The Impact of Government Guarantees on Banks' Wholesale Funding Costs and Risk-taking: Evidence from a Natural Experiment

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This version: 27 June 2017

Abstract

This study compares the effects of the introduction and subsequent removal of a unique government Wholesale Funding Guarantee Scheme (WGS) in Australia on the funding costs and loan growth of authorised deposit-taking institutions (ADIs). Our identification strategy exploits the voluntary adoption of the WGS by ADIs using a difference-in-differences estimation approach. We find strong causal evidence to indicate that the government guarantee helped large ADIs to reduce their funding costs relatively more than for the smaller ones. Furthermore, large ADIs continued to benefit from the WGS beyond the official removal of the government guarantee due to market perceptions of continued implicit government support for the too-big-to-fail banks. We also find that the guarantee increased leverage in large banks and supported the growth of housing loans in their loan portfolios. Further tests using guaranteed and non-guaranteed bonds issued by ADIs show that the largest banks experienced a net reduction of 17.8 bps from adopting the government guarantee

JEL Classification: G21, G28

Keywords: Bank lending, Government guarantee, Funding costs, Market discipline, Risk-taking, Wholesale debt funding

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We thank the Australian Prudential Regulation Authority for the provision of data used in this research. We thank Michael Hawari for providing valuable research assistance. Financial support from the Centre for International Finance and Regulation (CIFR, project number F002) is gratefully acknowledged. CIFR was funded by the Commonwealth and NSW Governments and supported by other Consortium members (see www.cifr.edu.au). We are grateful to Thorsten Beck, Charles Calomiris, Ding Ding, Kose John, Martien Lubberink and participants at the 7th Financial Markets and Corporate Governance Conference, the FMA Asia/Pacific Conference 2016, the FIRN/ANU Banking and Financial Stability research meeting 2016, and the seminars at the Bank of Korea, Reserve Bank of New Zealand and the University of Technology Sydney for comments that have improved this work. All errors remain our own.

The Impact of Government Guarantees on Banks' Wholesale Funding Costs and Risk-taking: Evidence from a Natural Experiment

1. Introduction

Government interventions and support of the banking sector has been the subject of much public debate since the 2007-2008 Global Financial Crisis (GFC). The potential adverse consequences of government support for banks and the sovereign-bank nexus are well documented in the recent literature (Acharya, Drechsler and Schnabl (2014), Dam and Koetter (2012), Duchin and Sosyura (2014), Gropp, Gruendl and Guettler (2013) and Hryckiewicz (2014)). The evidence focuses on government support in the form of bailouts and government protection of bank deposits. In contrast, the impact of government guarantees on banks' wholesale debt funding costs and risk-taking behaviour is less understood due to limitations of bank level data.[2] This paper accesses a unique dataset from Australia and aims to fill this void by examining the direct impact of the provision of an explicit guarantee by the Australian Government on deposit taking institutions' wholesale debt funding during the height of the GFC.

In recent years, governments in a number of countries around the world have strengthened deposit protection arrangements and introduced explicit guarantees for financial institutions' wholesale debt. Wholesale funding guarantee schemes have been implemented in response to the extremely difficult funding conditions experienced during the GFC. The schemes are designed to promote financial system stability and to encourage the ongoing provision of credit, by supporting confidence in the financial sector, reducing actual and perceived risks and assisting financial institutions to access wholesale funding (at a reasonable cost) during a time of considerable financial turbulence. Unlike the Financial Claims Scheme which was introduced to

[2] A notable exception is the prior work of Gropp, Gruendl and Guetller (2013) studying the removal of a government guarantee for German savings banks and the subsequent reduction in bank risk.

protect retail deposits up to AUD 1 million, the Australian Government Wholesale Funding Guarantee Scheme (WGS) covered large deposits greater than AUD 1 million, as well as, wholesale debt funding used by Australian deposit-taking institutions up to maturities of five years. The WGS commenced on 28 November 2008 at the height of the GFC and closed on the 31 March 2010. The government guarantee provided was unique in that Australia did not previously have any explicit deposit protection, the scheme was voluntary, and unlike other government guarantees offered, there was initially no explicit end date announced for the scheme. This signalled to market participants that the government was prepared to support the banks for 'as long as it takes'. This offers a rare natural experiment for understanding the causal effects of government guarantees on bank funding costs and lending behaviour.

Our study not only bridges but also extends the two separate strands of the banking literature - on the determinants of bank funding costs and the impact of the provision of a financial safety net on market discipline. For example, Demirguc-Kunt and Huizinga (2004), Imai (2006), Yan et al. (2014), Hadad et al. (2011), Karas, Pyle and Schoors (2013), all find that the introduction of a domestic deposit insurance scheme lowers the perceived risks for financial institutions and this, in turn, leads to a reduction in market discipline by depositors for protected banks. This reduces the interest rates demanded by depositors resulting in a major reduction in funding costs for financial institutions. However, going forward, banks worldwide may become increasingly less reliant on traditional deposit funding for two main reasons. First, the new Basel III liquidity rules incentivise banks to use more long-term wholesale funding to better match the maturity structures in their typical uses of funds for extending longer-term loans.[3] Second, as investors chase higher yields in an historically low interest rate environment they tend to have a stronger preference to invest their funds in longer term debt securities offered by financial institutions

[3] Basel III liquidity standards require banks to have net stable funding ratios (NSFR) above 100% to ensure that the liquidity mismatches between banks' assets and liabilities are significantly reduced and they become more resilient in times of liquidity shortages, such as during the GFC (see King (2013) for details on this measure).

over deposits. Hence, it is important to understand the unintended distortionary effects of wholesale funding guarantees provided by governments. It is possible that guarantees on wholesale funding may pose an even greater moral hazard concern, given that the monitoring of banks by sophisticated creditors in the wholesale funding markets is likely to be more effective than that provided by individual retail depositors. Furthermore, Boyle et al. (2015) provide evidence based on survey responses to show that there is actually greater withdrawal risk for deposits when countries, without prior explicit deposit insurance, introduce deposit insurance schemes during banking crises, which was the case in Australia.

Australia offers a unique setting to study the impact of the introduction of a wholesale funding guarantee scheme as, up until recently, it was one of only two OECD countries with neither an explicit deposit nor wholesale funding guarantee scheme (New Zealand being the other). We exploit the cross-sectional as well as time-series variation provided by the introduction of the voluntary WGS. ADIs that chose to participate in the WGS had to pay a risk-based fee priced between 70 and 150 basis points depending on their credit rating. The maximum fee of 150 basis points applied to ADIs which were rated BBB+ or below, as well as for unrated ADIs. Furthermore, unlike almost every other developed country, different types of deposit-taking institutions – banks, credit unions and building societies in Australia are all covered and supervised by the same regulator, the Australian Prudential Regulation Authority (APRA) and are all subject to the same prudential and legislative requirements. For this reason, Australia affords a rare, natural experiment for an empirical comparison on the impact of both the adoption and removal of a wholesale funding guarantee scheme on various financial intermediaries' funding costs.

In the context of the Financial Claims Scheme introduced in Australia for retail deposits during the GFC, Yan et al. (2014) showed that market deposit rates and deposit growth for ADIs became much less sensitive to bank fundamentals, once the scheme was in place. However, in contrast, relatively little is known about the effects of the WGS on different types of ADIs with heterogeneous funding and ownership structures. To date, there has been a dearth of attention paid to the effect of government guarantees on mutuals, such as credit unions and building societies. Moreover, there has also been no previous study on the effect of introducing a wholesale funding guarantee without any prior deposit insurance already in place nor the exogenous removal of a wholesale funding guarantee scheme after its implementation. Our paper aims to fill these voids in the literature by comparing the effects of the recent introduction of the WGS on commercial banks and mutuals (credit unions and building societies). Our study differs from existing studies on deposit insurance, in that we focus on the effects of explicitly insuring wholesale debt and large-sized deposits.

To establish causality, we use a difference-in-differences approach on a total sample of 29 Australian banks, 15 building societies and 196 credit unions, reporting to the prudential regulator, APRA. We find strong empirical evidence to indicate that ADIs in general, experienced a significant reduction in their funding costs and funding premiums after taking up the WGS. The removal of the guarantee scheme had no effect on the funding costs and funding premiums for all types of ADIs suggesting that the guaranteed ADIs continued to benefit from market perceptions of implicit government support beyond the guarantee scheme. Following WGS adoption, we find that whilst bank leverage increased, asset risk did not change significantly.

There are important policy implications emanating from our findings as policy makers need to be mindful of the moral hazard problems associated with offering government guarantees on banks' funding sources to maintain credit provision even in times of stress. There is some evidence to suggest that, had the government guarantee been kept in place for a prolonged period of time, banks could have been perversely incentivized to become highly levered. Consistent with the arguments of Calomiris and Haber (2014) on government policies to protect bank liabilities, we uncover a clear shift in loan portfolio allocations to the residential housing sector within protected large banks in Australia, underpinning a period of strong growth in housing prices since the introduction of the government guarantee on bank liabilities.

The remainder of the paper is structured as follows: in Section 2 we provide some background into the Australian financial institutions assessed in this paper as well as the Australian Wholesale Funding Guarantee scheme. Section 3 outlines and reviews the related literature. Section 4 presents the data and methodology used. Section 5 reports the main empirical results and robustness checks. Section 6 discusses our findings and concludes.

2. Background

2.1 Australian banking sector

The banking sector in Australia is highly concentrated, with four major banks ("the big four") accounting for approximately 88 per cent of all domestic bank assets as of 2014. Apart from the major commercial banks, the banking system also comprises various "other banks" that in the past have had a local concentration in one state or territory. These banks account for approximately ten per cent of all domestic bank assets. Additionally, there are two other categories of ADIs – credit unions and building societies. When combined together, they account for approximately two per cent of all bank assets. Credit Unions and Building Societies (also known as mutuals), unlike larger deposit-taking institutions, traditionally focus primarily on retail banking and are still a pivotal source of competition within the retail banking sector. Mutuals differ from commercial banks in that their customers have some ownership in the financial institution. They are not publicly listed companies and are limited in their ability to issue new shareholder equity. Thus, they rely to a greater extent on retained earnings to generate new capital. This differs from publicly listed commercial banks, which can issue new shares to raise extra capital (Rasmussen, 1988). In Australia, mutuals come under the same legislative and prudential requirements as all other Australian banks.

