# *Mandated superannuation contributions and the structure of the financial sector in Australia*

# Mandated superannuation contributions and the structure of the financial sector: a financial general equilibrium assessment

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## Abstract

Australian workers must contribute a proportion of their wage to superannuation. The mandated contribution rate has risen from 3 per cent in 1992, to 9.5 per cent today, and is scheduled to reach 12 per cent by 2025. We use a financial computable general equilibrium (FCGE) model to simulate an increase in the contribution rate. We find that raising the contribution rate has consequences for traditional financial intermediaries, and for financial structure more generally. This is of interest to Australian policy makers currently concerned with the size and role of Australia's banks, and the leverage of the household sector.

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# 1 Introduction

The central pillar of Australia's retirement income system is defined contribution superannuation. The superannuation legislation enforces mandatory contributions, collected by employers, for virtually all employees during any period of employment. In Australia, these compulsory employer-collected contributions are referred to as the "Superannuation Guarantee". The mandated Superannuation Guarantee contribution rate (hereafter, "SG rate") has increased steadily since the scheme began in 1992, rising from 3 per cent to 9.5 per cent in 2018, with the SG rate to peak at 12 per cent by 2025.

A mandated change in the level and allocation of savings of this scale is likely to have consequences for the structure of financial intermediation and the economy more broadly. For example, Australian banks, in submissions to the Financial System Inquiry (FSI), argued that growth of the superannuation sector would affect the supply of bank capital (such as deposits and institutional debt). They advocate policies that support higher deposit growth, a deeper corporate bond market, and allocation of more superannuation funds to bank deposits and fixed income products [Commonwealth of Australia (2014)].

The broader economic implications of pension schemes have been investigated by a number of authors. Vittas (2000) argues that financial markets generally benefit from the creation of funded pension plans via a number of channels. These include an expansion in the number of institutional-quality investors, leading to more financial innovation [e.g., see Bodie (1990), Diamond and Valdes-Prieto (1994)], better market integrity (via trained professionals employed as part of systemic reforms), improved corporate governance (via institutional investors exercising voting rights in transparent, policy-driven ways), and enhanced financial regulatory and supervisory systems.

As discussed by Fehr (2016), there have been a number of simulation-based analyses of the economic impacts of pension and social security reforms. These typically rely on either lifecycle/overlapping generations models (such as Cerda (2008), which includes detailed representation of households), or dynamic CGE models, which typically emphasise industry detail. Most recently, Giesecke et al. (2016) use a financial computable general equilibrium (FCGE) model to explore the macroeconomic effects of an SG rate rise. Two limitations of the model used in that paper are the absence of: (i) an active central bank (CB) and monetary policy rule; and (ii) representation of bank capital adequacy regulation. Both

limitations are addressed herein, allowing us to explore the implications of an SG rate rise for structure of the financial sector (including intermediaries like the banks) and macroeconomic stability indicators.

Our analysis highlights several implications of an expanded superannuation sector for financial sector structure: (1) banks expand in the short-run due to a rise in the savings rate; (2) bank capital structure is altered in both the short- and long-run, becoming less dependent on deposits and more dependent on bond and equity finance; and (3) non-bank financial intermediaries (NBFIs) expand via an increase in supply of financial capital. With regard to other structural impacts, with potential financial stability consequences, we find: (4) the economy-wide foreign financing requirement falls; (5) the debt-to-equity ratio of the residential housing sector rises; and, (6) the ratio of private debt to income rises.

## 2 The financial computable general equilibrium (FCGE) model

The FCGE model can be viewed as comprising two integrated parts: (i) A traditional CGE model describing the real side of the economy, based on the model described in Dixon and Rimmer (2002); and, (ii) a model of the behaviour of individual financial agents and their links with the real side of the economy.[3] Consistent with Dixon and Rimmer (2002), the real side of the FCGE model recognises many industries, capital creators, a representative household, government, and a foreign sector. Industries, investors and households are modelled as constrained optimizers. Each industry minimizes unit costs subject to given input prices and a constant-returns-to-scale (CRS) production function. Consumer demands are modelled via a representative utility maximizing household. Units of new industry-specific capital are formed as cost minimizing combinations of construction, machinery, engineering services, and other inputs relevant to physical capital formation. Imperfect substitutability between imported and domestic varieties of each commodity is modelled using CES specifications. Export demand for each commodity is inversely related to its foreign currency price. Physical capital accumulation is specified separately for each industry. Industry-specific investment in year *t* is modelled as a positive function of the expected rate of return on industry-specific physical capital, relative to the weighted average cost of financial capital (hereafter, the WACC).

[3] We refer the reader to Dixon et al. (2015) for a detailed discussion of the model.

Market clearing conditions and endogenous prices reconcile the demand- and supply-sides of commodity and factor markets. The labour market is characterised by an endogenous unemployment rate and wage stickiness in the short-run, transitioning to a long-run environment of wage flexibility and a given natural rate of unemployment. Zero profit conditions in production and capital formation determine basic prices for domestic output. Purchaser prices differ from basic prices by the value of margin services and indirect taxes. In addition to indirect taxes, government revenue from direct taxes is identified, together with outlays on public consumption, benefits, and public investment. Together with variables describing foreign transfers, this provides sufficient detail for the identification of the public sector borrowing requirement (PSBR), household disposable income, and household savings.

Policy modelling with real-side CGE models has a long history [Dixon and Rimmer (2016)]. However, such models typically have limited treatment of the financing of important transactions (like investment, the PSBR, and the current account deficit [CAD]), financial channels (like bank lending, savings allocation, and monetary policy mechanisms), and capital costs (like industry WACC, PSBR financing, and the policy rate). An important role of the financial part of the FCGE model is to model these matters. A defining characteristic of CGE models is sectoral detail (Dixon and Rimmer 2016). We maintain this attention to detail in developing the FCGE model's financial side, identifying 11 financial agents and 5 financial instruments.[4] This distinguishes our FCGE model from previous CGE models with financial detail, e.g. Yeldan (1997), whose FCGE model of Turkey is comparative static, and carries four industries, four households, a single government and five financial agents. The FCGE model described herein is dynamic, and each of the 11 financial agents are concerned with both the asset and liability/equity sides of their balance sheet. We refer to financial agents as "asset agents" in matters concerned with the asset sides of their balance sheets, and "liability agents" in matters concerned with the liability/equity side of their balance sheets. The core of the model's financial theory relies on three arrays and equations describing how these arrays change through time. These arrays are: $A_{(s,f,d)}$, being the holdings by asset agent $d \in AA$ (where AA comprises 11 asset agents) of financial instrument $f \in IN$

[4] The financial instruments are: cash, deposits/loans, bonds, equity, and gold and SDRs. The financial agents are: commercial banks, central bank, foreigners, government, households, industries, NBFIs, superannuation, life insurance, non-reproducible housing, reproducible housing. Non-reproducible housing comprises established inner-city dwellings. Reproducible housing comprises apartments, units and houses outside the inner-city.

(where IN comprises 5 financial instruments) issued by liability agent $s \in$ LA (where LA comprises 11 liability agents); $F_{(s,f,d)}$ being the flow of net new holdings by asset agent $d \in$ AA, of instrument $f \in$ IN, issued by liability agent $s \in$ LA; and $R_{(s,f,d)}$ being the power of the rate of return (i.e. one plus the rate) on instrument $f \in$ IN, issued by liability agent $s \in$ LA, held as an asset by agent $d \in$ AA.

Financial agents are modelled as constrained optimisers. In their capacity as liability agents, financial agents are assumed to issue a mix of instruments that minimises liability servicing costs subject to a constraint preventing them moving to corner solutions in the issuance of particular instruments to particular asset agents. Formally, we assume domestic liability agent $s$ chooses $A1_{(s,f,d)}$ for all $f,d$ to:

$$\begin{aligned} &\text{minimise:} && Z_s^{(L)} = \text{CET}\left[ A1_{(s,f,d)} \cdot R_{(s,f,d)}, \forall\, f,d \right] , && \left(s \in \text{LALF}\right) \\ &\text{subject to:} && \sum_f \sum_d [A1_{(s,f,d)} - A0_{(s,f,d)} \cdot V_{(s,f,d)}] = \text{NEWLIAB}_{(s)} , && (1) \end{aligned}$$

where LALF is the set of domestic liability agents; $A0_{(s,f,d)}$ and $A1_{(s,f,d)}$ are start-of-year and end-of-year values for instrument $f$ issued by liability agent $s$ and held as an asset by agent $d$; $R_{(s,f,d)}$ is the power (one plus the rate) of return on instrument $f$ issued by agent $s$ held by agent $d$; $V_{(s,f,d)}$ is a revaluation term; $Z^{(L)}_{(s)}$ is an agent-specific constant elasticity of transformation function; and $\text{NEWLIAB}_{(s)}$ are the new liabilities that must be raised by agent $s$.[5]

Domestic asset agents choose an allocation of their end-of-year portfolio across domestic and foreign assets, in order to maximise a function in which the arguments are end-of-year asset allocations (weighted by rates of return). That is, agent $d$ chooses $A1_{(s,f,d)}$ for all $(s,f)$ to:

$$\begin{aligned} &\text{maximise:} && Z_{(d)}^{(A)} = \text{CES}\left[ A1_{(s,f,d)} \cdot R_{(s,f,d)}, \forall\, s,f \right] , && \left(d \in \text{AALF}\right) \\ &\text{subject to:} && \sum_s \sum_f [A1_{(s,f,d)} - A0_{(s,f,d)} \cdot V_{(s,f,d)}] = \text{NEWASSET}_{(d)} , && (2) \end{aligned}$$

where AALF is the set of domestic asset agents; $\text{NEWASSET}_{(d)}$ is $d$'s budget for new acquisitions of assets over the year;[6] and $Z^{(A)}_{(d)}$ is an agent-specific constant elasticity of substitution function.

[5] For example, for industries, NEWLIAB is the value of their gross fixed capital formation.
[6] For example, for the household sector, the value of NEWASSET is the value of household savings.

