The impact of government funded retirement contributions (matching) on the retirement savings behaviour of low and middle income individuals

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Abstract
To date, randomized experiments are the only evidence available that evaluates the impact of retirement matching programs on the savings behaviour of low and middle income individuals or families (Duflo et al. 2006; Saez 2009). This paper is the first to evaluate a national government-funded matching policy targeted explicitly at low and middle income individuals. It exploits changes in the Australian Government's national retirement contribution matching (co-contribution) policy over time in order to identify the impact of the matching program on low and middle income individuals' savings behaviour using a difference-in-difference methodology. In particular, in the 2012-13 financial year, the income eligibility threshold was decreased from $61,920 to $46,920. The results show that reducing the eligibility threshold of the matching policy decreased the percentage of individuals who made a contribution by 0.9 percentage points and the value of retirement contributions made by 6.2%. Conditional on making a post-tax contribution, the value of individuals' contributions declined by between 17 – 19%. The analyses also provide evidence of a reallocation effect. When individuals ceased to be eligible for the matching policy, they increased personal savings by about 11%. The drop in post-tax superannuation savings combined with the increase in personal savings points to a reallocation effect. However, the effect is not one-to-one and there is a drop in overall savings. The results show that a $1 increase in post-tax superannuation contributions leads to a $0.77 reduction in personal savings.

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Executive summary

Superannuation tax concessions for voluntary savings are designed to boost individuals' superannuation balances. Are these policies effective at encouraging individuals to make larger contributions to their superannuation accounts? If so, do the larger contributions represent new savings (and reduced consumption) or a reallocation of existing savings towards more tax preferred savings instruments? This research evaluates one such policy, the Australian government's co-contribution policy, to contribute to a better understanding of these questions.

The government co-contribution was introduced in the 2003 – 04 financial year and matches the post-tax personal superannuation contributions made by low and middle income individuals, dollar for dollar. The income eligibility criteria for the policy have changed significantly since its introduction. In particular, in the 2012-13 financial year, the income eligibility threshold was decreased from $61,920 to $46,920. As a result, there were some individuals who were eligible for the policy in the 2011 – 12 financial year, but who no longer qualified in 2012-13 when the threshold changed. This research compares the savings behaviour of these individuals – who were initially eligible and then ineligible (the treatment group) – to the savings behaviour of similar individuals who earned slightly more, between $61,921 and $76,920, and were never eligible for the policy (the control group), in order to evaluate the policy's effectiveness.

Formally, the comparison of the two groups' savings behaviour was evaluated using a difference-in-difference design which considered three savings outcomes. First, the research considered the impact of reducing the eligibility threshold on the likelihood that an individual would stop making contributions. The results show that decreasing the eligibility threshold reduced the percentage of individuals who made a contribution by 0.9 percentage points. Second, the research evaluated the impact of the change in the policy on the value of superannuation contributions made. The estimates show that the value of retirement contributions decreased by 6.2% when the eligibility thresholds for the matching program were reduced. Finally, among individuals who made a post-tax superannuation contribution, the research considered whether the reduction in superannuation contributions resulted in lower savings levels or a reallocation of savings to other forms of savings. The results conclude that when individuals ceased to be eligible for the matching policy, they increased other forms of personal savings by about 11%. The drop in post-tax superannuation savings combined with the increase in personal savings points to a reallocation effect. However, the effect is not one-to-one and there is a drop in overall savings. The results show that a $1 increase in superannuation post-tax superannuation contributions leads to a $0.77 reduction in personal savings.

These results are consistent with the international literature and limited Australian literature available. While the literature tends to diverge with respect to the effectiveness of the matching rate for matching policies, with a few exceptions, most studies find a positive (negative) effect of the existence (elimination) of matching programs on individuals' participation (consistent with the findings of this research). While the international evidence regarding the new savings versus reallocation of savings is not entirely conclusive, there is a much stronger consensus that asset reallocation in response to tax incentives occurs, particularly for voluntary (as opposed to compulsory) savings incentives (OECD 2018); this also aligns with the conclusions of this research.

In conclusion, the government's co-contribution policy has impacted the savings behaviour of a modest percentage of low and middle income individuals. While the matching program certainly increased the superannuation balances of this small minority, the majority of low and middle income individuals remained unaffected. If boosting superannuation balances is an explicit policy goal, recent international literature suggests that compulsory savings policies tend to be more effective than tax subsidies for retirement savings. While the Australian literature in this area is limited – and more is required – this research provides some evidence in support of this hypothesis and of its relevance in Australia.

1. Introduction

Policies aimed at encouraging private savings for retirement attempt to ensure adequate retirement incomes for retirees and help alleviate government budgetary pressures associated with ageing populations and increasing life expectancies. Internationally, Governments tend to employ tax incentives, namely tax deductions, tax credits and exemptions, to encourage private retirement savings. All of these incentives change the effective rate of tax on savings. The effects of savings taxes have been evaluated in the literature with mixed empirical results. Some studies do not find a statistically significant impact of savings taxes on savings rates (Paiella and Tiseno 2014; Chetty et al. 2014; Anton et al. 2014; Corneo et al. 2010; Attenasio et al. 2004), while other studies find a negative and statistically significant effect of savings taxes on savings rates (Jakobsen et al. 2018; Beshears et al. 2015; Gelber 2011; Rossi 2009; Conolly 2007; Poterba et al. 1996).

