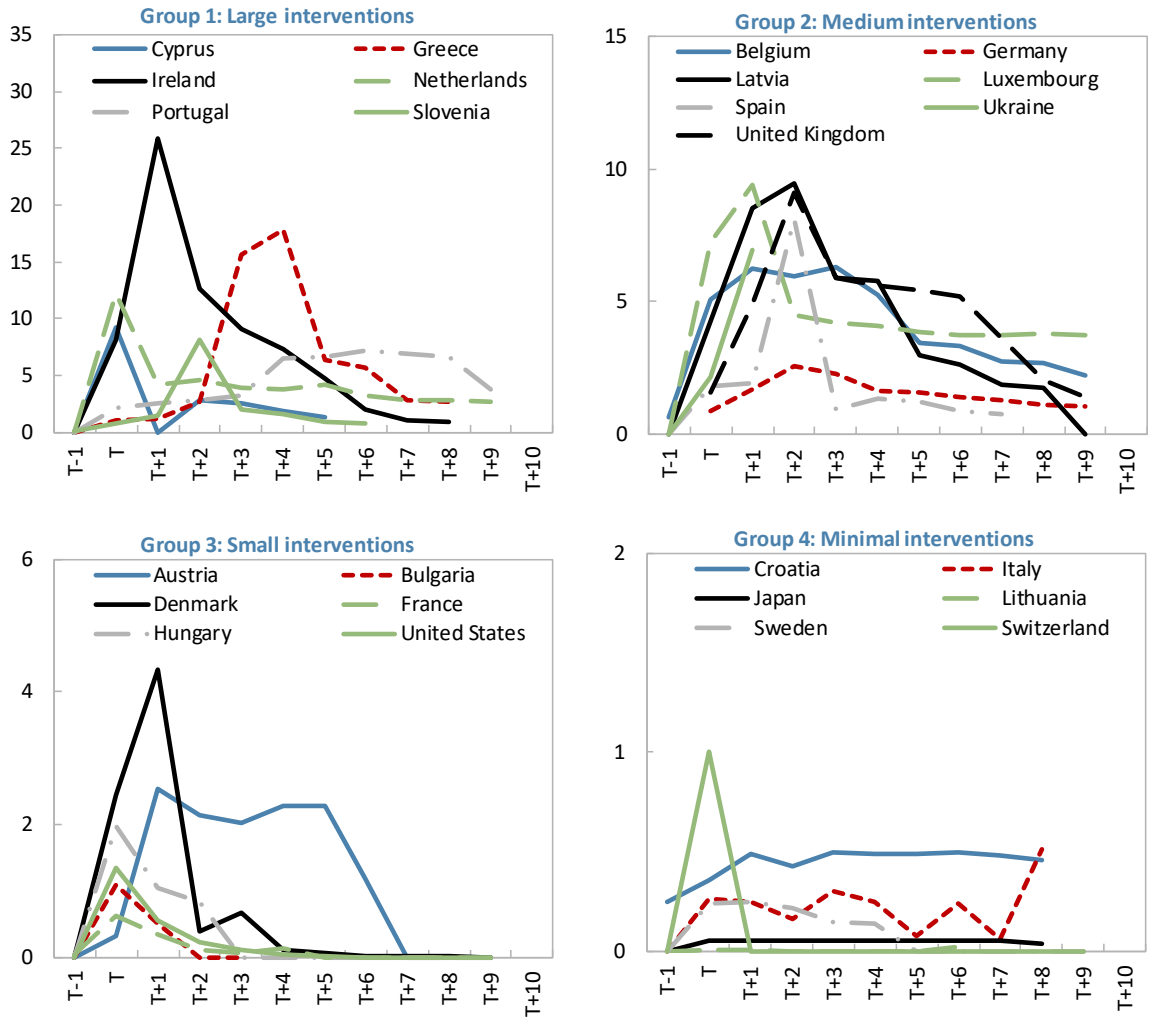
[21] Gross direct interventions are categorized as large if they exceed 10 percent of 2017 GDP, medium if they are between 4 and 10 percent, small if between 1 and 4 percent, and minimal if below 1 percent.

[22] One concern is that the patterns of unwinding may reflect valuation losses since the government stake is expressed in market value whenever such information is available (that is, when the intervened bank is and continue to be publicly traded). To address this, we re-do Figure 5 with total value of the equity in the intervened banks instead of GDP in the denominator. The picture remains broadly the same.

[23] We group countries based on how much reduction they have achieved in their public holdings of equity in the banks that were intervened. The documented associations are not about the level of government ownership but rather about the change in the level of government stake from its peak.

Figure 5. Bank Liabilities in Public Hands

(2007–17; in percent of GDP)

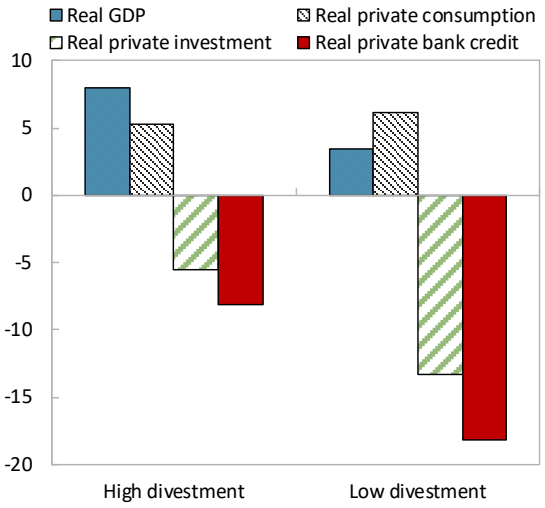


Sources: National authorities; European Commission; bank reports; IMF staff estimates.

Note: This figure shows the evolution of public holdings in banks that received public support since the GFC as a percent of GDP. T is the country-specific date of first intervention in either equity shares, hybrid securities, or debt instruments. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

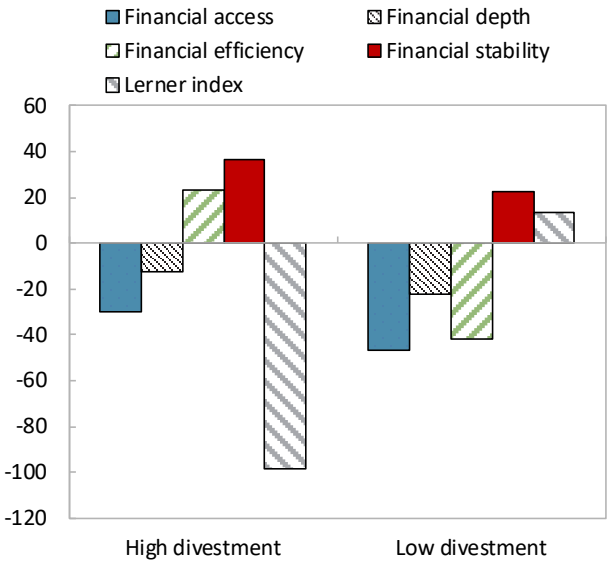
Furthermore, in countries with slow recovery we also observe deterioration in financial access, depth, efficiency, and competition, while the improvement in financial stability is not as pronounced as in countries where the public stake has been reduced more swiftly (Figure 7). As before, these patterns do not prove causality.

Figure 6. Divestment and Macroeconomic Aggregates



Sources: IMF World Economic Outlook, Haver Analytics, IMF staff calculations.
Note: This figure shows the cumulative percent change in macroeconomic variables between 2008 and 2017 across country groups that differ by the divestment rate of public stakes in banks which received public support since 2008. A country has a high[low] divestment rate if it experienced above- [below-] average drops in public holdings between the peak holdings and 2017. Private investment is measured as the gross fixed capital formation. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

Figure 7. Divestment and Financial System Characteristics

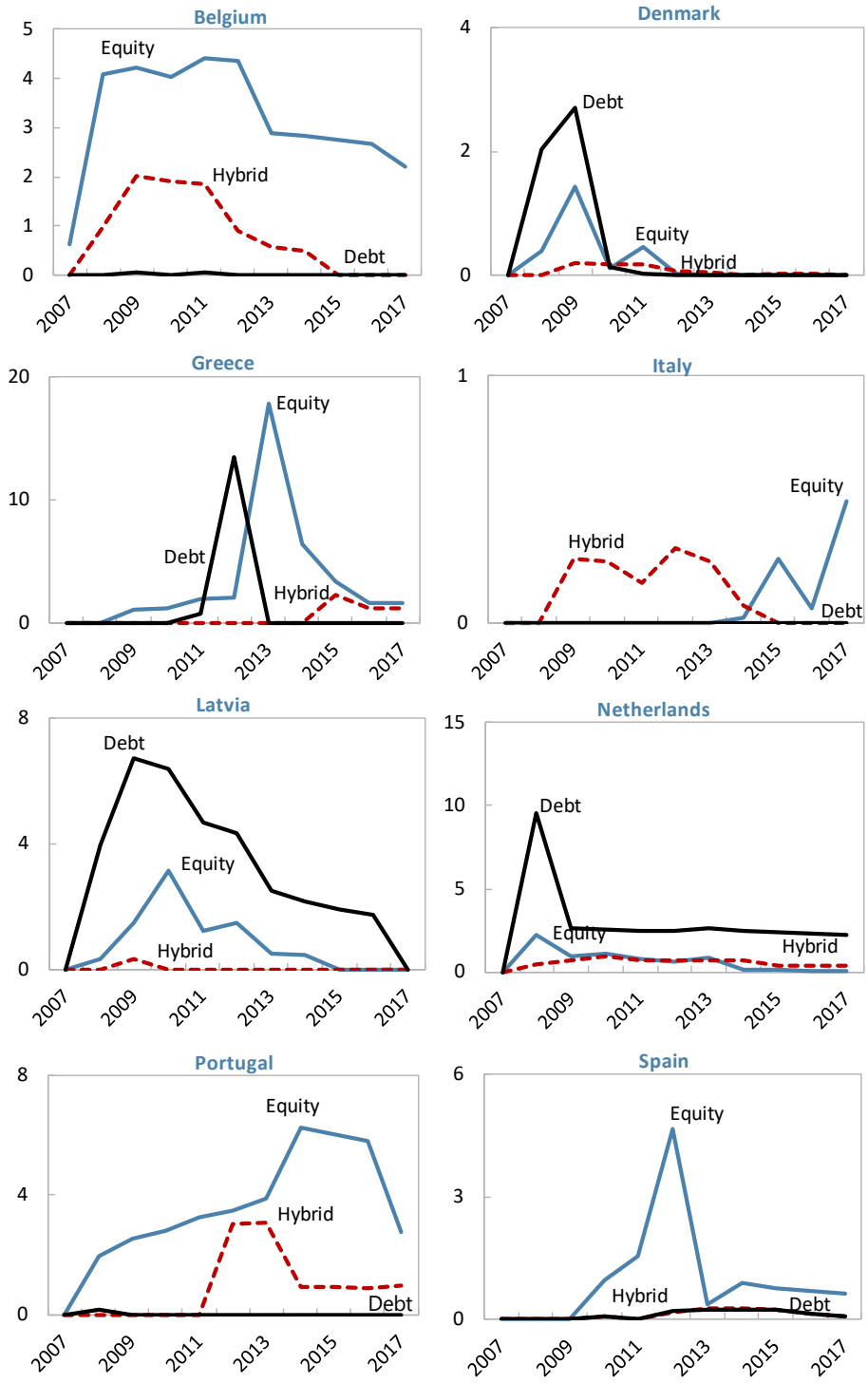


Sources: World Bank Global Financial Development Database, IMF staff calculations.
Note: This figure shows the cumulative percent change in structural variables between 2008 and 2016 across country groups that differ by the divestment rate of public stakes in banks which received public support since 2008. A country has a high [low] divestment rate if it experienced above- [below-] average drops in public holdings between the peak holdings and 2017. Except for the Lerner index, the cumulative percent change in each structural variable is calculated as the average of several structural indicator changes. Financial access is bank branches per 100,000 adults. Financial depth includes five indicators: private credit by deposit-money banks [DMBs] to GDP; DMBs' assets to GDP; nonlife insurance premium volume to GDP; private credit by DMBs and other financial institutions to GDP; and domestic credit to the private sector. Financial efficiency includes seven indicators: bank net interest margin; bank overhead costs to total assets; bank return on assets after tax; bank return on equity after tax; bank return on assets before tax; bank return on equity before tax; and credit to government and state-owned enterprises. Financial stability includes two indicators: bank regulatory capital to risk-weighted assets and liquid assets to deposits and short-term funding. Calculations are as of 2016 because a later update was not available at the time of calculation except for the Lerner index, which was calculated as of 2014. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

Unwinding equity (and hybrid) stakes takes longer than unwinding debt instruments (Figure 8). This could simply be due to the nature of the instrument, with debt contracts having a well-defined maturity. It could also be a reflection of the challenge in finding the right time to put an acquired equity stake on the market. It is worth noting that the initial choice of the instrument is likely endogenous and could be indicative of the nature or severity of the problems in the intervened bank. For instance, authorities may believe equity stakes are needed because of deep-rooted managerial quality issues that require more time to fix.

Figure 8. Direct Holdings by Instrument Pecking Order

(2007–17; in percent of GDP)



Sources: National authorities; European Commission; bank reports; IMF staff estimates.

Note: This figure shows the evolution of public holdings of bank equity shares, hybrid instruments, and debt securities in countries that have used all three types of interventions since the GFC as a percent of GDP. Data reflect the available information as of April 2018.

IV. Other Aspects of Interventions: Impaired Assets and Indirect Costs

Country-level data from official sources provide complementary information on the fiscal costs associated with gross direct interventions and confirm our findings. The bank-level data in Sections II and III do not include all components of the impact of direct interventions on public finances. For instance, they do not capture the revenue and expenditure streams associated with government assets holdings. Moreover, while the bank-level dataset allows us to assess the remaining public holdings of individual financial institutions, it does not include public holdings of impaired assets, therefore potentially underestimating total public holdings of banking assets due to GFC interventions. To address these concerns, we turn to official data at the country level to complement the dataset developed in the earlier sections of this paper. These data are available on a consistent basis for a narrower set of countries, namely those in the European Union and the United States.

We collect this information from several sources. For the European Union countries, we examine Eurostat's Excessive Deficit Procedure (EDP) Supplementary Tables and European System of Central Bank's (ESCB) Financial Assistance Measures (FAM) Tables (as of April 2018). For the United States, detailed information is available on the TARP, but less is known on, for instance, the public asset holdings and revenue/expenditure streams resulting from the Treasury conservatorship of Fannie Mae and Freddie Mac. Therefore, the following sections present data solely on TARP.[24]

A. Current Asset Holdings Including Impaired Assets

An assessment of the remaining public asset holdings in the financial sector should include impaired assets that were transferred onto the general government balance sheet. Such transfers

[24] Based on reports available from the Department of the Treasury and the Federal Housing Finance Agency (FHFA), total gross financial support in our sample increases by $412 billion (at end-2018) once we include the Purchase Programs for GSE and Mortgage-Related Securities and the Senior Preferred Stock Purchase Agreement of Fannie Mae and Freddie Mac. The revenue flows resulting from these agreements have been substantial. For instance, revenue from draws on Treasury commitments to Fannie Mae and Freddie Mac under the second program amounted to about 1.5 percent of GDP by end-2018 (https://www.fhfa.gov/DataTools/Downloads/Pages/Treasury-and-Federal-Reserve-Purchase-Programs-for-GSE-and-Mortgage-Related-Securities.aspx).

do not show in our bank-level dataset. [25] At the country level, however, aggregate data on the acquisition and disposal of impaired assets are available. Accordingly, a country-level approach is appropriate to investigate the overall impact of interventions and subsequent divestments on governments' balance sheets.

The country-level data confirm the bank-level data for equity, debt, and hybrid instruments. (Figure A3–A5 in the Appendix). In addition, the country-level data provide information on impaired assets that were purchased by the government and subsequently reclassified into general government balance sheets. For instance, the data reveal that Austria, Germany, and Slovenia still hold sizable impaired assets in excess of 4 percent of 2017 GDP (Figure 9). Including these distressed assets, total financial asset holdings that remain on government balance sheets are currently worth some $356 billion for European countries (Table 8, column D).[26]

B. Fiscal Impact of Direct Interventions

Aggregate country-level data broadly confirm individual bank data on gross direct interventions and divestment. Even with the methodological difference in data compilation, the average difference in gross direct interventions between the two datasets is about half a percent of 2017 GDP (Appendix III).

The country-level data provide further interesting insights. First, recovery has been uneven across countries. Only a few governments have fully unwound their involvement in the financial sector through asset sales and loan repayments. Denmark, France, Hungary, Lithuania, and the Netherlands recovered more than 80 percent of the gross direct interventions cumulatively over

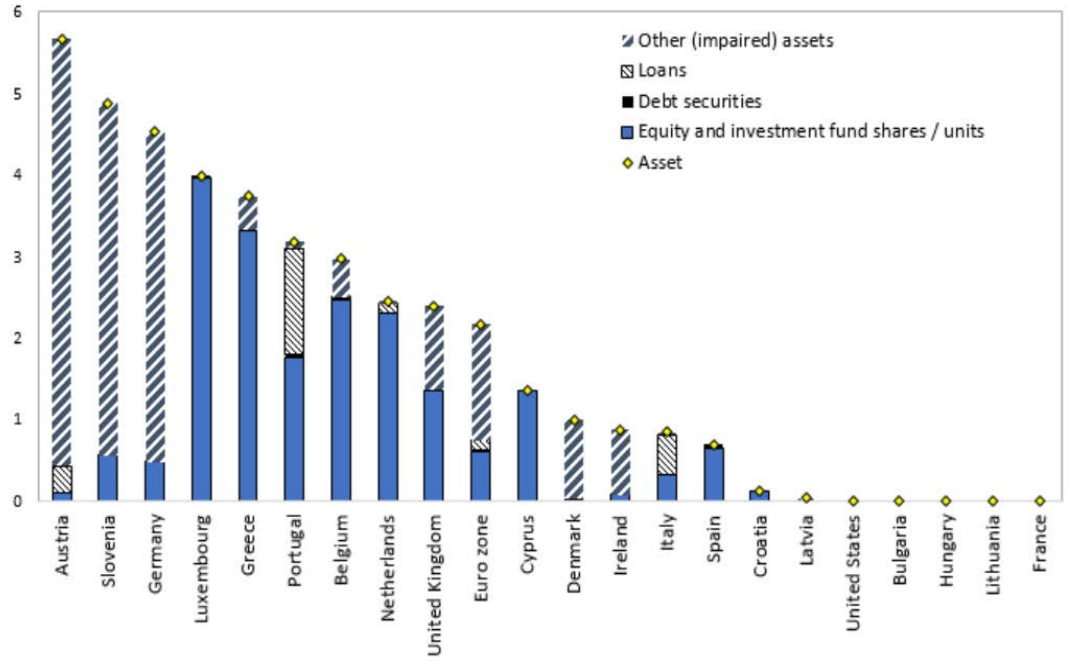
[25] In particular, the lack of available data on these asset management vehicles and their often-complex ownership structures complicate attempts to value the assets they manage, and the profits accrued from any asset sales.

[26] The current holdings of financial assets are estimated at nominal value, except for ordinary shares which are estimated at market value. Therefore, given that it is unlikely that a potential sale of these financial assets would take place exactly at current valuations, subsequent columns in Table 8 must be interpreted with caution.

2007–17. In contrast, among the countries with large interventions, recovery stood well below 20 percent in Cyprus and Portugal over the same period.[27,28]

Figure 9. Asset Holdings by Instrument

(2007–17; in percent of 2017 GDP)



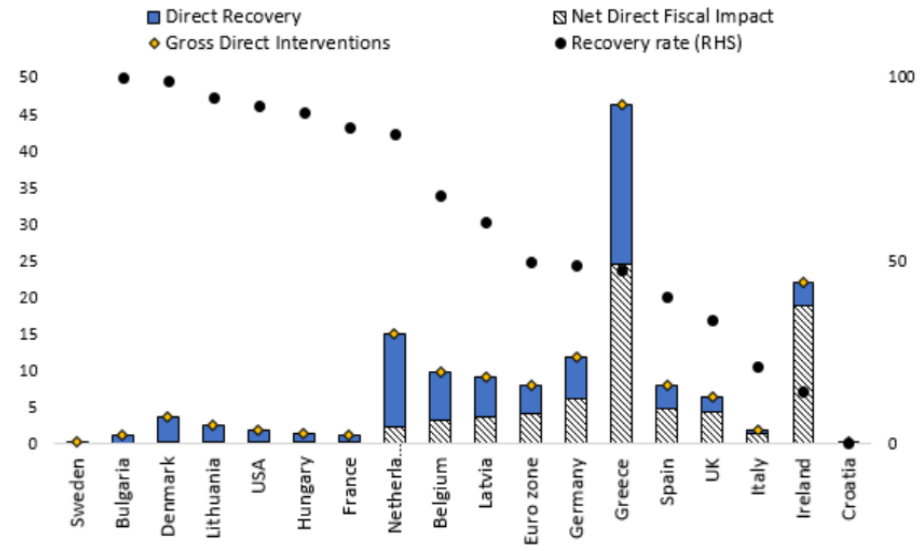
Sources: National authorities; Eurostat; TARP and IMF staff estimates. Data vintage: April 2018.
Note: This figure shows asset holdings by instrument in selected economies as of 2017, expressed as a percent of 2017 GDP. Instruments include equity and investment funds shares/units, debt securities, loans, and other assets. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

[27] Country-level (flow) data on gross direct interventions and their recovery for Austria, Luxembourg, and Slovenia are not public and were not made available for this study. Country-level (flow) data on gross direct interventions, their recovery, net indirect and total costs for Ireland were made available for this study but are not public. For these countries, all macro-level data are based on Eurostat EDP Supplementary Tables. Data for Cyprus are estimated based on ECSB and Eurostat data. Euro area and European Union aggregate data, however, do include these countries. Numbers for individual eurozone countries do not necessarily add up to the total eurozone numbers given, for instance, valuation changes in countries for which the data were not provided for the purpose of this study.