These optimisation problems yield a set of return-sensitive supply equations (governing the issuance of financial instruments by liability agents) and return-sensitive demand equations (governing the demand for financial instruments by asset agents). In general, the joint solution to these equations determine rates of return across financial instruments, and the structure of agent balance sheets.[7] Expressed in percentage change form, the supply and demand equations are:

$$a1_{(s,f,d)} = liabilities_{(s)} - \tau_{(s)}\left(r_{(s,f,d)} - wacc_{(s)}\right), \qquad (\mathrm{s} \in \mathrm{LALF}) \tag{3}$$

$$a1_{(s,f,d)} = assets_{(d)} + \sigma_{(d)}\left(r_{(s,f,d)} - averor_{(d)}\right), \qquad (\mathrm{d} \in \mathrm{AALF}) \tag{4}$$

where: $a1_{(s,f,d)}$ and $r_{(s,f,d)}$ are the percentage changes in $A1_{(s,f,d)}$ and $R_{(s,f,d)}$; $liabilities_{(s)}$ and $assets_{(d)}$ are the percentage changes in the end-of-year liabilities and assets of agents *s* and *d* respectively; $wacc_{(s)}$ is the percentage change in the WACC for agent *s*; $averor_{(d)}$ is the percentage change in the weighted average return on the portfolio of agent *d*; and $\tau_{(s)}$ and $\sigma_{(d)}$ are positive parameters governing the elasticity of capital structure and asset allocation shares to movements in relative rates of return.

We assume that foreign asset agents solve a problem like equation (2), however they are concerned with the allocation of their portfolios across global assets expressed in foreign currency terms. The resulting demand equations for Australian-dollar assets (in percentage change form) are:

$$a1_{(s,f,Foreign)} + \phi = fassetsfc + \sigma_{(Foreign)}\left(r_{(s,f,Foreign)} - averorfor\right), \tag{5}$$

where $\varphi$ is the nominal exchange rate; *fassetsfc* is the foreign currency value of the foreign agent's global portfolio of financial assets; and, *averorfor* is the average rate of return on the foreign agent's global portfolio. The latter two variables are determined by factors outside Australia and thus are exogenous. $r_{(s,f,Foreign)}$ is determined by the interaction of demand for Australian assets by foreign agents, and the willingness of Australian financial agents to supply the corresponding liabilities. With appropriate weights, the sum of $a1_{(s,f,Foreign)}$ over *s* and *f* reflects the CAD which must be financed by foreigners. Hence (5) determines $\varphi$. As described in Giesecke *et al*. (2017), movements in $\varphi$ affect the domestic price level by changing domestic traded goods prices. The addition of a policy rule allows the

[7] Exceptions are: (A) rates of return on: (i) foreign assets and liabilities (exogenous); (ii) cash (exogenous); (iii) bank exchange settlement balances/loans with the central bank (determined by a policy rule in which movements in inflation and an output gap measure are arguments); (iv) existing industry and housing equity (calculated as a residual after the cost of debt finance); and (B) equity/debt ratios for banks (determined by capital adequacy requirements, see Giesecke et al. 2017).

CB to target its long-run price and short-run employment objectives, by affecting the returns available to foreigners on domestic assets through changes in the policy rate, and thus influencing $\varphi$ via equation (5). In the FCGE model, we link movements in the policy interest rate to deviations in the price level from target and output from potential, via:

$$\left(R_{(CB,DeposLoans,Banks),t} / R_{(CB,DeposLoans,Banks),t-1}\right) = FR\left(P_t / P_t^{(T)}\right)^{\alpha} \left(ER_t / ER_t^{(T)}\right)^{(1-\alpha)}, \qquad (6)$$

where $R_{(CB,DeposLoans,CB),t}$ and $R_{(CB,DeposLoans,CB),t-1}$ are the current and lagged powers of the interest rate offered by the CB on settlement balances, $P_t$ and $P^{(T)}_t$ are the actual and target levels for the consumer price index in year $t$, $ER_t$ and $ER^{(T)}_t$ are the actual and target levels of the employment rate in year $t$, $FR$ is an exogenous shift variable, and $\alpha$ is a parameter governing the sensitivity of movements in the policy rate to deviations in prices and the employment rate from target.

Results from the real side of the FCGE model provide constraints on the model's financial side, and vice versa. For example: the PSBR determines new liability issuance by government; gross fixed capital formation by industry determines new liability issuance by industry; household savings determines new asset acquisitions by households; the CAD, plus foreign asset purchases by domestic agents, determines new asset acquisitions by foreigners; superannuation contributions determine liability issuance by the superannuation sector; and changes in the WACC influences gross fixed capital formation. Linkages within the financial sector are also modelled. For example, the model traces the superannuation sector's activities in raising equity finance from households, and using these funds to purchase financial instruments like bank equity. In this system, changes in prospects for one financial agent have consequences for the costs and flows of funds for other agents.

# 3 Simulation design

Our aim is to explore the implications of a one percentage point increase in Australia's SG rate for the structure of the financial system, and then consider the potential impact of these structural changes for policy-relevant indicators of macroeconomic growth and financial stability. In this section, we discuss: (i) how we implement expansion of the superannuation sector within the FCGE model; (ii) our closure assumptions for the FCGE model; and (iii) our choice of financial stability indicators.

We model a one percentage point increase in the SG rate via two shocks to the FCGE model: (1) we increase the proportion of household savings intermediated by the superannuation sector by an amount equal to one percentage point of national wages (hereafter, the *intermediation effect*); (2) we reduce the average propensity to consume (APC) in line with the findings of Connolly (2007) on the ratio of new-to-displaced savings generated by a rise in the SG rate (hereafter, the *savings effect*). As we will discuss, the central bank policy rule plays a role in offsetting some of the impacts of the intermediation effect. To show this, we decompose the intermediation effect into two sub-effects, by presenting results for the intermediation effect under two settings: (1) "passive monetary policy", where the CB allows the cash rate to be determined by bank demand for exchange settlement balances (ESBs); and (2) "active monetary policy", where the CB sets the policy rate according to the policy rule.

In all simulations we assume that real public consumption and the PSBR-to-GDP ratio are unaffected by the movement in the SG rate (i.e. both public consumption and the PSBR-to-GDP ratio follow their baseline paths). Maintenance of the PSBR-to-GDP ratio on its baseline path is achieved by endogenous determination of a lump sum tax on households.

In section 4.2 we discuss a range of model results, which summarise both the macroeconomic impact of an SG rate rise, and the implications of the policy for financial structure. Why is financial structure important? Wang (2016) notes that differences in cross-country financial structure can have important policy implications, e.g., the impacts of unconventional monetary policies are influenced by financial structure. Herein, we study how a rise in Australia's SG rate affects financial structure, and discuss how these structural changes in turn have consequences for macro stability. To this end, we discuss FCGE model results for: (A) the ratio of private debt to income; (B) the ratio of debt to equity in housing finance; (C) the structure of bank finance; (D) regional asset allocation; (E) the foreign capital dependency of domestic agents; and (F) the size of the domestic corporate bond market.

Our interest in results for (A) and (B) stems from Calvo and Talvi (2005), OECD (2012) and Sutherland et al. (2012). OECD (2012) examine the relationship between financial agent balance sheets and macro stability. They find high debt levels amplify macro vulnerabilities during periods of economic stress, raising the risk that adverse shocks will migrate through the financial system. Sutherland et al. (2012)

argue that debt affects macro stability by magnifying the exposure of financial agents to income and asset price shocks. With insufficient capital buffers, contagion risk grows, enhancing the possibility of sudden-stop episodes (defined as systemically significant drops in external capital flows) and the resulting falls in investment, employment and consumption [Calvo and Talvi (2005)]. While high debt levels can impair macro stability in the event of an adverse shock, the capital structures and asset allocations of the economy's financial agents can also influence the rate at which shocks propagate [Gadanecz and Jayaram (2009)]. For this reason, we also study results for variables (C) and (D).

Our interest in (E) and (F), two indicators of capital deepening, stems from several papers. Nier et al. (2014) study the relationship between foreign direct investment (FDI) and macro stability. They show that sudden-stop episodes increase during periods of market stress. The effect of this on stability is compounded when FDI penetration is significant, which leads us to study results for variable (E) [Curwin and Mahutga (2014)]. Allen et al. (2002), Calvo and Talvi (2005) and IMF Macro Research for Development (2014) all argue that promoting domestic financial deepening can be helpful in insulating against sudden-stop episodes. As such, we consider the impact of the policy on variable (F).

# 4 Results and Implications

## 4.1 Database shares and the intermediation effect

Within the FCGE model, when we expand household allocations to superannuation via an SG rate rise, we simultaneously recognise an expansion in household ownership of superannuation equity. The expansion in issuance of superannuation equity is matched by an expansion in the asset side of the superannuation sectors' balance sheet. By understanding the types of assets that the superannuation sector holds, and the types of assets that households hold outside of superannuation, we can anticipate salient features of the FCGE model results. Hence, before discussing the model results, we begin by describing the structure of the assets held by the superannuation and household agents. This leads us to form five expectations about our FCGE model results.

*Expectation 1: The nominal exchange rate will adjust.* Ceteris paribus, the superannuation agent allocates each additional dollar of contributions as per the asset allocation shares (AASs) in Table 1

(see the column headed SPR). Superannuation funds have a proclivity for offshore investment relative to households (the respective AASs are 19% and 3%; see the SPR and HLDXS columns in Table 1). Hence, we expect an increase in gross capital outflow from Australia when the SG rate rises. In the absence of an independent movement in the CAD towards surplus, the capital outflow will need to be matched by foreign capital inflow. In the absence of CB reaction, this causes nominal depreciation (Giesecke et al. 2016).

*Expectation 2: Supply of capital to banks will increase*. The superannuation sector (SPR in Table 1) has a stronger affinity for bank financial liabilities than households (excluding their allocation to superannuation; see column HLDXS in Table 1), with AASs to banks for each respective agent being 26% and 21% (Table 1). Hence, we expect the intermediation effect will increase the supply of financial capital to banks. Ceteris paribus, this will reduce the WACC of banks.

*Expectation 3: Demand for bank finance will increase.* We note from Table 1 that superannuation funds do not invest directly in housing. This contrasts with households, who allocate 49% of their portfolio outside superannuation to housing equity. By increasing the allocation of household assets to superannuation (and thereby reducing their allocation to non-superannuation assets), we expect the intermediation effect will reduce the capacity to equity finance Australia's housing stock. Hence, the intermediation effect will increase the demand for bank home loans. Ceteris paribus, this will lead to an expansion of bank balance sheets and increase their WACC. While the net outcome of expectations 2 and 3 on bank WACC is ambiguous, the bank balance sheet will expand in the short-run.