Contribution matching is another policy tool at Governments' disposal (which was not explicitly considered by the previously mentioned research), and its effectiveness has never been evaluated in the academic literature in a non-experimental setting at a national level. Yet, the effects of a government-funded matching policy could very well differ from those of a tax credit or deduction, particularly for low and middle income individuals. In particular, the use of (non-refundable) tax credits require an individual to have a positive income tax liability. Deductions are only valuable if the individual has a marginal income tax rate greater than zero. These constraints limit the extent to which low and middle income individuals can benefit from tax concessions. In addition, the lower marginal income tax brackets in which low and middle income individuals concentrate reduces the value of the tax incentives, compared to their high-income counterparts in higher marginal income tax brackets. For these reasons, a government co-contribution matching scheme is potentially better suited for low and middle income individuals since it requires neither a tax liability nor taxable income and can be provided at rates above the individual's marginal tax rate.

The academic literature on the effectiveness of matching policies has focused primarily on private employer matching schemes. This literature finds mixed results with respect to the effectiveness of these schemes on increasing private savings. There are however, several reasons to believe that the effects observed from private schemes would differ from a governmentally instituted policy. First, contributors to private schemes, like the 401(k) in the United States, tend to be higher income. Second, 401(k) contributions are done through payroll, whereas contributions to other retirement income products are not. Third, since employer programs are firm specific, there could be selection effects in terms of the types of firms which offer matching programs as well as the types of employees they attract.

Duflo, Gale, Liebman, Orszag, and Saez (2006) and Saez (2009) are the only two studies which attempt to evaluate the impact of matching programs on low and middle income families through a non-employer funded program. Both studies rely on a randomized experiment with 14,000 tax filers in H&R Block offices in St. Louis. The results from both studies suggest that matching is an effective policy which increases the savings of low and middle income families, particularly if information about the matching policy is framed in a particular way. While the sample size is extensive, the authors can only conjecture about the extent to which their results might apply to a government scheme at the national level.

Research on the impact of *voluntary* superannuation tax concessions in Australia is quite limited. Connolly (2007) evaluates the expansion of *compulsory* superannuation in Australia and finds evidence that significant new savings were generated. However, the recent academic literature suggests that voluntary and compulsory savings policies may have different effects. Whelan et al. (2018) focus on voluntary savings generated by high-income earners in Australia due to the 2005 removal of the superannuation surcharge. The authors conclude the reduction in taxes led to an increase in superannuation contributions of 1.7 percentage points. However, the Whelan et al. (2018) analysis does not consider whether the increased savings was new savings or a reallocation of existing savings. Subsequently, there is an absence of information about the impact of *voluntary* tax concessions on the savings behaviour of low and middle income individuals in the Australian and international contexts.

Given this absence, this paper reports evidence from the first national evaluation of a government-funded retirement co-contribution scheme that targeted low and middle income individuals. In July 2003, the Australian government introduced its co-contribution scheme which matched the post-tax contributions of individuals to their private (superannuation) retirement income accounts. While the policy continues to exist, the eligibility criteria, income thresholds, matching rate, and maximum matching entitlement have changed over time. As a result, the policy design features provide significant variation over time both across and within individuals. Using the Australian Taxation Office (ATO) Longitudinal Information Files (ALife), a 10% sample file of Australian administrative tax records, we exploit this variation to identify the impact of the Government matching policy on low and middle income individuals' participation in the matching program and retirement savings contribution rates.

In the 2012-13 financial year, the income eligibility threshold was decreased from $61,920 to $46,920. By exploiting the changes in eligibility for this policy between 2011-12 and 2012-13 and applying a difference-in-difference approach, the results show that reducing the eligibility threshold reduced the percentage of individuals who made a contribution by 0.9 percentage points and the value of retirement contributions made by 6.2%. Conditional on making a post-tax superannuation contribution, reducing the eligibility criteria decreased the value of individuals' contributions by between 17 – 19%. The analyses also consider whether decreasing the eligibility threshold induced individuals to reallocate their savings to another savings form or to save less. When individuals ceased to be eligible for the matching policy, they increased personal savings by about 11%. The drop in post-tax superannuation savings combined with the increase in personal savings points to a reallocation effect. However, the effect is not one-to-one and there is a drop in overall savings as well. The results show that a $1 increase in superannuation post-tax superannuation contributions leads to a $0.77 reduction in personal savings.

2. Background: Australian Government retirement income policy and the co-contribution (matching) policy

Australia's retirement income system contains three pillars. The first pillar consists of a means-tested Old-Age Pension funded through general government revenue. Owner-occupied housing is excluded from the means test for the Old Age Pension. The second pillar consists of individual retirement income accounts (superannuation accounts) managed by superannuation funds.

Employers are required, by legislation, to contribute 9.5% of an employee's earnings to the individual's superannuation account. Contributions belong to the employee (immediate vesting) and are portable if the employee changes jobs. Contributions and earnings made to a superannuation fund are taxed at a reduced flat rate and are tax-free when withdrawn during retirement. The third pillar is private savings which include: owner-occupied housing, any other forms of investments, and personal contributions to an individual's superannuation account (these can be made pre-tax or post-tax).

The Australian Government's superannuation co-contribution policy was designed to increase the superannuation balances of low and middle income individuals by incentivizing post-tax superannuation contributions by matching the value of their contributions. Prior to the co-contribution scheme, the government offered low income taxpayers up to a $100 rebate for un-deducted[1] personal contributions made to their superannuation accounts. The co-contribution scheme replaced the rebate with a more generous policy. The co-contribution policy was presented in the Government's policy statement *A Better Superannuation System* on 5 November 2001 and clarified in the Minister for Revenue and Assistant Treasurer's Press Release No. 43 of 14 May 2002.

The Government co-contribution policy was implemented in the 2003 – 04 fiscal year with three important design features which have all changed over time. First, the maximum entitlement (level) of Government matching refers to the maximum amount of an individual's post-tax contributions that the Government matched. For example, if an individual contributed $5000, the Government would only match up to the maximum entitlement level. This was introduced at $1000 in the 2003 – 04 fiscal year. The value of the maximum entitlement varied over time and was set at $1000, $1500, or $500 over the duration of the policy.