[28] Since end-2017, Cyprus has liquidated several banks. The recovery rate shown does not take this into account as the cutoff date for our dataset is end-2017.

Figure 10. Recovery Rate

(2007–17; in percent of 2017 GDP and in percent on RHS)



Sources: National authorities; ECB; Eurostat; and IMF staff estimates. Data vintage: April 2018.
Note: This figure shows the gross direct interventions, the direct recovery, the net direct fiscal impact [[+] indicates a positive fiscal cost; [-] indicates a negative fiscal cost (gain)], and the recovery rate in selected economies as of 2017. The first three measures are expressed as a percent of 2017 GDP. Recovery rate is the percent ratio of direct recovery [column B of Table A1 in Appendix II] to gross direct interventions [column A]. A higher ratio is associated with larger recovery of the government support provided to financial institutions. The recovery rate for Sweden is 297 percent and is not shown. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

Second, the net direct fiscal impact—the difference between gross direct interventions and direct recovery—is just below $0.7 trillion (Table 8, column C), equivalent to some 2 percent of 2017 GDP. Net direct fiscal impact is the highest for Greece and Cyprus (Figure 10). After subtracting remaining asset holdings, the net fiscal impact drops to below 1 percent of 2017 GDP (Table 8, column E).

Table 8. Fiscal Impact of Government Interventions in the Financial Sector

	Gross Direct Interventions [A]	Direct Recovery [B]	Net Direct Fiscal Impact [C=A-B]	2017 Financial Asset Holdings [D]	Net Direct Fiscal Impact minus Asset Holdings [E=C-D]	Indirect Fiscal Impact [F]	Total Fiscal Impact[G=E+F]
USD billions	1,615	935	680	356	324	-75	250
Eurozone	1,062	527	535	287	249	-23	225
United States [TARP]	361	332	29	0	29	-41	-13
Non-Eurozone EU	192	76	116	69	47	-10	37
Percent of GDP	4.5	2.6	1.9	1	0.9	-0.2	0.7

Sources: National authorities; ESCB; Eurostat; TARP; IMF staff estimates. Data vintage: April 2018.

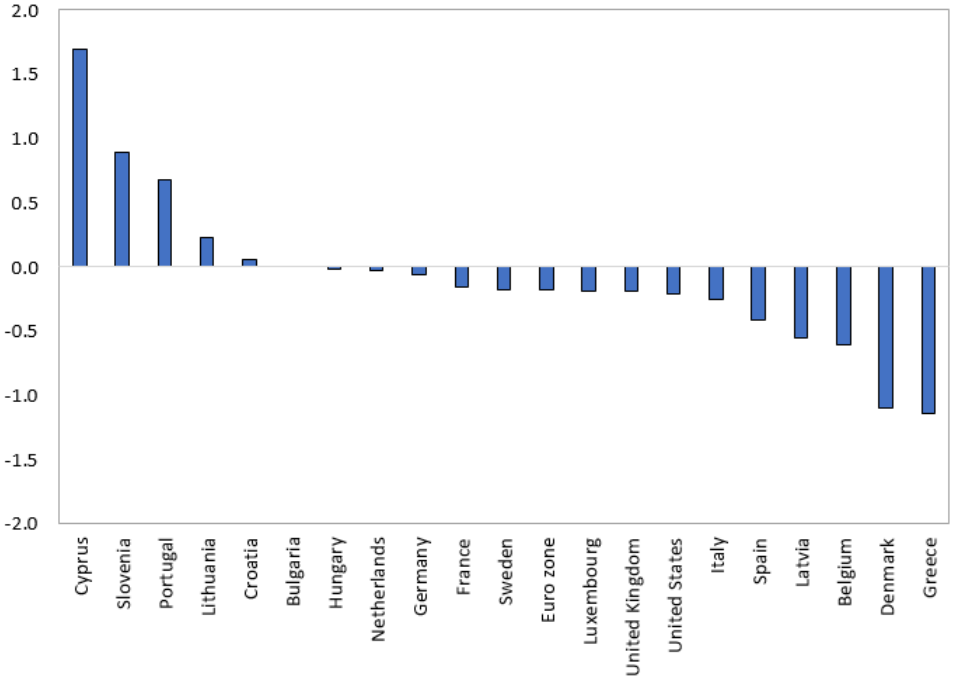
Note: [+] indicates a positive fiscal cost; [-] indicates a negative fiscal cost (gain). This table shows the gross direct interventions, the direct recovery, the net direct fiscal impact, the financial asset holdings of governments as of 2017, the indirect fiscal impact, and the total fiscal impact in current billion USDs [end-of-period] and as a [weighted average] percent of 2017 GDP in the full sample of 29 countries. It also shows these measures separately for the Eurozone, the United States, and the non-Eurozone EU in current billion USDs. Data are cumulative from the beginning of the GFC in 2007 until the latest available data at end-2017 and do not include forthcoming support or redemptions. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

Third, cumulatively over a decade, the net indirect benefits amounted on average to 0.2 percent of 2017 GDP (Table 8, column F). These benefits have resulted from higher revenue than expenditure streams from public asset holdings (ECB 2016). Such revenues include, for instance, received dividends and fees, while expenditures include interest payments on debt issued to finance the government's support of financial institutions. For many governments the indirect fiscal impact has been positive in net terms (e.g., Greece and Denmark—see Figure 11), while others have incurred net costs over the last decade (e.g., Cyprus, Slovenia, and Portugal).[29] Taking account of these indirect benefits lowers the total fiscal impact of interventions to some $250 billion or an average 0.7 percent of 2017 GDP (Table 8, column G).

[29] Subsequent revenue and expenditure streams once assets are reclassified into the general government are not captured in the existing European frameworks. Therefore, the full indirect fiscal impact is difficult to estimate. For instance, repayments from the British defeasance structures set up for Northern Rock and Bradford & Bingley, which were both reclassified into the general government after their failure, have amounted to £37.7 billion and significantly reduced the total fiscal impact of gross direct interventions. But because such repayments are within-government and do not affect the general government debt nor deficit, they are not included in either the ECB or the Eurostat data.

Figure 11. Indirect Fiscal Impact of Government Interventions

(2007–17; in percent of 2017 GDP)



Sources: National authorities; Eurostat; ECB; IMF staff estimates. Data vintage: April 2018.

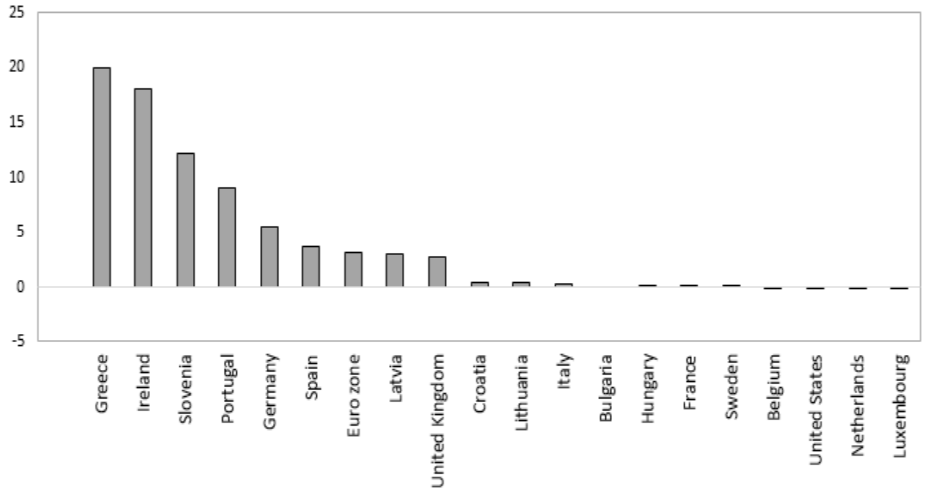
Note: This figure shows the indirect fiscal impact of government interventions as a percent of 2017 GDP. Data is from column F of Table A1 in Appendix II. [+] indicate a positive fiscal cost; [-] indicates a negative fiscal cost [i.e., gain]. For details on the fiscal impact of financial interventions for Austria, please refer to Eurostat EDP tables and Holler and Reiss (2017). Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

Putting all components (gross direct interventions, direct recovery, remaining asset holdings, and indirect impact) together, Figure 12 shows the total fiscal impact across our sample. The total impact varies widely across countries. It is near 20 percent of 2017 GDP in Greece and Cyprus, 12 percent in Slovenia, and 9 percent in Portugal. Other countries saw total costs of 5 percent of 2017 GDP or less, with 11 countries exhibiting total costs of below 1 percent of 2017 GDP or even small gains.[30]

[30] For more information on the fiscal impact of direct interventions on government debt, please see Box 1.

Figure 12. Total Fiscal Impact of Government Interventions

(2017; in percent of GDP)



Sources: National authorities; Eurostat; and IMF staff estimates. Data vintage: April 2018.
Note: This figure shows the total fiscal impact of government interventions as a percent of 2017 GDP. Data is from column G of Table A1 in Appendix II. [+] indicate a positive fiscal cost; [-] indicates a negative fiscal cost [i.e., gain]. For details on the fiscal impact of financial interventions for Austria, please refer to Eurostat EDP tables and Holler and Reiss [2017]. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

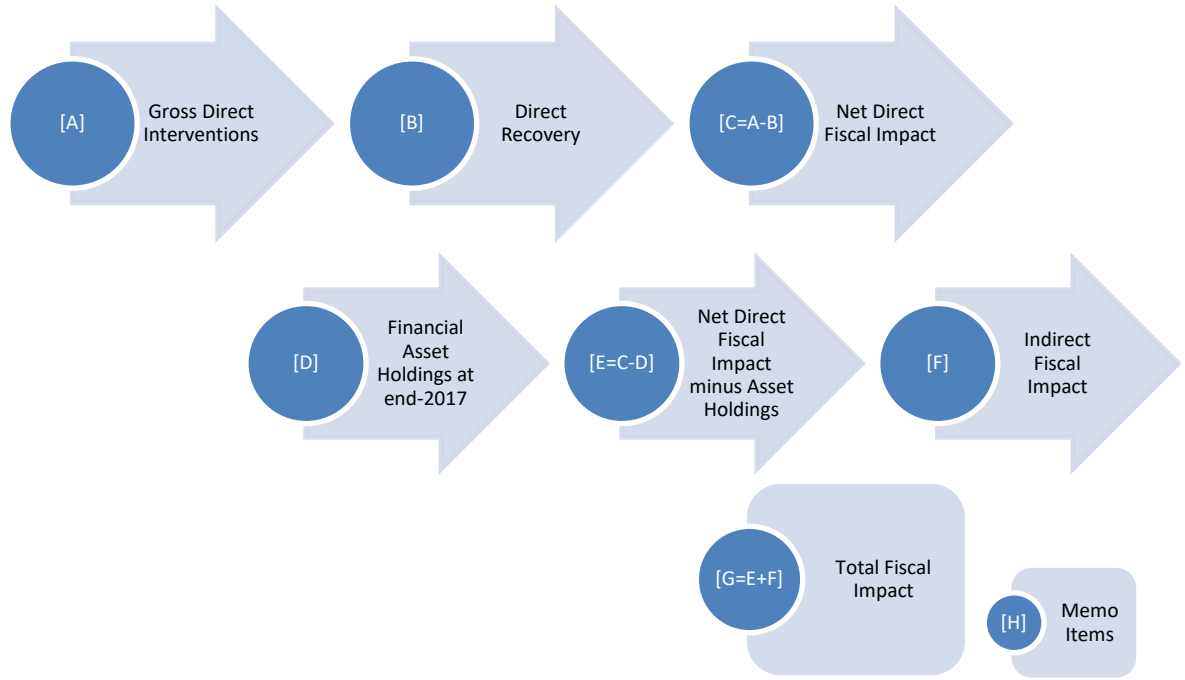
Note that our dataset and analyses have exclusively focused on direct government interventions and the stake the government has taken in banks as a result. In some cases, the size of government interventions was reduced by means of private sector burden sharing or bail-in (e.g., in Portugal and Slovenia; see Dell'Ariccia et al., 2018, for further information and references). The fiscal cost of public interventions would have been even larger in the absence of bail-ins in the cases where burden sharing has been achieved (e.g., converting to equity or writing off debt holders). This is particularly relevant for future crises, given the fact that the reformed resolution frameworks would resort more to such procedures to resolve distressed banks.

Box 1. Linking Direct Interventions to Public Finances

The approach adopted in this paper ('approach A') and summarized in Table 8 shows the build-up and unwinding of gross direct interventions. It takes stock of intervened financial assets remaining in government hands at end-2017 and assesses the fiscal impact on government finances at end-2017. This approach complements the conventional view on the impact of direct interventions on the general government budget balance and debt ('approach B'). Sparing some differences in statistical conventions, reclassifications, and valuation changes, this box aims to illustrate the differences and similarities of the two approaches.

Figure 1.1. Direct Interventions and Public Finances

Approach A, as applied in Table 8



Approach B: the conventional approach

Differences

- Approach A records each intervention as a fiscal impact [A] and 'traces' the recovery [B] of direct support to assess the net fiscal impact.
- Under approach B, each intervention that results in a transfer of cash to a financial institution—irrespective of its financing source—is recorded as an impact on government debt.

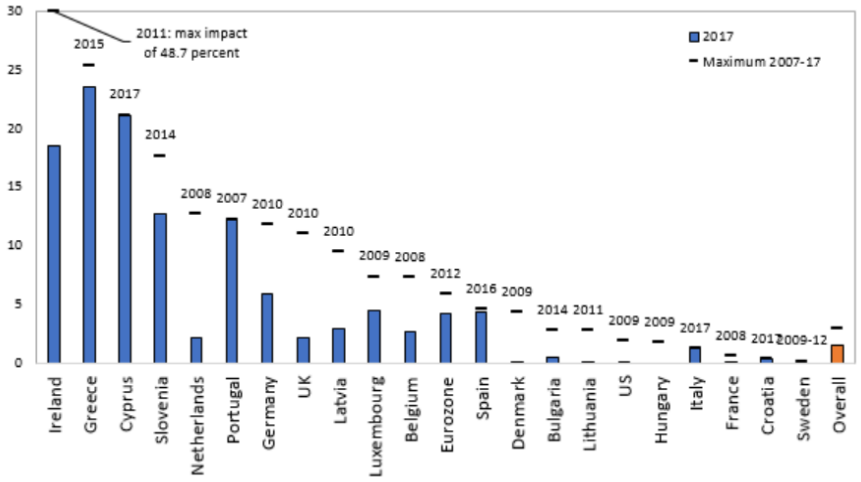
Box 1. Linking Direct Interventions to Public Finances (cont'd)

Similarities

- The net acquisition of financial assets at end-2017 [D'] under approach B is equal to end-2017 asset holdings [D] under approach A.
- The net direct and indirect fiscal impacts [C+F] under approach A is similar to cumulative impact on budget balances [G'] under approach B.
- In both approaches, if the intervention is financed through means other than debt issuance (e.g., the use of cash balances or the sale of other assets), a correction is made in the memo items [H; I].

Figure 1.2 displays the impact of direct interventions on the general government debt at the peak of the interventions and at end-2017, based on data from the April 2018 EDP Supplementary Tables. The peak impact reveals that the largest debt increases—i.e., the largest financing needs—were recorded in Ireland, Greece, and Cyprus. In contrast, Sweden, Croatia, and France saw only marginal effects. Comparing peak impact with end-2017, we see that Ireland, the Netherlands, and the United Kingdom recorded more significant debt reductions. Other countries, such as Cyprus, Portugal, and Spain, have yet to see more than marginal decreases in their liabilities.

Figure 1.2. Impact of Direct Interventions on Government Liabilities
(2007-17; in percent of GDP)



Sources: National authorities, ESCB, Eurostat, and IMF staff estimates. Data vintage: April 2018.
Note: This figure shows the maximum and current impact of direct interventions on government liabilities for selected economies, expressed as a percent of 2017 GDP. Data are taken at closing balance sheets. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States. For Bulgaria, data includes the assistance to the Deposit Guarantee Fund not related to the Financial Crises (source: Bulgarian National Bank)

Box 2. Fiscal Impact: Stock-Flow vs. Cash-Flow Approaches[1/]

The *stock-flow* approach adopted in this paper differs from *cash-flow* methods used, for instance, by Laeven and Valencia (2008, 2013, 2018). The main differences are threefold:

Asset holdings. Both approaches account for the total amount of public support provided through direct interventions. The *stock-flow* approach allows disentangling the price paid for the acquisition of the assets at the time of their purchase from capital transfers, when the price paid was above market value, whereas the *cash-flow* method does not distinguish the two. The *stock-flow* approach also accounts for valuation changes of equity holdings. The net direct fiscal impact under the *stock-flow* approach and the net fiscal cost under the *cash-flow* approach are conceptually computed in the same way. Both methods subtract from the gross fiscal costs any subsequent recoveries and asset sales and loan repayments.

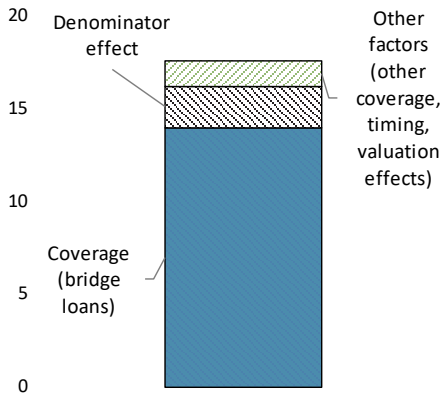
Coverage. Both approaches cover interventions related to purchases of financial assets (equity, loans, impaired assets), exercised public guarantees, and debt assumption/cancellation. The methods differ mainly in terms of the coverage of other measures and country-specific interventions (see below). Moreover, the *cash-flow* approach includes operating costs of agencies or entities such as asset management companies as well as any other fiscal cash outlay directly attributable to the rescue of financial institutions. The *stock-flow* approach considers liquidity support to financial institutions and defeasance structures but does not necessarily include the operating costs of these structures if such costs are not reported in the EDP or FAM tables. Also, the *stock-flow* approach captures the repayment of liquidity support from defeasance structures to the government. Neither method accounts for post-intervention revenue and expenditure flows among and within government entities.

Timing. Our *stock-flow* approach examines the fiscal impact of direct financial interventions since the start of the GFC in 2007 and uses end-of-period (2017) exchange rates and GDP. In contrast, Laeven and Valencia consider cash flows in domestic currency, normalized by nominal GDP of the year in which the cash flow occurred.

While country-by-country details vary, the example below illustrates how the methodological differences affect the assessment of the fiscal impact of interventions for Greece. Total fiscal impact in the *stock-flow* approach is closest to the Laeven-Valencia net fiscal cost concept. The difference in this number between the two approaches amounts to some

Figure 2.1. Greece: Differences between Gross Direct Interventions and Gross Fiscal Costs

(in ppt of GDP)



2.4 percentage points of GDP (Table 2.1). The gross direct interventions and the Laeven-Valencia gross fiscal costs show a difference of 17.6 percentage point of GDP. The Spring 2012 bridge recapitalization loans that were converted into ordinary equity the following year explain most (80 percent) of this difference (Figure 2.1).[2] The denominator effect accounts for 13 percent while different timing of transition recording and other factors explain the remaining 7 percent.

Table 2.1. Fiscal Impact of Direct Interventions in Greece: Stock-Flow vs. Cash-Flow Approaches

Stock-flow country-level approach (2007-17; in percent of 2017 GDP)		Laeven and Valencia *cash-flow* approach (2008-16)	
Gross Direct Interventions	Total Net Fiscal Impact	Gross Fiscal Costs	Net Fiscal Costs
46.3	19.5	28.7	17.1

Sources: National authorities; ESCB; Eurostat; IMF staff estimates.

[1/] Prepared with input from Fabian Valencia.

[2/] To ensure the consistent treatment of interventions between the financial accounts and EDP supplementary tables, the Greek recapitalizations of viable banks in 2012 and 2013 have been treated as one transaction since April 2019. A similar treatment has been adopted by Laeven and Valencia.

V. CONCLUSIONS

This paper presents a new dataset on public interventions in the financial sector since the global financial crisis. Through these data, we track both gross interventions and recovery in over 1,100 individual financial institutions across 37 countries. The dataset is validated against aggregate country level data. As the latter include impaired assets on government balance sheets and revenue and expenditure streams from public asset holdings, we are able to assess the total fiscal impact of public interventions in the financial sector.

This effort contributes to greater transparency in recording the fiscal implications of financial sector support. Nevertheless, data availability and transparency remain issues in many countries. Data are often not easily accessible and inconsistent across countries, or, in some cases remain confidential even a decade after the onset of the crisis. Such practices hinder the evaluation of crisis intervention and resolution measures. We hope this paper will advance the discussion on data availability, transparency, and accountability.

Going forward, we aim to build on these datasets to provide more in-depth analysis of public interventions. Some interesting questions we plan to examine revolve around the interaction between bank size and government interventions, the macro-financial environment's effect on recovery and divestment rates, the factors underlying the choice of deploying different instruments in asset purchases, and the long-term consequences of government interventions in the financial sector including on growth, stability, and market structure.