*Expectation 4: The supply of bond and equity finance to banks will increase, at the expense of bank deposits.* Superannuation funds prefer to own a different mix of bank liability instruments to households (see Figure 5). For example, for every A$1 of investment by superannuation in bank liabilities, approximately A$0.26 is bank equity. For households, the corresponding value is A$0.13. The difference in bank bond allocations is particularly stark. While superannuation and foreign investors directly invest in bank bonds, Australian households do not. Hence, we expect the expansion in capital supply to banks (see expectation 2) to be accompanied by a compositional shift in bank capital structure.

*Expectation 5: Supply of financial capital to other financial intermediaries will increase*. From Table 1, it is clear that superannuation funds have a greater affinity for the financial liabilities of other financial intermediaries relative to households. For example, NBFI liabilities comprise 17% of superannuation asset holdings, while households allocate only 3% of their savings to NBFI liabilities. Hence, we expect the intermediation effect will increase the supply of financial capital to NBFI's.

## 4.2 Simulation results

As discussed in section 3, we consider the consequences of a one percentage point rise in the SG rate in terms of two effects: (1) The intermediation effect, showing the impact of a rise in the proportion of savings intermediated by the superannuation sector rather than allocated by households directly; (2) The savings effect, showing the impact of the rise in the national savings rate caused by the additional savings of households that would have saved less if not for the higher SG rate. We present the model results using a series of decomposition diagrams, which distinguish the contributions made by the intermediation effect and the savings effect taken in isolation. The decomposition diagrams are generated via four simulations:

(i) One in which only the savings rate rises and the central bank (CB) adjusts the policy rate according to the policy rule. We refer to this as the "Savings effect". The results of this simulation are depicted by *dotted bars* in all decomposition diagrams;

(ii) One in which the share of household savings flowing to superannuation rises, the savings rate is unchanged, and the CB takes no action to influence the policy rate. We refer to this as the "Intermediation effect (no CB)", and depict these results by *tilde-patterned bars* in all diagrams;

(iii) One in which the share of household savings flowing to superannuation rises, the savings rate is unchanged, and the CB takes action to influence the policy rate. We report the difference between (iii) and (ii) in the decomposition diagrams as "CB response to intermediation effect". These results are presented as *vertical-dashed bars* in all figures;

(iv) One in which the savings rate and the share of household savings flowing to superannuation rise, with CB policy activated as in simulation (i) and (iii). We refer to this as the "Aggregate effect". These results are reported by the solid line in the decomposition diagrams.

Additionally, we report the net impact of the intermediation effect (*tilde* plus *vertical dashed* bars) as dashed lines in all decomposition diagrams.

Our intention in the discussion that follows, is to elucidate the impacts of increased intermediation, and examine whether these impacts persist in the presence of the savings effect. Our results identify five short-run structural shifts:

(1) Compulsory superannuation increases intermediation of household savings. This causes a reduction in the supply of housing equity finance. This raises demand for bank home loans. Financial intermediaries thus play a greater role in funding the nation's housing stock, causing the debt-to-equity ratio of the housing sector to rise. This is evident in Figure 1, where we plot the deviation from baseline in the debt-to-equity ratio of the reproducible housing sector.[8]

(2) The economy-wide level of gross private debt rises relative to income due to both the intermediation and savings effects, as shown in Figure 2.

(3) From Figure 3, the SG rate rise reduces the net foreign financing requirement.

(4) Banks and NBFIs expand in the short-run. For banks, this is dependent on the savings effect; the intermediation effect leaves bank balance sheets largely in line with baseline in the short-run (Figure 4). Superannuation funds have a greater affinity for holding the liabilities of NBFIs than do households (Table 1). The intermediation effect therefore increases the supply of financial capital to NBFIs, leading to their expansion (Figure 4). This is reinforced by the savings effect.

(5) The intermediation effect causes a shift in the capital structure of the banks, because superannuation funds and households have different preferences for bank liabilities. This persists when we account for the savings effect.

The long-run impacts on financial structure are very similar. For this reason, we briefly summarise the long-run impacts of a rise in Australia's SG rate in section 4.2.3.

[8] A similar result is observed for the debt to equity ratio of the non-reproducible housing (NRH) sector. For brevity, we omit the NRH decomposition diagram.

### 4.2.1 Short-run implications for macroeconomic variables

#### *4.2.1.1 The intermediation effect without central bank response*

Without CB action [equation (6) is inactive], the SG rate rise in year 1 causes the nominal exchange rate to depreciate (Figure 6, tilde bars). This is consistent with expectation 1: superannuation's higher propensity to invest offshore, relative to households, causes capital outflow when it intermediates a higher proportion of savings. This causes nominal depreciation, raising the price of imports and domestic traded goods, and thus generating a positive deviation in the price level (Figure 7, tilde bars). With the nominal wage sticky in the short-run, the positive deviation in prices generates a negative deviation in the real producer wage. With physical capital stocks sticky and the real producer wage lower, an SG rate rise increases short-run employment in the absence of CB action (Figure 8, tilde bars).

The positive deviation in short-run employment generates a positive deviation in short-run real GDP (Figure 9, tilde bars). With physical capital stocks sticky in the short-run and employment higher, the marginal product of capital rises relative to baseline. This explains the short-run positive deviation in investment (Figure 10, tilde bars). With public consumption held at baseline (see section 3), the gross national expenditure (GNE) deviation is less than the GDP deviation in the first year (Figure 11, tilde bars). Hence the balance of trade moves towards surplus, causing the CAD to fall (see Figure 3).

#### *4.2.1.2 Central bank response to the intermediation effect*

Equation (6) leads the central bank to tighten monetary policy in response to the positive short-run deviations in inflation and employment (Figure 7 and Figure 8, tilde bars). The policy rate rises by 5.9 basis points in year 1 relative to baseline (vertical dashed bars, Figure 12). This has two consequences.

First, with official interest rates higher, liability agents must increase rates of return offered on their liabilities to attract financial capital. This raises the WACC's of domestic agents, like banks (Figure 13, column 1, vertical dashed bars). This damps short-run investment relative to baseline (Figure 10, vertical dashed bars). This contributes to the short-run GNE deviation being lower than the short-run GDP deviation (Figure 11, vertical dashed bars), reinforcing the year 1 movement of the CAD towards surplus (Figure 3, vertical dashed bars).

Second, with rates of return on domestic assets elevated relative to foreign assets, the nominal exchange appreciates (Figure 6, vertical dashed bars). Taken together with the intermediation effect without CB action (Figure 6, tilde bars) this leaves the nominal exchange rate little changed from baseline (Figure 6, dashed line). This explains why there is little net impact under the full intermediation effect on the consumption deflator (Figure 7, dashed line) and employment (Figure 8, dashed line).

#### *4.2.1.3 The savings effect and the aggregate real-side impact of superannuation expansion*

We implement the savings effect via a reduction in the APC. This reduces private consumption relative to baseline. With savings elevated relative to baseline, so too is the domestic supply of financial capital. This causes a negative deviation in the WACC's of financial agents (Figure 13, dotted bars), and thus a positive deviation in investment (Figure 10, solid line). Nevertheless, with private consumption below baseline and public consumption on baseline, the GNE deviation lies below the GDP deviation in year 1 (Figure 11). This pushes the balance of trade towards surplus and causes a negative deviation in the CAD-to-GDP ratio (Figure 3, dotted bars), reinforcing the intermediation effect (Figure 3, dashed line).

### 4.2.2 Short-run implications for the structure of the financial system

#### *4.2.2.1 The impact of an expanded superannuation sector on net foreign debt*

As discussed in section 4.2.1, the intermediation effect (both under passive and active monetary policy) and the savings effect drive the balance of trade towards surplus in year 1. The CAD therefore moves towards surplus, and the CAD-to-GDP ratio falls (see Figure 3). Australia's net foreign financing requirement is thus reduced slightly in year 1, under both the intermediation and savings effects**.**

#### *4.2.2.2 The supply of equity finance to the housing sector rises*

With the CB inactive, the intermediation effect induces nominal depreciation and with it, a positive deviation in the price level (Figures 6 and 7, tilde bars). This causes capital returns to rise, lifting equity valuations, and thus expanding the portfolio values of financial agents. Figure 14 plots the year 1 impact of this price effect on the value of household assets (column 1, tilde bar). In the absence of movements in relative rates of return, this drives an expansion effect [via $assets_{(d)}$ in equation (4)], leading households to increase holdings of all financial assets, while leaving allocation weights unchanged.

Figure 14 reports the impact of this expansion effect on the supply of equity to NRH and RH housing (columns 3 and 6). With the CB inactive, the intermediation effect causes the supply of equity to housing to expand. This finding is inconsistent with expectation 3. But in forming this expectation, we did not account for the possibility of the intermediation effect raising the price level, and with it, the aggregate asset budgets of financial agents. However, this result hinges on central bank inactivity. As discussed in section 4.2.1.2, the CB responds to the elevated price and employment levels by raising the policy rate. This neutralises the positive deviation in the price level (Figure 7, dashed line) and as such, leaves the value of the household's financial assets little changed from baseline (Figure 14, column 1, white squares). In line with expectation 3, we see that the household's allocation to housing equity falls when it is directed to allocate more savings to superannuation (see white squares, column 3 and 6, Figure 14).

The reduction in the supply of equity capital to housing due to intermediation is more than offset by the savings effect in year 1 (see the dotted bars in Figure 14). Hence, in the short-run, the net effect of the SG rate rise is to increase the supply of equity finance to housing (see the dark diamonds in Figure 14).

#### *4.2.2.3 The debt to equity ratio of the housing sector rises as loan demand growth exceeds growth in the supply of equity by households*

As discussed in section 4.2.2.2, with equation (6) deactivated the household expands its housing equity holdings in response to the intermediation effect (columns 3 and 6, Figure 14, tilde bars). But, the financing needs of both the RH and NRH sectors expand by more (columns 2 and 5, Figure 14, tilde bars). With the rise in supply of equity from households insufficient to finance the housing stock, a rise in the debt-to-equity ratio occurs (tilde bars in: columns 4 and 7, Figure 14, and in Figure 1).