We exclude foreign branches and subsidiaries in this study as these rely on funding by parent companies overseas as well as transfer costing rendering these ADIs to be incomparable to local ADIs for the purpose of our study.

2.2 Wholesale Funding Guarantee Scheme

The Australian Government Guarantee Scheme for deposits greater than AUD 1 million and wholesale funding (WGS), was announced in October 2008 and commenced on 28 November in that year. It was introduced in response to the evaporation of liquidity in the global financial system. The scheme was designed to restore financial system stability in Australia and to encourage the ongoing provision of credit by supporting confidence and assisting ADIs to access wholesale funding from international credit markets at a reasonable cost during the time of considerable turbulence and liquidity shortage. The scheme also ensured that Australian institutions were not placed at a disadvantage, compared to their international competitors, who could access similar government guarantees on bank debt. The scheme was administered by the national central bank (the Reserve Bank of Australia) for the federal government. Eligible ADIs were able to apply to having their eligible wholesale funding securities guaranteed under the scheme. The scheme was voluntary and subject to an approval process and the payment of a monthly fee by the ADI on the amounts guaranteed. Following improvements in funding and market conditions, the Australian government closed the wholesale funding guarantee to new borrowings on 31st of March 2010. Outstanding large deposits and wholesale funds of approximately AUD 160 billion with up to 5 years of maturity remained at the time of the removal of the government guarantee.

3. Related literature and research questions

3.1 Determinants of banks' funding costs and funding premiums

We contribute to the emerging literature on banks' funding costs that remains comparatively small and includes contributions by Deans and Stewart (2012), Araten and Turner (2013), Berkelmans and Duong (2014), Beau (2014), Babihuga and Spaltro (2014) and Aymanns et al. (2016). These papers examined a number of drivers on banks' funding costs and reveal that banks' asset quality, capital adequacy, funding liquidity, funding mix, and the general state of the macroeconomy matter.

Funding costs across financial institutions differ due to ADIs' access to wholesale debt markets. There can be various proxies for banks' fundings costs. To measure funding costs, first we use the implicit interest rate on a bank's interest-bearing liabilities, i.e., total interest expenses divided by interest-bearing liabilities (Demirgüç-Kunt and Huizinga, 2004). Additionally, we also explicitly account for the dynamics in base-level funding costs within the economy by computing measures of banks' funding premium and also the funding costs on repriced interest-bearing liabilities.

Large ADIs can take advantage of their size, diversification and frequent security issuances to reduce their funding costs (see Kroszner (2016) and Aymanns et al. (2016)). Beau (2014) analyses direct and indirect costs associated with the issuance of wholesale funding. Deans and Stewart (2012) show evidence for Australia that major banks have a higher proportion of wholesale debt compared to other banks while for credit unions and building societies, deposits make up the bulk of their funding structure. Therefore, the wholesale liabilities ratio is a key factor driving variations in funding costs across banks. Furthermore, Babihuga and Spaltro (2014) investigate marginal funding costs, defined as the sum of the LIBOR rate and bank credit spreads and find that macroeconomic variables account for much of the variations in bank funding costs.

In terms of funding premiums, which is a measure of the difference between overall funding costs and the cash rate (interest rate for short-term bank deposits with the Reserve Bank of Australia), Deans and Stewart (2012) show that during 2008 and the early part of 2009, funding premiums increase strongly as a result of the GFC. Berkelmans and Duong (2014) document that spreads between funding costs and cash rate narrow marginally after a crisis, reflecting the shifts in the composition of banks' funding liabilities and the narrowing of wholesale debt spreads. However, both studies are based on aggregate summary statistics rather than a bank-level analysis and it is not clear how government guarantees introduced around the world during the GFC have directly affected banks' funding costs.

To extend the current literature on bank funding costs we test the following hypotheses:

H1: Banks that utilised the Wholesale Funding Guarantee Scheme (WGS) experienced lower funding costs compared to ADIs that did not participate in the WGS.

H2: The removal of the WGS had less effect on banks' funding costs than its adoption due to a continued perceived level of implicit government support beyond the closure of the WGS.

3.2 Guarantees and bank risk-taking

Banks' shareholders are residual claimants. Equity is similar to a call-option on the asset value (with the debt value as the strike price). The value of the option increases with the variance of the underlying asset value and shareholders have hence an incentive to engage in high risk-taking activities to increase their residual claims at the expense of depositors' funds. However, in mutual institutions, the depositors are also the shareholders. Hence, residual claims are offset by the decrease in fixed claims (interest paid on deposits) and the incentive for mutuals to take higher risk is lower than for non-mutuals. Furthermore, mutuals are also deterred from pursuing risky ventures by their limited capacity to raise new equity capital. They typically rely on retained earnings to generate capital. Thus, capital constraints impede risk-taking (Llewellen and Holmas, 1991). The ability to raise capital from external capital markets gives banks a competitive advantage and in turn makes them more attractive to depositors. Recent banking theories suggest that there is a positive relationship between bank capital and market share (Mehran and Thakor, 2011). The evidence suggests that well-capitalised institutions are able to compete more effectively for deposits (Calomiris and Wilson, 2004). Berger and Bouwman (2013) find that high levels of capital enhance medium and large US banks' performance, in relation to their resilience (i.e., survival) and market share, primarily during banking crises. This is consistent with most theories predicting that capital enhances banks' survival probabilities. Banks typically argue that holding more capital jeopardises their performance and leads to less credit supply and loss of profit due to increased funding costs. However, incentive based theories predict that higher capital should enhance bank profitability. Holding more capital will either strengthen bank incentives to monitor its relationship with borrowers or banks will attenuate assets that elevate the probability of a financial crisis such as risky commercial real-estate loans (Acharya et al., 2011, Allen, Carletti and Marquez, 2011, Baker and Wurgler, 2013 and Berger and Bouwman, 2013).

Deposit insurance and other guarantees may present a moral hazard problem. Prior studies show that deposit insurance schemes increase bank risk and also the likelihood of having a banking crisis (Demirguc-Kunt and Detragiache (2002), Barth et al. (2004)). Yet, it remains that deposit insurance is a cornerstone of many banking systems, because it helps to protect savers and prevent bank runs. However, it also provides banks with incentives for excessive risk-taking because, firstly, it weakens the market discipline carried out by creditors, and secondly, the deposit insurance premium is typically mispriced due to regulators' limited ability to assess risks and to charge risk-adjusted premiums. Some studies provide more specific evidence. For example, Gropp and Vesala (2004) find for a sample of European banks that explicit deposit insurance reduced bank risk during the 1990s whilst Anginer et al. (2014) find for a global sample of banks that deposit insurance generally increases bank risk during normal times, but decreased bank risk during the crisis period from 2007-2009. Ioannidou and Penas (2010) analyze the effect of deposit insurance on banks' risk-taking behavior using Bolivian credit registry data and find that banks originate riskier loans without mitigation through collateral or maturities. In a similar vein, Gropp et al. (2013) study the removal of a government guarantee following a lawsuit and find a reduction in bank risk via a reduction in the origination of high risk loans. Furthermore, Black et al. (2016) argue that government guaranteed bank bonds improve debt liquidity and default risk, consistent with a reduction in bank funding costs but they do not provide empirical evidence on the latter.

To further extend this current literature on the effects of deposit insurance and government guarantees on bank debt we also test the following hypotheses:

H3: Banks became more indebted and took more risk after their voluntary adoption of the WGS.

H4: Banks allocated the cheaper debt funding towards growing their loan portfolios in the booming housing sector after they adopted the WGS.

4. Empirical framework

The decision to participate is voluntary and banks that chose to participate may have special characteristics. Hence, in order to control for this selection process, we implement a two stage model throughout. In a first stage, we model the probability to participate in the WGS and we compute the Inverse Mills Ratio (IMR). We control for the IMR in all of our second stage models and employ a difference-in-differences estimation approach to directly test our key hypotheses. All models are based on standard errors clustered at the bank level. Using a difference-in-differences estimation we can observe the impact on the "treated" (insured) ADIs before and after the implementation of the WGS treatment. All panel regressions in this study are estimated using Ordinary Least Squares (OLS).

4.1 Control for WGS selection

More formally, banks participate voluntarily in the WGS and we model the probability to participate in the WGS with a Probit model with standard errors, which are clustered at the bank level:

$$P(WGS_{it} = 1) = \phi(\vartheta X_{it}) \tag{1}$$

We compute the Inverse Mills Ratio as follows:

$$\mathrm{IMR_{it}} = \frac{\phi(\vartheta \mathrm{X_{it}})}{\Phi(\vartheta \mathrm{X_{it}})}, \tag{2}$$

With the marginal density function of the standard normal distribution $\phi(.)$ and the cumulative density function of the standard normal distribution $\Phi(.)$. X_{it} is a vector of bank characteristics determining individual bank's participation decision. In a second step, we include the Inverse Mills Ratio (IMR) as a control variable in the models testing our main hypotheses.

4.2. Test of the adoption of the WGS guarantee

The following difference-in-differences equations are formulated to test the Wholesale Funding Guarantee Scheme's (WGS) impact on ADIs' funding costs:

$$FundingCost_{it} = \alpha\left(WGS_{ij} * DuringGar_t\right) + \beta WGS_i + \gamma DuringGar_t + \delta X_{it} + \theta IMR + \varepsilon_{it} \tag{3}$$

where *i* indicates the individual ADI and *t* indicates the time period. We test three distinct measures for bank funding costs (*FundingCost$_{it}$*): (i) the average funding costs as the ratio of interest expenses relative to total liabilities, (ii) the funding premiums as the difference between average funding costs and the cash rate (i.e., a proxy for the risk-free interest rate), and (iii) the rate sensitive funding costs as the ratio of incremental interest expenses paid on new liabilities to new liabilities.

WGS_{ij} is the vector of two dummy variables, *WGS_Small* and *WGS_Big* that take the value of one for the small and large sized ADIs respectively that chose to take the guarantee and the value of zero for those that did not. *DuringGar* is a dummy variable that takes the value of one for the period during the guarantee (Nov 2008 - Mar 2010) and the value of zero for other periods. WGS_{ij}*DuringGar* is our difference-in-differences (DiD) operator that shows the effect of the guarantee on the insured ADIs after it was introduced. X_{it} is a vector of bank-specific and macroeconomic control variables (see Table 1 for details). *IMR* is the Inverse Mills Ratio from our first stage regression which is included to account for the selection bias created by banks' voluntary adoption of the WGS. In addition, $\alpha, \beta, \gamma, \delta, and\ \theta$ are the respective parameters that indicate the sensitivities of test and control variables with regard to the dependent variable.