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APPENDIX I. CONSTRUCTING THE BANK-LEVEL DATASET

Methodological Challenges

The collection of these data on divestment and remaining public stakes is challenging. First, numerous banks that existed in 2007 ceased operations during the crisis. Some banks were acquired by governments (e.g., Heritable Bank plc), some were sold to other financial institutions (e.g., Banco de Valencia), and some were split into a good bank and a bad bank (e.g., Parex Banka). In these cases, we track the gross interventions until the formal announcement of the cease of operations. If public information on the unwinding of support is unavailable, we assume no direct recovery of this support and accumulate it until the formal announcement date. These cases are further complicated if the gross financial support received by the failing bank had still not been fully repaid at the time of the resolution and was subsequently transferred to the acquiring entity. If the latter is a public entity, we cease tracking the repayment of the intervention as such a repayment would then occur between governmental entities. For instance, this is the case of Bradford & Bingley, which was transferred to UK Asset Resolution Limited in October 2010. If the acquiring entity is private, we track the public stake holding until its repayment. This is the case of Banca Cívica Group, for instance, when it was acquired by Caixabank in March 2012.

Second, the treatment of some interventions in banks' annual reports is not straightforward to decipher. For instance, Allied Irish Bank received a capital contribution of €6.1 billion on July 28, 2011—but merely a single line of the bank's 457-page 2011 annual report alludes to the fact that this is a capital contribution, in noting that the authorities have no "entitlement to seek repayment of these capital contributions." Furthermore, the accounting treatment of equity recapitalizations differs across banks. While most banks recorded a corresponding increase in the bank's share capital, some banks split the recapitalization between the share capital and the share premium. Our recording of these interventions necessitated dealing with these peculiarities consistently across all 1,114 financial institutions.

Third, the ownership structures of public entities complicate our analysis. In some cases, the state became a direct stakeholder. In other cases, state-controlled entities were used. For instance, in September 2008, the Belgian authorities recapitalized Dexia not only directly, but also indirectly by contributing capital through three public-owned entities: Holding Communal SA, Acrofin SCRL, and Ethias. Similarly, whereas the direct French intervention into Dexia was managed by the Agence des Participations de l'Etat, the French authorities also contributed capital indirectly through the Caisse des Dépôts et Consignation and CNP Assurances. Similarly, the Irish authorities recapitalized their banking sector in part through the National Pensions Reserve Fund Commission. Tracking public holdings across time, therefore, requires careful consideration of all the shareholders of a bank, as public interventions might be channeled through entities other than treasury departments or finance ministries.

Case-by-Case Summaries

Australia

Australian banks did not receive any outright public intervention in the aftermath of the crisis. The authorities supported the financial system by introducing a retail deposit insurance scheme, guaranteeing wholesale bank debt issuance, and purchasing portfolios of residential mortgage-backed securities from Australian lenders. The Reserve Bank also supported the financial system's liquidity by expanding the range of securities that qualified as eligible collateral for open-market operations to include bank debt and AAA-rated tranches of securitizations. In addition, the authorities employed both monetary and fiscal policy to support the economy.

Austria

The Austrian sample covers Hypo Group Alpe Adria, Raiffeisen Zentralbank Österreich, Landes-Hypothekenbank Steiermark, Hypo Tirol, Österreichische Volksbanken, BAWAG, and Kommunalkredit.

The Austrian authorities first recapitalized Hypo Group Alpe Adria (HGAA) in December 2008 with €900 million in *Partizipationskapital*, a form of preference shares. They then nationalized the bank on December 23, 2009, triggering in the process several aid measures: €450 million in equity and €1,450 million in guarantees by the federal authorities. The bank also received another €200 million in *Partizipationskapital*, a €20,700 million guarantee, and a €200 million in liquidity facilities by the state of Carinthia. Note that we do not include the latter in our dataset. These measures automatically led to the restructuring of HGAA per the European Commission's guidelines on public recapitalizations of financial institutions. The authorities also enacted a guarantee of HGAA's assets of €200 million in December 2010 given additional asset write-downs and recapitalized HGAA with €500 million to allow it to meet its regulatory requirements in December 2012. After multiple rounds of negotiations between the Austrian authorities and the European Commission that lasted from July 2010 to August 2013, the original restructuring plan morphed into a liquidation plan under which HGAA would be wound down in an orderly manner, and its performing assets sold when possible. Accordingly, these assets were split among HGAA's regional subsidiaries in the Balkans and Italy, which currently operate as Hypo Group Alpe Adria A.G. and HBI-Bundesholding A.G. respectively. Simultaneously, HGAA was guaranteed with €9,700 million in total during this process, and its toxic assets were transferred to a winding-down public entity, HETA. As of end-2017, HETA still had a portfolio of about €6,400 million.

The Austrian authorities also recapitalized Raiffeisen Zentralbank Österreich (RZB) in July 2009 with a non-controlling equity participation of €1,750 million, which the bank paid back in June 2014. Note that RZB merged with Raiffeisen Bank International AG (RBI) in March 2017, so the former bank's annual reports are listed on the latter bank's website.

The Austrian authorities also intervened in Landes-Hypothekenbank Steiermark (Hypo Steiermark), Hypo Tirol, and Österreichische Volksbanken (ÖVAG). The European Commission ruled that the intervention into the first bank does not constitute State aid, so we

exclude it from our dataset. The second bank's intervention was in the form of equity of €220 million in April 2012, repaid back in 2013. The bank had also been granted a guarantee of €100 million in 2009. The third entity is an association of banks and was recapitalized twice: € 1,000 million in 2009 and €250 million in 2012. The association was also guaranteed with €100 million in 2008 and €3,000 million in 2012. Given its severe liquidity problems, however, the association underwent a voluntary liquidation in 2015, through which it was demerged, some of its assets sold to other banking entities, and its impaired assets transferred to Immigon, a public winding-down company.

BAWAG was recapitalized with *Partizipationskapital* of €550 million, fully paid back by 2014, and guaranteed with €400 million in December 2009. The bank remains in operation today. Erste Group, which also remains in operation today, was recapitalized in 2009 jointly by the Republic of Austria with *Partizipationskapital* of €1.224 billion and by private investors. The Group fully redeemed the *Partizipationskapital* on August 8th, 2013.

Kommunalkredit (KA) was nationalized on November 3, 2008 with the authorities' purchase of 99.78 percent of the bank from ÖVAG and Dexia Credit Local (DCL) for €1 each (the other shareholder of KA was the Austrian Communes Association which retained its stake following the nationalization). This nationalization entailed converting non-collateralized claims of ÖVAG (€172.5 million) and DCL (€200 million) into *Partizipationskapital*, boosting therefore KA's regulatory ratios. This nationalization also entailed a restructuring plan for KA, which was finalized in March 2011 after multiple rounds of negotiations. In the process, KA's nonperforming assets remained in the bank, now renamed as Kommunalkredit Finanz AG under State ownership, whereas performing assets were transferred to a new bank, Kommunalkredit Austria AG (KA Neu). KA Finanz received €1,000 million in non-refundable loans, while KA Neu was recapitalized with €250 million in ordinary shares and €441 in impaired asset relief. KA's guarantees, which amounted to €10,800 million, were transferred to KA Finanz. The latter was further guaranteed with €1,200 million on impaired assets and €3,000 million on commercial paper. Note that €25 million of KA Neu's recapitalization was treated as non-repayable. As to the remaining amount, it was repaid back in 2015 with KA Neu's privatization. The government's holding of the bank (99.78 percent, equivalent to the remaining recapitalization of €225 million) was sold to Gesona, the current majority shareholder of the bank. The remaining public ownership of KA remains at a miniscule 0.22 percent with the Association of Austrian municipalities.

Belgium

The Belgian authorities intervened in several cross-border banks, which are detailed separately at the end of this appendix. Those banks include Dexia (and Belfius) and Fortis Bank (and Fortis BGL). The Belgian authorities also intervened in KBC and Ethias. In the case of Kaupthing Bank Luxembourg, Belgium and Luxembourg intervened jointly. Sources on the Belgian government's complex interventions in financial institutions include the IMF Financial System Stability Assessment reports,[31] the European Commission, public letters between the Belgian National Accounts Institute and Eurostat (the National Accounts Institute

[31] See https://www.imf.org/external/pubs/ft/scr/2013/cr13124.pdf.

being the Belgian governmental body responsible for reporting government finance statistics), bank investor presentations, press releases and annual reports, and other sources.[32]

The Belgian authorities and the Flemish Region recapitalized KBC in December 2008 and February 2009, respectively, with €3,500 million in hybrid instruments each, which were fully paid back by 2015. KBC was also placed under a €20 billion guarantee in May 2009.

Ethias was jointly recapitalized by the Belgian authorities and the Flemish and Walloon Regions with €1,500 million in the form of preference shares in 2008 and €278 million in the form of debt instruments in 2011.

Brazil

Akin to the Australian response to the crisis, the Brazilian authorities did not directly intervene in any banks. Instead, the Brazilian central bank cut interest rates, established credit facilities in foreign currency (including repurchase agreements and specific lines to exporters), reduced reserve requirements, and sold swap contracts to ease pressure on the domestic currency.

Bulgaria

The Bulgarian authorities provided a loan of BGN 1,200 million to First Investment Bank (FIB) in June 2014. The authorities extended the maturity of BGN 900 million of the loan to the bank in November 2014. That same month, FIB repaid BGN 300 million of the loan, followed by BGN 450 million in 2015 and BGN 450 million in 2016.

Canada

Given the heavy exposure of Canadian banks to the housing market, they faced significant liquidity problems at the onset of the crisis. In response to funding shortages, Canadian authorities intervened in two main ways to ease market pressures on the banking system: they bought mortgages from banks and provided any troubled institutions with temporary liquidity assistance. Accordingly, in addition to some Canadian banks' access to the Federal Reserve's liquidity programs, the Bank of Canada implemented several facilities starting 2008 such as the Term Loan Facility. Furthermore, through the Insured Mortgage Purchase Program (IMPP) enacted by the Canada Mortgage and Housing Corporation, Canadian banks could securitize insured residential mortgage loans by creating mortgage-backed securities and selling some of those securities to the Canada Mortgage and Housing Corporations in governmental auctions until March 2010, shedding thereby some of these risky assets from their balance sheets and onto the government's. For instance, under this program, Scotia Bank is estimated to have received up to CAD 9 billion in public aid. Note, however, that Canadian authorities have not released any bank-level information on aid disbursed through the IMPP, and bank annual reports confound any such estimations by embedding these securities' sales in other financial information, preventing a straightforward calculation of the associated risks borne by the authorities.

[32] See http://www.bcl.lu/fr/cadre_juridique/doctrine/ALJB_VOLUME6_Gatti.pdf for details.

Croatia

The Croatian authorities recapitalized Croatia Banka, a public bank, in October 2012 with HRK 200 million in equity. They also recapitalized Hrvatska Poštanska Banka, the largest Croatian-owned bank in the country, in multiple interventions. Starting in 2009, the bank issued a hybrid instrument of HRK 250 million to several state companies, HRK 50 million of which was converted into equity in 2010. This conversion was accompanied by another recapitalization in 2010 for HRK 450 million in equity. With the government's stake in the bank at 99 percent, these capital-strengthening measures did not increase the public holding of ordinary stock, but they did increase the bank's total equity. The remaining hybrid instrument was converted in June 2015. New equity was again issued in September 2015 to both public and private investors. The private share of new issuance was HRK 305.9 million, while the public share was HRK 244.1 million. This boosted the bank's capital but reduced the public holding of common stock to 72 percent, where it still currently stands.

Cyprus

The Cypriot banking system was hit hard by the crisis and several interventions took place.

In May 2012, the Cypriot authorities recapitalized Cyprus Popular Bank (CPB) with €1,800 million, which increased the government's holding of ordinary stock to 84 percent. Following the EU-IMF program agreement in March 2013, CPB's assets were transferred to the Bank of Cyprus (BoC), which was then recapitalized with bail-in measures, such as converting uninsured deposits and additional equity contributions.

The Cypriot authorities also recapitalized Cooperative Central Bank Ltd (CCB). The latter received two capital injections in the form of ordinary shares, first in February 2014 for €1,500 million, then in December 2015 for €175 million. CCB became effectively nationalized as the government's holding of common equity increased to 99 percent. However, the CCB faced an accelerated deposit outflows in 2018 and Cypriot authorities placed €3.19 billion bonds and €351 million deposits at CCB to strengthen its balance sheet and facilitate its sale. In September 2018, the assets (primarily performing loans and sovereign bonds) and all customer deposits of the CCB were sold to Hellenic Bank, leaving the bulk of the nonperforming loans in a residual entity, which has evolved into a government-owned asset management company.

Czech Republic

The Czech banking system weathered the crisis well which eliminated the need for taking any public stake in individual institutions.[33]

[33] See https://www.imf.org/external/pubs/ft/scr/2012/cr12173.pdf for more details.

Denmark

The Danish banking sector was hit hard by the crisis. By accounts of the Danish Financial Crisis Committee, more than a third of the sector disappeared after the crisis.[34] To process all the resolutions and liquidations, the Danish authorities set up in October 2008 a resolution authority, Finansiel Stabilitet, to manage the banking sector's restructuring. The authorities also introduced five bank packages in the span of four years: the Stability Package in October 2008, the Credit Package in January 2009, the Exit/Resolution Package in June 2010, the Consolidation Package in September 2011, and the Development Package in March 2012. By estimates from its 2014 annual report, Finansiel Stabilitet took over asset portfolios from failing banks of nearly DKK 100 billion since 2008. Of those in which the authorities intervened, we cover EBH Bank, Roskilde Bank, Fionia Bank, Nova Bank Fyn, Eik Banki, Eik Bank Danmark, Amargerbanken, Fjordbank Mors, Max Bank, FIH Erhvervsbank (FIH), Capinordic Bank, Løkken Sparekasse, Gudme Raaschou Bank, Sparebank Østjylland, Danske Bank, Vestjysk Bank, and Aarhus Lokalbank. Of the banks taken over by Finansiel Stabilitet under the bank packages, EBH Bank was taken over on November 21, 2008; Løkken Sparekasse on March 2, 2009; Gudme Raaschou bank on April 16, 2009; Fionia Bank on May 28, 2009; Eik Banki and Eik Bank Darnmark on September 30, 2010; Amagerbanken on February 6, 2011; Fjordbank Mors on June 24, 2011; Max Bank on October 8, 2011, and Sparkassen Østjylland on April 21, 2012. Our sources include Finansiel Stabilitet's annual reports and press releases, the European Commission, Danmarks Nationalbank's reports and accounts, Rigsrevisionen (the national Danish audit agency)'s report to the Danish Public Accounts Committee, and the IMF Financial Sector Assessment Program reports.

EBH Bank received the first recapitalization from Finansiel Stabilitet in November 2008 with DKK 1,000 million, followed by DKK 2,400 million in the same month and DKK 2,000 million in January 2009. The bank was also financed by debt instruments in 2010 for a total DKK 207 million.

Roskilde Bank, despite having been Denmark's eighth largest bank, sought State aid as early as July 2008 when it was granted an unlimited liquidity facility and an unlimited guarantee on this facility. This measure, however, failed to shore up the capital base of the bank, which was subsequently taken over by the Danish central bank in March 2009 and later transferred to Finansiel Stabilitet. As part of the liquidation process, the bank received DKK 1,720 million in Tier 1 capital, DKK 2,000 million in Tier 2 capital and DKK 36,800 million as a senior loan to repay the bank's debt obligations. The bank also obtained share capital of DKK 11,423 million and a subordinated loan of DKK 1,000 million.

Fionia Bank faced large write-downs starting in 2008 due its heavy exposure to the real estate market. The Danish authorities intervened in the bank with a credit facility of DKK 5,100 million and a restructuring plan to carve out the impaired assets and return the bank to profitability. The restructuring process entailed splitting the bank into two entities: Old Fionia, which solely contained equity and subordinated debt, and New Fionia, which contained

[34] For more details, see the Committee Chairman's presentation during the Financial Safety Net Conference 2015, available at https://www.riksgalden.se/globalassets/dokument_eng/fsnc/presentationer/fsnc2015-jesper-rangvid-presentation.pdf.

everything else. New Fionia would then take over the activities of Fionia Bank and continue serving its customers. By mid-2009, however, the Danish authorities ascertained that Fionia's restructuring could no longer be viable as the write-downs were larger than originally anticipated. The bank, including New Fionia, would have to be liquidated. Accordingly, New Fionia was then split into a red part (Nova Bank Fyn) which solely contained customers with high risk exposure and possible future impairments, and the green and yellow parts which contained everything else in New Fionia. Nordea Bank acquired the green and yellow parts of New Fionia in November 2009 following its successful bid. Nova Bank Fyn was terminated and converted to FS Bank A/S, which was then terminated in 2014. In the process of winding down Nova Bank Fyn, the Danish authorities transferred Fionia Bank's credit facility of DKK 5,100 million to Nova Bank Fyn and increased it to 8,500 million in October 2010. Nova Bank Fyn also received a capital injection of DKK 1,300 million (later amended to DKK 790 million, which we record in our dataset), while Old Fionia had received a capital injection of DKK 12 million in May 2009.

In June 2011, the Danish authorities intervened in the Faroese bank Eik Bank Danmark and its subsidiary Eik Banki. In Eik Bank Danmark, the Danish State injected DKK 2,327 million in capital measures, DKK 7,850 million in credit facilities, and DKK 2,000 million in liquidity facilities. In Eik Banki, the Danish State injected DKK 1,775 million in capital measures, DKK 5,500 million in credit facilities, and DKK 2,000 million in liquidity facilities. Note that to match official data, we treat the credit facilities to both banks as guarantees and we do not include liquidity facilities in our dataset. Additionally, the Danish authorities guaranteed DKK 2.8 billion of the parent company's exposures and DKK 6 billion of the subsidiary's exposures. Eik Bank Danmark was sold to Sparekassen Lolland in 2011 and renamed as FinansNetbanken. When Sparekassen Lolland failed in 2013, Jyske Bank took over FinansNetbanken. As to Eik Banki, it was acquired by Betri Bank (formerly known as TF Holding).

Amargerbanken was the recipient of a DKK 3,000 million guarantee and a DKK 1,106 capital injection, while Capinordic Bank was taken over by Finansiel Stabilitet upon its bankruptcy in February 2010, and rebranded in another entity, Finansieringsselskabet. The latter was recapitalized with DKK 100 million. As for Amargerbanken, the Danish authorities further expanded its guarantee in 2010 to DKK 13,500 million and recapitalized it with an additional DKK 1,700 billion in 2011. The bank was sold that same year to BankNordic.

In 2011, the Danish authorities also recapitalized Fjordbank Mors by a total DKK 900 million (the bank was liquidated that same year), and Max Bank by a total DKK 850 million. The latter benefited from a guarantee on its bonds of DKK 3.3 billion and was acquired by Sparekassen Sjælland in 2011.

Similarly, FIH benefitted from the Danish authorities' guarantee on its bonds of DKK 41.7 billion and was recapitalized in 2009 with DKK 1.9 billion in hybrid instruments that were repaid in July 2012. It also received an impaired asset relief in July 2012 of DKK 2.25 billion. Notably, FIH is still operating today. Finansiel Stabilitet, after having been recapitalized by DKK 100 million in 2009, also extended an individual guarantee to Danske Bank of DKK 100 billion that same year.

Løkken Sparekasse was recapitalized in 2009 for DKK 760 million in share capital and DKK 177 million in debt. The bank was also split into a good bank and a bad bank, with the good bank sold to Nordjyske Bank in April 2009 and the bad bank renamed as Løkken Sparebank, a subsidiary of Finansiel Stabilitet.

Upon the failure of Gudme Raaschou Bank, Finansiel Stabilitet sold part of the lender's assets to Lån & Spar Bank in June 2009 and transferred the remaining assets to a newly established subsidiary of Finansiel Stabilitet, Pantebresselskabet af, whose sole purpose is to manage mortgage deeds. Subsequently, the latter was wound down and recapitalized with DKK 1,701 million in 2009 as share capital and DKK 1,900 million in 2010.

Sparebank Østjylland also received DKK 350 million in equity and DKK 200 million in subordinated loans in April 2012. The bank was acquired by Sparekassen Kronjylland in 2012.

Lastly, upon Vestjysk Bank's merger with Aarhus Lokalbank, the merged entity (under the name Vestjysk Bank) received DKK 167 million in capital injections and DKK 9,400 million in guarantees. The two banks had been previously recapitalized, in 2009, to the order of DKK 1,440 million (in hybrid capital) and DKK 178 million, respectively. Vestjysk Bank gradually converted the government's holdings into ordinary shares starting in 2012, raising the government's stake in common equity from null in 2009 to 81.5 percent in 2016. The Danish State sold its stake in both ordinary shares and subordinated debt in the bank in 2017.

Estonia

With high capitalization ratios, a gradual credit tightening ahead of the global decline, and government interventions in parent bank countries, the Estonian banking system weathered the financial crisis well. No state aid for the banking system occurred.

Finland

In October 2008, the Finnish authorities implemented a guarantee scheme of banks through which the government made available €50,000 million of debt instruments. No direct stake-taking in any Finnish banks occurred.

France

At the onset of the crisis, the French authorities established a recapitalization fund, Société de Prise de Participation de l'État (SPPE), that would inject preference shares in the banking sector. Our sources are the European Commission, bank annual reports, and SPPE's financial statements.