Activating equation (6) causes households to reduce their supply of equity finance to the housing sector under the intermediation effect (see white squares in Figure 14, columns 3 and 6). While the use of debt finance by the housing sector also falls in response to the increasing policy rate (see vertical dashed bars in Figure 14, columns 4 and 7), the net impact of the intermediation effect is to leave short-run home loan demand elevated relative to baseline (see white squares in columns 4 and 7 of Figure 14). This result, which is in line with expectation 3, raises the debt-to-equity ratio of the housing sector (see Figure 1, dashed line). The savings effect lifts the supply of equity capital by households to the housing

sector in year 1 (see section 4.2.2.2). This reduces the housing sector's debt-to-equity ratio (Figure 1). However, from the solid lines in Figure 1, it is clear that the aggregate impact of an SG rate rise is a rise in the debt-to-equity ratio of the housing sector. The savings effect is therefore insufficient to offset the impact of the intermediation effect on the housing sector's debt-to-equity ratio.

#### *4.2.2.4 Private gross debt increases relative to income*

With employment broadly in line with baseline but the terms of trade below baseline and private debt levels elevated relative to baseline, the net impact of the intermediation effect is for the ratio of private gross debt to income to rise (Figure 2, dashed line). As shown by the dotted bars in columns 4 and 7 of Figure 14, the savings effect has a small positive impact on the use of debt by the housing sector. With short-run employment broadly in line with baseline (Figure 8) and the terms of trade damped, income falls and the savings effect causes the ratio of private gross debt to income to rise (Figure 2, dotted bars). This reinforces the rise in the ratio of gross debt to income caused by the intermediation effect.

#### *4.2.2.5 Commercial banks expand as the superannuation guarantee rate rises*

As discussed in section 4.1, banks benefit from increased intermediation of household savings by superannuation funds via a supply-side effect, i.e., superannuation funds have a higher propensity to own bank liabilities than do households (see Table 1).[9] As discussed in section 4.2.2.3, the banks also benefit from a rise in housing loan demand (columns 4 and 7, Figure 14, tilde bars).[10] These demand- and supply-side stimuli impose countervailing pressures on bank WACC (see column 1 of Figure 13). Nevertheless, in line with expectations 2 and 3, under passive monetary policy the demand- and supply-side stimuli cause an expansion of bank risk-weighted assets (tilde bars, column 3, Figure 4).

When the CB responds to the intermediation effect, housing demand for bank loans is lower than that observed under the intermediation effect with passive CB scenario (see vertical dashed bars, columns 4 and 7, Figure 14). This mutes much of the expansion experienced by the commercial banks under passive monetary policy. In the short-run, the intermediation effect therefore has little net impact on the

[9] With equation (6) deactivated, banks also benefit from a short-run depreciation in the nominal exchange rate (tilde bars, Figure 6). This assists banks, because foreign investors are banks largest creditors (owning 33% of outstanding bank liabilities) and nominal depreciation triggers an increase in gross financial capital inflows.

[10] The Industry agent also expands their use of loan finance. To avoid clutter, we do not report this in the figures.

size of Australia's commercial banks, which experience a marginal expansion (see white squares in columns 2 – 4 of Figure 4, which lie slightly above the horizontal axis in year 1).

As discussed in section 4 and shown in Figure 13, the WACC of the banks falls in response to the savings effect. This causes an expansion in both their risk-weighted asset base and their financial liabilities (see Figure 4). The banks therefore expand in the short-run (black diamonds, columns 2 – 4, Figure 4), with this being largely driven by the savings effect.

#### *4.2.2.6 Bank finance relies less on bank deposits and more on corporate bonds*

Relative to superannuation funds, households supply more deposit finance and less equity finance to banks. Also, households do not hold bank bonds, whereas superannuation funds do. In Figure 15, we observe the influence of these instrument-specific preferences. With equation (6) deactivated (Figure 15, tilde bars), banks fund that part of their year 1 expansion attributable to the intermediation effect using proportionately more bond and equity finance than deposits. When the CB responds to the intermediation effect, bank use of bond finance remains slightly elevated relative to baseline (see white squares, Figure 15). In line with expectation 4, we observe a shift in bank capital structure under the intermediation effect, with greater use of bond finance relative to both equity and deposits.

The savings effect also causes bank expansion in year 1 (see section 4.2.2.5). This expansion is funded via a proportionate rise in the use of bonds and deposits (Figure 15).[11] The aggregate impact (savings *plus* intermediation effect) is to alter bank capital structure towards greater reliance on bonds, and reduced reliance on deposits (Figure 15, black diamonds).

#### *4.2.2.7 An expansion of the superannuation sector causes a commensurate expansion of NBFIs*

Because superannuation funds have a stronger propensity than households to own the liabilities of NBFIs, the intermediation effect causes expansion in the supply of financial capital to NBFIs. Hence

[11] Bank equity finance rises by more than bond and deposit finance, because bank risk-weighted assets expand relative to the asset-side of their balance sheet in year 1 and the capital adequacy ratio is exogenous (see column 2 and 3, Figure 4). This is due to a shift in bank loan books, away from lending to agents with lower risk weights (e.g., non-reproducible housing), and towards reproducible housing and industry lending.

NBFI WACC falls relative to baseline (column 2, Figure 13) and the NBFI sector expands (white squares, column 1, Figure 4). This expansion is reinforced by the savings effect (column 1, Figure 4).

#### 4.2.3 Long-run impacts of a rise in the superannuation guarantee rate in Australia

The long-run structural impact of a rise in the SG rate largely mirrors the year 1 impacts discussed in section 4.2.2. Hence, we provide a brief summary of the long-run macroeconomic and structural implications of the policy. Our discussion is focussed on the net impact of a rise in the SG rate, i.e., we describe the impact of the intermediation effect *plus* savings effect (solid lines or white squares for year 11 in all referenced figures).

With regard to macroeconomic impacts, the rise in the national savings rate depresses real GDP in year 1 (Figure 9) because it drives down real private consumption. However, in the long-run, increased supply of financial capital by domestic investors increases the capital stock, because it increases real investment (Figure 10). With employment largely in line with baseline (Figure 8), a rise in long-run real investment and capital stocks drives long-run real GDP above baseline (Figure 9).

Differences between the short- and long-run response of real GDP to the policy initiative do not drive material differences in the structural implications of a rise in Australia's SG rate. The mechanisms generating these shifts are also similar to those described for the short-run; see section 4.2.2.

## 4.3 How does superannuation expansion affect macro stability indicators?

In section 4.2.2, we identified five structural shifts arising from an increase in the SG rate:

(1) A rise in the debt to equity ratio of the housing sector (see Figure 1);

(2) A rise in ratio of gross private debt to household income (see Figure 2);

(3) A fall in net foreign financing, i.e., the CAD to GDP ratio falls (see Figure 3);

(4) An expansion in the size of financial intermediaries, e.g., superannuation funds, commercial banks and NBFIs (see Figure 4);

(5) A change in bank capital structure, with a reduced reliance on bank deposits and a greater share of financial capital secured via bond and equity finance (see Figure 15).

These shifts are caused by the intermediation effect, and are either partially offset or reinforced by the savings effect. With the aid of the literature survey in section 3, we now discuss the implications of these five structural shifts [hereafter referred to as outcomes (1) – (5)] for macro stability.

### 4.3.1 Increased indebtedness decreases macroeconomic stability

Two key outcomes of an SG rate rise are a rise in the use of debt to finance housing investment [outcome (1), see Figure 1], and a rise in the ratio of private debt to income [outcome (2), see Figure 2]. Outcome (1) is consistent with an analysis of the Netherlands by the OECD (2012), which found that high pension savings rates were accompanied by an expansion in the use of debt by households to finance investments, like dwelling purchases. These two outcomes are concerning from a macro stability perspective. As discussed in section 3, both outcome (1) and (2) enhance vulnerabilities to asset price and income shocks, and outcome (2) is a leading indicator of diminished macro stability. This suggests outcomes (1) and (2) are channels via which an SG rate rise can diminish long-run macro stability. In an environment of low debt levels and service burdens, the macro stability impact of outcomes (1) and (2) might nevertheless be small. However, Australian household debt-to-income and debt-to-GDP ratios are not low, either by historical or international standards [Zabai (2017)]. Policy makers therefore have reason for concern when assessing outcomes (1) and (2), given the current Australian macroeconomic climate.

### 4.3.2 A reduction in foreign capital dependency improves macro stability

Both the intermediation and savings effects reduce net reliance on foreign finance via negative deviations in the CAD-to-GDP ratio [Outcome 3, see dashed line and dotted bars in Figure 3]. This is consistent with studies by Vittas (1992) and Reisen and Williamson (1994): a larger domestic superannuation/pension sector coincides with an increase in the ratio of domestic-to-foreign financial capital. This could be helpful in insulating against sudden-stop episodes.

Why is this important for Australian macro stability? As D'Arcy and Ossolinski (2009) show, foreign capital flows into Australia (as was the case in many economies) became more volatile during the 2008/09 global financial crisis. In Australia, this was largely isolated to private capital flows associated with internationally-domiciled commercial bank debt. Australian banks therefore found it more difficult

to raise offshore bond finance. This was the main channel via which the global financial crisis affected Australian macro stability. The findings by D'Arcy and Ossolinski (2009) suggest that changes in foreign capital supply to specific agents (like banks) could be a more important lens through which to assess financial vulnerabilities, rather than an economy-wide measure like the CAD-to-GDP ratio. Hence, we report deviations in foreign ownership shares classified by agent and instrument in Figure 16. This figure shows the foreign ownership proportions of the liabilities raised by Australian financial agents fall in response to an SG rate rise (see black diamonds in Figure 16). This indicates a movement on the part of Australian liability agents towards less potential exposure to foreign capital inflow volatility, which can be interpreted as a stability-enhancing consequence of an SG rate rise.

#### 4.3.3 Financial deepening improves macroeconomic stability

A corollary of outcomes (4) and (5) is strong expansion in the supply of corporate debt. Here, we assess the impact of this expansion for the depth of the corporate bond market by studying the change in the ratio of the stock of bank bonds to real GDP [see section 3]. If we compare the year 11 results in Figures 9 and 15, financial deepening is evident in the market for bank bonds, because the stock of bank bonds expands by 0.7 per cent (white squares in Figure 15), whereas real GDP is 0.13 per cent above baseline (Figure 9). Because foreign capital dependency falls in response to a rise in the SG rate (see section 4.3.2), we can also conclude that the new bank debt is largely held by domestic agents. The domestic market for corporate bank bonds therefore deepens.