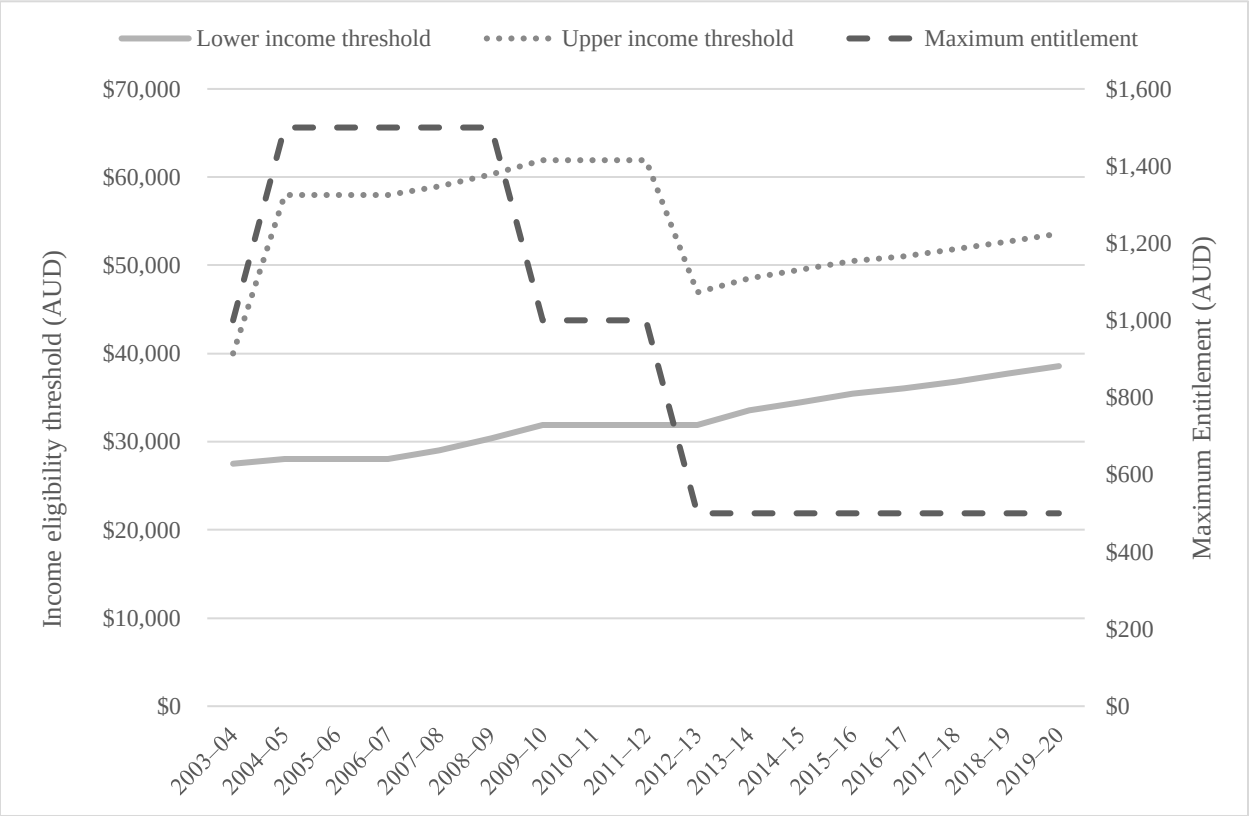
Second, by design, the policy matched post-tax contributions, made by individuals, dollar for dollar, up to a lower income threshold (described in detail below), until 2012-13. In other words, the matching rate for individuals earning up to the lower income threshold equalled 100% until 2012-13. From 2012-13, the Government changed its matching rate to 50%. For example, if an individual contributed $1000, the Government would have contributed $1000; from 2012-13 the Government would have only contributed $500.

Finally, as previously described, the policy stipulates a lower income threshold and a higher income threshold. The lower income threshold was introduced at $27,500 in 2003-04 and is indexed in line with Average Weekly Ordinary Time Earnings (AWOTE) each income year, but the thresholds were frozen between 2010–11 and 2012–13. The higher income threshold was initially set $12,500 above the lower income threshold. This increased to $30,000 above the lower income threshold in the second year of the policy and was eventually reduced to $15,000 above the lower income threshold in 2012-13 (where it currently stands). As a result, while the lower income threshold remained relatively constant, eligibility for the policy, based on changes to the

[1] In Australia, individuals itemize deductions (there is no standard deduction like that which exists in the United States). Individuals can make a post-tax contribution to their superannuation retirement account in two ways: (1) make a post-tax contribution (un-deducted contributions) or (2) make a post-tax contribution and subsequently deduct the value of the post-tax contribution from their taxable income. If an individual chooses the latter, the value of the deducted post-tax contribution is disqualified from eligibility for the government matching scheme.

higher income threshold, extended to middle income individuals at the beginning of the policy and was reduced over time. Figure 1 illustrates the changes to the government's co-contribution policy over time.

Figure 1. Australian government co-contribution policy, in nominal terms, 2003– 04 to 2019 – 20



Source: Australian Taxation Office (ATO), Co-contribution income thresholds.

In addition to changes in the design features of the policy, the definition of income used to determine eligibility changed over time, as did the coverage of the policy. The specific changes to the eligibility criteria and the definition of income are summarized in the appendix. The most significant change worth noting included extending the policy from employees to the self-employed in the 2007 – 2008 financial year.