The difference-in-differences models do not allow bank or time fixed effects due to multi-collinearity as *DuringGar* conflicts with the time dummy and *WGS* with the bank dummy.

4.3. Test of the removal of the guarantee

As Australia has been the only country that has removed an existing wholesale funding guarantee without any prior explicit protection scheme in place prior to the 2007-2008 Global Financial Crisis, our identification strategy also exploits this quasi-natural experiment to assess the removal effect of the guarantee on ADIs' funding costs. We introduce the variable *RemovalGar* in the following model:

$$FundingCost_{it} = \alpha(WGS_i * RemovalGar_t) + \beta(WGS_i * DuringGar_t) + \gamma RemovalGar_t + \pi DuringGar_t + \vartheta WGS_i + \delta X_{it} + \theta IMR + \varepsilon_{it} \quad (4)$$

The variable WGS_{ij} is the vector of two dummy variables, *WGS_Small* and *WGS_Big* that take the value of one for small and big ADIs respectively that chose to take the guarantee and the value of zero for those that did not. The variable *RemovalGar* takes the value of one for the periods after the removal of the guarantee and the value of zero for the periods before and during the guarantee. The variable *RemovalGar* allows us to incorporate both the removal and adoption effects in a single regression. However, as *RemovalGar* is identical with the control for the timing of the Financial Claims Scheme (*FCS*) included in Equation (3), we have removed *FCS* from the list of control variables in this model specification. All other variables and their parameters in Equation (4) are identical to those in Equation (3).

4.4. Test of bank risk-taking

We test the risk-taking behaviour of banks using the following model:

$$RiskTaking_{it} = \alpha\left(WGS_{ij} * DuringGar_t\right) + \beta WGS_i + \gamma DuringGar_t + \delta X_{it} + \theta IMR + \varepsilon_{it} \quad (5)$$

We apply three proxies for bank risk-taking commonly used in the banking literature: (i) leverage as the ratio of total liabilities to total assets, (ii) *Z-score* as the ratio of the sum of the averaged return on assets (*ROA*) and the capital adequacy ratios (*CAR*) to the standard deviations of *ROA* over the past four quarters, and iii) risk weighted assets (RWA) as the ratio of the risk weighted assets to total assets. We note that the capital adequacy ratio is highly correlated with the leverage ratio, the Z-score and RWA ratio. Therefore, we exclude CAR in the vector of control variables (X_{it}) in Equation (5). Other independent variables and their parameters in Equation (5) remain the same as in Equation (3).

4.5 Test of the impact of the WGS on bank loan portfolios

We next examine loan growth within banks after their adoption of the WGS using the following DiD model specification:

$$LoanGrowth_{it} = \alpha\left(WGS_{ij} * DuringGar_t\right) + \beta WGS_i + \gamma DuringGar_t + \delta X_{it} + \theta IMR + \varepsilon_{it} \quad (6)$$

In Equation (6), we test three distinct measures for loan growth: (i) the quarterly growth rate of housing loans, (ii) the quarterly growth rate of non-housing loans, and (iii) the quarterly growth rate of gross loans extended. In addition, $\alpha, \beta, \gamma, \delta, \theta, \mu, \rho, \tau$ are the respective parameters that indicate the sensitivities of test and control variables with regard to the dependent variable.

4.7. Robustness checks: bond yield spread analysis

As a robustness check, we analyse the impact of the WGS on the yield spreads of bonds issued by Australian banks.

In the first stage, we estimate the propensity of issuing a WGS guaranteed bond:

$$P(WGS_{it} = 1) = \phi(\delta X_{it}) \quad (7)$$

In the second stage, we control for the IMR and test the impact of WGS participation on the wholesale funding costs:

$$FundingCost_{it} = \alpha(WGSBond_i) + \beta Period_t * + \gamma B_{it} + \delta X_{it} + \theta IMR + \varepsilon_{it} \quad (8)$$

In Equation (8), the funding costs are measured by the bond yield spreads as the differences between the mid-yields at issuance and the US treasury rates (as the bonds are denominated in USD) of equal maturity. The dummy variable *WGSBond* takes the value of one if bonds are guaranteed by the WGS and takes the value of zero otherwise. $Period_t$ is a vector of variables that indicate three different sub-periods: i) pre-guarantee, ii) during guarantee, and iii) post-guarantee regimes. B_{it} is a vector of bond-specific factors and X_{it} is a vector of bank-specific factors. Again, IMR is the Inverse Mills Ratio generated from the guaranteed bond selection model in Equation (7) following Equation (2). Note that contrary to the bank models presented in prior sections (i.e., panel data) we analyse bond origination data (i.e., cross-sectional data; one observation per bond) and are unable to apply a DiD model due to the existence of multi-collinearity.

5. Empirical results

5.1 Data

In this paper we analyse 158 ADIs (13 Australian banks and of these, there are four major banks with 88 per cent of all domestic banking assets, 13 building societies, and 132 credit unions). The sample period that we study is from January 2008 to December 2011. This full sample period is selected in this study to provide three quarters before the guarantee, six quarters during the guarantee and three quarters after the guarantee. We use confidential data provided by APRA that have been submitted by ADIs to APRA at a quarterly frequency. The data used includes information from the banks' balance sheets and profit and loss statements and other filings to the prudential regulator (including interest rate sensitivity, mortgage origination patterns and risk-weighted assets). Information in relation to ADIs' specific balance sheet figures are mandatorily collected periodically and is more detailed than publicly available annual report data. There is also a greater cross-sectional consistency as the data submission is subject to APRA's reporting standards that are common to all ADIs and this effectively rules out any reporting bias.

We identify the list of banks that participated in the WGS from the Reserve Bank of Australia. In this paper, we analyse two sub-samples of ADIs: i) a pooled sample, and ii) mutuals (credit unions and building societies combined). These sub-samples are based on the consideration of a large number of building societies and credit unions in the Australian banking sector. As most Australian banks chose to adopt the WGS, we do not separate them into an individual sub-sample. We are unable to run subsample regressions for the dominant four major banks individually as they all made use of the wholesale funding guarantee, rendering no control group but we analyse treatment effects for those by introducing a separate variable, *WGS_Big*.[4]

Furthermore, we analyse the economic rationale for guaranteeing bond issuances in a robustness check by analysing the yields to maturity at origination of bonds issued before and during the WGS. We map Moody's credit rating for each ADI at the time of WGS participation to the risk-based fee that ADIs had to pay for coverage under the WGS. The fee for ADIs to have their wholesale funds insured under the WGS was 70 basis points for ADIs rated AA- or higher, 100 basis points for ADIs rated between A- and A+, and 150 basis points for ADIs rated BBB+ or below, as well as for unrated ADIs (RBA, 2009).

Table 1 provides the definitions of all the variables used in this study.

< Insert Table 1 Here>

5.1.1 Dependent variables: bank funding costs

Figure 1 describes the ADIs' average funding costs, funding premiums and rate sensitive funding costs over time. The WGS period is highlighted by the grey shaded area.

< Insert Figure 1 Here>

The rate sensitive funding costs are based on the liabilities repriced within the next quarter and all liabilities.

Figure 1 shows the funding costs over time. The funding costs are also affected by changes in monetary policy (interest rate levels set monthly by the Reserve Bank of Australia) which is why we explicitly control for the cash rate prevailing in the economy in the computation of funding premiums. Bank funding premiums (funding costs less the cash rate) were fairly stable but started

[4] As the potential impact of the WGS would depend on the extent to which ADIs relied on the scheme, we have tested the maximum amount of the wholesale liabilities that was covered for each ADI (relative to their total assets) as a measure of their wholesale funding guarantee utilisation by replacing the WGS dummy variable with the utilisation ratio. The utilisation ratio is the ratio of guaranteed liabilities to total liabilities (i.e., bounded between zero and one).The results are comparable to the WGS dummy.

to decline from 2006 in the lead up to the GFC as the market's risk appetite increased. There is a significant run-up in the funding costs faced by ADIs following the GFC. The implementation of the WGS may have helped ADIs to significantly reduce their funding costs. It should be noted that whilst the WGS was in place, ADI funding costs on average even reverted to their 2002 levels. With the help of quantitative easing around the world, ADIs' funding costs have reached new lows, while the funding premiums continued to rise. Whilst the rate sensitive funding costs are of a leading nature they are similar to the average funding costs and both indicate that there is a reliance on a low average maturity of wholesale debt funding in Australia as the difference between the two funding cost measures is rather small.

5.1.2 Bank funding costs by WGS participation

Figure 2 describes ADIs' funding costs by participation in the WGS. It can be seen that banks that participated in the WGS have on average higher funding costs than non-participants:

< Insert Figure 2 Here>

Whilst the funding costs for ADIs that took up the WGS and those that did not moved closely together throughout the whole sample period, the difference in their funding costs were visually reduced whilst the WGS was in place, indicating that the WGS provided ADIs with a significant competitive advantage relative to those that did not take up the WGS. Although the gap in funding costs expanded briefly after the removal of the WGS, it has subsequently narrowed with the monetary easing implemented around the world. Even though existing guarantees remained in place until maturity after the WGS was removed, the funding cost advantage was substantially reduced. The difference in funding costs between participating and non-participating banks supports the necessity to control for the selection of WGS participating banks.

Table 2 displays descriptive summary statistics before the implementation of the WGS. Statistics are provided for the pooled sample of all ADIs and the sample that contains only mutuals.

< Insert Table 2 Here>

The funding premiums before the guarantee were negative for all ADIs, suggesting that average funding costs during that period were lower than the cash rate as deposit rates are often below the risk free rate and offshore wholesale funding is more competitively priced. The funding costs for mutuals are relatively lower than for the pooled sample and for the pooled sample excluding major banks, which is reasonable because the funding structure for mutuals comprises approximately 95% deposits and 5% wholesale liabilities, while for Australian banks, the funding mix normally comprises 65% deposits and 35% wholesale liabilities. We control for these variations in funding structure by including the wholesale liabilities ratio (WLR) in all models.