Société Générale received €1,700 million in 2008 and another €1,700 million in 2009, which the bank bought bank also during 2009. Similarly, BNP Paribas received €2,550 million in 2008 and €5,100 million in 2009, which the bank also bought bank in 2009. Note that BNP Paribas also received aid from the Belgian authorities in relation to the Fortis case, which we detail separately in the cross-country cases below. Groupe Crédit Agricole received €3,000 million in 2008, bought back in 2009. Banque Fédérative du Crédit Mutuel received €1,036 million in 2008, paid back in 2009. Compagnie Financière du Crédit Mutuel also received €164

million. As to Groupe Caisse D'épargne and Groupe Banque Populaire, they were first recapitalized in December 2008 with €1,100 million and €950 million, respectively. They later received €1,000 million each in June 2009. In July 2009, the two banks merged to form Groupe BPCE, which also received €3,000 million upon the merger and inherited the recapitalizations of Groupe Caisse D'épargne and Groupe Banque Populaire. These interventions were partially redeemed in the last quarter of 2009 with €750 million and were fully paid back in 2010. Under resolution in 2013, Crédit Immobilier de France also received a guarantee of €46 billion.

France also recapitalized Dexia in coordination with Belgium and Luxembourg, a case that we detail separately below.

Germany

The German authorities intervened in IKB, Sachsen LB, Landesbank BadenWürttemberg (LBBW), Bayern LB, Sparkasse KölnBonn, Sicherungseinrichtungsgesellschaft (SdB), West LB, Nord LB, HSH Nordbank, Commerzbank, Hypo Real Estate (HRE), and Super SIV. Our sources include the European Commission, bank annual reports, and an IMF report on German crisis management arrangements, dated December 2011.[35]

One of the first assisted banks, IKB first received public risk shields of €6,150 million (reduced from €8,100 million) in July 2007 and €150 million in November 2007 to avoid its moratorium. Under restructuring, IKB's capitalization kept deteriorating, prompting more guarantees of €5,000 million in December 2008 and €7,000 million in July 2009. Through the state-owned bank Kreditanstalt für Wiederaufbau (KfW), the German authorities also provided a non-repayable loan to IKB of €2,000 million in December 2008 by the estimates of the European Commission (there were several aid measures implemented jointly by private investors and the authorities, so we rely on the European Commission's assessment to provide a final estimate of the actual public funds involved in the rescue). KfW sold its ordinary stock holding in IKB to Lone Star Funds in 2008, privatizing thereby the industrial bank.

Another bank that faced trouble as early as 2007 was Sachsen LB. As its funding sources vanished, an association of public German banks repaid Sachsen LB's commercial paper obligations of €17,100 million. As this credit facility was fully backed by the government, we treat it as a permanently outstanding debt instrument, especially that Sachsen LB was sold in 2008 to LBBW, another public German bank. The net sale price of Sachsen LB was determined at €328 million and compatible with the market value of Sachsen LB, barring therefore any State aid in that measure. As such, we do not include it in the dataset. The bank was also granted a guarantee of €2,750 million for the transfer of its impaired structured portfolios to a newly created investment vehicle, Super SIV, which was financed by LBBW. However, the European Commission ruled that the latter financing is not considered State aid, thus we do not include it in our dataset. The German authorities later recapitalized LBBW with €5,000 million in equity in June 2009 and granted the bank a risk shield (guarantee) of €12,700 million on its impaired portfolios.

[35] See https://www.imf.org/external/pubs/ft/scr/2011/cr11368.pdf.

Bayern LB, another public bank, was also recapitalized during the crisis with €10,000 million and granted a risk shield (guarantee) of €4,800 million from the State of Bavaria and a guarantee of €15,000 million by Sonderfonds Finanzmarktstabilisierung (Special Fund for Stabilization of Financial Markets, or SoFFin). Note that the recapitalization proceeded in three stages: on December 30, 2008, €3,000 million were transferred to the bank's reserves. Then, on January 30, 2009, the State of Bavaria transferred another €3,000 million to the bank as a silent participation, which we treat as an equity instrument. The last tranche of €4,000 million was transferred on March 30, 2009 as a capital increase. This raised the State of Bavaria's holding of ordinary stock from 50 percent in 2007 to 94 percent in 2009. This level decreased to 75 percent in 2013 with a capital increase subscribed entirely by the Association of Bavarian Savings Banks. Abiding by the restructuring plan approved by the European Commission in July 2012, the bank repaid €5,000 million of the State aid by 2017, two years earlier than the deadline. We estimate the outstanding aid in 2017 at €2,058 million, in addition to a public stake of 75 percent in subscribed capital.

The German authorities also recapitalized Sparkasse KölnBonn with €300 million in 2008 and €350 million in 2009, and guaranteed SdB with €6,700 million in December 2009. SdB was created to support the German Deposit Protection Fund and the banking sector in processing compensation payments.

West LB was another landesbank that was recapitalized and eventually wound down during the crisis. The landesbank received €3,000 million in equity in December 2009 and total guarantees of €12,400 million, some of which were to set up a bad bank (Erste Abwicklungsanstalt) to wind down West LB's nonperforming assets. Under restructuring, the remaining parts of the bank were split between a regional bank (Verbundbank) that was eventually sold to another landesbank (Helaba) and a financial company (Portigon) in 2012. Portigon inherited the recapitalization of West LB. Through a series of loss recognition and repayments, €1,224 million of the original €3,000 million remained outstanding in 2017.

Another landesbank, HSH Nordbank was also recapitalized in June 2009 with €3,000 million and extended a guarantee of €30,000 million. By our calculations, €2,772 million remained outstanding in 2017. As to Nord LB, after its capital ratios fell short of the regulatory minimums in 2011, the landesbank announced a capital-strengthening program of €2,500 million in total (€188 million in loan repayment on behalf of the bank and the rest in equity) and guarantees of €10,700 million. By our calculations, €1,607 million were outstanding in 2017.

The German authorities also recapitalized Commerzbank with two separate capital issuances in October and December 2008 of €10,000 million and €8,200 million, respectively. Commerzbank was also guaranteed with €15,000 million in 2009. By our calculations, only €213 million of the €18,200 million capital issuance remain outstanding in 2017 due to a public holding of ordinary stock at 17 percent.

HRE was the most heavily guaranteed German bank during the crisis with guarantees at €145,000 million by 2010. HRE first faced insolvency in October 2008, so the German authorities granted the bank a guarantee of €35,000 million (extended in April 2009 to €52,000 million) and bought ordinary stock in the bank for €60 million, equivalent to a holding of 8.7

percent. The bank's funding position, however, continued deteriorating to alarming levels. Subsequently, in April, June, and October 2009, the authorities acquired more ordinary stock in the bank for €124 million, €2,959 million and €3,000 million, respectively, squeezing out minority shareholders (who received a compensation of €158 million) and nationalizing the bank. The restructuring plans submitted at the time revealed that the authorities would try to repair the bank's balance sheet to privatize it again. During its restructuring, the bank received additional guarantees of €18,000 million and recapitalized with €1,850 million in May 2010. In September 2010, the bank was granted more guarantees of €40,000 (half of which were a liquidity guarantee and the rest a settlement guarantee for the transfer of impaired assets to a winding-down institution). HRE also received €2,080 million that same month in impaired asset relief that was ultimately transferred to the winding-down company of HRE, FMS Wertmanagement AöR. The German authorities also granted HRE impaired asset relief of €20,000 million. The exact amount of recapitalization was first classified confidential in the reports of the European Commission but cleared later. The bank remains in operation today but has sized down by nearly 85 percent.

Greece

We document public interventions in 19 Greek banks, of which only 4 remain operating today: National Bank of Greece (NBG), Piraeus, Alpha Bank, and Eurobank. The Greek banking system was restructured into large systemic banking groups during the crisis as follows.

NBG acquired Lesvos-Limnos Bank, Achaia Bank, Lamia Bank, First Business Bank (FBB), and Probank between 2012 and 2015. The Greek authorities injected €57 million into Lesvos-Limnos Bank, €213 million into Achaia Bank and €56 million into Lamia Bank between June and July 2012 to cover the banks' funding gaps (difference between assets and liabilities). We treat these injections as buyer compensation for the existence of funding gaps, i.e. as impaired asset relief. Similarly, by 2013, FBB had been extended loans of nearly €60 million and guaranteed with €150 million (FBB was also recapitalized with another €50 million that we cannot date, hence do not include). FBB also received €457 million for its funding gap, as did Probank. The latter obtained around €700 million in December 2013, although the precise amount of the recapitalization remains confidential in the European Commission's State aid cases (we take the average value of the possible range of variables).

Piraeus acquired ATE Bank in July 2012 and Panellinia Bank in April 2015. Under guarantee of €4,697 million, ATE Bank had been repeatedly recapitalized prior to its sale with €1,735 million in equity and €8,878 million in bonds. Panellinia Bank was also recapitalized with €28 million and guaranteed with €41 million prior to its sale to Piraeus, its funding gap having been financed with €328 million.

Alpha Bank acquired Dodecanese Bank, Evia Bank, and Western Macedonia Bank in December 2013. Under resolution, the acquired banks all had funding gaps that the authorities covered: Dodecanese with €259 million, Evia with €105 million, and Western Macedonia with €82 million.

Eurobank acquired Nea Proton and New TT Bank in July 2013. Nea Proton was the good bank of Proton Bank which had been liquidated in October 2011. The Greek authorities had

previously recapitalized Proton Bank with €80 million and extended it loans of €78 million in 2009. The bank was also extended a guarantee of €149 million in 2010. Upon its creation in 2012, Nea Proton was recapitalized by HFSF with €515 million. The bank also had a funding gap of €1,122 million that the authorities covered. Nea Proton was last recapitalized prior to its sale in May 2013 when it received €395 million from HFSF. Similarly to Nea Proton, New TT Bank was the bridge bank of TT Hellenic PostBank which had been liquidated in January 2013. New TT Bank had a funding gap of €3,732 million that the Greek authorities financed. The bridge bank was also recapitalized with €500 million in 2013. Prior to its liquidation, TT Hellenic PostBank had been recapitalized in May 2009 with €225 million in equity and had acquired T Bank in December 2011. The acquired bank, T Bank, had a funding gap of €677 million that the Greek authorities financed.

As to the four systemic banks (NBG, Piraeus, Alpha, and Eurobank), they received state aid as follows.

The Greek authorities first recapitalized Piraeus in May 2009 with €370 million under the Greek recapitalization scheme, then in December 2011 with €380 million. After the Private Sector Involvement (PSI), further recapitalizations of Piraeus became inevitable. Subsequently, Piraeus received a first bridge recapitalization in May 2012 of €4,700 million, followed by a second bridge recapitalization in December 2012 of €1,553 million. This latter measure was accompanied by contingent convertible instruments of €1,082 million. Note that Piraeus was in the process of acquiring ATE Bank during these recapitalizations (the acquisition occurred in July 2012). Note also that Piraeus never proceeded with issuing the contingent convertible instruments, so we include that measure as a guarantee in our dataset. Piraeus' capital position kept deteriorating well into 2013, which necessitated further recapitalizations that involved the other systemic banks as well. As a result, the Spring 2013 recapitalizations were a series of measures through which the bridge recapitalizations of the four systemic banks including Piraeus were converted to permanent recapitalizations in the form of ordinary shares, making the Hellenic Financial Stability Fund (HFSF) the largest shareholder in all the big four systemic banks. For Piraeus, this process meant the conversion of the two bridge recapitalizations of May 2012 and December 2012 into equity in May 2013 for a total of €5,891 million (note that this amount is less than the bridge recapitalizations because private investors contributed to the Spring 2013 recapitalizations, decreasing therefore the aid provided by HFSF). This raised the government's holding of Piraeus' ordinary stock through HFSF from 0 percent in 2012 to 81.01 percent in 2013. The bank was also recapitalized with €1,094 million in equity in April 2013, of which €524 million were for the acquisition of the Greek operations of three Cypriot banks and count as State aid. As to the preference shares, they were redeemed in 2014. But with the Greek economy still in recession and the bank's capital position in need of strengthening, the Greek authorities recapitalized Piraeus again in November 2015 with €680 million in equity (in the form of ESM bonds that led to ordinary share issuance) and €2,040 million in contingent convertible instruments. These measures, along with HFSF exercising warrants after 2013, reduced the government's holding of ordinary stock from to 26.42 percent, where it still stands today. They also granted Piraeus a guarantee the amount of which is kept confidential due to jurisdiction issues. Note that the bank has also been under guarantees of €9,900 million since 2010. As of 2017, the contingent convertible bonds of €2,040 million remain outstanding.

NBG was first recapitalized in May 2009 (similarly to Piraeus) with €350 million, then in December 2011 with €1,000 million. NBG's first bridge recapitalization was €7,430 million in May 2012, followed by NBG's second bridge recapitalization of €2,326 million in December 2012. The Spring 2013 recapitalization entailed converting the 2012 recapitalizations into equity, with HFSF contributing €8,677 million. These measures raised HFSF's holding of common equity in NBG from 0 percent in 2012 to 29.3 percent in 2013. And the 2015 recapitalizations brought €676 million in new equity and €2,029 million in contingent convertible instruments (and guarantees which are kept confidential due to jurisdiction issues) to NBG. These measures, along with the conversion of the 2009 preferences into ordinary equity in 2015, raised the public holding of ordinary stock to 40.4 percent, a level at which it currently stands. In December 2016, NBG repaid the contingent convertible bonds to HFSF. Note that, as of May 2012, NBG was granted guarantees of €17,800 million.

Alpha Bank was first recapitalized in May 2009 (similarly to Piraeus and NBG) with €940 million in preference shares that were redeemed in 2014. Alpha Bank's first bridge recapitalization was €1,900 million in May 2012, followed by Alpha Bank's second bridge recapitalization of €1,042 million in December 2012 and a guarantee of €1,629 million. The Spring 2013 recapitalization entailed converting the 2012 bridge recapitalizations into equity, with HFSF contributing an additional €1,079 million. These measures raised HFSF's holding of common equity in Alpha Bank from null in 2012 to 81.7 percent in 2013. The bank raised further capital from private investors in 2014, reducing HFSF's holding of common equity to 66.2 percent. In 2015, Alpha Bank was recapitalized by private investors, bypassing the need for further government interventions, although it was granted a guarantee the amount of which was kept confidential due to jurisdiction issues. This recapitalization further reduced HFSF's holding of common equity in Alpha Bank to 11 percent, a level at which it currently stands.

Eurobank was first recapitalized in May 2009 (similarly to the other three systemic banks) with €950 million, fully redeemed in January 2018. Eurobank's first bridge recapitalization was €3,970 million in May 2012, while its second bridge recapitalization was €1,341 million in December 2012. This latter measure was accompanied with a guarantee of €528 million. The Spring 2013 recapitalization involved converting the 2012 recapitalizations into equity, with HFSF contributing an additional €5,839 million. These measures raised HFSF's holding of common equity from null in 2012 to 98.6 percent in 2013, effectively nationalizing Eurobank. The bank was further recapitalized in April 2014 with €2,864 million in State aid and an additional capital subscription by private investors, which decreased the government's holding of common equity to 35.4 percent in 2014. Lastly, in 2015, the bank was privately recapitalized which reduced public holding of ordinary stock to 2.4 percent, a level at which it currently stands. The bank also received a guarantee the amount of which is kept confidential due to jurisdiction issues.

Lastly, Attica Bank faced solvency issues in September 2016, upon which the Greek government guaranteed the bank with €380 million.

Hungary

The Hungarian authorities intervened in four banks: FHB Jelzálogbank Nyrt (FHB), Magyar Fejlesztési Bank (MFB), OTP Bank, and Magyar Kereskedelmi Bank Zrt (MKB).

While under restructuring and subsequent resolution in 2014, MKB transferred some of its assets to an asset management company and received HUF 32 billion in the process as impaired asset relief in 2015, according to the SA.40441 decision of the European Commission.

The other three banks were extended loans in 2009 by the Hungarian authorities: FHB received a loan of HUF 120 billion, which it fully paid back in 2012; OTP Bank got HUF 400 billion, fully paid back by 2010; and MFB got HUF 170 billion, fully paid back by 2012. Lastly, the Hungarian authorities also recapitalized FHB with HUF 30 billion, paid back in 2010. Note that, since FHB was established by the Hungarian government in 1997, the government maintained a holding of common equity in the bank prior and during the crisis of around 5 percent, in addition to the recapitalization.

Ireland

Over the course of the crisis, the Irish authorities intervened in Anglo Irish Bank, Allied Irish Bank (AIB), Bank of Ireland (BOI), Irish Nationwide Building Society, Educational Building Society, Permanent TSB, and the National Asset Management Agency (NAMA).

The first Irish interventions were announced on December 21, 2008 in the form of preference shares into Anglo Irish Bank, AIB, and BOI. These interventions, however, never occurred. Instead, the authorities first intervened in BOI on February 11, 2009 with €3.5 billion in preference stock, and in AIB, which led to the restructuring of both banks per European Commission guidelines on public recapitalizations of financial institutions. This intervention led to the government holding 15 percent of BOI's ordinary shares by the end of 2009, as the agreement allowed the State to own up to 25 percent of common stock in addition to its preference share holdings. This 15 percent holding, however, increased in March 2010 when the State converted €1.6 billion of its preference shares into common stock, raising its holding of the latter to 36 percent. Following the Prudential Capital Assessment Review / Prudential Liquidity Assessment Review (PCAR/PLAR) exercises in 2011, BOI was found in need of more capital injections. Accordingly, in late 2011, BOI underwent capital raising exercises in which the State participated. This recapitalization resulted in €200 million injection by the State in the form of ordinary equity and €1,000 million in the form of hybrid instruments and was accompanied by €10.2 billion in impaired asset relief when impaired assets were transferred to the bad bank of the Irish State, NAMA. Furthermore, the government sold some of its common stock ownership of BOI to institutional investors in 2011, reducing its stake back to 15 percent. On January 9, 2013, the government sold its contingent capital stake of €1 billion to international investors. In December 2013, BOI redeemed €0.5 billion of the remaining "2009 Preference Stock" and transferred the rest (€1.3 billion) to private investors. Through 2017, the government's holding of common stock in BOI hovered around 14 percent.

AIB was similarly found in need of capital, following its own PCAR exercises in 2010. Accordingly, the government injected an additional €3.9 billion in common non-voting shares (CNV) and €6.3 billion in new ordinary shares into the bank in December 2010, amounting to a total gross of €10.2 billion and net of €9.8 billion. This intervention made the government a stakeholder in the bank, with 49.9 percent of ordinary stock. In 2011, the government converted all its CNV into ordinary stock, increasing the government's holding to 92.8 percent

of the ordinary share capital. AIB became effectively nationalized. This was accompanied by a transfer of impaired assets to NAMA, resulting in €1.6 billion in impaired asset relief.

To strengthen the Irish financial system, the Finance Minister announced in March 2011 the restructuring of the banks into two entities: AIB and BOI. Accordingly, AIB were to merge with Educational Building Society (EBS),[36] which had previously received €875 million in hybrid instruments from the State and an estimated €100 million for asset transfers to NAMA (impaired asset relief). Upon the merger, the resulting entity, still named AIB, received €11.5 billion in aid (EBS was renamed as EBS d.a.c.), divided into €5 billion in ordinary stock, €1.6 billion in contingent capital notes (CCNs), and €6.1 billion in capital contributions, raising the State's holding of common stock to 99.8 percent. AIB was then completely nationalized. Note that the hybrid instruments of EBS were transferred to AIB and converted into ordinary shares. The government's stake holding remained outstanding until 2015, when AIB converted €2,140 million of the 2009 Preference Stock into ordinary shares and redeemed the remaining amount. This left outstanding €1.6 billion in CCNs. As to the €6.1 billion in capital contributions, according to AIB's 2011 annual report, neither the Irish State nor its representative National Pensions Reserve Fund Commission (NPRFC) "has an entitlement to seek repayment of these [€6.1 billion] capital contributions," making them a one-off payment. AIB redeemed the CCNs in 2016, and, following the bank's initial public offering in June 2017, the government's holding was reduced to 71 percent of the common stock, where it currently stands.

Anglo Irish Bank (Anglo) was nationalized on January 15, 2009 and recapitalized later in 2009 with €4 billion in ordinary stock following its weakening funding position. Anglo's capitalization, however, declined further and the bank recognized €12.7 billion in losses during 2009, mainly due to impairment of its loan portfolios. As a result, in addition to submitting restructuring plans to the European Commission, the Irish State issued two promissory notes to Anglo in March and August 2010 of €10.44 billion and €10.054 billion respectively, which we treat as hybrid instruments, and recapitalized the bank in September 2010 with €4.946 billion. Those measures were accompanied by an impaired asset relief of ER 36.5 billion upon transfer of bad assets to NAMA. However, after submitting three restructuring plans of Anglo to the European Commission, on January 31, 2011, the Irish State initiated Anglo's merger with Irish Nationwide Building Society, which had received €5.4 billion in equity from the State in 2010, with the goal of resolving the merged entity, Irish Bank Resolution Corporation. The latter is currently in special liquidation.

The State also intervened in Permanent TSB in the form of €2.3 billion in ordinary shares and €400 million in contingent convertible instruments on July 26, 2011, which effectively resulted in the government's holding of 99.2 percent of ordinary stock. Note that we treat the State's Standby Investment of €1.1 billion as a guarantee as "it could have been used if the various capital raising measures […] had not achieved the target […]."[37] The institution was formerly known as Irish Life and Permanent PLC, but upon its financial hardship, it sold the insurance arm of the business, Irish Life, and renamed itself as Permanent TSB. The group did not repay

[36] Irish building societies resemble cooperatives in that they are owned by their members and they take deposits and provide loans.

[37] See http://ec.europa.eu/competition/state_aid/cases/241557/241557_1662492_396_2.pdf.

the State until 2015, when it repurchased the CCN and reduced the government's stake in common equity to 74.92 percent, where it currently stands.