#### 4.3.4 Concentration risks fall and regional diversification improves

Outcome (5) is also consistent with an increase in the diversity of the commercial banks' capital structure (see Figure 15). As discussed in section 3, reduced concentration risk is stability-enhancing. A higher SG rate also reduces regional concentration risk. This is because superannuation funds have a greater proclivity for offshore investment than do households directly (see the AASs for households [HLDXS] and superannuation funds [SPR] in Table 1). Hence, a higher SG rate increases the weighting of foreign assets in the household sector's consolidated portfolio.

# 5 Conclusions and future work

We have investigated the implications of an expanded Australian superannuation system for the banking sector, other financial intermediaries, and the structure of the broader financial sector. This is an important question, because shifts in financial structure can have implications for macroeconomic stability. We modelled expansion of the superannuation system via a rise in the mandated superannuation guarantee (SG) rate. This rise was decomposed into two parts: (1) an intermediation effect, modelled as an increase in the share of national savings invested in superannuation; and (2) a savings effect, modelled as a rise in the savings rate. Our analysis of the FCGE model output elucidates five structural changes arising from a rise in the SG rate. Among these changes, we found that growth in superannuation promotes financial intermediation, which increases the debt-to-equity ratio of the housing sector. This effect persists when we also account for the savings effect. Similarly, the ratio of gross private debt to income rises, via both the intermediation and savings effects. With the Australian ratio of household debt to income high by historical and international standards, these findings must be carefully balanced against any benefits of increasing the SG rate. Among those benefits, our results show that both the intermediation and savings effects act to reduce reliance on foreign financial capital. Australian banks found it difficult to raise offshore bond finance during the 2008 financial crisis: a key channel via which the crisis affected Australian macro stability. We also found that an expanded superannuation sector contributes to a deepening of the domestic market for corporate bonds. This was raised as a financial development issue in bank submissions to the FSI [Commonwealth of Australia (2014)]. This drives potential diversification benefits in bank capital structure (via a reduced reliance on deposits). Finally, enhanced regional diversification in the financial asset portfolio of households (via increased exposure to foreign assets) is also stability-enhancing.

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# Tables

**Table 1: Portfolio weights by asset agent (%), FCGE model's financial database[12]**

| Liab. agent \ Asset agent | BNK | RBA | FGN | GOV | HLD | SPR | HLDXS[13] | IND | LFE | OFI | NRH | RH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Commercial banks (BNK) | 0 | 17 | 41 | 31 | 15 | 26 | 21 | 41 | 13 | 22 | 0 | 0 |
| Central Bank (RBA) | 1 | 0 | 0 | 8 | 1 | 0 | 1 | 3 | 0 | 0 | 0 | 0 |
| Foreign Investor (FGN) | 12 | 55 | 0 | 17 | 2 | 19 | 3 | 45 | 5 | 13 | 0 | 0 |
| Government (GOV) | 4 | 23 | 10 | 0 | 6 | 2 | 9 | 3 | 5 | 4 | 0 | 0 |
| Households (HLD) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Superannuation (SPR) | 0 | 0 | 0 | 0 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Industries (IND) | 23 | 0 | 39 | 23 | 10 | 20 | 13 | 0 | 8 | 24 | 0 | 0 |
| Life insurers (LFE) | 0 | 0 | 0 | 0 | 1 | 15 | 2 | 0 | 0 | 0 | 0 | 0 |
| Non-bank financial intermediaries (OFI) | 10 | 6 | 8 | 11 | 3 | 17 | 4 | 9 | 69 | 0 | 0 | 0 |
| Non-reproducible housing (NRH) | 28 | 0 | 1 | 6 | 28 | 1 | 39 | 0 | 0 | 20 | 0 | 0 |
| Reproducible housing (RH) | 23 | 0 | 1 | 5 | 7 | 1 | 10 | 0 | 0 | 16 | 0 | 0 |
| *TOTAL* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *100* | *0* | *0* |

[12] Share of each asset agent's portfolio represented by the financial instruments of liability agents. E.g. 23% of the assets of the commercial bank are the liabilities of reproducible housing (i.e. mortgages).

[13] HLDXS is a derived asset agent, which represents the scaled-up asset ownership shares of households (HLD) when we exclude their allocation of 26% to the superannuation sector (SPR), i.e., HLDXS allocation to BNK is 20.8 = 15.3 * 100 / 26.3.