In summary, the maximum entitlement, the matching rate and the higher income threshold have varied significantly over the course of the policy's existence; they provide significant sources of variation, across individuals and time, that can be used to identify the impact of superannuation tax concessions on low and middle income individuals' savings behaviour. To evaluate the impact of the policy, the steep drop in the upper income threshold, which occurred in the 2012 – 13 financial year, is exploited to capture the impact that an arbitrary exclusion from the policy has on the choice of individuals to make a post-tax contribution (extensive margin) as well as the value of the post-tax contribution (intensive margin). Finally, it is important to highlight that taxpayers were unlikely to be able to precisely assess their eligibility for the co-contribution policy due to

the complexity of the income definition applied and the changes to this definition over time. This aspect could attenuate behavioural effects of the policy.

3. Literature review

3.1 Do superannuation concessions encourage additional superannuation contributions?

The question of whether superannuation concessions encourage additional superannuation contributions is related to a literature on the impact of tax concessions on retirement savings. Of particular interest are policies that involve governments or employers "matching" individuals' contributions to a retirement fund. This scenario corresponds to the Australian co-contribution policy. The effect of matching contributions is a matter of active debate, which is reflected in the literature. From a theoretical standpoint, there is a divide between traditional neoclassical economic models and theories from behavioural economics which, contrastingly, do not necessarily assume that individuals respond to savings subsidies in a fully rational manner. The empirical literature is similarly divided.

Theory

The traditional "lifecycle hypothesis" (Modigliani & Braumberg 1954) implies that the decision to contribute to retirement savings is made in a rational, forward-looking manner and on the basis of purely financial factors. The consequence of this theory, for the expected behavioural response towards matching contributions, is that they should induce a substitution effect and an income effect. The substitution effect refers to saving being made less expensive relative to consuming income – therefore individuals should substitute savings for consumption in response. The income effect refers to some individuals being motivated to reduce their contributions so that they can increase their disposable income while still saving the desired amount. This effect may be expected for individuals who would save the amount being matched anyway. The aggregate effect of a matching contribution scheme depends on the interaction between these two potentially offsetting effects.

The neoclassical paradigm may be augmented by ideas from behavioural economics, which additionally take into account nonfinancial factors in individuals' decision making. These include cognitive biases which result in suboptimal decision making such as present bias, complexity aversion, inattention and temptation (Madrian 2012). Inertia and anchoring bias may also affect behaviour, which can be useful for policymakers who wish to incentivize individuals to take some particular action. While neoclassical and behavioural economic models are sometimes thought of as being in opposition, some economists have called for a "pragmatic approach" intending to unify the models by recognizing that behavioural models allow for the assumptions of neoclassical models to be modified (when it is advantageous to do so) rather than being a replacement for them (Chetty 2015).

Empirical studies

Findings tend to fall into three main categories, as noted by Engelhardt and Kumar (2007). Some studies find that an increase in the matching rate leads to increased retirement savings contributions; others find only minimal positive effects, with the availability of a matching policy being more significant than the matching rate itself; further, a minority of studies suggests that an increase in the matching rate reduces contributions, implying that the income effect dominates the substitution effect. Much of the literature is based on American employer-provided 401(k) savings plans. It should also be noted that there is a distinction between studies that examine participation and contribution behaviour, with the former not necessarily predicting the latter (Dworak-Fisher 2011), and the latter being especially relevant to the research question of this paper.

There have been several influential studies identifying a positive and significant effect on 401(k) retirement savings behaviour from matching contributions. While a useful reference point, these studies may not generalize perfectly to the Australian superannuation co-contribution policy, as 401(k) contributors tend to have higher incomes, and that system is administered through payroll (Engelhardt & Kumar 2007). Choi, Laibson, Madrian and Metrick (2002) exploit a change to an employer's 401(k) plan, finding overall that employer matching of 25 per cent on contributions up to 4 per cent of income increases 401(k) participation by over 40 per cent. They do this via a Cox proportional hazard model on anonymized employee data from a large firm to estimate time from hire until date of initial participation. The authors also note the importance of behavioural effects – in particular, anchoring effects due to the choice of matching threshold, and default effects, or the phenomenon of employees strongly preferring "default" savings options, regardless of their optimality. Vanderhei and Copeland (2001) similarly predict a positive relationship between the matching rate and retirement savings from 401(k) market data. They use a sequential response regression model which extends the traditional regression approach to account for a varying marginal matching rate, as is common in 401(k) policies.

With more relevance to the Australian co-contribution policy, further studies have attempted to focus on the savings behaviour of low and middle income earners. Duflo, Gale, Liebman, Orszag and Saez (2006) present an influential study, in which they implement a randomized controlled trial via the tax preparation company H&R Block to examine the impact of matching contributions on the savings behaviour of this demographic in the US. In their experiment, the authors vary the matching rate for contributions between 0, 20 and 50 per cent, with contributions being matched up to $1000. They find that matching has a positive impact on participation in retirement savings, as well as the value of contributions. Conditional on take-up, average contribution levels increase from $1100 to $1280 for the 20 per cent group, and from $1110 to $1590 for the 50 per cent group. Take-up also increases with the matching rate.

Saez (2009) conducts a similar study with a few modifications. In his study, he compares matching contributions with the alternative policy of providing a tax credit of economically equivalent value, and also investigates the effects of providing advanced notification of the benefit being offered to participants, to better recreate the conditions of a real-world policy. He finds that the matching approach has a stronger positive impact on participation and contributions than providing a tax credit, but that at best the take-up rate reaches 15 per cent, indicating that voluntary matching

policies can only partially fulfil the intent to raise retirement savings for low and middle income earners.