In addition to these measures, the assisted institutions received the following guarantees: €80 billion in 2009 and another of €5.9 billion in 2011 to BOI; €195.5 billion in 2009 to AIB; an estimated €35 billion in 2009 to Anglo; €22.4 billion in 2009 to EBS; €41.3 billion in 2009 and another €19.2 billion in 2013 to Permanent TSB. Lastly, impaired asset relief directed to NAMA was estimated by the European Commission at €2,597 million in 2010 and €872 million in 2014 in relation to the various bad assets of the Irish financial sector.

Italy

Since the crisis, the Italian authorities intervened in Monte dei Paschi di Siena (MPS), Piccolo Credito Valtellinese (PCV), Banco Popolare, Banca Popolare di Milano (BPM), Banca Tercas, Banca delle Marche (Marche), Banca Popolare dell'Etruria e del Lazio (Etruria), Cassa di Risparmio di Ferrara (Carife), and Cassa di Risparmio della Provincia di Chieti (Carichieti), Banca Popolare di Vicenza (Vicenza), and Veneto Banca (Veneto). Our sources for the details of the interventions include the European Commission, bank press releases and financial statements, and annual reports of the Italian National Resolution Fund.

The first wave of Italian bank recapitalizations occurred in the spring of 2009 with the Tremonti bonds, a form of hybrid securities named after the former Italian minister Giulio Tremonti. The Ministry of Economy and Finance (MEF) subscribed to bonds issued by four banks: MPS with €1,900 million, PCV with €200 million, Banco Popolare with €1,450 million, BPM with €500 million.

In November 2012, MPS announced the issuance of €3,900 million new financial instruments (NFIs), which entailed swapping the old securities for the new ones and requesting further public support. Specifically, the bank requested €2,000 million in order to address the capital shortfall stemming from the 2011 EBA capital exercises, and € 171 million for the interest payments that accrued on the Tremonti bonds through December 31, 2012. MEF later received the interest payments in the form of common stock, which increased MEF's holdings in MPS to 4 percent. This intervention of €4,071 million remained outstanding until June 2014, when MPS redeemed €3,000 million of the NFIs, and May 2015, when MPS repaid the remaining €1,071 million to MEF. Following the EU-wide stress test results in 2016, MPS was found again in need of fresh capital. As a result, in addition to liquidity aid, MPS was the recipient of a €5.4 billion in "precautionary recapitalization," which raised MEF's holding of ordinary stock from 4.024 percent to 69.247 percent by the end of 2017, a level at which the holding still stands. Note that in 2018, MPS also bought guarantees granted by the Italian authorities under the GACS scheme for the securitization of nonperforming loans (€24 billion in gross value). The guarantees were granted on €3 billion senior notes that were issued by the securitization vehicle. As this scheme was sold at market conditions, it did not constitute State aid according to the European Commission (case SA.43390).

PCV redeemed its Tremonti bonds on June 28, 2013. Those instruments were the only aid that the bank received after 2008. Similarly, Banco Popolare repaid its Tremonti bonds of €1.45

billion on March 14, 2011, and BPM on June 28, 2013 (BPM had also received a government guarantee in 2011 of €1 billion).

The Italian authorities also intervened in Banca Tercas, which they put under special administration on April 30, 2012. Tercas had already issued in 2012 bonds worth €300 million which were guaranteed by the Italian State. Considering the negative equity that emerged after a due diligence exercise, the bank benefited from a capital contribution of €265 million and a guarantee of €65 million provided by the Italian Deposit Guarantee Scheme (Fondo Interbancario di Tutela dei Depositi, or FITD). In 2014, the bank was acquired by Banca Popolare di Bari which recapitalized Tercas with €230 million. In 2015, however, the European Commission found the aid granted by the FITD to be illegal, requiring therefore the full amount of the capital contribution to be recovered by the FITD.[38] As a result, the Italian authorities set up a voluntary scheme for the banking system itself to carry out the same intervention in place of the previous one which had been rejected by the European Commission. In this regard, the General Court of the European Union in its judgment of March 19, 2019 annulled the European Commission's decision, concluding that the measures granted by the FITD to Tercas did not constitute State aid given that, in the Court's opinion, the Commission could not demonstrate that the FITD's support was influenced by the State. Note that the European Commission has appealed the Court's ruling.

The Directorate-General for Competition's decision on the illegal nature of aid granted by the Italian FITD prevented the latter's involvement in addressing subsequent crises. As a consequence, in 2015, the Bank of Italy put four banks which were at that time under special administration, in resolution: Marche, Etruria, Carife, and Carichieti. The authorities resolved those banks and sold all their assets and liabilities (with the exception of the subordinated debt and bad loans) to four newly established bridge banks (Nuova Banca Marche, Nuova Banca Etruria, Nuova Carife, and Nuova Carichieti). After a complex procedure, three of those bridge banks (Nuova Banca delle Marche, Nuova Banca Etruria, and Nuova Carichieti) were sold to UBI in May 2017, while Nuova Carife was sold to BPER in June 2017. As part of the resolution and sale processes, the bridge banks were recapitalized by the authorities between 2015 and 2017 and benefited from impaired asset relief measures, assessed by the European Commission as follows: Nuova Banca Marche received a total of €2.61 billion in equity and €222 million in impaired asset relief; Nuova Banca Etruria received €877 million in equity and €98 million in impaired asset relief; Nuova Carichieti received €167 million in equity and €51 million in impaired asset relief; Nuova Carife received €914 million in equity and €84 million in impaired asset relief. Simultaneously, UBI and BPER received guarantees of €750 million and €205 million following the sale. Note that the impaired asset relief took the form of asset transfers to REV Gestione Crediti, an asset management vehicle established in 2015 and owned by the National Resolution Fund (NRF). The latter was recapitalized by the NRF in 2015 with €136 million. A further equity contribution of €85 million by the NRF took place in 2017.[39]

In a further consolidation effort of the Italian banking sector, Intesa Sanpaolo acquired in June 2017 some assets and liabilities of two banks, Vicenza and Veneto, both of which had been

[38] See http://ec.europa.eu/competition/state_aid/cases/257219/257219_1730462_184_2.pdf.

[39] See https://www.bancaditalia.it/pubblicazioni/relazione-gestione/2018/rel_gest_BI-2017.pdf.

put under liquidation. In January and May 2017, Vicenza had received guarantees in the form of liquidity support from the government for a total of €5.2 billion. Simultaneously, Veneto had also received guarantees of €4.9 billion. In June 2017, in order to allow the immediate sale out of liquidation of the assets and liabilities of Vicenza and Veneto, the Italian authorities transferred two lump sum capital contributions to Intesa Sanpaolo of €1,285 million to cover future restructuring costs and €3,500 million for the recapitalization of the transferred activities up to a 12.5 percent CET1 ratio in order to preserve the buyer's capital ratios. Intesa Sanpaolo also received €12,342 million as guarantees on the gap between acquired assets and liabilities, any potential future gaps arising from the transfer of high-risk nonperforming loans to the two residual entities under liquidation, as well as various assets and other risks, including legal disputes. The nonperforming loans not included in the sale perimeter and left in the residual entities carried a net book value of around €10 billion and were transferred to Società per la Gestione di Attività S.p.A. (SGA), a public asset management company.

Japan

The Japanese authorities supported the banking system through two initiatives implemented by the Bank of Japan and the Financial Services Agency (FSA) between 2008 and 2012. According to the authorities' press releases, the Bank of Japan resumed the purchase of stocks held by financial institutions starting February 23, 2009 until April 2010 for an aggregate JPY 387.8 billion and provided subordinated loans to banks from June 10, 2009 to March 10, 2010. The Bank of Japan also suspended its selling of stocks on October 15, 2008 due to market instability. In the meantime, through the Deposit Insurance Corporation of Japan, the FSA boosted the capital base of financial institutions through capital injections until 2012. Accordingly, the Agency expanded the availability of public funds for bank recapitalization from JPY 2 trillion to JPY 12 trillion on December 16, 2008 (those funds had already been in place in the aftermath of the Japanese crisis during the 1990s). Note that the Japanese authorities intervened in the banking sector following the 2011 earthquake and tsunami, but we do not include recapitalizations performed after 2011 as such measures were in response to idiosyncratic shocks rather than to the potential repercussions of the Global Financial Crisis.

Through this program, the FSA disbursed in March 2009 preferred shares of JPY 100 billion to North Pacific Bank Ltd (Hokuyo Bank), JPY 6 billion to Fukuho Bank, and JPY 15 billion to Minami Nippon Bank. Additionally, in September 2009, the Daisan Bank and Michinoku Bank were the recipients of JPY 30 billion and JPY 20 billion, respectively, in Class A preferred share recapitalization, while Kirayaka Bank received JPY 20 billion in Class III preferred shares. Later that year, in December 2009, the Japanese authorities injected JPY 15 billion in Class I preferred shares into Bank of Kochi, and JPY 35 billion in Class II preferred shares into Towa Bank. In March 2010, Hokuto Bank received JPY 10 billion in Class B preferred shares, while Miyazaki Taiyo bank received JPY 13 billion in Class A preferred shares. These measures remained outstanding as of March 2018, with the exception of two banks: Kirayaka Bank and North Pacific Bank Ltd. Indeed, by 2012, Kirayaka Bank had repurchased its JPY 20 billion worth of preferred shares, while North Pacific Bank Ltd had repurchased JPY 30 billion by July 2013 and the remaining JPY 70 billion by March 2014.

Lastly, the Japanese authorities also recapitalized other non-bank financial institutions, such as Chuo Mitsui Trust Holdings, Inc., and acquired trust beneficiary rights in several entities,

such as Yamanashikenmin Shinyokumiai. However, due to the lack of cross-country comparability of trust beneficiary rights, we do not include them in the dataset.

Latvia

The Latvian authorities intervened in Latvijas Hipoteku un zemes banka (LHZB), Parex Banka, and the latter's good bank spinoff, Citadele. LHZB was a State-owned bank and the recipient of multiple recapitalizations. Starting in 2009, the capital base of the bank was strengthened by LVL 43.29 million in hybrid instruments and LVL 30 million in equity, then LVL 70.2 million in equity in 2010. The bank was further recapitalized in 2012 with LVL 310 million in liquidity facilities as some impaired assets were forcibly liquidated, and LVL 50 million in equity instruments. Note that we do not include liquidity facilities in our dataset. Furthermore, the bank's assets were guaranteed up to LVL 49 million, LVL 32 million of which applied to the commercial segment of the bank's operations. In September 2013, the bank's operations were dismantled, and its banking license revoked. Accordingly, its commercial activities were transferred to a new bank, ALTUM, fully owned by the Latvian authorities, starting January 1, 2014. ALTUM remains in operation today.

As to Parex Banka, the bank was nationalized on November 24, 2008 for a symbolic EUR 3 and received various measures in support of the nationalization: a credit facility in the form of a subordinated loan of LVL 200 million, a guarantee of syndicated loans of LVL 1,050 million, State Treasury deposits in the bank of LVL 674 million (some of those were later converted to debt securities), a recapitalization of LVL 191 million in equity, and LVL 50 million in subordinated debt to reach the capital adequacy ratios. These measures increased the Latvian government's holding of ordinary stock in the bank from null in 2007 to 84.8 percent in 2008. Despite its nationalization, however, the bank was unable to persistently strengthen its capital base. As such, in September 2010, the bank's strategic assets were transferred to a new good bank, Citadele, while the bank's nonperforming assets were to remain within Parex, now considered a bad bank and later renamed as Reverta. The government's holding of common equity in Reverta remained around 84 percent after 2008 and reached 96.9 percent in 2017.

Reverta managed to pay back the Treasury deposits extended to Parex in 2008 gradually through 2017, when the Ministry of Finance ceded its remaining claim of around EUR 300 million. Parex's subordinated debt claims were transferred to Citadele, which also received an additional LVL 103 million to boost its share capital. Citadele fully repaid the subordinated debt claim on Parex by 2017. As to the government's holding of common equity in Citadele, the government first sold a quarter of its stake through its privatization agency to the European Bank for Reconstruction and Development (EBRD). The resulting 75/25 ownership stakes remained until September 2014, when the government sold its remaining stake to international investors led by Ripplewood Advisors LLC. The EBRD still holds the remaining stake.

Lithuania

The Lithuanian authorities repeatedly intervened in the Lithuanian Central Credit Union (LCCU) and AB Ukio Bankias. LCCU was first recapitalized with €1.74 million in December 2011 (repaid by October 2014), then with €8.88 million in 2017. In contrast, AB Ukio Bankas faced more difficult problems: the bank was liquidated in 2013 and sold to Siauliu Bank in

2014 due excessive risk-taking and lack of proper collateral valuations, among other issues. Accordingly, the Latvian Deposit Guarantee Fund disbursed LTL 128.5 million in 2013, followed by LTL 799 million in 2014, to compensate depositors for their losses and to cover the difference between the bank's assets and liabilities that were transferred to Siauliu Bank. We treat this aid into AB Ukio Bankas as impaired asset relief.

Luxembourg

Luxembourg participated in the rescue operations for Dexia and Dexia BIL in coordination with Belgium and France, for Fortis and Fortis BGL in coordination with Belgium and the Netherlands, and for Kaupthing Bank Luxembourg in coordination with Belgium. All these cases involved risk-sharing in cross-border resolution processes which we detail separately at the end of this appendix.

Malta

Adequately capitalized, profitable, and relatively insulated from the toxic assets, the Maltese banking system weathered the crisis well. No state aid to the banks occurred.

Netherlands

The Dutch authorities intervened in Fortis and ABN AMRO, cases that we detail at the end of this appendix separately, in addition to Aegon NV, ING, and SNS Reaal.

Aegon NV was recapitalized with €3,000 million in October 2008, which the insurer paid back by 2011. The authorities recapitalized ING during that same month with €10,000 million, which the bank gradually paid back between 2009 and 2013. The bank was also the recipient of €21,600 million in guarantees.

The authorities also intervened in SNS Reaal, which received €750 million capital injection in November 2008. Due to the entity's persistent problems, however, it was nationalized in February 2013. Consequently, the bank received €3,059 million in capital injections, including recapitalization aid and impaired asset relief, and €1,100 billion in the form of a bridge loan. In terms of guarantees, SNS Reaal was extended €5,000 million in 2013, in addition to guarantees under the Dutch Guarantee Scheme in 2009 of €4,480 million, $900 million, and £500 million. SNS Reaal is currently in orderly resolution.

New Zealand

New Zealand did not take any direct stake in any banks during the crisis. The authorities instead provided a variety of liquidity measures, funding guarantees, and fiscal relief. Specifically, the Reserve Bank cut interest rates, established swap lines with the Federal Reserve Bank, and set up term auction facilities. Simultaneously, the Treasury approved temporary deposit insurance guarantees, while the authorities implemented tighter restrictions on dividends and introduced personal income tax cuts.

Poland

The Polish banking system survived the crisis without any government interventions.

Portugal

Through cases of the European Commission, bank annual reports, and a public court ruling of the Portuguese State v. Banco Privado Português (BPP), we document public interventions in Caixa Geral de Depósitos (CGD), Banco Português de Negócios (BPN) and its spin-off Novo Banco, Banco Espírito Santo (BES), Banco Internacional de Funchal (Banif), Banco BPI, Banco Comercial Português (BCP), Banco Privado Português (BPP).

CGD, one of the largest banks in Portugal and whose sole shareholder has been the Portuguese State since its inception in 1870, was recapitalized with €400 million in 2008. This increased CGD's share capital to €3,500 million up from €3,100 million in 2007. The bank was recapitalized again with €1,000 million in 2009 and €550 million in 2010, raising its share capital to €5,050 million by December 2010. Through reserve shifting in 2011, the Portuguese State raised the bank's capital again to €5,150 million. Since this measure did not entail any new aid, we do not include it in our dataset. CGD's capitalization, however, declined further with the sovereign crisis in 2012. The bank was therefore recapitalized with €750 million in ordinary shares and €900 million in hybrid instruments (contingent convertibles) in June 2012. The former measure raised the bank's share capital to €5,900 million, while the latter measure remained outstanding until 2017, when the bank was recapitalized again by the Portuguese authorities. Under restructuring, the bank failed to meet certain Key Performance Indicators in 2016, prompting more capital measures by the State in January 2017: recapitalization of €500 million through the transfer of another public entity's shares (Parcaixa) to CGD, hybrid instruments (contingent convertibles) of €945 million, share increase of €2,500 million, and additional hybrid instruments of at least €930 million. Note that the hybrid measure necessitated cancelling the 2012 hybrid measure of €900 million. Under this recapitalization plan, the bank's share capital increased from €5,900 million to €7,344 million. This capital, however, was later reduced by €6,000 million to cover retained losses.

Using CGD as an intermediary, the Portuguese government also supported the private bank BPN with a loan of €315 million in October 2008 (reimbursed in March 2009). Following severe impairments and malpractice-related issues, however, the Portuguese authorities nationalized BPN in November 2008. The bank was subsequently granted guarantees of €2,000 million in 2009 and €2,500 million in 2010 and impaired asset relief of €3,895 million following the transfer of impaired assets to public special purpose vehicles. After this aid, the Portuguese authorities tried to privatize the bank twice by November 2010 to no avail. In a third attempt, the authorities struck a deal with Banco BIC Português to sell BPN in July 2011. Accordingly, the authorities recapitalized BPN again in February 2012 with €600 million with the sole purpose of selling the bank at negative equity levels. We record this as a loss to the government rather than as acquiring a new stake in the bank.

On August 3, 2014, BES was set to undergo resolution following the deterioration of its capital ratios and liquidity positions. A new bridge bank, Novo Banco, was immediately created by the Bank of Portugal and capitalized by the Portuguese Resolution Fund (with about 80 percent

of the €4,900 million financing provided through a loan from the State, and the rest from private sector contributions including resolution funds). BES was left as a bad bank meant to be liquidated in the future. The Portuguese authorities also transferred to Novo Banco BES' State Government Guaranteed Bank Bonds (GGBB) guarantee of €3,500 million. Note that the GGBBs were offered to all Portuguese banks and not only those under resolution. After a previous failed sale attempt for Novo Banco, the authorities struck a deal with Lone Star on March 31, 2017. The sale would make Lone Star the major shareholder of the bank with 75 percent of Novo Banco's share capital, while the Portuguese Resolution Fund would remain in control of the remaining 25 percent. The sale also included a Contingent Capital Agreement, which has effect for a specified period of time (up to 2026 at the latest) and allows Novo Banco to claim payments linked to losses related to a pre-defined portfolio of assets which may affect the bank's regulatory capital position, subject to a set of specific conditions. Accordingly, we treat this measure as a guarantee (in the bank's balance sheet, this claim is booked as an asset and would be either reflected as other income or equity directly once the credit right against the Resolution Fund is recognized).

Banif also underwent resolution. In January 2013, the authorities injected €700 million in equity and €400 million in hybrid instruments (contingent convertibles). The bank also received €1,175 million in GGBB guarantees by 2015. After the unsuccessful submission of a set of restructuring plans to the European Commission, the Portuguese authorities split Banif in December 2015 into a bad bank that contained impaired assets (liquidated and transferred to Oitante, a public asset management company created by the Bank of Portugal and whose share capital is owned solely by the Resolution Fund) and a good bank, which was sold to Banco Santander Totta for €150 million. The assets and liabilities that were not transferred to Oitante or sold to Banco Santander Totta were left behind in Banif, which entered judicial liquidation proceedings. A considerable amount (€1,081 million) of the losses associated with this resolution operation was absorbed through bail-in of private stakeholders, but the financing of the operation still involved State aid of €2,407 million, as documented in European Commission case SA.43977.

The Portuguese authorities also injected €1,500 million in hybrid instruments (contingent convertibles) into Banco BPI, which the bank redeemed by 2014, three years ahead of its deadline. The authorities also recapitalized BCP (also known as Millenium BCP) with €3,000 million in hybrid instruments in 2012, of which the bank repaid €2,250 million in 2014 and the remaining in 2017. Note that these recapitalizations happened to make both banks compliant with the new capital requirements and the instruments subscribed by the State were remunerated according to market practices (considering what their peers from other European countries were paying for similar instruments) and these instruments were repaid in the agreed deadline, with the State getting its money back with interest. BCP was also granted GGBB guarantees of around €8,000 million between 2012 and 2014. Finally, BPP received a guarantee of €450 million in 2009.

Romania

Although the Romanian economy was hit hard by the global financial crisis, the Romanian banking system weathered it well. No government interventions occurred.

Russia

Russian authorities enacted at the onset of the crisis a law on "additional measures to strengthen the stability of the banking system until December 3, 2011," which was later extended to December 31, 2014. Accordingly, considering further idiosyncratic developments in the Russian financial sector that might confound our sample (e.g. sanctions on the banking sector), we restrict our investigation to the period between the enactment of the law on October 27, 2008, and its expiry on December 31, 2014. As such, using the Deposit Insurance Agency (DIA)'s website in the Russian language as our reference, we monitor and report information on 181 liquidated Russian banks. Notably, this sample is much smaller than the one listed on the DIA's website (a total of 645 liquidated banks and 50 recapitalized banks) due to out-of-coverage interventions (pre-2008 and post-2014) in cases of liquidation, and due to a lack of detailed information in cases of recapitalization.

Slovak Republic

The Slovakian banking system survived the crisis without any government interventions except for liquidity assistance provided by the European Central Bank.

Slovenia

The Slovenian authorities intervened in Nova Ljubljanska Bank (NLB), Nova Kreditna Banka Maribor (NKBM), Probanka, Factor Banka, Abanka, and Banka Celje.