Table 3 provides the summary statistics after the introduction of the WGS for ADIs that did not take up the guarantee (WGS=0) and those that did (WGS=1).

< Insert Table 3 Here>

In Table 3, it can be seen that for all sub-samples, after the implementation of the guarantee scheme, funding costs of ADIs that voluntarily entered into the WGS exceeded those of ADIs that did not. The reason for this is that, generally speaking, banks with a higher WLR and higher funding costs have a higher participation rate. Funding premiums of ADIs that chose to participate in the WGS were positive while funding premiums for those that did not participate were negative.

5.1.3 Control variables: bank characteristics and macroeconomic variables

Following the existing literature on bank funding costs, we include several accounting ratios as our independent variables to account for institutional (bank specific) risk. We control for the capital adequacy ratio (CAR) which is the amount of eligible Tier 1 and Tier 2 capital relative to total assets. We expect that the capital adequacy ratio would be negatively related to the banks' funding costs as a strong capital base signals a lower level of default risk. In addition, we also control for liquidity risk and credit risk by using the liquid assets ratio (LAR) which is a ratio of cash and liquid assets relative to total assets and annualised loan loss provisions (LLP) measured as the provisions for bad and doubtful debts divided by total assets. We include the wholesale liabilities ratio (WLR) for wholesale funding relative to total liabilities as a control variable to account for differences in institutional size and funding structures. Large institutions, such as the major banks, may have access to different sources of wholesale funds, and consequently, exhibit systematically different patterns in their funding costs. We also include the size of ADIs as the natural logarithm of total assets. Larger banks are perceived to be less risky due to their greater diversification in asset holdings and funding sources. Furthermore, larger institutions are deemed to be Too-Big-To-Fail, because these large institutions impose significant negative externalities if they are to fail and are more likely to be rescued if faced with financial difficulties (Flannery and Sorescu, 1996, Park and Peristiani, 1998 and Yan et al., 2014). In the context of our research, we do not include a dummy variable for too-big-to-fail (TBTF) banks because of multicollinearity between the participation indicator (WGS) and a TBTF indicator as all four Australian major banks participated in the guarantee scheme. Furthermore we do not control for the RWA ratio as it is highly correlated with CAR, and we do not control for bank profitability (with proxies like ROA) as it is related to the dependent variable, *FundingCost*.[5]

In terms of macroeconomic factors, we use the real gross domestic product growth rate (GDP) to proxy for economic conditions. We choose not to include interest rates in our regressions as funding costs as measured by funding premiums, are already computed based on the cash rate. An inclusion of interest rates in the models for average funding costs and rate sensitive funding costs renders comparable models and results are available on request.

[5] However, the results are comparable when we include these terms. Results are available on request.

5.2 Regression results

Our results are divided into three parts. Firstly, we examine the effect of WGS participation on alternative measures of funding costs – interest expenses, funding premiums, and rate sensitive funding costs. Secondly, we investigate the impact of the WGS removal. Finally, we study the link between the WGS and bank risk-taking behaviour.

5.2.1. The effect of the adoption of WGS

Table 4 shows the parameter estimates of the selection model from Equation (1):

< Insert Table 4 Here>

We find that large banks, banks with a lower capital adequacy ratio (CAR), liquid assets ratio (LAR) and greater risk-weighted assets ratio (RWA) were more likely to participate in the WGS. Only significant variables were included as an exclusion restriction in the first-stage regression.

Table 5 reports the effect of the WGS on ADI funding costs according to Equation (3) and controlling for the Inverse Mills Ratio (IMR) from Equation (2). We run these regressions multiple times for different subsamples of ADIs. First, we run a pooled regression, where all ADIs in our sample are included and second, we run a regression for mutuals (credit unions and building societies combined).

< Insert Table 5 Here>

The *DuringGar* coefficients indicate that the average funding costs, and rate sensitive funding costs reduced after the WGS, as the parameter estimate is negative and significant while the WGS estimate is positive and significant indicating that the funding costs were generally higher for banks that participated in the WGS. The negative and significant estimate of our DiD estimators, *WGS_Small* DuringGar and WGS_Big*DuringGar* suggests that banks that took up the guarantee scheme, had lower funding costs relative to banks that did not. Consistent with our expectations, larger ADIs that chose to participate in the WGS experienced a more economically significant reduction in funding costs than the smaller ones and also the mutuals. Specifically, during the guarantee period, average funding costs reduced by 120 bps for big banks and 19 bps for small banks that voluntarily adopted the WGS.

5.2.2. The effect of the removal of the WGS

Table 6 shows the estimates for Equation (4). We include the variable *RemovalGar* that takes the value of one for the periods after the removal of the guarantee and the value of zero for the periods before and during the guarantee.

< Insert Table 6 here >

The result on the impact of the removal of the guarantee scheme is shown in Table 6. It can be observed for all funding cost measures and data sub-segments that the estimates of the DiD estimator, *WGS_Small*RemovalGar*, are insignificant. This indicates that unlike the decision to participate, the removal of the guarantee had no significant impact on small ADIs' funding costs and funding premiums. This can be attributed to the fact that a large amount of wholesale funds remained insured until maturity (i.e., up to another five years) after the removal of the guarantee. Moreover, the market potentially believed that an implicit government guarantee extended beyond the removal of the WGS. Hence, we find that the coefficient estimate for *WGS_Big*RemovalGar* is consistently negative and significant, meaning that the big four banks continued to benefit from a funding cost reduction beyond the official removal of the WGS. Specifically, after the WGS was closed, average funding costs continued to be reduced by 94 bps for big banks and 10 bps for small banks. This suggests that the four major banks in Australia continued to benefit from an implicit guarantee after the explicit guarantee was removed corroborating with Acharya et al.'s (2016) observations regarding banks that are too-big-to-fail. Our results also shed new light on the recent findings of Boyle et al. (2015) in that we do not find depositors or debt investors are more sensitive and quicker to withdraw their funds from ADIs when insurance gets provided for the first time during a financial crisis in banks that are deemed to be too-big-to-fail.

5.2.3. Bank Risk-taking

Figure 3 compares the leverage in ADIs that participated in the WGS and those that did not over time. It can be seen that leverage ratios increased for WGS participating banks throughout the sample period.

< Insert Figure 3 Here>

In Table 7 we report the parameter estimates for Equation (5). We analyse three alternative proxies for bank risk-taking: (i) bank leverage, (ii) banks' Z-scores, and (iii) risk-weighted assets ratio (RWA). With regard to bank leverage, the *WGS_Big*DuringGar* estimates are positive and significant for the pooled sample, suggesting that big banks increased financial risk after adopting the government guarantee. However, *WGS_Small*DuringGar* is insignificant, indicating that the WGS has no impact on the leverage of mutuals. This is most likely due to the differences in their funding structure and their business model, as building societies and credit unions typically rely less on wholesale funds and more on deposit funding from members as their primary source of funding.

< Insert Table 7 here >

The regressions for the Z-scores and risk-weighted assets show all insignificant coefficients for *WGS_Small*DuringGar and WGS_Big*DuringGar,* meaning that the WGS has no effects on general bank risk. This may be explained by a greater allocation of bank portfolios towards residential mortgage loans following strong increases in house prices in the post-WGS period. We have tested the impact of the WGS on bank liquidity risk and high risk mortgage lending but did not find significant changes. Results are available on request.

5.3.2. Relationship between the WGS and credit growth

In this section, we explore whether the increase in leverage for large banks (see prior section), in combination with the observed increases in absolute lending may have fuelled increases in debt funded bank lending across the banking sector. The results in Table 8 show the parameter estimates for Equation (6) and report the interaction of the WGS with the CAR and its impact on the growth of housing loans, non-housing loans, and total loans.

< Insert Table 8 here >

The DiD estimators, WGS_Small*DuringGar are insignificant for all loan growth measures and sub-samples, indicating that for small banks, the WGS did not have an effect. However, the DiD estimator WGS_Big*DuringGar is positive and significant for explaining housing loan growth. The growth is also economically significant as large banks' loan books grew by 2.37 percent during the WGS period. This empirical evidence indicates that large banks were able to increase credit supply in the housing sector funded by the access to cheaper wholesale debt. This suggests that the WGS increased indebtedness in both banks and household sectors. Our results corroborate the findings of Ioannidou and Penas (2010) on the introduction of deposit insurance in that we also find banks lend more aggressively with the introduction of a government guarantee to strengthen the financial safety net within the banking system. Furthermore, our empirical evidence also supports the thesis of Calomiris and Haber (2014) in that there is a political economy dimension to government policies that protect bank liabilities. They argue that in the U.S. this resulted in a substantial increase in mortgage lending by banks and protected financial intermediaries in the lead-up to the great recession. We also find a clear shift in credit allocation in the too-big-to-fail banks in Australia and this has coincided with a period of strong growth in housing prices since the introduction of the government guarantee on bank liabilities.

5.4 Robustness check: bond yield spreads

As a robustness check, we collected the bid and ask yields at origination of all bonds issued by Australian ADIs during our sample period. We excluded covered bonds, bonds with embedded options and conversion features to ensure that our bond sample is comparable. We study 196 bonds issued by six Australian banks from 2008 to 2012 (100 bonds were issued outside of the WGS period and 96 bond issues occurred during the WGS period. During the WGS period, we identify 30 bonds that were guaranteed[6] and 66 bonds that were not guaranteed. We compute the yield spread above the US treasury rate of equal maturity as all bonds were issued in US dollars. Table 9 shows the summary statistics for the bond data during the guarantee period and over the full time period.

< Insert Table 9 Here>

The bond yield spreads during the WGS are significantly lower than the average yield spreads during the full time period. All bond spreads relate to bank issuers with a rating of A3 by Moodys (respectively A- by Standard and Poors) or better.

Table 10 reports the likelihood of seeking a WGS guarantee for a bond issue based on Equation (7). The model controls for bond features including the issuance amount, LAR, and WLR. It can be seen that banks with a higher wholesale liabilities ratio (WLR) have a higher propensity for their bonds to be guaranteed by the WGS. We tested a greater number of variables but only included significant variables as an exclusion restriction in the first-stage regression.