Several authors have postulated that endogeneity issues have attenuated the estimated effect of matching contributions on savings and have attempted to correct for this bias in prior literature. For example, employee saving preferences may have an impact on employer matching. Even and Macpherson (2005) use cross-sectional population survey data and define a bivariate probit model to correct for possible endogeneity. They find that, under the assumption that matching is endogenous, matching contributions increase participation by between 24 and 53 percentage points, compared to an estimate of between 5 and 10 percentage points under an exogeneity assumption. Dworak-Fisher (2011) takes an instrumental variables approach, analysing survey microdata relating to 401(k) plans in the US. His results support a significant positive effect on participation, similar to Duflo et al. (2006) but with a more pronounced effect. Specifically, he finds an "average partial effect" (APE) on participation of between 0.131 and 0.261, implying that a one standard deviation increase in the match applied to the first dollar increases participation by between 6.5 and 12.9 percentage points. By comparison, the APE implied by Duflo et al. is 0.068. However, when correcting the experiment of Duflo et al. for advanced notice, as in Saez (2009), the response is more than doubled, which accords with Dworak-Fisher's range of estimates. The author advocates for using nationally representative data and isolating causal effects, suggesting that the lack of consensus in the literature is due to discrepancies between previous studies in these aspects. He also notes that while his research addresses participation behaviour, it does not directly examine the effect on retirement savings contributions.

Additional international evidence has indicated at least a somewhat positive effect on retirement savings contributions from increasing the matching rate. Rashbrooke (2010) provides an overview analysis of the New Zealand KiwiSaver program, which is a government-initiated managed fund with the purpose of encouraging retirement savings, using aggregates from administrative tax data. He characterizes the program as successful, with high participation and broad coverage likely being due to the combination of automatic enrolment and matching incentives. The effect of matching incentives is suggested by the high proportion (24 per cent) of members with no source of income who therefore have likely enrolled to receive "kick-start" matching as well as access to a tax credit. Price (2010) provides an overview of evidence from the Saving Gateway in the UK, which was a government pilot program that used matching contributions to incentivize savings for people with low incomes – with a contribution ceiling limiting the total amount of contributions that one can make. He finds that the likelihood of joining the program doubles as the matching rate increases from 20 per cent to 50 per cent, but does not increase further as the rate increases to 100 per cent. However, the level of the weekly contribution ceiling appears to have a larger impact on contributions than the matching rate.

In contrast to the above findings, some studies have found only minimal evidence or no evidence of a positive relationship between the matching rate and retirement savings behaviour. Bassett, Fleming and Rodrigues (1998) find that participation in retirement savings increases in the presence of employer matching contributions but does not increase with the matching rate, using a probit regression model on cross-sectional survey data in the US. Kusko, Poterba and Wilcox (1998) also find only a minimal effect on participation from variation in the matching rate, by examining correlations within employee-level data over a four-year period collected from a

medium-sized manufacturing firm. They give a behavioural explanation for this finding – that it is the result of inertia. Engelhardt and Kumar (2007) additionally find that contributions and participation in retirement savings are relatively inelastic to employer matching, via a lifecycle model of 401(k) saving. Consequently, they posit that government matching of voluntary 401(k) contributions would likely be an ineffective policy. Their results are reinforced by Beshears, Choi, Laibson and Madrian (2010), who examine employee data from firms that have different matching rates, and some of which have changed their matching rate over time, estimating various regression models and finding that the behavioural effect of employers automatically enrolling employees in retirement plans is much stronger than that of matching contributions.

The conclusions of Duflo et al. (2006) outlined previously have been challenged by the authors themselves. In a follow-up study, Duflo et al. (2007) find that a federal Saver's Credit policy, as supported by Duflo et al. (2006), is not particularly effective in stimulating retirement savings contributions, with a significant but very modest effect. This policy provides a tax credit to low and middle income tax filers for contributions to an Individual Retirement Account up to $2000, with the matching rate varying between income bands. Increasing the matching rate from 25 per cent to 100 per cent increases take-up by 1.4 percentage points (from 1.9 per cent to 3.3 per cent), with smaller increases having much smaller effects. The effect on the level of contributions is similarly small. The authors propose that the framing of the policy as a tax credit rather than matching contributions, as well as the relative complexity of the policy, may have played a role in reducing its effect.

Finally, some further studies have found that increases in the matching rate are associated with reduced contributions. The Employee Benefit Research Institute (1994) finds that on average, employee contribution amounts are lower where the employer contributes a matching amount (6.9 per cent of pay, compared to 7.7 per cent with no employer match), implying a dominant income effect. Their simple analysis is based on cross-sectional US population survey data. Munnell, Sunden and Taylor (2002) similarly find that the income effect dominates the substitution effect, with the presence of an employer match increasing contributions, but the matching rate itself reducing contributions to a small but statistically significant extent. For example, if the matching rate is increased from 40 to 80 per cent, the employee contribution rate would decline by only 0.4 percentage points. Their estimates are based on a linear regression model using detailed American household survey data.

Despite a continuing and pronounced lack of consensus in the broader literature, the overall perspective from the behavioural economics literature is summarized by Madrian (2012). She indicates that matching contributions tend to increase both participation in and contributions towards retirement savings, although less so than behavioural incentives. However, conditional on participation, a higher matching rate has only a small effect on contributions. The matching threshold has a large impact, as it appears to function as a behavioural guideline.