NLB was first recapitalized in March 2011 with a capital increase of €250 million, fully subscribed by the Slovenian authorities. This raised the government's holding of ordinary stock in the bank from 33.1 percent in 2010 to 45.6 percent in 2011. Accordingly, the authorities initiated a restructuring process of NLB that was accompanied with more capital measures given the deterioration of NLB's capital ratios. In June 2012, NLB was recapitalized with €63 million in equity and €320 million in hybrid instruments. These instruments were converted into equity in March 2013 (after which we record them at market value as common equity holdings), increasing NLB's share capital by €320 million. The third recapitalization of NLB occurred in December 2013 with a capital increase of €1,558 million, after which the Slovenian government became the sole owner of NLB. The bank underwent restructuring afterwards and its impaired assets were transferred to BAMC, a public asset management company. In 2018, the Slovenian government sold 65 percent of NLB through an initial public offering and plans to sell another 10 percent in 2019.

NKBM was first recapitalized in December 2012 with €100 million in contingent convertible instruments (converted into equity in April 2013), followed in December 2013 by €195 million in impaired asset relief and €870 million in equity. These measures raised the government's holding of ordinary stock from 41.5 percent in 2008 to 100 percent in 2013. NKBM thus became effectively nationalized and was restructured. In 2015, the Slovenian government sold the bank to the investment fund Apollo and the European Bank for Reconstruction and Development, fully privatizing it.

The Slovenian authorities also recapitalized Probanka and Factor Banka in 2013 before liquidating both banks. Probanka received €176 million in equity and a state guarantee of €490

million for drawing an emergency liquidity assistance, while Factor Banka received €269 million in equity and a state guarantee of €540 million for drawing an emergency liquidity assistance. In both cases, the state guarantee for emergency liquidity assistance was repaid in full. The former also received €300 million in liquidity support (provided as guarantees), while the latter received €330 million in liquidity support until the end of the orderly winding down process but were never redeemed. Both banks were wound down and exited the market with a merger to the Bank Assets Management Company in February 2016.

Responding to a deterioration in the bank's loan portfolio, the Slovenian authorities injected into Abanka €348 million in equity in December 2013, nationalizing the bank and triggering its restructuring. Abanka was subsequently recapitalized with €243 million and extended impaired asset relief of €1,143 million in 2014. Banka Celje was recapitalized with €190 million in December 2014. Abanka and Banka Celje merged in October 2015. Accordingly, Banka Celje ceased its operations after it was acquired by Abanka, which remains in operation as a public bank. The Slovenian authorities announced a plan to privatize Abanka in 2019.

Note that for all Slovenian bank intervention cases, the equity injection does not match the equity stake in domestic currency as most of the former was allocated between share capital and share premia to recognize capital losses and impairments, while the latter solely records movement in share capital.

Spain

The Spanish banking sector underwent significant restructuring in the aftermath of the crisis. Any failing entities that escaped resolution experienced mergers and acquisitions to strengthen their capital bases. Certain impaired assets were transferred to SAREB. Established in 2012, SAREB is a "bad bank" partially owned by the Spanish government through Fondo de Reestructuración Ordenada Bancaria (FROB, the Spanish Executive Resolution Authority) and the recipient of certain real-estate related nonperforming assets of the Spanish banking sector in the aftermath of the crisis. FROB supported the creation of SAREB by investing €540 million in equity and €1,652 million in subordinated debt. FROB's holding of SAREB's ordinary stock is 45 percent. Our sources on these data include the European Commission, bank annual reports when available, Banco de España's notes on public financial assistance in the restructuring of the Spanish banking system, and FROB annual reports. We also collect information from the Fondo de Adquisicion de Activos Financieros (abbreviated as FAAF in Spanish or FAFA in English) on the sale of 54 institutions' distressed assets to the public fund between November 2008 and January 2009.

To restructure the banking system, the Spanish authorities organized their banks into four groups after the 2012 stress test. "Group 0" consisted of sound banks as determined in the test. "Group 1" consisted of banks controlled by FROB. "Group 2" consisted of banks with capital shortfalls that they *could not* cover without government intervention. "Group 3" consisted of banks with capital shortfalls that they *could* cover without government interventions (which we do not investigate for obvious reasons). Each "group" contained several banking entities, formed through the merger of a number of banks and *cajas*.

"Group 0" contained the following banking entities: Santander, Caixabank, BBVA, Banco Sabadell, Bankinter, Kutxabank, and Unicaja Banco. These were commonly involved in acquiring distressed banks, with some of the cases entailing State aid.

First, Caixabank acquired Banca Cívica Group in March 2012 and Banco de Valencia in December 2012. The Spanish authorities had previously injected €977 million in equity into Banca Cívica in 2010, which Caixabank redeemed in April 2013. The authorities had also put Banco de Valencia under administration and injected into it €5,500 million in equity in 2012 and €3,225 million in guarantees by 2012 (in liquidity facilities and asset protection schemes). The latter also received €500 million in impaired asset relief in 2012.

Second, BBVA acquired UNNIM in 2012 and Catalunya Banc in 2015. The Spanish authorities had taken over UNNIM and injected equity of €380 million in 2010, €568 million in 2011, and €953 million in 2012. They had also guaranteed it with €2,869 million. The authorities had also injected into Catalunya Banc equity of €1,250 million in 2010, €1,718 million in 2011, and €9,084 million in 2012, in addition to €525 million in subordinated bonds in 2015, a €1,335 million guarantee in 2014, and impaired asset relief of €1,600 million.

Fourth, Banco Sabadell acquired Caja de Ahorros del Mediterráneo (CAM) in December 2011 and Banco Gallego in July 2013. The authorities had previously placed CAM under administration and recapitalized it with €5,250 million in 2011. The authorities had also recapitalized Banco Gallego in 2013 with €245 million and granted it impaired asset relief of €948 million. In terms of guarantees, the Spanish government also granted Banco Gallego €1,170 million in 2013 and CAM €3,000 million in 2011 and €8,570 million in 2012 (the latter is estimated, as the actual guarantee ranges between €7,490 million and €8,210 million).

Fifth, Unicaja Banco acquired Banco CEISS (Caja España and Caja Duero) in March 2014. The authorities had recapitalized Banco CEISS with €525 million in equity in 2010 and €604 million in hybrid instruments in 2013. The latter were redeemed in September 2017. Banco CEISS had also received €696 million in impaired asset relief in 2012, €200 million in guarantees in 2013 and €241 million in more guarantees in 2014.

"Group 1" contained the following nationalized banks: BFA/Bankia, Catalunya Banc, NovaCaixaGalicia Banco (NCG), and Banco de Valencia. Note that Banco de Valencia was sold to Caixabank (of "Group 0"), while Catalunya Banc was sold to BBVA (also of "Group 0"), as reported above.

As to the rest of the banks, first, the Spanish authorities recapitalized BFA with €4,465 million in 2010 in preference shares which were converted into ordinary equity in 2012, followed by €4,500 million in September 2012, which was repaid back by Bankia in 2013, and €13,459 million into BFA in December 2012. Note that in terms of governance, BFA was the major shareholder of Bankia before the crisis. Upon the preference share conversion in 2012, FROB became 100 percent owner of BFA, thereby acquiring an indirect stake in Bankia. BFA/Bankia also received €13,759 million in impaired asset relief in 2012 and a liquidity facility (guarantee) of €19 billion. As the group underwent restructuring and returned to profitability in the following years, it partially repaid some of the government's holdings. Second, the authorities recapitalized NCG with €1,162 million in 2010, €2,465 million in 2011, and €5,425

million in 2012. NCG also received €1,300 million in impaired asset relief in 2012 and €2,332 million in guarantees in 2014. NCG was successfully privatized in 2014 with its sale to and subsequent merger with Banco Etcheverría. The bank was later rebranded and renamed as Abanka.

"Group 2" contained Banco Mare Nostrum (BMN), Banco CEISS, Caja3, and Liberbank, which had acquired Cajastur in 2011. Cajastur had acquired Caja Castilla la Mancha (CCM) in 2009, which had been placed under administration that same year. The latter, CCM, had also received €1,300 million in equity and €350 million in loans in 2010, while Liberbank had been under guarantees of €3,570 million in 2010 and received €124 million in contingent convertible instruments and €1,000 million in impaired asset relief in 2012. The bank redeemed the latter in December 2014.BMN was recapitalized with €915 million in 2010 and €730 million in 2013 and received impaired asset relief of €2,100 million. In January 2018, BMN merged with BFA/Bankia. Banco CEISS was acquired by Unicaja Banco in March 2014 as detailed above. Caja3 (CAI, Caja Circulo de Burgos, and Caja Badajoz) was acquired in November 2012 by Ibercaja (of "Group 3," see below). The integration was completed in 2014. Caja 3 had received public support of €407 million in contingent convertible instruments in 2012, which Ibercaja redeemed in December 2017.

"Group 3" consisted of Ibercaja and Banco Popular, both of which covered their capital shortfalls with private capital without resorting to any government interventions. Once Ibercaja covered this shortfall, Banco de España later reclassified it into "Group 0"[40] while Banco Popular continued to struggle with toxic real estate loans and was acquired by Santander in June 2017.[41]

The Spanish authorities also intervened in CajaSur, a savings bank run by priests. Banco de España took over the bank after its planned merger with Unicaja failed. It was recapitalized in 2010 with €800 million in equity, which the savings bank repaid the same year, and granted guarantees of €1,500 million for a credit facility and €392 million for an asset protection scheme, both in 2010. The latter helped facilitate CajaSur's acquisition by Bilbao Bizkaia Kutxa, which then merged with Gipuzkoa Donostia Kutxa and Caja Vital Kutxa to form Kutxabank in January 2012.

Note that we also include 54 banks that received impaired asset relief from FAAF in 2008 and 2009 through the purchase of bank assets. The auctions resulted in acquisitions of around €19 billion. Information on the recipients of this aid is available on FAAF's website.

Sweden

Having already extended liquidity assistance of SEK 5 billion, Swedish authorities rescued Carnegie Investment Bank in 2008 with a loan of SEK 2.4 billion, accompanied by a guarantee

[40] https://www.bde.es/f/webbde/GAP/Secciones/SalaPrensa/NotasInformativas/Briefing_notes/en/notabe060916en.pdf.

[41] For details on Santander's takeover of Banco Popular, see https://www.santander.com/csgs/Satellite/CFWCSancomQP01/en_GB/Corporate/Shareholders-and-Investors/Corporate-Governance/Banco-Popular-Acquisition.html.

of SEK 935 million according to the European Commission's press releases. The loan, however, was immediately written down due to valuation effects. Because of these interventions, the bank was temporarily nationalized by the Swedish National Debt Office on November 10, 2008, and its banking license revoked. The authorities privatized the bank on February 11, 2009. Today, Carnegie Investment Bank operates as an entirely private entity.

Swedish authorities also recapitalized Nordea Bank in April 2009 by buying into capital issues by the bank, according to the bank's annual reports, of SEK 5.6 billion. This capital raise did not alter the government's pre-crisis holding of common equity in the bank, which remained constant at 19.9 percent. This intervention was partially divested in 2011, when the government's stake was reduced to 13.5 percent. The authorities fully divested from Nordea Bank in 2013.

Switzerland

On October 16, 2008, the Swiss authorities announced a recapitalization of UBS of CHF 6 billion in mandatory convertible notes (MCNs) according to the Swiss National Bank's press releases and UBS's annual reports. On August 19, 2009, the Swiss confederation converted its MCNs into ordinary shares, selling thereby its stake of UBS. The central bank also established a stabilization fund (StabFund) to acquire distressed assets from UBS. An estimated USD 60 billion of assets (later revised to USD 39.1 billion) was transferred to this special purpose vehicle. Since the purchase price of those assets did not exceed the book value of assets, this aid does not constitute impaired asset relief. Note that Credit Suisse declined any recapitalization measures during the crisis.

Ukraine

The Ukrainian economy was particularly affected by the repercussions of the global financial crisis, prompting three IMF programs in 2008, 2010, and 2014 and triggering multiple liquidations in the financial sector.

The National Bank of Ukraine (NBU) reports at least 19 liquidated banks since 2012. This sample includes National Standard, Evropeyskiy, Hypobank, European Bank for Development and Savings, Odessa Bank, ARMA, Eastern European Bank, Transbank, Regional Development Bank, Ukrainian Industrial Bank LLC, Zemelniy Bank, BIG Energy, Agricultural Commercial Bank Dnister, Syntez Bank, Volodymyrsky, Soccom Bank, Innovational-Industrial Bank, Bank Stolytsya, and Bank Renaissance Capital PJSC. Information on the fiscal costs associated with such nationalizations and liquidations can be found in the NBU's Financial Stability Reports.

Apart from these dissolved entities, several other Ukrainian banks underwent nationalization, most notably PrivatBank, Ukraine's largest lender. The bank received a refinancing loan of UAH 15 billion from the authorities concurrently to its nationalization. Upon its nationalization on December 19, 2016, the bank received UAH 116.8 billion in recapitalization measures in the form of government bonds. Given that this aid boosted the bank's share capital (according to its 2017 annual report), we record it as an equity instrument rather than a debt instrument. Ukrainian authorities further recapitalized the bank with UAH 38.565 billion in government

bonds in June 2017, which we also treat as an equity instrument. The bank currently remains in operation under public ownership.

United Kingdom

The United Kingdom was one of the first countries affected by the global financial crisis. Our sources for the information we gather on public interventions in this case include annual reports of Her Majesty's Treasury and UK Financial Investments Ltd, special reports on financial stability from the National Audit Office and the Bank of England, the European Commission, and bank annual reports. UK Financial Investments Ltd, established in 2008, mainly manages the British government's stake holdings in the Royal Bank of Scotland (RBS) and Lloyds Banking Group. Our sample includes Northern Rock, Halifax Bank of Scotland (HBOS), RBS, Lloyds Banking Group, Bradford & Bingley, Heritable Bank, Kaupthing Singer & Friedlander, London Scottish Bank, Landsbanki Islands, and Dunfermline Building Society.

The British authorities extended Northern Rock a loan in the fall of 2007 of £24,300 million along with a guarantee of £20,700 million. It was also granted a liquidity facility of £3,800 million in March 2009. Under restructuring, Northern Rock was split in October 2009 into a good bank, Northern Rock plc, and a bad bank, Northern Rock Asset Management. The good bank was sold to Virgin Money in 2011, while the bad bank was transferred to UK Asset Resolution Limited in 2010 to manage its mortgage book. Note that UK Asset Resolution Limited is a public company established in 2010 for the sole purpose of managing the bad banks of Northern Rock and Bradford & Bingley. Accordingly, the good bank was recapitalized with £1,400 million in 2009, and upon its sale to Virgin Money, the latter received a tax indemnity of £310 million and a fixed-term retail deposit guarantee of £72 million. Simultaneously, the British authorities transferred to Northern Rock Asset Management the loan that was previously granted to Northern Rock. They also granted the bad bank several guarantees, some of which were simply a continuation of previous guarantees to Northern Rock, the total value of which stood at £12,400 million.

In October 2008, HBOS received a guarantee from the Treasury of £10,000 million upon a deterioration in its wholesale funding conditions. Simultaneously, the Treasury announced that it would recapitalize RBS, Lloyds TSB, and HBOS after Lloyds TSB announced its acquisition of HBOS to form Lloyds Banking Group (Lloyds).

Accordingly, the British authorities recapitalized RBS in October 2008 with £20,027 million, £5,000 million of which were in preference shares and converted in April 2009. RBS was recapitalized again in 2009 with £25,500 million in B shares through the Asset Protection Scheme. Those shares remained outstanding until their conversion into ordinary shares in October 2015. RBS was also placed under a guarantee of £8 billion in November 2009 through the Contingent Capital Commitment. These measures raised the government's holding of ordinary stock in RBS from null in 2007 to 57.9 percent in 2008 and 70.3 percent in 2009. This holding was at 71 percent at the end of 2017.

The British authorities also recapitalized Lloyds TSB with £4,500 million in ordinary shares and £1,000 million in preference shares and HBOS with £8,500 million in ordinary shares and £3,000 million in preference shares. Due to the acquisition, however, those recapitalizations

were implemented in January 2009 at a total value of £14,465 million as ordinary shareholders of HBOS received 0.605 ordinary shares in Lloyds for every 1 HBOS share they held. These interventions increased the government's holding of common equity in the group from null in 2007 to 43.4 percent in 2008. In December 2008, the group underwent a rights issue to which the government subscribed although its holding level did not change. The preference shares were converted into ordinary equity in March 2009. The government's stake remained stable until September 2013, when the Treasury reduced its stake to 32.7 percent following the group's return to profitability. The Treasury sold another major stake in March 2014, reducing its holding level to 24.9 percent. Subsequently, with a series of share trading, the government reduced its holding level of ordinary stock to 9.9 percent in 2015 and 6.9 percent in 2016. In May 2017, the government completed the sale of its remaining stake, therefore fully privatizing Lloyds.

Bradford & Bingley was liquidated in January 2010 after having received a loan of £18,400 million in 2008 and guarantees of nearly £19,000 million by 2009. Upon liquidation, the bank was split into a bad public bank, Bradford & Bingley plc, and a good bank that was sold to Abbey National. Bradford & Bingley plc was transferred to UK Asset Resolution Limited in October 2010. Note that we do not record any intra-governmental transactions between the British Treasury and UK Asset Resolution Limited.

Heritable Bank, Kaupthing Singer & Friedlander, London Scottish Bank, and Landsbanki were all put into administration and entered resolution in November 2008. Before their resolution, they had been extended loans in October 2008 as follows: Heritable Bank of £590 million, Kaupthing Singer & Friedlander of £3,250 million, London Scottish Bank of £260 million, and Landsbanki Islands of £5,300 million.

The British authorities granted Dunfermline Building Society guarantees of £1,550 million in 2009. Dunfermline, however, was liquidated (and granted a working capital facility of £10 million to fulfill its legal obligations) and its good assets were sold to Nationwide Building Society. The impaired assets of the building society were put under administration.

United States

The Troubled Asset Relief Program (TARP), enacted on October 3, 2008, consisted of different programs: Capital Purchase Program (CPP), Community Development Capital Initiative (CDCI), Automotive Industry Financing Program (AIFP), Targeted Investment Program (TIP), Asset Guarantee Program (AGP), AIG Investment Program (formerly known as Systemically Significant Failing Institutions Program), Term Asset-Backed Securities Loan Facility (TALF), Small Business Administration (SBA) 7a Securities Purchase Program, and Legacy Securities Public-Private Investment Program (S-PPIP). As our focus is on financial intermediaries, we collect information on government interventions through CPP, TIP, AGP, and AIG. Accordingly, we identify the US government interventions into 706 financial entities in the aftermath of the crisis through the CPP and the TIP. Reports on those interventions are downloadable in Excel and PDF formats from the website of the Department of the Treasury. Furthermore, we rely on press releases and special reports from the Federal Reserve Board (FRB), the Federal Reserve Bank of New York (FRBNY), the Federal Deposit Insurance Corporation (FDIC), Federal National Mortgage Association (Fannie Mae), the Federal Home

Loan Mortgage Corporation (Freddie Mac), the Federal Housing Finance Agency (FHFA), and the Congressional Budget Office (CBO) to inform our data collection. We treat preferred shares as equity instruments and subordinated debentures as hybrid instruments.

Troubles in the financial system began to surface with the failure of Bear Stearns on March 14, 2008. To prevent market-wide panic, JP Morgan Chase in coordination with the Federal Reserve Board agreed to purchase the failed institution through a stock swap. The FRBNY provided a loan to Bear Stearns of $12.9 billion to ensure a containment of the bank's risks. This loan proved insufficient to guide Bear Stearns to safety, and the authorities were forced to acquire a portion of Bear Stearns' mortgage trading portfolio that JP Morgan Chase was unwilling to absorb. As such, on March 24, 2008, the government acquired $30 billion in assets from Bear Stearns through Maiden Lane LLC with a loan of $29 billion from the FRBNY.

A few months later on July 11, the FDIC put IndyMac Bank, the seventh largest mortgage originator in the United States, under conservatorship. Accordingly, the FDIC extended deposit insurance coverage to all depositors in the bank whose account balances were less than $250,000 and created a successor bank, IndyMac Federal Bank FSB, for future sale. Initial estimates by the FDIC of the cost of resolution of IndyMac Bank ranged between $4 billion and $8 billion.[42] This does not translate into taxpayer costs since the FDIC is funded by the banking industry. On March 19, 2009, the FDIC sold the new bank to OneWest Bank FSB.

Meanwhile, Fannie Mae and Freddie Mac have been facing hardships. On July 13, 2008, the FRB authorized the FRBNY to extend loans to both institutions if necessary and the Treasury issued a temporary authorization to allow itself to purchase equity in either institution. Two days later, on July 15, 2008, the Securities Exchange Commission temporarily prohibited naked short selling of Freddie Mac and Fannie Mae. However, those measures proved insufficient to stem the troubles in the entities and they were taken into government conservatorship by the FHFA on September 6, 2008. The next day, they also entered into senior preferred stock purchase agreements with the Treasury, whereby "all future common and preferred stock dividends would be eliminated, other than dividends on the senior preferred stock issued to the U.S. Department of the Treasury."[43] According to the CBO, between 2008 and 2012, the Treasury purchased $187 billion in equity from Fannie Mae and Freddie Mac, and $258 billion remained in the form of guarantees as of September 30, 2016.[44] The institutions remain today under government ownership.

The Lehman Brothers filed for bankruptcy on September 15, 2008. The failure of an institution that held over $600 billion in assets and was interconnected led to trouble in others. On September 16, facing AIG's failure, the authorities provided a lifeline to the troubled insurer in the form of an $85 billion loan. This facility proved insufficient to shore up the insurer's reserves, leading to its recapitalization with $40 billion in preferred stock (with warrants) on November 25, and with an equity capital facility on April 17, 2009 for $29.835 billion. Accompanying such recapitalizations was a restructuring of AIG by the Treasury and the

[42] See https://www.fdic.gov/news/news/press/2008/pr08056.html for more information.