< Insert Table 10 here >

It should be noted that we do not control for the issuer rating because the bond sample only has six Australian banks allocated in two neighbouring categories of credit ratings (Aa and A). From this model we compute the Inverse Mills Ratio (IMR) following Equation (2). Table 11 shows the parameter estimates for the second stage model whilst controlling for the Inverse Mills Ratio:

< Insert Table 11 here >

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[6] The Reserve Bank of Australia provides public information on the list of bond issues and the issuance amounts that were guaranteed by the WGS on their website, www.rba.gov.au

We run two regression models for bond yield spreads, the first model considers the standalone effect of the WGS on bond yield spreads and the second one controls for period fixed effects. Model 1 shows that yield spreads for bonds insured by the WGS were significantly lower by an average of 57 basis points than bond yield spreads for non-guaranteed bonds. Model 2 shows the same result in that yield spreads for bonds guaranteed by the WGS were significantly lower than yield spreads for non-guaranteed bonds even with period fixed effects. The main benefit of this specification is that it controls for all unobservable characteristics specific to individual bond issues in a given year and helps to mitigate potential omitted variables bias. Model 2 also shows the impact of each single period before, during and after the guarantee scheme with four dummy variables. *PreGar* indicates the three quarters prior to the guarantee scheme and shows a positive but insignificant effect on bond yield spreads. During the WGS period, bond yield spreads were significantly reduced, which is supported by a negative and significant coefficient on *DurGar*. The unambiguous reduction in bond yield spreads for banks that adopted the WGS is consistent with Black et al.'s (2016) finding that government guarantees enhance the liquidity in bank bonds.

In the last three quarters after the closure of the guarantee scheme, we find that bond yields did not change materially, which is supported by the negative but insignificant coefficient on *PostWGS*. This also confirms our findings on the removal effect of the WGS, suggesting that the WGS removal had no significant effect on bond yield spreads. Furthermore, we are interested in the relative incentive of banks to guarantee bond issues using the WGS. We quantify the relative benefit of banks issuing bonds as part of the WGS.

We reveal in Table 11 that wholesale funding costs (expressed in bond yield spreads at issuance) reduced by 29.6 bps with the government guarantee. Moreover, the gross implied reduction in bond yield spreads for guaranteed bonds can be computed as the 29.6 bps standalone reduction of guaranteed bond yield spreads (estimate of *WGS_Bond)* plus the reduction for the period during the WGS (*DuringGar*) in Model 2 of Table 11 amounting to a total reduction of 87.8 bps. The average fee paid on guaranteed bonds suggested by mapping bonds covered by the WGS to the fee charged for the guarantee based on the issuer rating and is 70 bps. Hence, the *net* benefit for guaranteed bonds is 17.8 bps (i.e., the difference between the gross implied reduction in yield spreads and the average fee paid). Whilst the net benefit of 17.8 bps is positive the small amount also suggests that not all bonds may benefit from a lower net yield spread which explains why some bonds continued to be issued without the WGS guarantee during the WGS period. This net benefit from adopting the WGS nonetheless translates to a 40 per cent reduction (17.8/44.43 *100) from the average bond yields for all bonds issued by ADIs.

6. Conclusions

In this study, we investigate whether the introduction of a government guarantee on bank debt by the Australian government, following the Global Financial Crisis (GFC), had material impact on the funding costs of banks. Firstly, we empirically examine the impact of WGS participation and guarantee removal on different types of deposit-taking institutions' average funding costs, funding premiums, as well as rate sensitive funding costs. Secondly, we analyse the effect of the removal of the WGS on bank funding costs. Thirdly, we analyse the impact of the WGS on bank risk-taking.

We find strong empirical evidence that Australian banks entering into the guarantee experienced a significant reduction in their funding costs and funding premiums. In contrast, we showed that the subsequent removal of the guarantee did not result in a full repricing of funding costs back to normal levels. Furthermore, we find greater risk-taking after WGS participation in terms of bank leverage but not in terms of general bank risk, asset risk or liquidity risk. The analysis of loan growth rates confirms that banks allocated the additional debt funding to residential mortgage loans coinciding with a period of strong growth in house prices in Australia.

An analysis of guaranteed and non-guaranteed bonds confirms that the guarantee reduced the funding costs of banks. Our findings support the economic rationale for banks to participate in the WGS given the pricing of the guarantee fees.

Our findings are important for policy makers in two ways: firstly, our results show the efficacy of the WGS. The introduction of the wholesale funding guarantee was effective in helping ADIs to secure wholesale debt funding at reasonable costs during the GFC and as intended it supported consumer confidence, by lowering actual and perceived bank risks within the financial system. This we find led to a significant reduction in bank funding costs. However, we found that the removal of the guarantee scheme had no effect on ADIs' funding costs, which is a unique finding as to our best knowledge, there has been no previous study on the effect of the removal of any wholesale funding guarantee scheme in the world, especially in a setting without any explicit protection on bank deposits or other forms of bank debt. This suggests that the effects of the WGS may continue to persist in the form of an implicit subsidy for an extended period after the closure of the WGS given the precedence with having an explicit government guarantee. Secondly, the adoption of the guarantee may have led to greater leverage in the banking sector and an allocation of debt funding to support growth in residential mortgage lending. This highlights that sound regulation is required to restrict the moral hazard problem that is associated with a wholesale funding guarantee. Future research on government guarantees should focus on the ways in which banks can respond more quickly to the removal of explicit government guarantees to ensure a level playing field can be restored in a manner that is least disruptive on credit supply and ultimately the real economy.

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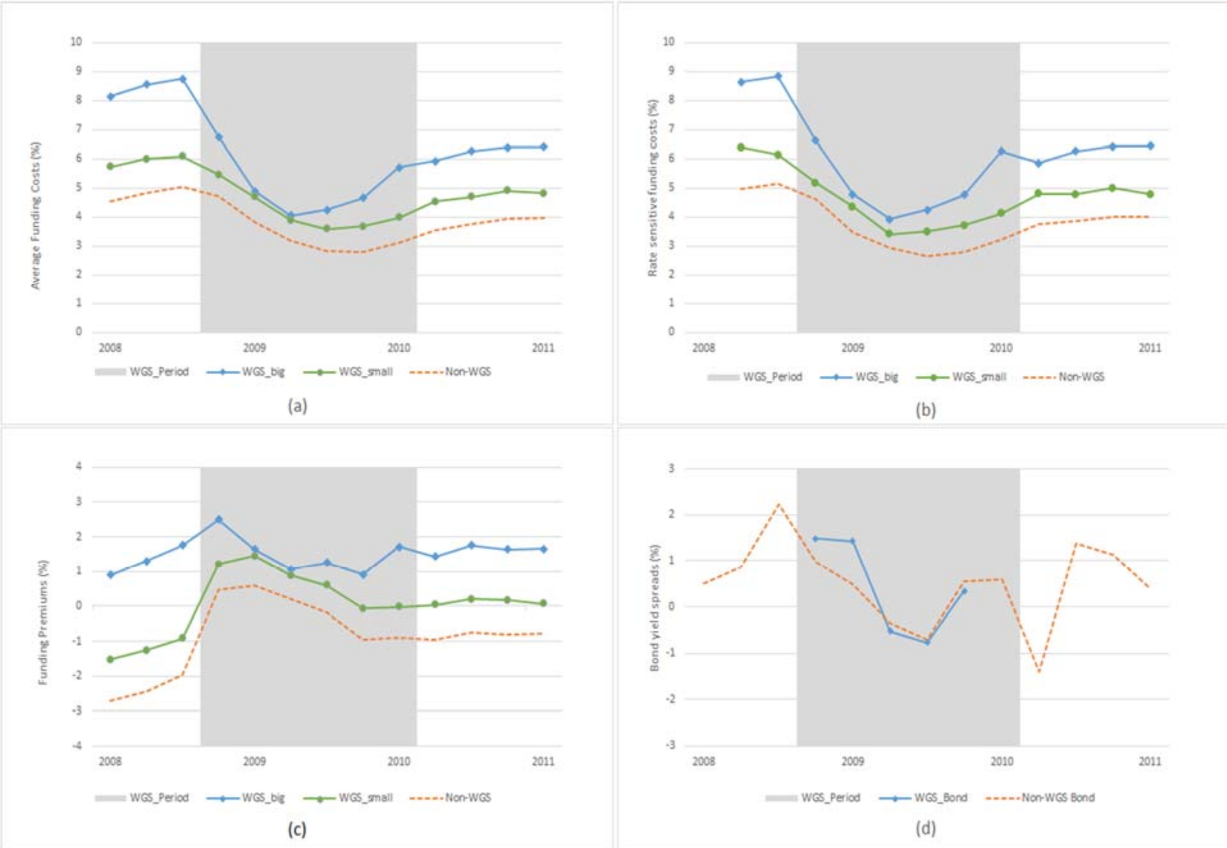
Figures

Figure 1. Average funding costs, rate sensitive funding costs, funding premiums and bond yield spreads