# Figures

**Figure 1: Debt to equity ratio for reproducible housing, basis point deviation from baseline**

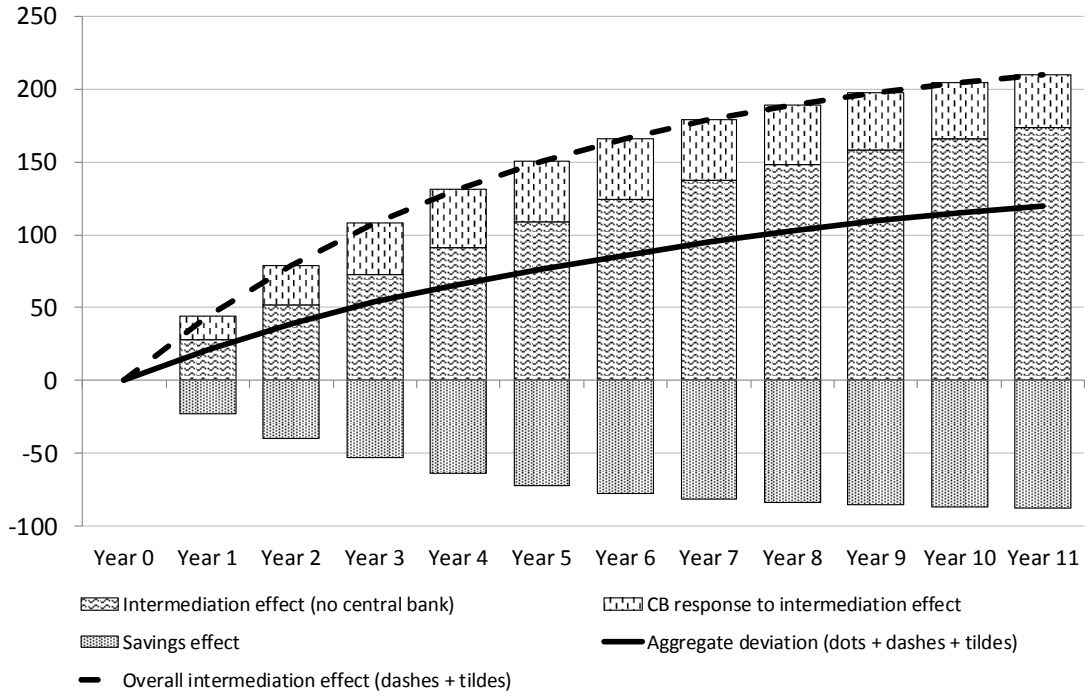



**Figure 2: Ratio of private debt to income, basis point deviation from baseline**

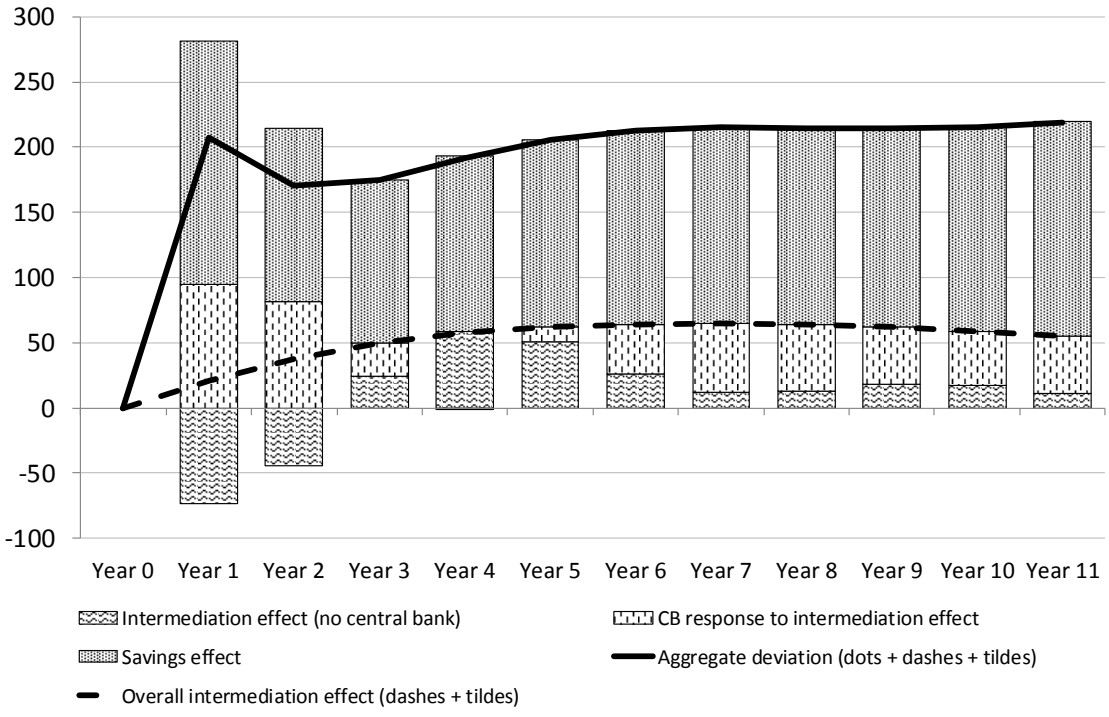


**Figure 3: Change in the CAD to GDP ratio (deviation from baseline)**

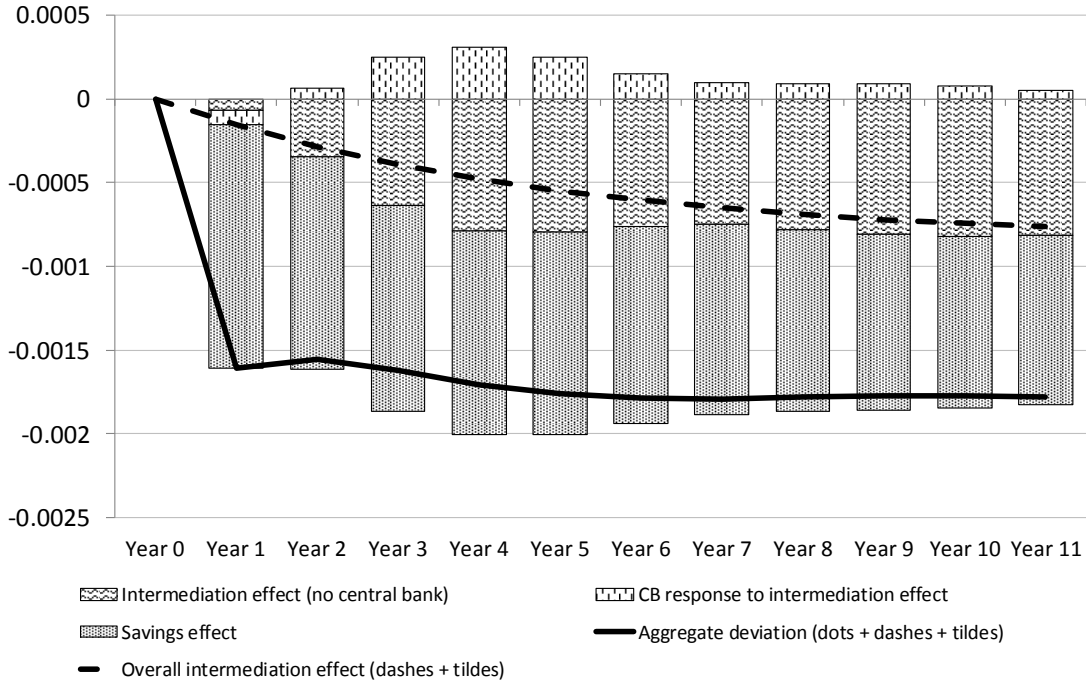



**Figure 4: Year 1 and year 11 movement in financial assets, risk-weighted assets and financial liabilities of the commercial bank and NBFI agents (% deviation from baseline)**

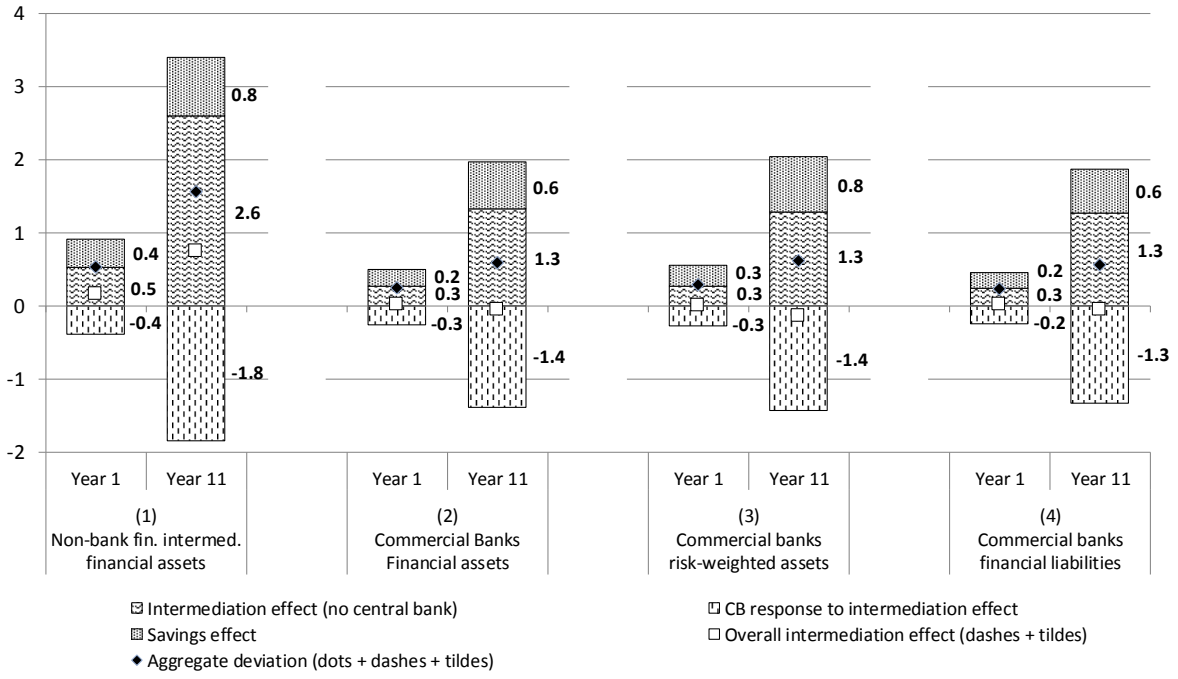


**Figure 5: Composition of commercial bank liability holdings by asset agent.[14]**

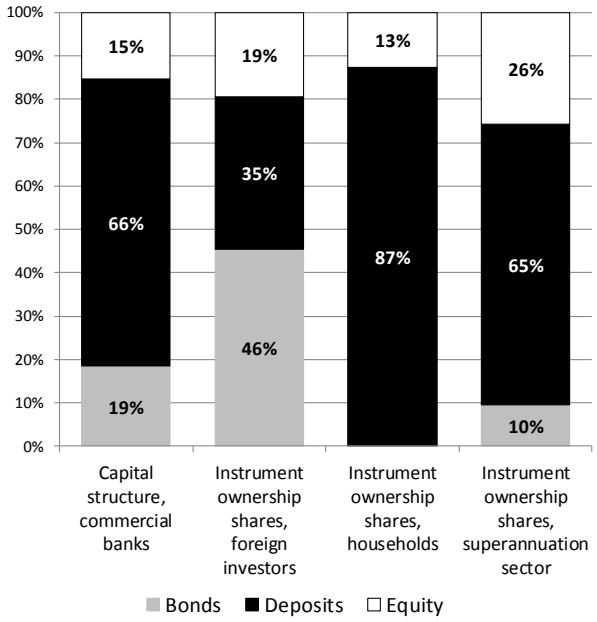
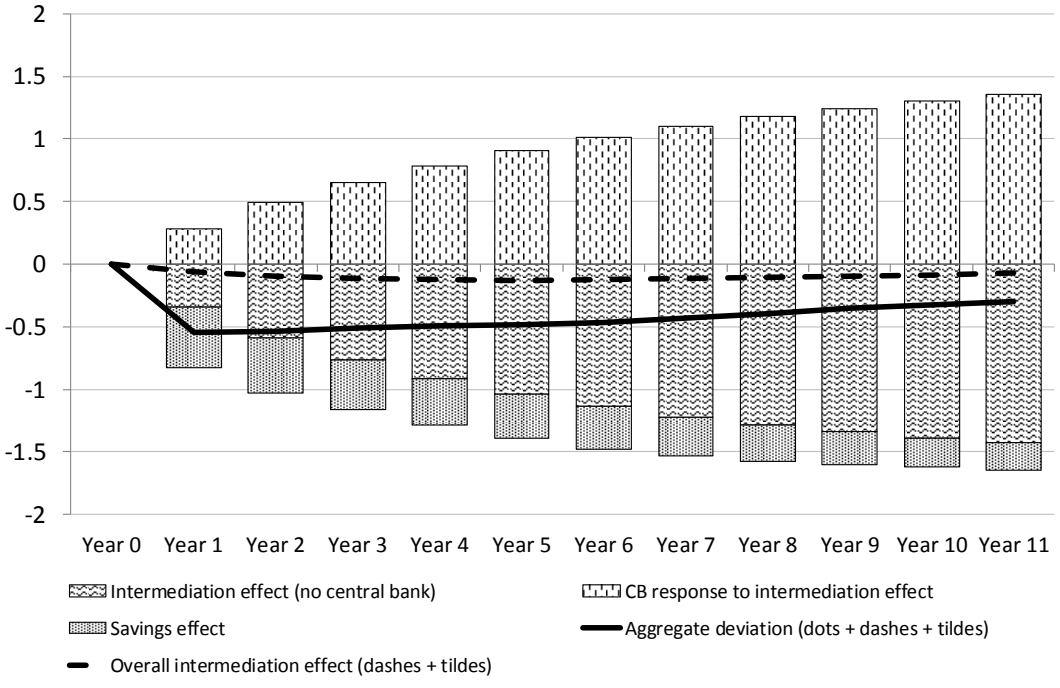



**Figure 6: Nominal exchange rate (% deviation from baseline)**




[14] Distribution across financial instruments of a $1's worth of holdings of commercial bank liabilities by all asset agents (column 1) and foreigners, households and superannuation (columns 2-3).