Superannuation policy in Australia

There has been limited research on the impact of policies to incentivize savings in Australia – this paper intends to address this gap in the literature. The studies in existence have largely examined the effect of changes in the taxation of superannuation on high-income earners. For example,

Whelan, Atalay and Dynan (2018) examine the effect of the removal of the superannuation surcharge in 2005 by comparing the contributions of high-income earners, who were previously required to pay an additional tax on superannuation contributions, and lower income earners, who faced no change in tax rates. Using a difference-in-differences research design, they find that this reduction in taxes led to an increase in superannuation contributions of 1.7 percentage points by one year following the policy change, with the effect dissipating over the following years. On a different policy and with reference to a broader subpopulation, Feng (2014a) analyses the tax concessions available for salary sacrifice contributions using a regression discontinuity framework on the Household, Income and Labour Dynamics in Australia (HILDA) panel survey dataset, indicating that they do not stimulate take-up.

Research on the effectiveness of the superannuation co-contribution policy in raising superannuation savings has been even more limited. It is understood that take-up is low, despite a high matching rate of 50 per cent (and ranging from 100 to 150 per cent through the years prior to 2012-13). The Australian National Audit Office (2010) suggests that only 15 per cent of those eligible received the co-contribution in 2008-09. Bruhn and Higgins (2013) suggest various explanations for the low take-up, including behavioural factors such as short-term rather than long-term focus, procrastination and loss aversion, as well as lack of optimality for some.

3.2 If individuals are affected by superannuation tax concessions, is this "additional savings" or a "reallocation of existing savings"?

To the extent that additional retirement savings contributions are successfully incentivized by government matching contributions, such as those offered by the Australian superannuation co-contribution policy, there is a further question of whether they represent additional savings or a reallocation of private savings. A body of literature closely related to that considered in the previous section addresses this question, and is equally divided. Again, those studies that examine the effects of matching contributions or subsidies are most applicable to the Australian co-contribution policy, as responses may vary behaviourally between different incentive mechanisms, even if these mechanisms are financially equivalent. However, there are relatively few studies that examine this question with regard to matching contributions – a gap in the literature which this paper aims to address, particularly within the Australian superannuation system. As noted by Bassett et al. (1998), a deficiency in data on household saving or wealth has inhibited research. Therefore, this section considers the literature on the effects of tax incentives more broadly.

Theory

As suggested by the previous section, an increase in the rate of return on savings has an ambiguous effect on the total amount of savings, due to the interaction between an income effect and a substitution effect in the lifecycle model of consumption. Here, the question of interest is whether an increase in the rate of return on a particular savings instrument causes reallocation of savings away from other savings instruments, or reallocation of income away from consumption – and again, the predictions of the lifecycle model are ambiguous. Thus, neoclassical and behavioural paradigms are subject to the same interplay in the literature as in the previous section. It should be noted that, even if additional savings resulting from savings incentives are only a reallocation of

existing savings, this may in the long run still result in larger household savings if the rate of return on the incentivized instrument is higher than that of the source.

Empirical studies

Studies have mainly found either a null relationship or a positive relationship between financial incentives to save and the total amount of savings. One possible way of explaining this split in the literature is that responsiveness to tax rates may be different for different types of savings taxes, for people of different ages, or across countries. It is also likely that nonfinancial factors, such as the framing of savings incentives, have a behavioural effect on the response, thus motivating a behavioural economics approach. Another explanation is that it is possible that some experimental designs used in the literature are not able to distinguish between a small effect and no effect. While the evidence regarding this research question is not entirely conclusive, there is a much stronger consensus that asset reallocation in response to tax incentives does occur (OECD 2018).

Among the studies that find no or minimal effect on total savings from savings incentives, Paiella and Tiseno (2014) use a difference-in-differences research design on population survey data to examine effects of the introduction of a social security reform in Italy in the early 1990s, while controlling for unobservable heterogeneity in savings preferences. The reform included a savings incentive in the form of a tax deduction for pension fund contributions, along with other similar tax incentives. They find a strong effect on the allocation of savings but minimal effect on the level of household savings. Antón, Muñoz de Bustillo and Fernández-Macías (2014) apply a fixed effects methodology on panel data to investigate the introduction of various pension tax incentives in Spain. In particular, they find that tax-incentivized contributions to a pension fund are not associated with lower consumption, implying no change to national savings.

The authors acknowledge that their results do not necessarily have implications for the effect of matching incentives on household savings – as is true of all such studies that do not specifically examine matching incentives. Corneo, Keese and Schröder (2010) examine the introduction of the Reister scheme in Germany, which aims to stimulate private savings via special allowances and tax exemptions, including deductions. Their methodology involves matching and panel regression techniques on survey data. The authors find a minimal effect on household savings as a result of the Reister scheme, due to asset reallocation, and they note that this policy ineffectiveness leads to an increase in public debt and therefore a substitution of future tax increases for ongoing increases in social security contributions – emphasizing the importance of such studies from a policy perspective.

An important insight from the literature is the distinction between ‘active savers’ and ‘passive savers’, as made by Chetty, Friedman, Leth-Petersen, Nielsen and Olsen (2014). Active savers respond to retirement savings incentives primarily by shifting savings to retirement accounts, whereas passive savers are relatively unresponsive to these, but heavily influenced by changes to the ‘default’ level of savings. To the extent that individuals or households are active savers, it is expected that savings incentives should give rise to an asset reallocation effect, whereas if the general tendency is to save passively, aggregate savings behaviour is expected to be determined more arbitrarily and in a way that is better understood through a behavioural economics lens, being especially influenced by default policy settings. In their study, Chetty et al. (2014) use Danish tax

panel data to compare the savings behaviour of individuals who switch firms (thus potentially being subject to different employer-provided retirement fund contributions). They also analyse a government-mandated savings program, and study the impact of retirement savings incentives in the form of subsidies introduced by a policy change. Of particular significance in terms of implications for the Australian co-contribution policy, the authors estimate that around 85 per cent of households are passive savers, and therefore that for every dollar of government expenditure on savings subsidies, total saving is increased by only 1 cent.