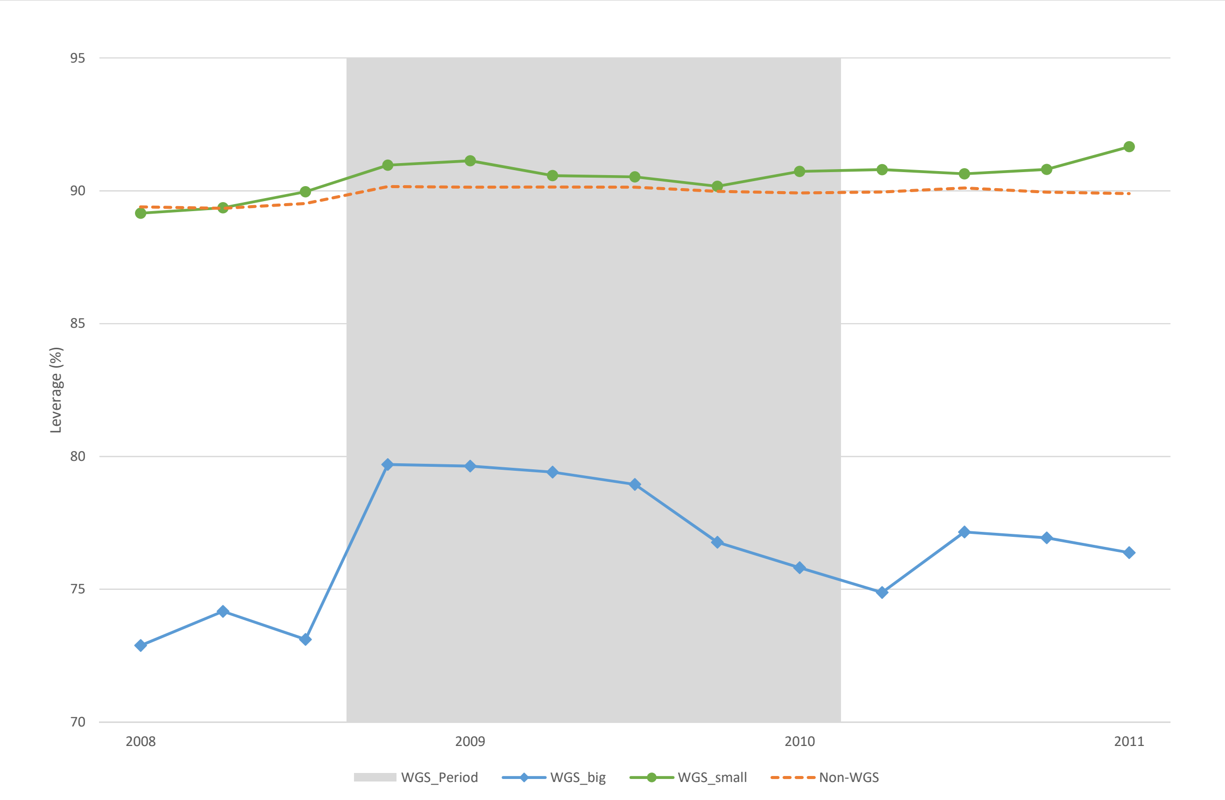
This figure shows the annualised average funding costs (AvgFundCost), rate sensitive funding costs (RSFC), funding premiums (FundPremium) and bond yield spreads (Yieldspread) over time. AvgFundCost is the ratio of annual interest expenses to total assets, RSFC is the ratio of incremental interest expenses paid on new liabilities relative to new liabilities, FundPremium is the difference between average funding costs and the cash rate and Yieldspread is the difference between mid-yield at issuance and the treasury rate. The grey bar indicates the WGS period from November 2008 to March 2010.

Figure 2. Funding costs by WGS participation



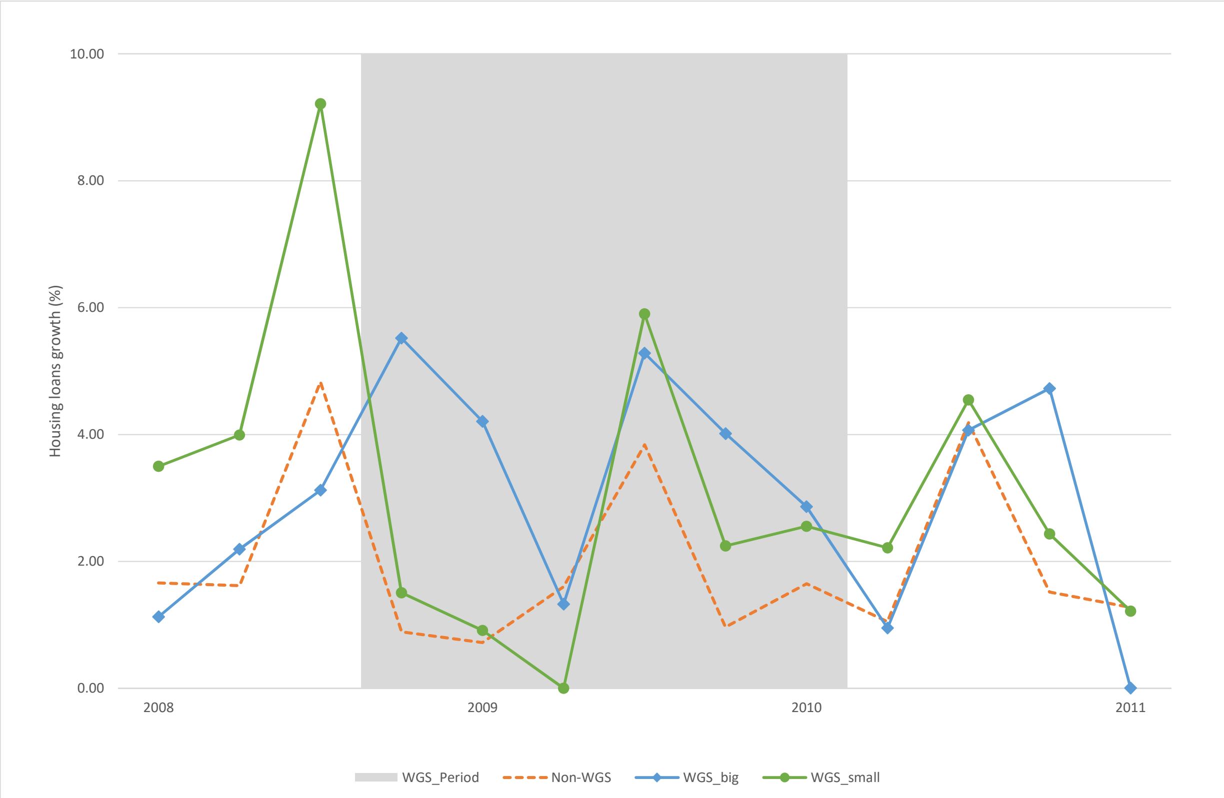
This figure shows the different measures of funding costs separately for big and small ADIs accessing the guarantee respectively WGS_Big and WGS_Small and for those that did not (Non-WGS). Figure 2a shows the average funding costs, Figure 2b the rate sensitive funding costs and Figure 2c the funding premiums. Figure 2d shows average bond yield spreads for bonds guaranteed by the WGS (WGS_Bond) and for those did not (Non-WGS Bond). The grey bar indicates the WGS period from November 2008 to March 2010.

Figure 3. Leverage by WGS participation



This figure shows leverage (measured as the ratio of total liabilities to total assets) over time for big and small ADIs accessing the guarantee respectively WGS_Big and WGS_Small and for those that did not (Non-WGS). The grey bar indicates the WGS period from November 2008 to March 2010.

Figure 4. Quarterly growth rates of housing total loans by WGS participation



This figure shows the quarterly growth rates of housing loans for big and small ADIs accessing the guarantee respectively WGS_Big and WGS_Small and for those that did not (Non-WGS). The grey bar indicates the WGS period from November 2008 to March 2010.

Tables

Table 1. Definition of variables

Variable name	Definition	Data source
Panel A: Dependent Variables		
Average funding cost (AvgFundCost)	Ratio of interest expense relative to total liabilities.	APRA
Funding premium (FundPremium)	Difference between average funding costs and the cash rate.	APRA
Rate sensitive funding cost (RSFC)	Ratio of incremental interest expense paid on new liabilities to new liabilities.	APRA
Leverage	Ratio of total liabilities to total assets.	APRA
Z-score	Natural logarithm of the ratio of the sum of the past 4-quarters average return on assets (ROA) and the capital adequacy ratio (CAR) to the standard deviation of ROA.	APRA
Risk weighted assets (RWA)	Ratio of risk weighted assets to total assets.	APRA
Housing loans growth rate (HousingGrowth)	Quarterly growth rate of housing loans.	APRA
Non-housing loans growth rate (NonhousingGrowth)	Quarterly growth rate of non-housing loans.	APRA
Bond yield spread (Yieldspread)	Difference between mid-yield at issuance and the US treasury rate.	Bloomberg
Panel B: Test variables		
WGS	Dummy variable that takes the value of one for all ADIs that chose to take the guarantee and the value of zero for the ADIs that did not.	APRA
WGS_Small	Dummy variable that takes the value of one for the small ADIs that chose to take the guarantee and the value of zero for the ADIs that did not.	APRA
WGS_Big	Dummy variable that takes the value of one for the four major ADIs that chose to take the guarantee and the value of zero for the ADIs that did not.	APRA
WGS_Bond	Dummy variable that takes the value of one for bonds guaranteed by the WGS and takes the value of zero if otherwise.	Bloomberg, RBA
DuringGar	Dummy variable that takes the value of one for the period during the guarantee (Nov 2008 - Mar 2010) and the value of zero for other periods.	APRA
RemovalGar	Dummy variable that takes the value of one for the period from the closing of the WGS, and the value of zero for before and during the WGS.	APRA
PreGar	Dummy variable that takes the value of one for the period from March 2008 - Dec 2008 (three quarters before introduction of the guarantee scheme) and takes the value of zero otherwise.	Bloomberg

PostGar	Dummy variable that takes the value of one for the period from Mar 2010 - December 2010 (three quarters after the closing of the guarantee scheme) and takes the value of zero otherwise.	Bloomberg
Panel C: Control variables		
Capital adequacy ratio (CAR)	Capital ratio measured as the eligible Tier 1 and Tier 2 capital to total assets.	APRA
Liquid assets ratio (LAR)	Ratio of cash and liquid assets relative to total assets.	APRA
Loan loss rate (LLR)	Annualised loan loss rate computed as the provision for bad and doubtful debts relative to total assets.	APRA
Wholesale Liabilities Ratio (WLR)	Ratio of wholesale liabilities relative to total liabilities.	APRA
FCS	Dummy variable that takes the value of one from the introduction of the Financial Claims Scheme for retail deposits since Oct 2008 and takes the value of zero in the periods prior.	APRA
Size	Natural logarithm of total assets.	APRA
BidAskSpread	Difference between bid price and ask price of bonds at issuance.	Bloomberg
Maturity_in_months	Length of maturity of bonds in months.	Bloomberg
LogAmountIssued	Natural logarithm of issued amounts of bonds.	Bloomberg
Real gross domestic product growth rate (GDP)	Annual growth rate of GDP.	Datastream
Inverse Mills Ratio (IMR)	Variable generated by a probit model to account for potential selection bias.	Authors' Own Calculations

Table 2. Summary statistics for the time period from 2008 - 2011

	Pooled sample		Mutuals	
Variable	Mean	SD	Mean	SD
AvgFundCost	4.17	(1.36)	4.01	(1.20)
FundPremium	-0.62	(1.50)	-0.78	(1.40)
RSFC	4.08	(1.44)	3.93	(1.33)
Leverage	89.49	(5.20)	90.23	(3.82)
Z-score	2.38	(0.88)	2.47	(0.82)
RWA	51.11	(7.67)	50.65	(6.08)
HousingGrowth	2.35	(5.34)	2.25	(5.19)
NonhousingGrowth	1.20	(28.48)	0.79	(28.77)
WGS	26.13	(43.95)	19.86	(39.91)
WGS_Small	22.36	(41.68)	19.86	(39.91)
WGS_Big	3.78	(19.07)	0.00	(0.00)
DuringGar	49.06	(50.01)	49.04	(50.01)
RemovalGar	23.36	(42.33)	23.22	(42.24)
CAR	9.41	(3.35)	9.58	(3.40)
LAR	4.31	(4.74)	4.42	(4.84)
LLR	0.13	(0.21)	0.10	(0.17)
WLR	6.17	(10.63)	3.48	(3.43)
FCS	72.42	(44.71)	72.26	(44.79)
Size	19.43	(2.28)	18.94	(1.54)
GDP	0.57	(0.49)	0.53	(0.49)

This table shows the summary statistics of the variables by showing the mean and standard deviation (SD) for different subsamples.