[43] See http://www.freddiemac.com/investors/preferred-stock.html for more information.

[44] See https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/52089-gse-report-onecol.pdf.

FRBNY, through which AIG's assets were cut nearly in half between September 2008 and September 2012. By January 2013, the federal authorities were completely divested from AIG after having sold their shares in the insurer.

As to the other components of TARP, the Treasury under CPP provided around $250 billion in capital measures to 706 banks in the United States, mostly in the form of preferred stock with warrants. We use TARP reports to construct a monthly measure of the net outstanding investment of the federal authorities in financial institutions. In addition to CPP, the authorities implemented TIP to extend $20 billion each to Citigroup and Bank of America on December 31, 2008 and January 16, 2009, respectively. Note that TIP solely benefited those two banks. Citigroup was also placed under government guarantees of $5 billion through the AGP.

Cross-Country Cases

In some cases, more than one government were involved in intervening in a bank with cross-border activities. We provide detailed summaries of these cases with particular focus on how we allocate the stakes taken across countries.

A. Dexia

The Franco-Belgian bank Dexia was first recapitalized in September 2008 in a cross-border intervention by the Belgian and French authorities for a total of €6,400 million: Belgium and France each contributed €3,000 million in common equity, while an additional €376 million in convertible bonds to be issued by Dexia BIL was initially to be subscribed by Luxembourg. This capital increase was effectively implemented through existing shareholders who were closely linked to the public sector. For Belgium, the federal authorities contributed €1,000 million, the Flemish Region €500 million, the Walloon Region €350 million, the Brussels Capital Region €150 million, Holding Communal SA €500 million, Acrofin SCRL €350 million, and Ethias €150 million. For France, the federal authorities contributed €1,000 billion, managed by the Agence des Participations de l'Etat, while Caisse des Dépôts et Consignation contributed €1,710 million and CNP Assurances €288 million. Accordingly, the Belgian State's direct and indirect holding of ordinary stock increased with these measures from 40.2 percent in 2007 to 44.6 percent in 2008. Similarly, the French State's direct and indirect holding of ordinary stock increased from 13.7 percent in 2007 to 26.3 percent in 2008. Simultaneously, Dexia was placed under €100 billion in guarantees (reduced from the initial €150 billion), to which Belgium contributed €60.5 billion (60.5 percent), France €36.5 billion (36.5 percent), and Luxembourg €3 billion (3 percent). Note that these guarantees were topped with an additional guarantee of $16.98 billion on a sub-portfolio of structured credit assets from Belgium and France to ensure the sale of Dexia's American subsidiary, FSA, in November 2008. Belgium covered 62.4 percent of the guarantee, while France covered the remaining stake. In February 2010, Belgium, France, Luxembourg, and the European Commission concluded a restructuring plan of Dexia, under which Dexia would give up its convertible bond that was to be subscribed by Luxembourg.

The authorities' common equity stake in Dexia remained stable until 2011, when Dexia found itself in an even more precarious funding position with its exposure to the escalating European sovereign debt crisis. Dexia was subsequently nationalized and placed in orderly resolution in

October 2011. The European Commission approved the resolution plans in December 2012. The initial guarantee agreement extended in 2008 was replaced by a new guarantee agreement of €55 billion (increased from the initial €45 billion). Belgium would cover €33.275 billion of the agreement, France €20.075 billion, and Luxembourg €1.65 billion. This measure was accompanied by the nationalization of Dexia's Belgian subsidiary, Dexia Banque Belgique, now renamed as Belfius. The Belgian authorities subsequently recapitalized Belfius with €4,000 million (Belfius remains public today). Shortly afterwards, the agreement was once again replaced by another, titled "Convention d'émission de garanties" and signed on January 24, 2013. According to this contract, the total amount of guarantees would be €85 billion, of which the Belgian authorities would cover €43.699 billion (51.41 percent), the French authorities €38.752 billion (45.59 percent), and Luxembourg €2.55 billion (3 percent).[45] To avoid the market disruption that an immediate liquidation of a systemic bank such as Dexia could cause, the Belgian and French authorities recapitalized Dexia again in December 2012 with €5,700 million in ordinary shares, of which Belgium provided €2,915 million and France €2,585 million. This raised Belgium's holding of common equity in the bank to 50.0 percent, and France's to 44.4 percent, levels at which the holdings still stand today. The share capital of the bank, however, dropped in 2013 from €6 billion to €500 million following impairments and loss recognition. Simultaneously, Luxembourg informed the European Commission in March 2012 of its sale of Dexia's subsidiary in Luxembourg, Dexia Banque Internationale à Luxembourg (Dexia BIL), for a price of €730 million to private investors. As the sale price was consistent with market prices, the European Commission ruled that this sale did not constitute State aid, so we do not include it in our dataset. As for the parent company Dexia, the most recent milestone in its orderly resolution has been the disposal of its 58.9 percent holding in Dexia Israël Bank in the first half of 2018.

B. Fortis/ABN AMRO/BNP Paribas

A risk-sharing process to resolve Fortis Bank SA/NV and two of its subsidiaries, Fortis Bank Luxembourg (FBL) and Fortis Bank Nederland (FBN), was simultaneously initiated by Belgium, Luxembourg, and the Netherlands on September 28, 2008.

First, the Belgian authorities initiated the recapitalization of Fortis Bank with €4,700 million in equity. This measure raised Belgium's holding of common equity in Fortis Bank from null in 2007 to 49.9 percent in 2008. Then, on October 10, 2008, the Belgian authorities acquired the remaining 50.1 percent stake of Fortis Bank with the injection of another €4,700 million and began arrangements to transfer impaired assets of Fortis Bank to Royal Park Investments (RPI), a public special purpose vehicle. On the same day, Belgium negotiated with BNP Paribas the sale of 75 percent of Fortis Bank ("Protocole d'Accord"), through which the government's holding of ordinary equity would be reduced to 25 percent. However, in an extraordinary general shareholder meeting on February 11, 2009, the shareholders of Fortis Bank rejected the proposed takeover by the Belgian authorities and the subsequent sale to BNP Paribas. This ruling triggered another round of negotiations, whereby some measures concerning the transfer of assets to RPI were modified. Accordingly, Belgium implemented several further capital measures, with the total effect estimated at around €4,528 million in

[45] A continuously-updated table showing the total outstanding amount of guaranteed liabilities of Dexia is available at https://www.nbb.be/doc/dq/warandia/pdf/gotot.pdf.

impaired asset relief (meant to strengthen RPI's capital base, whose goal was to repair Fortis Bank's balance sheet) and €3,500 million in guarantees (which includes a guarantee to subscribe to more capital if need be). In addition, the Protocole d'Accord was implemented after some delay in the spring of 2009, when BNP Paribas acquired a majority stake of 75 percent in Fortis Bank. This stake remained stable until November 2013, when the government sold its remaining stake in the bank to BNP Paribas. The bank currently operates under the name BNP Paribas Fortis and is a full subsidiary of the French lender. As to RPI, it sold its entire portfolio to a private investor. In exchange for this sale in the spring of 2009, the Belgian authorities acquired an ordinary stock holding in BNP Paribas through the Société Fédérale de Participations et d'Investissement (SPFI) of €7,165 million in May 2009, equivalent to 10.8 percent of the bank's capital. This stake remained broadly stable until 2017, when the Belgian authorities sold €1,780 million, reducing thereby the ordinary stock holding to 7.7 percent of capital. Note that we record this series of transactions in our data at market value. Note, in addition, that the gross amounts are not disclosed by neither the European Commission nor the bank itself. Instead, they are only available through the French or Dutch annual reports of SPFI.

Second, Luxembourg extended a convertible loan to FBL of €2,400 million (amended from the initial €2,500 million). Upon the loan's conversion in December 2008, Luxembourg's holding in FBL increased from null in 2007 (the bank was a subsidiary of Fortis Bank) to 49.9 percent in 2008. The major shareholder of FBL then was Fortis Bank, which had been already nationalized by the Belgian authorities. That meant that FBL had become, through direct and indirect holdings, a public entity. FBL also changed its name to BGL in December 2008. In relation to the February 11, 2009 measure, Luxembourg extended an additional €100 million in convertible loans to FBL, which were converted two months later. In May 2009, BNP Paribas acquired 66 percent of the bank through direct and indirect holding of Fortis Bank, reducing Luxembourg's holding of common equity from 49.9 percent in 2008 to 34 percent in 2009. The bank currently operates in Luxembourg under the name BGL BNP Paribas as a subsidiary of BNP Paribas, with Luxembourg's stake still at 34 percent.

Third, the Dutch authorities acquired FBN, which included ABN AMRO at the time of the purchase, at a price of €12,800 million (we do not include another €4,000 million that was disbursed to the insurance arm of the group, Fortis Insurance). Along with this acquisition, the Dutch authorities assumed FBN's loan obligations to Fortis Bank in the amount of €16,100 million (a so-called "novation") and granted FBN a short-term liquidity facility in the amount of €45,000 million (repaid back by July 2009). Given the characteristics of a legal novation and the lack of further disclosed information, we treat the assumption of loan obligations as never redeemed. As a result, ABN AMRO became indirectly under public ownership. Note that since the European Commission does not treat the acquisition of FBN as a State aid,[46] we do not include it in our dataset. On November 21, 2008, the Dutch authorities announced a merger between FBN and ABN AMRO, leading to public acquisition of ABN AMRO from FBN for €6,500 million. Even though this acquisition did not take place in cash, but rather in the waiving of ABN AMRO debt owned by the Dutch State, we treat it as an equity instrument since it allowed the authorities to become the direct holder of ABN AMRO Group. Note that this amount may overstate the true aid contained in this measure since it was made at prices

[46] See recital (94) in No C 11/2009, available at http://ec.europa.eu/competition/state_aid/cases/230806/230806_1235915_338_2.pdf.

above the market value. To facilitate the acquisition, ABN AMRO/FBN was recapitalized with €2.5 billion in hybrid instruments in July 2009 (consisting of mandatory convertible securities and credit default swaps) and €4,390 million in November 2009. The mandatory convertible securities were converted into equity in 2010 and the credit default swap was terminated in October 2010, while a subordinated loan of €1,600 million was redeemed in July 2015. Note that in terms of corporate structure and governance, the authorities first became owners of 33.8 percent of ABN AMRO Holding NV's ordinary stock through the purchase of FBN. This company was the holding entity of ABN AMRO Bank NV. As part of the restructuring, ABN Holding NV was demerged, and ABN AMRO Bank NV became the subsidiary of a new public entity, ABN AMRO Group NV, starting in April 2010. An illustrative graph of this process can be found in the 2009 annual review of ABN AMRO Bank NV. The merged entity, ABN AMRO Group NV, was also extended a guarantee of €950 million. Following an initial public offering of the group in November 2015 and a series of depository receipt transactions, the Dutch authorities' holding of common equity in the bank decreased from 100 percent in 2014 to 56 percent in 2017.

C. Kaupthing Bank Luxembourg

In June 2009, the Luxembourg state provided a loan of €320 million to Kaupthing Bank Luxembourg, which had been already in liquidation since 2008. As the bulk of deposits stemmed from Kaupthing's Belgian activities, this loan was granted in cooperation with the Belgian authorities that agreed to extend to the Luxembourg state a loan of €160 million, on the condition that the Luxembourg authorities use these funds to finance the loan to Kaupthing Bank. While the Luxembourg state did receive notes in return for the loan provided, it was agreed that their reimbursement be done via cash payments.

APPENDIX II. FISCAL IMPLICATIONS OF GROSS DIRECT INTERVENTIONS BY COUNTRY

Tables A1 and A2 show the fiscal impact of government interventions in the financial sector in the period between 2007 and 2017 in percent of 2017 GDP and in percent of 2017 total financial sector assets, respectively. The tables cover the major cases where government intervention has been sizeable and where national authorities provide information that is broadly comparable across countries.

Table A1. Selected Economies: Government Interventions in the Financial Sector
(Percent of 2017 GDP)

Table A1. Selected Economies: Government Interventions in the Financial Sector
(Percent of 2017 GDP)

	Gross Direct Interventions[1] (A)	Direct Recovery[2] (B)	Net Fiscal Cost (C=A-B)	Current Holdings of Financial Assets[3] (D)	Net Fiscal Cost minus Asset Holdings (E=C-D)	Indirect Fiscal Cost[4] (F)	Total Fiscal Cost (G=E+F)
Belgium	9.6	6.5	3.1	2.5	0.6	-0.6	0.0
of which financial assets[5]	8.2	5.2	3.0	2.5			
Bulgaria	1.2	1.2	0.0	0.0	0.0	0.0	0.0
of which financial assets[5]	1.2	1.2	0.0	0.0			
Croatia	0.3	0.0	0.3	0.1	0.2	0.1	0.2
of which financial assets[5]	0.3	0.0	0.3	0.1			
Cyprus	18.9	0.0	18.9	1.4	17.5	1.7	19.2
of which financial assets[5]	18.9	0.0	18.9	1.4			
Denmark	3.5	3.5	0.0	0.0	0.0	-1.1	-1.1
of which financial assets[5]	3.5	3.5	0.0	0.0			
France	1.1	1.0	0.2	0.0	0.2	-0.2	0.0
of which financial assets[5]	1.1	1.1	0.0	0.0			
Germany	11.7	5.7	6.0	0.5	5.5	-0.1	5.5
of which financial assets[5]	11.3	5.9	5.4	0.5			
Greece	46.3	21.9	24.4	3.3	21.0	-1.1	19.9
of which financial assets[5]	38.8	22.6	16.2	3.3			
Hungary	1.4	1.2	0.1	0.0	0.1	0.0	0.1
of which financial assets[5]	1.4	1.2	0.1	0.0			
Italy	1.7	0.4	1.4	0.8	0.6	-0.2	0.3
of which financial assets[5]	1.7	0.4	1.3	0.8			
Ireland				0.1			
of which financial assets[5]				0.1			
Latvia	9.1	5.5	3.6	0.0	3.6	-0.6	3.0
of which financial assets[5]	7.9	5.5	2.4	0.0			
Lithuania	2.5	2.4	0.1	0.0	0.1	0.2	0.3
of which financial assets[5]	0.1	0.1	0.0	0.0			
Luxembourg[6]			4.0	4.0	0.0	-0.2	-0.2
of which financial assets[5]				3.0			
Netherlands	14.9	12.6	2.3	2.4	-0.1	0.0	-0.1
of which financial assets[5]	11.3	8.4	3.0	2.4			
Portugal	14.1	2.8	11.4	3.1	8.3	0.7	9.0
of which financial assets[5]	11.1	0.2	10.9	3.1			
Slovenia			11.8	0.6	11.2	0.9	12.1
of which financial assets[5]				0.6			
Spain	8.0	3.2	4.8	0.7	4.1	-0.4	3.7
of which financial assets[5]	7.6	3.2	4.4	0.7			
Sweden[7]	0.2	0.5	-0.3	0.0	-0.3	-0.2	-0.5
of which financial assets[5]	0.2	0.5	-0.3	0.0			
United Kingdom	6.4	2.2	4.3	1.4	2.9	-0.2	2.7
of which financial assets[5]	4.9	1.3	3.6	1.4			
United States (TARP)[8]	1.9	1.7	0.1	0.0	0.1	-0.2	-0.1
Euro zone	8.0	4.0	4.0	0.7	3.3	-0.2	3.1
of which financial assets[5]	7.1	3.9	3.3	0.7			

Table A2. Selected Economies: Government Interventions in the Financial Sector[1]
(Percent of 2017 Financial Sector Assets)

Table A2. Selected Economies: Government Interventions in the Financial Sector[1]
(Percent of 2017 Financial Sector Assets)

	Gross Direct Interventions[1] (A)	Direct Recovery[2] (B)	Net Fiscal Cost (C=A-B)	Current Holdings of Financial Assets[3] (D)	Net Fiscal Cost minus Asset Holdings (E=C-D)	Indirect Fiscal Cost[4] (F)	Total Fiscal Cost (G=E+F)
Belgium	2.2	1.5	0.7	0.6	0.1	-0.1	0.0
of which financial assets[5]	1.9	1.2	0.7	0.6			
Bulgaria	0.8	0.8	0.0	0.0	0.0	0.0	0.0
of which financial assets[5]	0.8	0.8	0.0	0.0			
Croatia	0.2	0.0	0.2	0.1	0.1	0.0	0.1
of which financial assets[5]	0.2	0.0	0.2	0.1			
Cyprus	1.3	0.0	1.3	0.1	1.2	0.1	1.3
of which financial assets[5]	1.3	0.0	1.3	0.1			
Denmark	0.7	0.7	0.0	0.0	0.0	-0.2	-0.2
of which financial assets[5]	0.7	0.7	0.0	0.0			
France	0.3	0.2	0.0	0.0	0.0	0.0	0.0
of which financial assets[5]	0.3	0.3	0.0	0.0			
Germany	2.9	1.4	1.5	0.1	1.4	0.0	1.4
of which financial assets[5]	2.8	1.5	1.3	0.1			
Greece	22.8	10.8	12.0	1.6	10.4	-0.6	9.8
of which financial assets[5]	19.1	11.2	8.0	1.6			
Hungary	0.5	0.5	0.1	0.0	0.1	0.0	0.0
of which financial assets[5]	0.5	0.5	0.1	0.0			
Italy	0.6	0.1	0.5	0.3	0.2	-0.1	0.1
of which financial assets[5]	0.6	0.1	0.5	0.3			
Ireland				0.0			
of which financial assets[5]				0.0			
Latvia	5.1	3.1	2.0	0.0	2.0	-0.3	1.7
of which financial assets[5]	4.4	3.1	1.3	0.0			
Lithuania	2.1	2.0	0.1	0.0	0.1	0.2	0.3
of which financial assets[5]	0.1	0.1	0.0	0.0			
Luxembourg[6]			0.0	0.0	0.0	0.0	0.0
of which financial assets[5]				0.0			
Netherlands	1.3	1.1	0.2	0.2	0.0	0.0	0.0
of which financial assets[5]	1.0	0.7	0.3	0.2			
Portugal	4.5	0.9	3.6	1.0	2.6	0.2	2.9
of which financial assets[5]	3.5	0.1	3.5	1.0			
Slovenia			8.1	0.4	7.8	0.6	8.4
of which financial assets[5]				0.4			
Spain	2.8	1.1	1.7	0.2	1.4	-0.1	1.3
of which financial assets[5]	2.7	1.1	1.5	0.2			
Sweden[7]	0.0	0.1	-0.1	0.0	-0.1	0.0	-0.1
of which financial assets[5]	0.0	0.1	-0.1	0.0			
United Kingdom	0.7	0.2	0.4	0.1	0.3	0.0	0.3
of which financial assets[5]	0.5	0.1	0.4	0.1			
United States (TARP)[8]	0.4	0.3	0.0	0.0	0.0	0.0	0.0
Euro zone	1.5	0.8	0.8	0.1	0.6	0.0	0.6
of which financial assets[5]	1.3	0.7	0.6	0.1			

Sources: National authorities; ESBC; Eurostat; TARP; IMF staff estimates. Data vintage: April 2018.

Data are cumulative since the beginning of the global financial crisis in 2007 in percent of total cumulative assets of financial corporations. Latest available data up to end-2017. Data do not include forthcoming support or redemptions. (+) indicates a positive fiscal cost, (-) indicates a negative fiscal cost (gain).

[1] **Gross Direct Interventions** include the total acquisition of financial assets (equities, debt, and other securities), loans, capital transfers linked to these acquisitions, debt assumptions and cancellation, the gross occurrence of other measures (e.g., government liquidity provisions, loans to deposits guarantee fund classified inside of the general government). Separate data for Austria, Luxembourg, and Slovenia were not provided or are not available. *Sources: ESCB, national central banks' data on the financial assistance measures (FAM); IMF staff computation.*

[2] **Direct Recovery** includes sales of financial assets, repayment of the loans, and cancellation of assumption and other measures recorded at their transaction value. Data for Austria, Luxembourg, and Slovenia are not available. *Sources: ESCB, national central banks' data on the FAM; IMF staff computation.*

[3] **Current Holdings of Financial Assets** include the outstanding amount of equity and investment fund shares, loans, debt securities figuring on the general government (closing) balance sheet. *Source: Eurostat, Supplementary tables to Excessive Deficit Procedure (EDP) Notification Tables; IMF staff computation.*

[4] **Indirect Fiscal Impact** capture any subsequent stream of revenue and expenditure related to holdings of financial assets or the occurrence of actual and contingent liabilities, such as dividends, fees, interest payments. *Sources: ESCB, national central banks' data on the FAM; IMF staff computation.*

[5] **Financial Assets** include equities, debt, and other securities. *Source: Eurostat, Supplementary tables to EDP Notification Tables; IMF staff computation.*

[6] Computations based on ESCB, Eurostat, other official data.

[7] **Sweden**: includes the sale of Nordea bank shares. *Sources: ESCB, national central banks' data on the FAM; IMF staff computation.*

[8] **USA**: Gross Direct Interventions correspond to Disbursements under the TARP; Direct Recovery includes Repayments; Current Asset Holding corresponds to Outstanding Asset Holdings; and Indirect Cost includes Total Income steaming from assets holdings (Dividend and Interest Payments, Warrants Sold, Other Income/Expenses) *Sources: Troubled Asset Relief Program; IMF staff computation.* Gross Financial Interventions in the United States would amount to US$ 773 billion if we were to account also for the Treasury Purchases Program of Government-Sponsored Entities (GSE) Mortgage-backed Securities that totaled US$ 220.8 billion at end-2009—when the program was terminated—and commitment to Fannie Mae and Freddie Mac per the Senior Preferred Stock Purchase Agreement that accounted for $US 191.5 billion at end-December 2018. For more details, see https://www.fhfa.gov/DataTools/Downloads/Pages/Treasury-and-Federal-Reserve-Purchase-Programs-for-GSE-and-Mortgage-Related-Securities.aspx

[9] Numbers for individual Eurozone countries do not necessarily add up to the total Eurozone numbers given, for instance, the valuation changes for countries for which the data were not provided for the purpose of this study.