Several studies have inferred a minimal relationship between savings incentives and household savings from reviewing the literature. Attanasio, Banks and Wakefield (2014) conduct a literature review of research from the US and UK, concluding that only small fractions of tax-favoured retirement funds represent new savings, and therefore that these policies have been relatively ineffective. Engen, Gale and Scholz (1996) also review evidence on preferential taxation of Individual Retirement Accounts (IRA) and 401(k) plans in the US, using a variety of cross-sectional and panel data sources. They find a strong effect of savings incentives on allocation of saving and wealth, but little or no effect on the total level. The authors argue that the primary reason for disagreement in the literature is that some estimates of the effects have been biased upwards by failure to account for various factors – such as selection bias regarding savings schemes, consideration of household debt as well as assets, interactions over time between different savings incentives and disincentives, the taxability of eventual income from retirement savings accounts, and overstatement of the effects of 401(k)s by ignoring the distinction between cash wages and total compensation.

On the other hand, there are some other studies that find a positive relationship between savings incentives and the level of savings. Gelber (2011) uses a difference-in-differences research design on panel survey data to compare the savings behaviour of employees at companies who offer 401(k) plans after they have worked at a firm for a specified period. He finds that 401(k) eligibility raises balances substantially, with no evidence that voluntary contributions are offset by decreases in other assets. He actually finds an additional "crowd-in" effect of increased IRA saving, perhaps due to an increased awareness or understanding of retirement savings instruments due to exposure to the 401(k) system. However, wide confidence intervals and lack of statistical significance with respect to the impact on net worth introduce some ambiguity around this finding. Rossi (2009) examines the introduction of the 1986 Social Security Act in the UK, with associated tax incentives for retirement saving, using Tobit regression models on household panel survey data and controlling for unobserved saving preferences. Results suggest that there is no crowding out from the introduction of personal pension plans, and similar to Gelber's study, this form of retirement saving appears to increase other forms of saving.

As observed by Chetty et al. (2014), the phenomenon of passive saving may significantly reduce any response to savings subsidies, including matching contributions – but depending on the policy considered, such behavioural biases may alternatively induce a stronger response to savings incentives. Beshears et al. (2015) look at the contributions of employees at companies that introduce 'Roth' 401(k) plans, which provide an incentive to save in the form of taxing savings upfront instead of in retirement. They do this via administrative records from 11 companies, finding that the introduction of Roth 401(k) plans has increased the amount of retirement savings, with a corresponding reduction in take-home pay. On the basis of survey data, the authors suggest

that this result is due to behavioural effects including lack of understanding about the tax properties of Roth accounts, rather than being a deliberate decision on the part of individuals. Dolls, Doerrenberg, Peichl, and Stichnoth (2019) consider a policy change in Germany which mandated that the pension administration provide information to individuals (in the form of letters) about their date of statutory retirement and the value of expected pension payments, among other detailed but broadly accessible facts relating to the way that the pension system could be expected to affect them. Their analysis uses an event-study regression design to isolate causal effects and is performed on household survey panel data. The authors find evidence that individuals tend to overestimate their expected pensions, with the letters serving as a negative shock. Dolls et al. find that Riester pension savings increased by 14.3 euro due to this policy, with the additional private savings not crowding out other savings.

It may be important to extend methodologies to account for heterogeneous responses. For example, across the literature, lower income earners seem to be more likely to respond to favourable tax rates by boosting their amount of savings, whereas higher income groups appear to be more likely to reallocate savings to lower taxed vehicles (Hawksworth 2006). Jakobsen, Jakobsen, Kleven and Zucman (2020) use administrative data from Denmark to estimate a lifecycle model and compare how different groups of wealthy individuals change their savings behaviour in response to the reduction and subsequent removal of the Danish wealth tax. They find a significant long run elasticity of wealth with respect to the net-of-tax return, particularly for the very wealthy as compared to the moderately wealthy. The authors note that some of this response, especially for the very wealthy, may be due to tax avoidance or evasion behaviour. The study of Jakobsen et al. highlights not only the usefulness of considering heterogeneous responses, but also of taking a long run perspective, as this may reveal larger effects than estimated by a short run analysis only.

Some literature reviews have interpreted overall evidence as favouring the view that savings incentives successfully encourage net additions to savings. Poterba, Venti and Wise (1996) review evidence (including from the authors themselves) examining the tax-preferential IRA and 401(k) programs in the US, with an emphasis on studies that control for heterogeneous savings preferences. They suggest that the majority of such contributions constitute net additions to savings. They provide several explanations for the conflicting results in the literature, including the use of different data sources and different definitions of wealth, as well as methodological differences that make the conclusions of certain studies more sensitive to variations in the underlying data.

Superannuation policy in Australia

As noted in the previous section, there has been limited Australian research on the effects of saving incentives, including on aggregate savings. There are a few relevant studies, although these largely focus on the mandatory components of superannuation. Connolly (2007) analyses the introduction of compulsory superannuation by comparing the savings behaviour of those who had previously received a workplace pension contribution with those who receive one for the first time as the result of the superannuation reforms, using HILDA panel data. This study estimates that for each dollar placed in superannuation accounts, total household wealth is increased by between 70 and 90 cents. The effect appears to be greater for financially constrained households, who are unable to reduce holdings of other assets to offset compulsory saving. The author also notes that voluntary

savings appear to increase slightly as a result of the compulsory superannuation policy. The total impact of superannuation on national savings is further explored by Gruen and Soding (2011), who estimate it to be significantly positive, at around 1.5 per cent of GDP, and expected to rise to close to 3 per cent over the following decades. As their estimates similarly refer to the introduction of superannuation, they capture the combined impact of lower superannuation tax rates and the compulsory nature of superannuation contributions.