Table 3. Summary statistics for the period of during the government guarantee from Nov 2008 to Mar 2010

	WGS_Small		WGS_Big		Non-WGS	
Variable	Mean	SD	Mean	SD	Mean	SD
AvgFundCost	4.22	(1.10)	4.96	(1.13)	3.43	(1.12)
FundPremium	0.68	(1.06)	1.47	(0.85)	-0.11	(1.08)
RSFC	4.04	(1.13)	4.99	(1.30)	3.29	(1.11)
Leverage	90.69	(5.89)	78.09	(6.41)	90.08	(3.76)
Z-score	2.20	(1.00)	1.25	(0.79)	2.29	(0.78)
RWA	51.39	(7.36)	61.90	(13.55)	49.90	(5.63)
HousingGrowth	2.25	(5.64)	4.11	(4.56)	1.64	(4.47)
NonhousingGrowth	3.83	(28.27)	0.67	(8.18)	0.22	(23.73)
TotalLoanGrowth	2.83	(5.17)	2.57	(1.25)	1.33	(3.16)
WGS	100.00	(0.00)	100.00	(0.00)	0.00	(0.00)
WGS_Small	100.00	(0.00)	0.00	(0.00)	0.00	(0.00)
WGS_Big	0.00	(0.00)	100.00	(0.00)	0.00	(0.00)
DuringGar	100.00	(0.00)	100.00	(0.00)	100.00	(0.00)
RemovalGar	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
CAR	7.76	(1.89)	7.93	(1.34)	9.77	(3.39)
LAR	3.85	(4.06)	2.52	(2.12)	4.62	(4.93)
LLR	0.13	(0.24)	0.66	(0.41)	0.10	(0.15)
WLR	10.85	(15.75)	34.17	(8.74)	2.92	(2.51)
FCS	100.00	(0.00)	100.00	(0.00)	100.00	(0.00)
Size	20.99	(1.89)	26.26	(0.72)	18.59	(1.35)
GDP	0.52	(0.58)	1.03	(0.00)	0.41	(0.62)

This table shows the summary statistics of the variables by showing the mean and standard deviation (SD) for different subsamples.

Table 4. Selection model for bank-level WGS participation

	Probability of participation
CAR	-9.4547***
	(2.2202)
LAR	5.9448***
	(1.0392)
RWA	2.9161***
	(0.690)
Size	0.5389***
	(0.0329)
Intercept	-12.1757***
	(0.8214)
Obs	1,589
R-square	37.01%

This table shows the selection model for the probability that a bank participates in the WGS based on significant bank characteristics. Standard errors are clustered at the bank level and presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Table 5. Impact of WGS participation on funding costs

	Pooled sample	Mutuals	Pooled sample	Mutuals	Pooled sample	Mutuals
	Average funding cost		Rate sensitive funding cost		Funding premium	
WGS_Small*DuringGar	-0.0019**	-0.0019***	-0.0029**	-0.0034**	-0.0019*	-0.0018***
	(0.0010)	(0.0007)	(0.0013)	(0.0014)	(0.0010)	(0.0007)
WGS_Big*DuringGar	-0.0120***		-0.0092***		-0.0118***	
	(0.0025)		(0.0029)		(0.0023)	
WGS_Big	0.0048		0.0068		0.0047	
	(0.0053)		(0.0057)		(0.0053)	
WGS_Small	0.0030**	0.0030**	0.0037**	0.0040***	0.0031**	0.0032**
	(0.0013)	(0.0013)	(0.0015)	(0.0015)	(0.0013)	(0.0013)
DuringGar	-0.0042***	-0.0044***	-0.0070***	-0.0071***	0.0073***	0.0071***
	(0.0004)	(0.0004)	(0.0005)	(0.0005)	(0.0004)	(0.0004)
CAR	-0.0151	-0.0066	-0.0112	-0.0115	-0.0165	-0.0068
	(0.0270)	(0.0304)	(0.0284)	(0.0312)	(0.0268)	(0.0302)
LAR	0.0079	-0.0096	-0.0083	-0.0100	0.0067	-0.0118
	(0.0235)	(0.0283)	(0.0217)	(0.0277)	(0.0233)	(0.0282)
LLR	-0.1575	-0.2798	-0.1297	-0.2475	-0.1305	-0.2733
	(0.2584)	(0.3367)	(0.2696)	(0.3421)	(0.2574)	(0.3357)
WLR	0.0170**	0.0105	0.0152*	0.0350	0.0155**	0.0078
	(0.0076)	(0.0154)	(0.0087)	(0.0294)	(0.0076)	(0.0162)
FCS	-0.0124***	-0.0120***	-0.0124***	-0.0122***	0.0135***	0.0139***
	(0.0006)	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0006)
Z-score	0.0001	0.0003	0.0005	0.0004	-0.0001	0.0001
	(0.0005)	(0.0005)	(0.0006)	(0.0006)	(0.0005)	(0.0005)
RWA	-0.0137	-0.0192	-0.0168*	-0.0181	-0.0131	-0.0196
	(0.0089)	(0.0149)	(0.0097)	(0.0154)	(0.0089)	(0.0149)
Size	0.0033*	0.0017	0.0021	0.0021	0.0035*	0.0018
	(0.0020)	(0.0027)	(0.0022)	(0.0027)	(0.0020)	(0.0027)
GDP	-0.5536***	-0.5747***	-0.6398***	-0.6697***	-0.2033***	-0.2224***
	(0.0280)	(0.0233)	(0.0331)	(0.0271)	(0.0272)	(0.0234)
IMR	0.0157	-0.0094	-0.0037	-0.0027	0.0190	-0.0077
	(0.0308)	(0.0412)	(0.0350)	(0.0419)	(0.0308)	(0.0410)
Intercept	-0.0116	0.0370	0.0266	0.0273	-0.0911	-0.0394
	(0.0588)	(0.0807)	(0.0652)	(0.0824)	(0.0588)	(0.0805)
Obs	1,588	1,460	1,431	1,317	1,588	1,460
R-square	53.44%	43.62%	52.54%	47.19%	61.33%	57.57%

This table shows the impact of the WGS participation by a deposit taking institution on their funding costs. Standard errors are clustered at the bank level and presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Table 6. Impact of WGS removal on funding costs

	Pooled sample	Mutuals	Pooled sample	Mutuals	Pooled sample	Mutuals
	Average funding cost		Rate sensitive funding cost		Funding premium	
WGS_Small*RemovalGar	-0.0010	-0.0009	-0.0021	-0.0036	-0.0010	-0.0008
	(0.0013)	(0.0010)	(0.0019)	(0.0022)	(0.0013)	(0.0010)
WGS_Big*RemovalGar	-0.0094**		-0.0114***		-0.0095**	
	(0.0044)		(0.0042)		(0.0044)	
WGS_Big*DuringGar	-0.0172***		-0.0166***		-0.0170***	
	(0.0044)		(0.0052)		(0.0043)	
WGS_Big	0.0101		0.0142*		0.0100	
	(0.0070)		(0.0077)		(0.0070)	
WGS_Small*DuringGar	-0.0024*	-0.0023**	-0.0041*	-0.0055**	-0.0024*	-0.0022**
	(0.0014)	(0.0010)	(0.0023)	(0.0026)	(0.0014)	(0.0010)
RemovalGar	-0.0119***	-0.0118***	-0.0115***	-0.0115***	0.0141***	0.0141***
	(0.0006)	(0.0006)	(0.0007)	(0.0007)	(0.0006)	(0.0006)
WGS_Small	0.0035**	0.0035**	0.0049**	0.0061**	0.0036**	0.0035**
	(0.0016)	(0.0015)	(0.0022)	(0.0024)	(0.0016)	(0.0015)
DuringGar	-0.0164***	-0.0164***	-0.0189***	-0.0189***	0.0211***	0.0211***
	(0.0006)	(0.0006)	(0.0007)	(0.0007)	(0.0006)	(0.0006)
CAR	-0.0150	-0.0064	-0.0107	-0.0109	-0.0165	-0.0066
	(0.0271)	(0.0305)	(0.0286)	(0.0313)	(0.0269)	(0.0302)
LAR	0.0074	-0.0097	-0.0090	-0.0101	0.0061	-0.0119
	(0.0235)	(0.0283)	(0.0217)	(0.0277)	(0.0233)	(0.0283)
LLR	-0.1684	-0.2758	-0.1340	-0.2326	-0.1418	-0.2697
	(0.2594)	(0.3380)	(0.2716)	(0.3454)	(0.2586)	(0.3369)
WLR	0.0170**	0.0106	0.0153*	0.0354	0.0154**	0.0079
	(0.0075)	(0.0153)	(0.0088)	(0.0292)	(0.0076)	(0.0161)
Z-score	0.0001	0.0003	0.0005	0.0004	-0.0001	0.0001
	(0.0005)	(0.0005)	(0.0006)	(0.0006)	(0.0005)	(0.0005)
RWA	-0.0128	-0.0193	-0.0161	-0.0184	-0.0122	-0.0197
	(0.0090)	(0.0150)	(0.0099)	(0.0155)	(0.0090)	(0.0150)
Size	0.0033*	0.0017	0.0020	0.0020	0.0035*	0.0018
	(0.0020)	(0.0027)	(0.0022)	(0.0027)	(0.0020)	(0.0027)
GDP	-0.5538***	-0.5746***	-0.6400***	-0.6692***	-0.2035***	-0.2223***
	(0.0281)	(0.0233)	(0.0332)	(0.0272)	(0.0273)	(0.0234)
IMR	0.0149	-0.0097	-0.0050	-0.0034	0.0182	-0.0079
	(0.0308)	(0.0283)	(0.0352)	(0.0420)	(0.0308)	(0.0411)
Intercept	-0.0108	0.0374	0.0281	0.0282	-0.0903	-0.0390
	(0.0588)	(0.0808)	(0.0653)	(0.0826)	(0.0589)	(0.0806)
Obs	1,588	1,460	1,431	1,317	1,588	1,460
R-square	53.64%	43.63%	52.78%	47.31%	61.49%	57.58%