**Figure 7: Private consumption deflator (% deviation from baseline)**

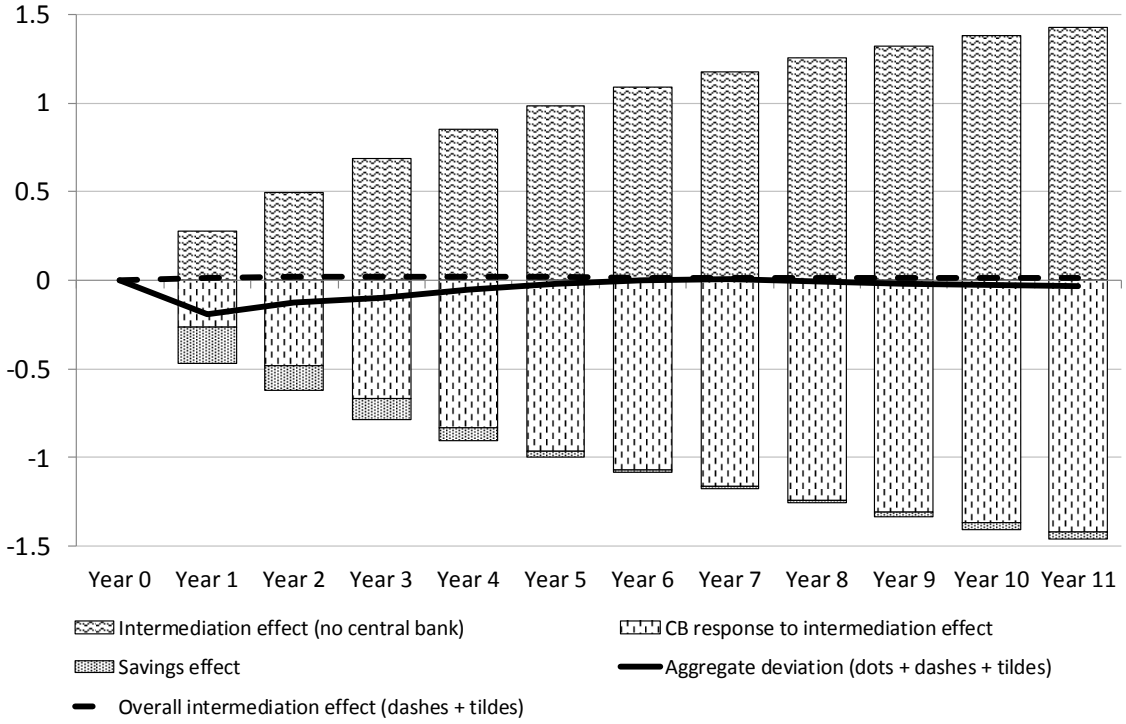



**Figure 8: Employment (% deviation from baseline)**

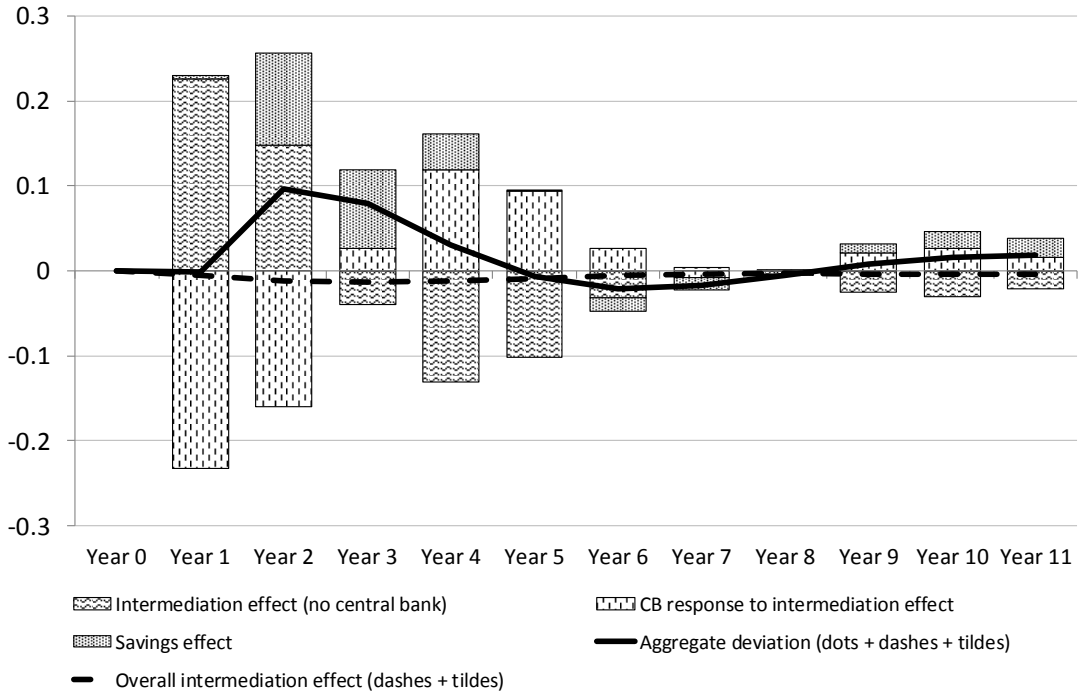


**Figure 9: Real GDP (% deviation from baseline)**

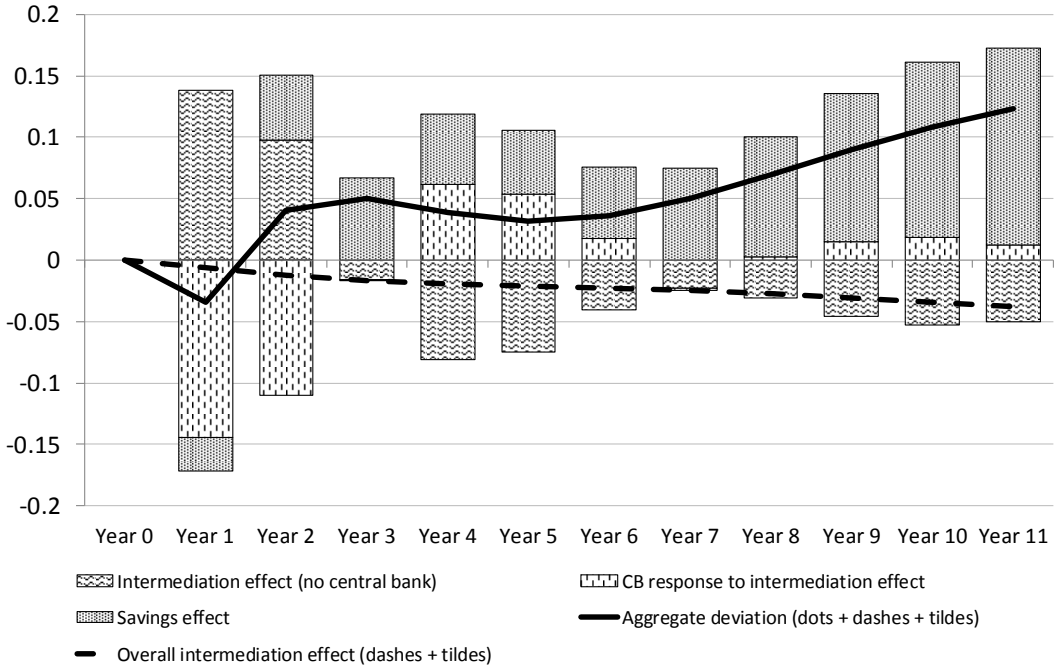



**Figure 10: Real investment (% deviation from baseline)**

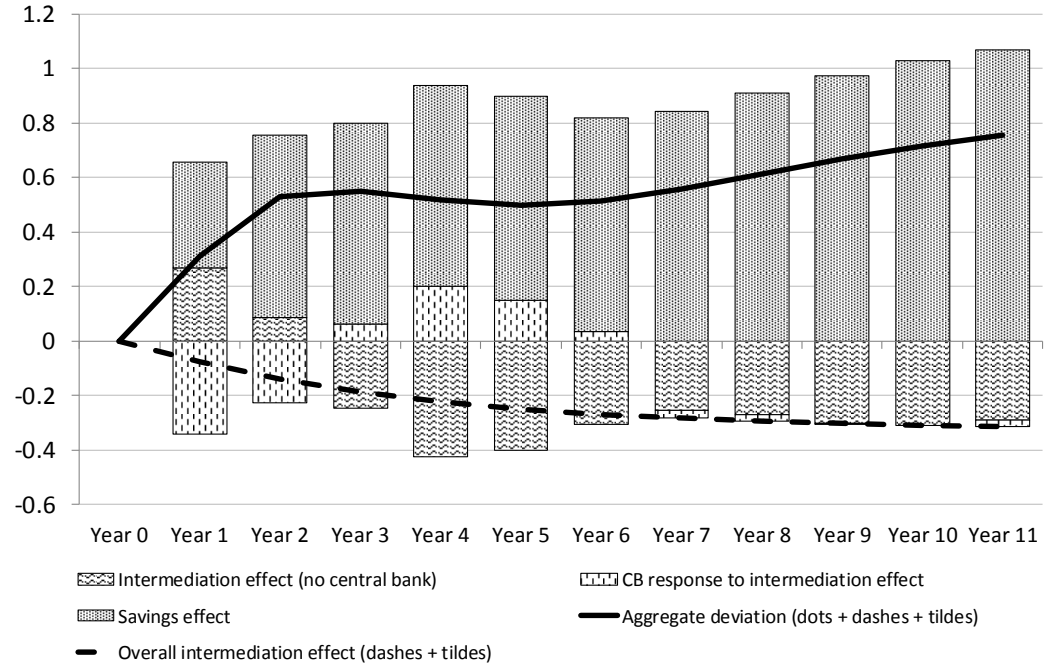


**Figure 11: Year 1 and year 11 movement in real GNE and real GDP (% deviation from baseline)**

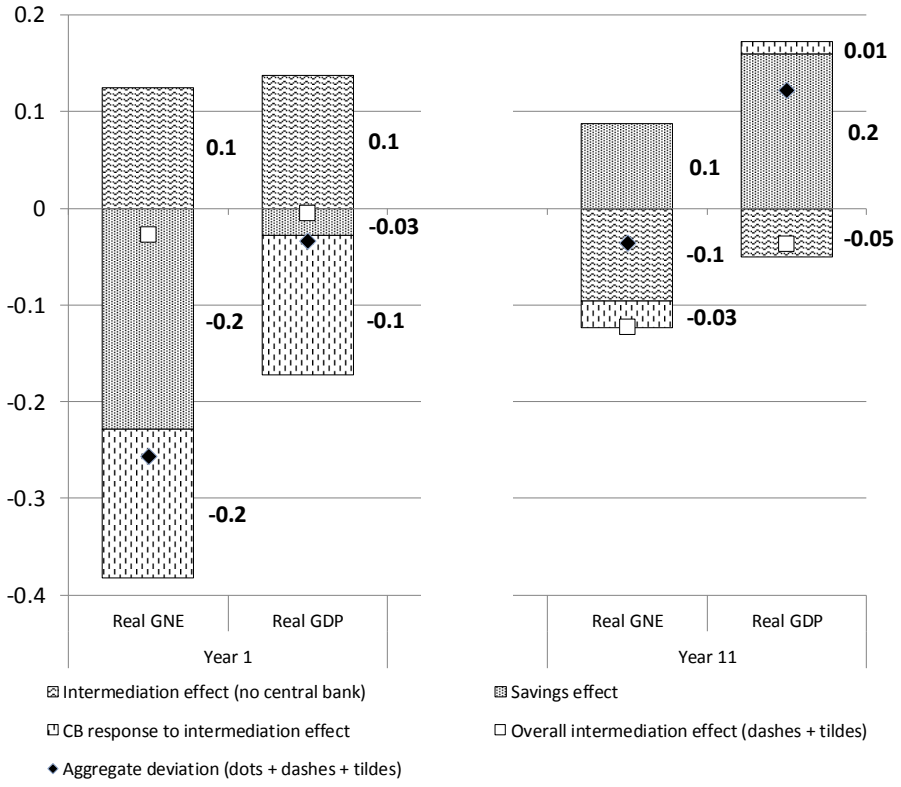



**Figure 12: Domestic policy rate (basis point deviation from baseline)**

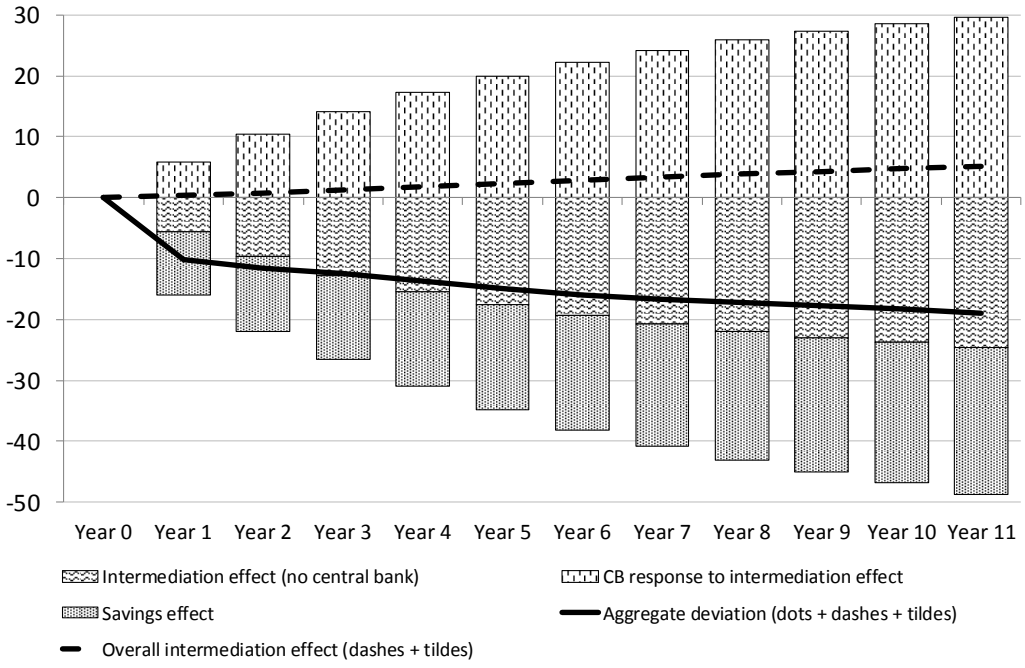