For European countries, the impact of financial assistance on government budget balance and public debt is computed following the ESCB FAM and Eurostat Supplementary tables to EDP Notification Tables. The ESCB and Eurostat assume that each government intervention resulting in a transfer of cash to the financial institutions is deficit-financed and has an impact on government debt.

Impact on public debt (Box 1) includes liability instruments recorded in government accounts owning to financial interventions, such as incurred loans and debt issued to finance the interventions, and other liabilities of entities that have been reclassified into general government or newly established government defeasance structures. The impact on public debt can be computed as a sum of the net acquisition of financial assets, the cumulative impact on the budget balance, reclassification, and valuation changes.

MACRO-LEVEL DATA SOURCES BY COUNTRY: APRIL 2018 VINTAGE

Austria: Data were not provided for the purpose of this study. For details on the fiscal impact of financial interventions for Austria, we refer the reader to Eurostat EDP tables and Holler and Reiss (2017). Data on impaired asset holdings in Figure 9 are taken from Eurostat EDP tables.

Belgium: All (FAM) data come from the ESCB and Banque Nationale de Belgique. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Bulgaria: All (FAM) and assets, liabilities, and impaired asset holdings data come from the ESCB and Bulgarian National Bank.

Croatia: All (FAM) data come from the ESCB and Hrvatska Narodna Banka. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Cyprus: Selective (FAM) data are available from the ESCB FAM website. Other FAM data come from the European Commission reports. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Denmark: All (FAM) data come from the ESCB and Danmarks Nationalbank. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

France: All (FAM) data come from the ESCB and Banque de France. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Germany: All (FAM) data come from the ESCB FAM website or were provided by the Deutsche Bundesbank. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Greece: All (FAM) data come from the ESCB and Bank of Greece. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Hungary: All (FAM) data come from the ESCB and Magyar Nemzeti Bank. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Ireland: Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Latvia: All (FAM) data come from the ESCB and Latvijas Banka. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Lithuania: All (FAM) data come from the ESCB and Lietuvos Bancas. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Luxembourg: Data were not provided for the purpose of this study. Selective (FAM) data are available from the ESCB FAM website. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Netherlands: All (FAM) data come from the ESCB and De Nederlandsche Bank. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Portugal: All (FAM) data come from the ESCB and Banco de Portugal. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Slovenia: Data were not provided for the purpose of this study. Selective (FAM) data are available from the ESCB FAM website. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Spain: All (FAM) data come from the ESCB and national central bank. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

Sweden: All (FAM) data come from the ESCB and Suomen Pankki Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

United Kingdom: All (FAM) data come from the ESCB and UK Office for National Statistics. Assets, liabilities, and impaired asset holdings are taken from Eurostat EDP tables.

United States: Data are taken from TARP. Some information comes from the Federal Housing Finance Agency. Please refer to note 8 on the page above for details.

Data for the remaining EU countries come from Eurostat EDP tables.

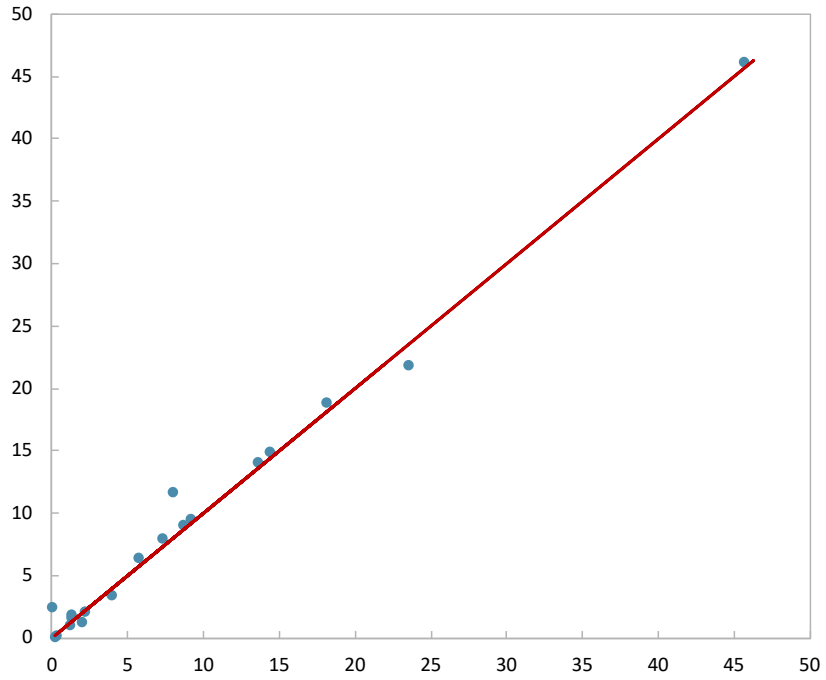
APPENDIX III. COMPARING THE TWO DATASETS

We cross-check the results of the bank-level and the country-level datasets. For this purpose, we compare gross direct interventions between the two datasets (Figure A1).

Overall, the correspondence between the datasets is encouraging. The average and median differences for gross direct interventions are 0.52 and 0.56 percentage points of 2017 GDP, respectively. For 4 of the 19 countries that intervened in their banking systems and that we investigated in both datasets, the difference is less than 0.1 percentage point.

In only two cases, the differences are stark. Specifically, for Germany and Lithuania, they exceed 1 percent of GDP because of the treatment of special purpose vehicles and impaired asset relief, as expected. For instance, the Lithuanian authorities used the Deposit Insurance Fund to recapitalize the banking sector. Therefore, while the country-level approach encompasses flows to this fund, the bank-level approach solely includes flows from the Deposit Insurance Fund to the recapitalized banks.

Figure A1. Gross Direct Interventions in Country-Level vs. Bank-Level Datasets
(2007–17; in percent of 2017 GDP)

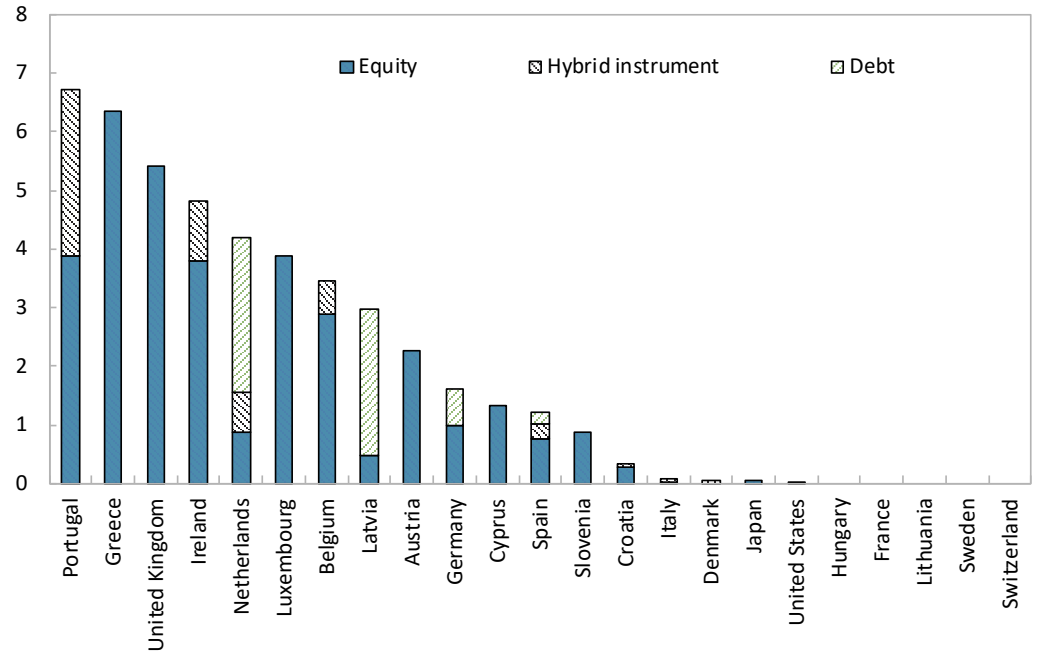


Sources: National authorities; and ECB DG Statistics; Eurostat; US Department of the Treasury; and IMF staff estimates.

Note: This figure shows the scatterplot of the gross direct interventions in the official country-level dataset [vertical axis] and the bank-level dataset [horizontal axis]. Interventions are expressed in percent of 2017 GDP. The straight line is the 45-degree line. The sample covers the countries for which country-level data are reported. For more information on the bank-level sources and methodology, see Appendix I. For more information on the country-level sources and methodology, see Appendix II.

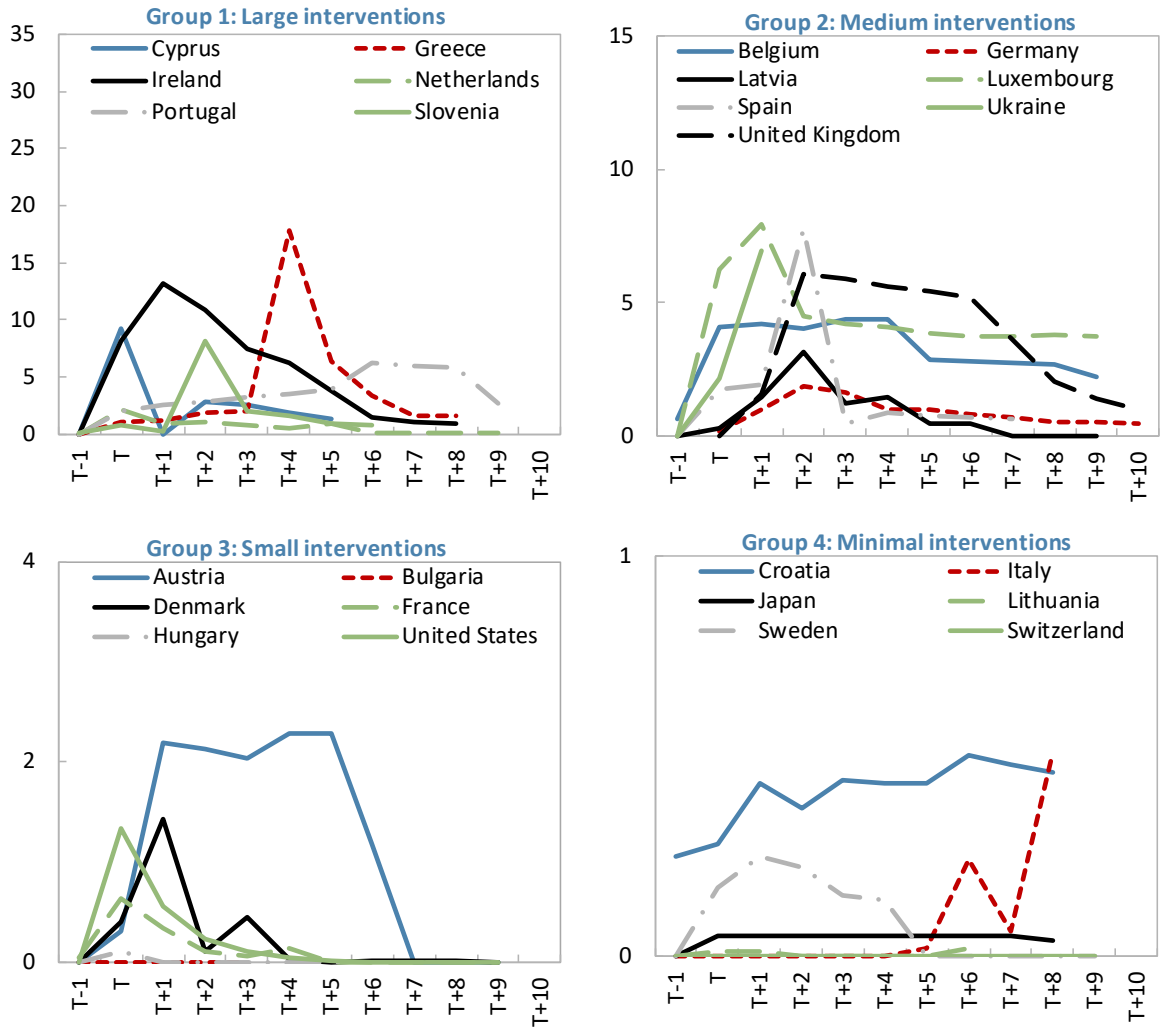
APPENDIX IV. ADDITIONAL FIGURES

Figure A2. Public Asset Holdings by Instrument
(T+5; in percent of 2017 GDP)



Sources: National authorities; European Commission; bank reports; IMF staff estimates.
Note: This figure shows public asset holdings in banks five years after the first intervention, expressed as a percent of GDP.

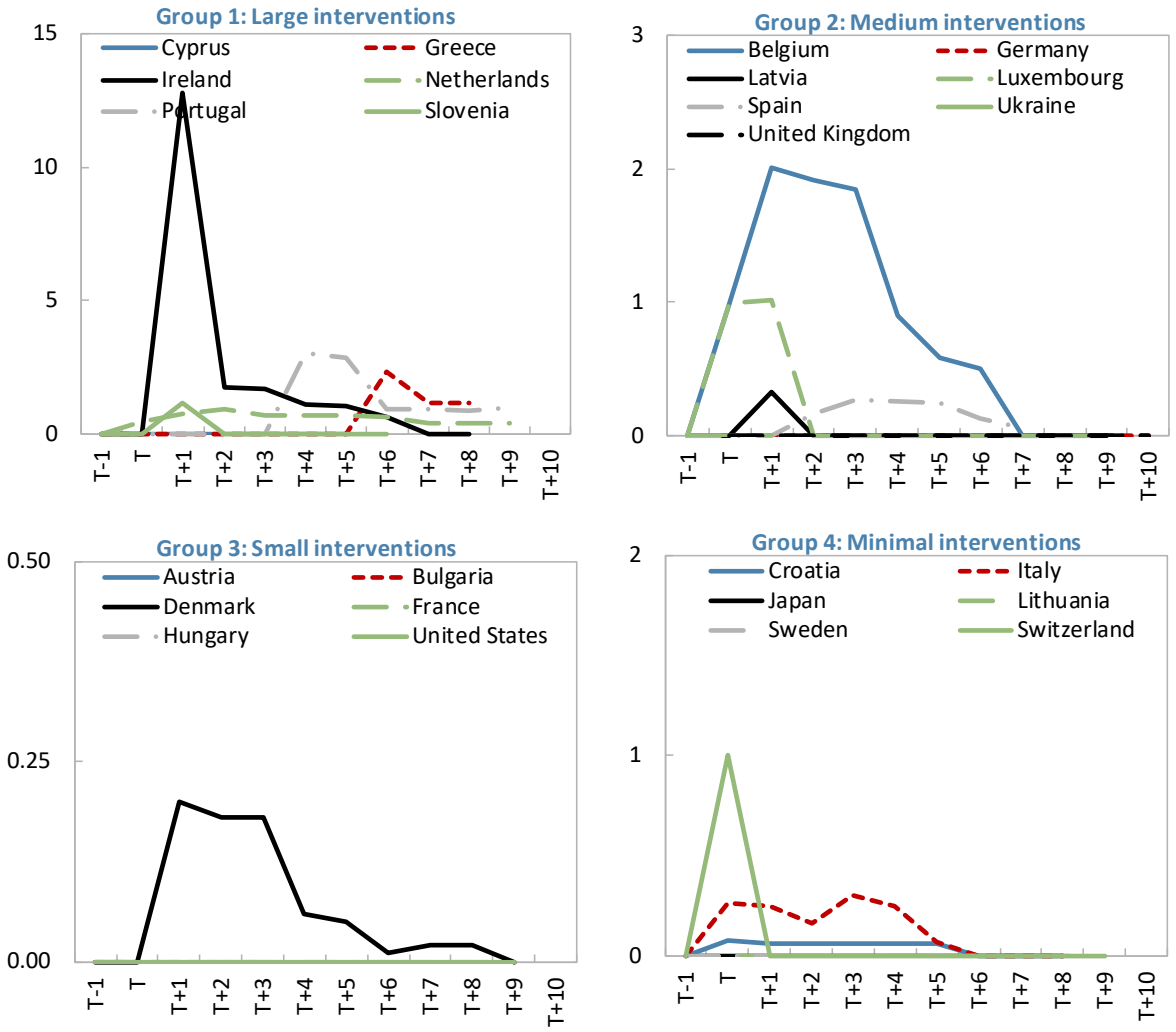
Figure A3. Bank Liabilities in Public Hands—Equity Shares
(2007–17; in percent of GDP)



Sources: National authorities; European Commission; bank reports; IMF staff estimates.

Note: This figure shows the evolution of public holdings in bank equity since the GFC as a percent of GDP. T is the country-specific date of first intervention in either equity shares, hybrid securities, or debt instruments. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

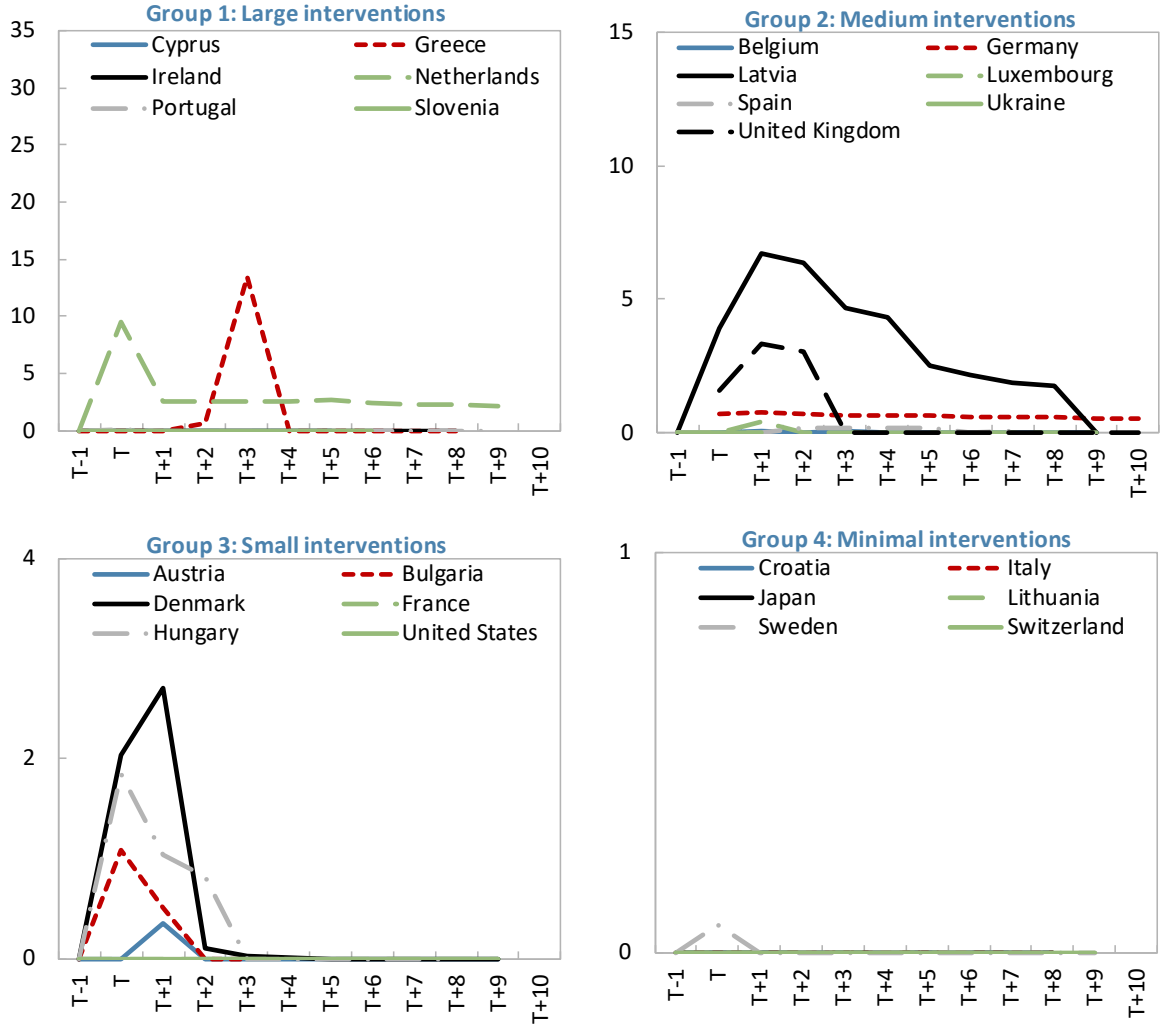
Figure A4. Bank Liabilities in Public Hands—Hybrid Securities
(2007–17; in percent of GDP)



Sources: National authorities; European Commission; bank reports; IMF staff estimates.

Note: This figure shows the evolution of public holdings in bank hybrid instruments since the GFC as a percent of GDP. T is the country-specific date of first intervention in either equity shares, hybrid securities, or debt instruments. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.

Figure A5. Bank Liabilities in Public Hands—Debt
(2007–17; in percent of GDP)



Sources: National authorities; European Commission; bank reports; IMF staff estimates.

Note: This figure shows the evolution of public holdings in bank debt since the GFC as a percent of GDP. T is the country-specific date of first intervention in either equity shares, hybrid securities, or debt instruments. Data reflect the available information as of April 2018 for EU countries and as of end-2018 for the United States.