This table shows the impact of the WGS removal on bank funding costs. Standard errors are clustered at the bank level and presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Table 7. Impact of WGS participation on bank risk-taking

	Pooled sample	Mutuals	Pooled sample	Mutuals	Pooled sample	Mutuals
	Leverage		Z-score		RWA	
WGS_Small*DuringGar	0.0006	0.0001	0.0038	-0.0326	0.0000	-0.0030
	(0.0034)	(0.0018)	(0.1240)	(0.1202)	(0.0075)	(0.0037)
WGS_Big*DuringGar	0.0286**		0.1089		0.0223	
	(0.0121)		(0.2089)		(0.0476)	
WGS_Big	-0.0568		-0.7173**		0.0812	
	(0.0420)		(0.3135)		(0.0581)	
WGS_Small	-0.0112*	-0.0114	0.2325*	0.2602*	-0.0050	0.0053
	(0.0066)	(0.0070)	(0.1340)	(0.1346)	(0.0142)	(0.0126)
DuringGar	-0.0013	0.0003	-0.3134***	-0.2866***	-0.0004	0.0024
	(0.0012)	(0.0009)	(0.0709)	(0.0721)	(0.0035)	(0.0020)
LAR	-3.5585**	-1.5521**	-40.1272***	-38.7005**	8.0153***	7.2486***
	(1.6787)	(0.6678)	(14.3658)	(18.4996)	(1.9855)	(2.0717)
LLR	-0.5138***	-0.4520***	2.5395***	3.4071***	-0.3719**	-0.3283**
	(0.0703)	(0.0648)	(0.9620)	(0.9331)	(0.1858)	(0.1399)
WLR	-0.1239	-0.0124	-3.7085***	-2.3745*	0.1565	-0.1095
	(0.0850)	(0.0545)	(0.5253)	(1.3977)	(0.1388)	(0.1029)
FCS	0.0090***	0.0075***	-0.0116	-0.0682	-0.0131	-0.0231***
	(0.0025)	(0.0022)	(0.0809)	(0.0844)	(0.0080)	(0.0045)
Size	-0.0459***	-0.0341***	0.4450***	0.5250***	-0.0500***	-0.0406***
	(0.0068)	(0.0060)	(0.1000)	(0.0990)	(0.0176)	(0.0114)
GDP	-0.1854**	-0.0543	-0.8113	-1.7701	0.4727*	0.0314
	(0.0907)	(0.0634)	(2.6079)	(2.6466)	(0.2833)	(0.1296)
IMR	-0.8860***	-0.7338***	7.0232***	8.0755***	-0.8044***	-0.6447***
	(0.1175)	(0.1163)	(1.6466)	(1.6524)	(0.2661)	(0.1765)
Intercept	2.3615***	2.0332***	-10.2488***	-12.4773***	1.9751***	1.7105***
	(0.2043)	(0.1868)	(2.9355)	(2.9230)	(0.5040)	(0.3274)
Obs	1,589	1,460	1,589	1,460	1,589	1,460
R-square	50.88%	40.29%	24.14%	13.19%	19.68%	16.57%

This table reports the regression estimates on the impact of the guarantee scheme on bank risk-taking. Standard errors are clustered at the bank level and presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Table 8. Impact of WGS participation on loan growth rates

	Pooled sample	Mutuals	Pooled sample	Mutuals	Pooled sample	Mutuals
	Housing loans growth		Non-housing loans growth		Total loans growth	
WGS_Small*DuringGar	-0.0105	-0.0042	0.0283	0.0426	0.0018	0.0042
	(0.0077)	(0.0078)	(0.0391)	(0.0444)	(0.0058)	(0.0064)
WGS_Big*DuringGar	0.0237***		-0.0128		0.0047	
	(0.0072)		(0.0281)		(0.0070)	
WGS_Big	-0.0032		0.0145		0.0158	
	(0.0156)		(0.0579)		(0.0147)	
WGS_Small	0.0135*	0.0081	-0.0062	-0.0160	0.0064	0.0034
	(0.0074)	(0.0072)	(0.0347)	(0.0353)	(0.0053)	(0.0052)
DuringGar	-0.0013	-0.0019	-0.0094	-0.0121	0.0011	-0.0002
	(0.0033)	(0.0034)	(0.0306)	(0.0316)	(0.0026)	(0.0025)
CAR	-0.1482*	-0.2300**	0.7299	0.4550	0.0319	-0.0646
	(0.0776)	(0.0960)	(0.5525)	(0.6903)	(0.0866)	(0.0902)
LAR	-0.0552	0.0483	-0.4926**	-0.1738	-0.2236***	-0.0989**
	(0.0553)	(0.0578)	(0.2455)	(0.2128)	(0.0634)	(0.0436)
LLR	-2.3063***	-2.3601***	-0.6252	1.1019	-1.9478***	-1.5161***
	(0.6496)	(0.6835)	(3.1229)	(3.4407)	(0.6090)	(0.5266)
WLR	0.0033	0.0371	0.1903	-0.1013	0.0294	0.0202
	(0.0312)	(0.0613)	(0.1592)	(0.4046)	(0.0378)	(0.0426)
FCS	-0.0119***	-0.0117***	0.0152	0.0245	-0.0090***	-0.0065**
	(0.0040)	(0.0042)	(0.0235)	(0.0262)	(0.0031)	(0.0031)
Z-score	0.0033*	0.0023	0.0107	0.0124	0.0021	0.0014
	(0.0312)	(0.0019)	(0.0197)	(0.0214)	(0.0019)	(0.0018)
RWA	0.0490*	0.1126***	-0.0215	0.2108	0.0044	0.0855***
	(0.0260)	(0.0350)	(0.1769)	(0.2693)	(0.0269)	(0.0250)
Size	0.0041	0.0140***	-0.0290	-0.0051	-0.0092*	0.0017
	(0.0051)	(0.0052)	(0.0220)	(0.0209)	(0.0050)	(0.0037)
GDP	-0.3140	-0.2640	0.3185	0.4956	-0.4171**	-0.3985**
	(0.2280)	(0.2340)	(1.5044)	(1.5762)	(0.1953)	(0.1997)
IMR	0.0650	0.2230**	-0.5335	-0.1394	-0.1747**	0.0001
	(0.0902)	(0.0922)	(0.4058)	(0.4038)	(0.0846)	(0.0645)
Intercept	-0.1003	-0.4163**	0.8183	0.0073	0.3109**	-0.0450
	(0.1598)	(0.1633)	(0.7409)	(0.7455)	(0.1562)	(0.1144)
Obs	1,589	1,460	1,589	1,460	1,589	1,460
R-square	5.16%	5.31%	0.89%	0.93%	8.63%	8.04%

This table reports the impact of the government guarantee on loan growth. Standard errors are clustered at the bank level and presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Table 9. Robustness check: summary statistics for bonds issued by Australian banks

	Full period from 2008 to 2012		Guarantee period from Nov 2008 to Mar 2010	
Variable	Mean	SD	Mean	SD
Yieldspread	44.43	(121.30)	12.93	(116.63)
WGS_bond	15.31	(36.10)	31.25	(46.59)
PreGar	1.02	(10.08)	0.00	(0.00)
DuringGar	48.98	(50.12)	100.00	(0.00)
PostGar	11.22	(31.65)	0.00	(0.00)
BidAskSpread	10.01	(32.01)	12.61	(43.98)
Maturity_in_months	60.85	(38.43)	52.00	(23.07)
Amount_Issued ($M)	943.97	(720.71)	1,281.61	(655.85)

This table shows the summary statistics of the variables by showing the mean and standard deviation (SD) for bonds issued by Australian banks.

Table 10. Robustness check: selection model for bond-level WGS participation

	Probability of bonds taking up guarantee
LogAmountIssued	0.2989***
	(0.1093)
LAR	-13.4590**
	(5.8704)
WLR	7.0525***
	(2.5015)
Intercept	-9.4045***
	(2.3604)
Obs	196
R-square	0.1339

This table reports the selection model for bonds taking up the government guarantee scheme. Standard errors are clustered at the bank level and presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Table 11. Robustness check: impact of WGS participation on bond yield spreads

	Bond yield spreads	
WGS_Bond	-0.4798***	-0.2961***
	(0.1062)	(0.0318)
PreGar		0.6892
		(0.4991)
DuringGar		-0.5821*
		(0.2399)
PostGar		-0.2387
		(0.3603)
BidAskSpread	0.5671**	0.5837**
	(0.2020)	(0.2242)
Maturity_in_months	0.0086***	0.0090***
	(0.0011)	(0.0009)
LogAmountIssued	0.3547**	0.4024**
	(0.1003)	(0.1249)
CAR	18.1271	12.7482
	(9.1964)	(8.0223)
LAR	-8.0548	-8.5445
	(8.4566)	(8.0437)
LLR	-46.9937***	-35.8509***
	(6.6075)	(5.6585)
WLR	9.5554	9.4972
	(4.8441)	(4.9282)
Zscore	0.0138	0.0240
	(0.0406)	(0.0551)
RWA	-1.1537*	-0.3857
	(0.5637)	(0.7661)
IMR	11.1285	10.3782
	(6.0447)	(6.1314)
Intercept	-18.0209*	-18.3366*
	(7.3494)	(7.7241)
Obs	196	196
R-square	36.23%	33.35%

This table reports the regressions on the impact of the government guarantee scheme on bond yield spreads. Standard errors are clustered at the bank level and presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.