**Figure 13: Year 1 and year 11 movements in the WACC for various financial agents (basis point deviation from baseline)**

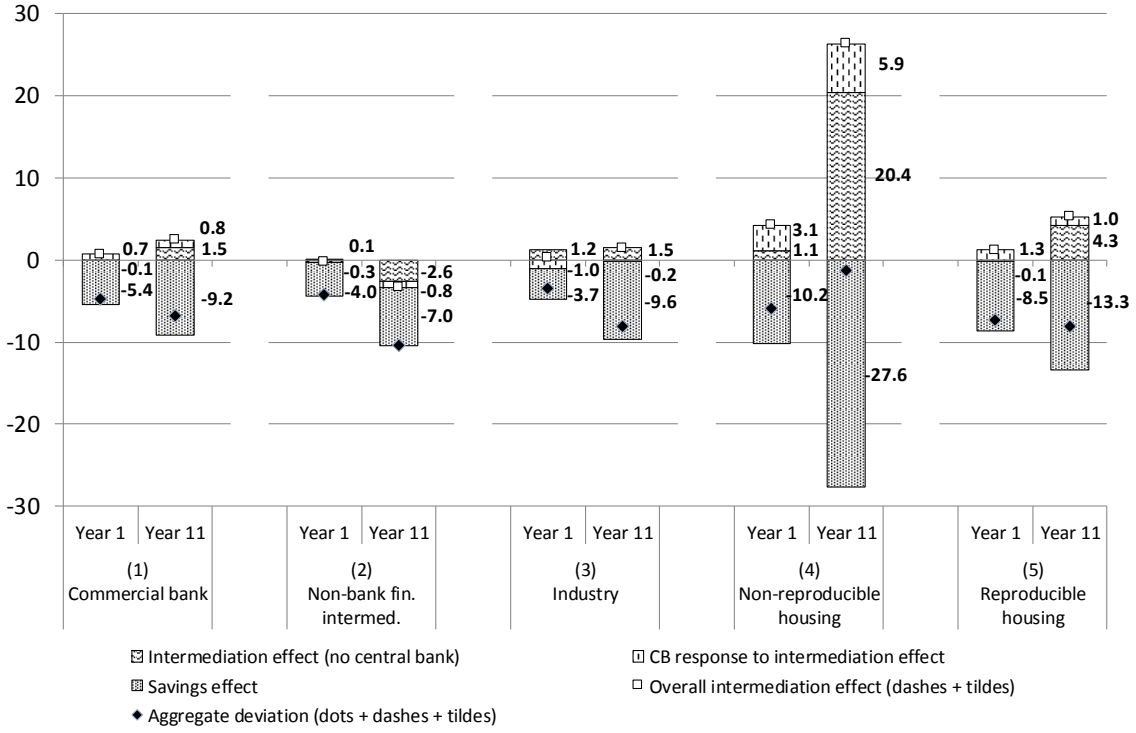



**Figure 14: Year 1 movements in selected balance sheet elements (% deviation from baseline)**

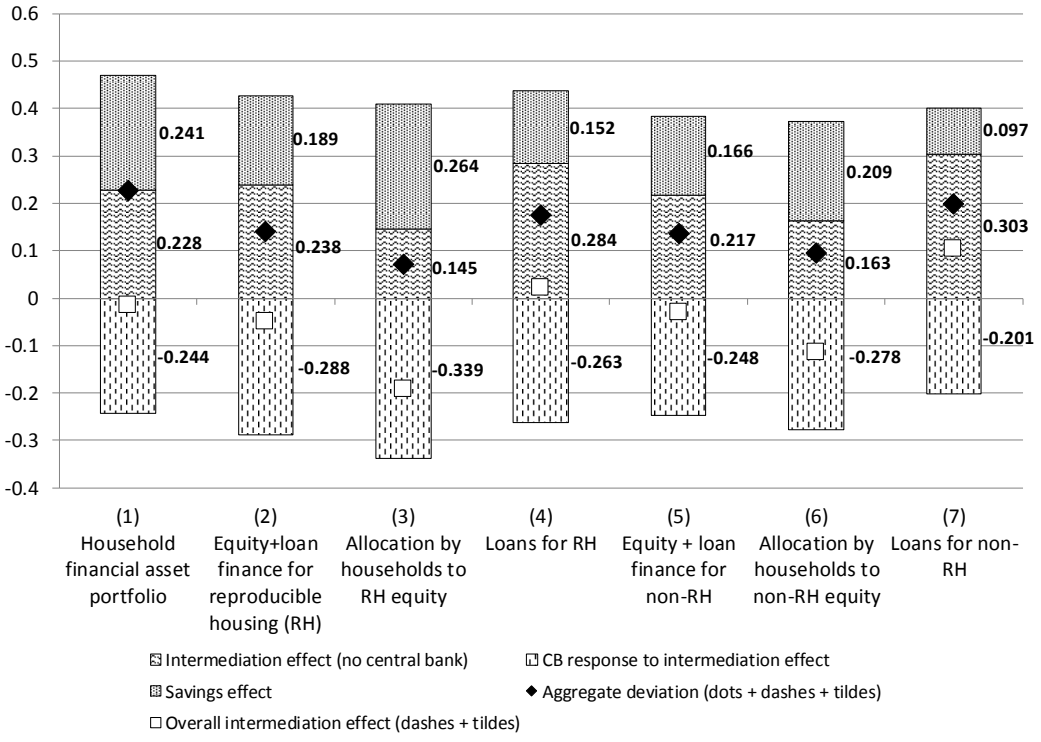


**Figure 15: Year 1 and year 11 movement in commercial bank financial liabilities by instrument (% deviation from baseline)**

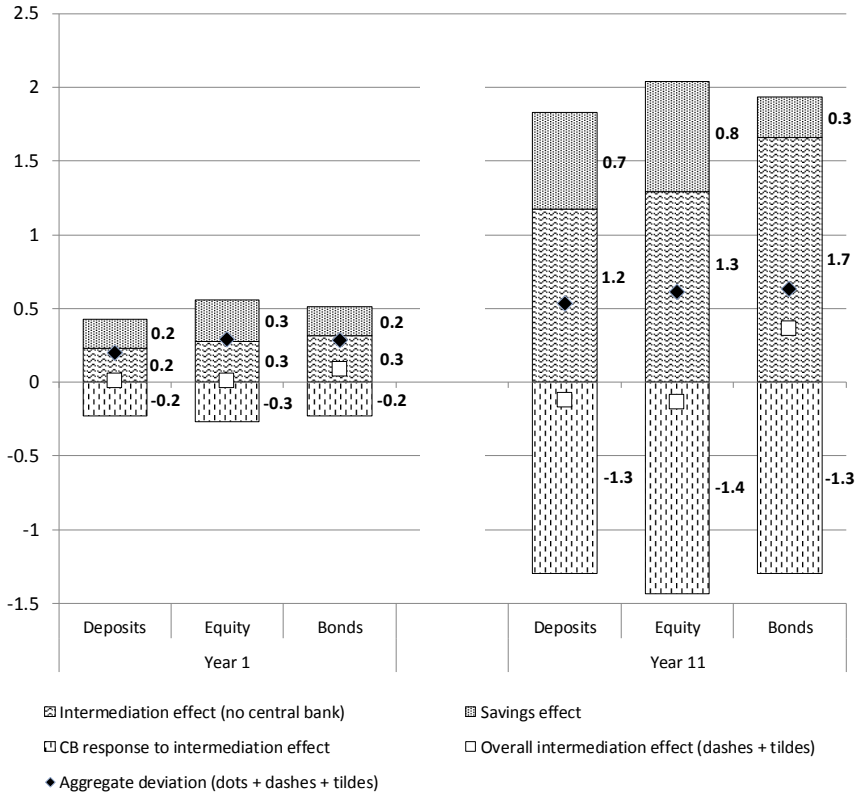



**Figure 16: Change in foreign ownership shares for various Australian financial agent liabilities (by liability agent and financial instrument) (% deviation from baseline in year 11)**