Regarding voluntary aspects of superannuation savings, Gallagher (1995) indicates a prior expectation that the co-contribution policy would increase national savings by around 1.2 per cent of GDP over the 10 years following implementation, on the basis of the government's microsimulation modelling. This was because the policy was expected to be implemented during a period of already increasing wages. Feng (2014b) observes that there has been low take-up of voluntary superannuation savings but strong growth in superannuation assets, concluding that the mandatory Superannuation Guarantee has been largely responsible for increases in national savings.

4. Data

This analysis uses data from the ATO Longitudinal Information Files (ALife), a random and deidentified 10 per cent sample file of tax returns, prepared by the Australian Taxation Office (ATO) for use by researchers. The data were extracted by the ATO in December 2019. To conduct the analysis, a database is compiled from the 1998 – 1999 financial year to the 2015 – 16 financial year. While the policy evaluation focuses on the 2011 – 12 and 2012 – 13 financial years, the longer time series permit a richer analysis of the descriptive trends in the policy over time.

Data are restricted to the adult working aged population between 18 to 64. Eligibility for the policy was defined by year and the eligibility criteria specific to a particular year (see the appendix for details). Individuals who would have been ineligible for the policy because of non-income related criteria (see the appendix) have been excluded from the dataset, to the extent possible. For example, while ALife contains data on tax residency, it does not have information on citizenship.

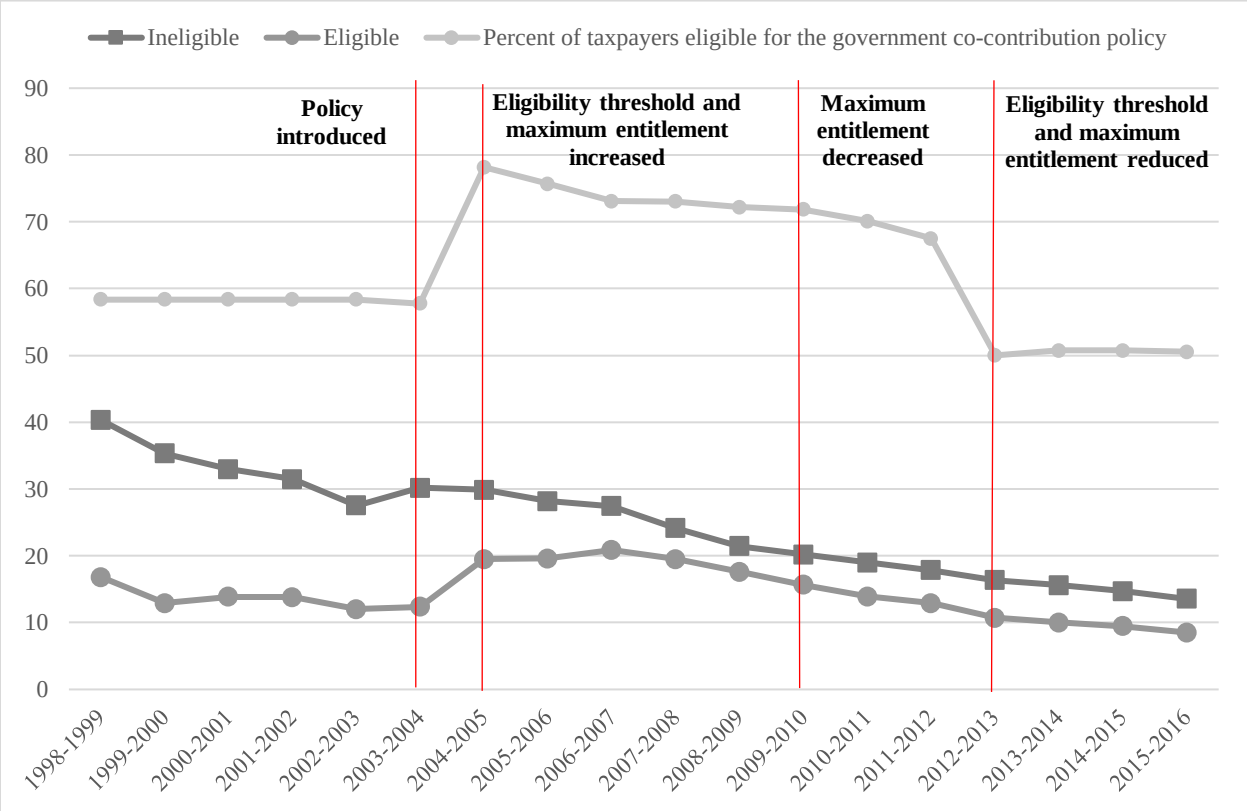
In order to qualify for a government co-contribution, an individual must meet the eligibility criteria and must make a post-tax superannuation contribution that she does not claim as a tax deduction. A measure of post-tax superannuation contributions is derived from deducting the value of tax-deductible personal superannuation contributions from the sum of the individual's total personal superannuation contributions. Participation in the policy is defined as making a post-tax superannuation contribution.

In the absence of survey data with details on individuals' superannuation contributions, administrative data are the only source which permit an evaluation of the government's co-contribution policy. The administrative data provide a long time series, large sample size, and less measurement error than survey data. Unfortunately, however, the administrative data have limited demographic control variables.

5. Empirical strategy

Figure 2 shows the percentage of taxpayers who made a post-tax superannuation contribution by their eligibility status for the policy. The figure takes into account all year-on-year policy changes introduced over the course of the policy. For example, among taxpayers eligible for a government co-contribution (low and middle income individuals) when the policy was introduced, in the 2003-04 financial year, about 12.3% made a post-tax superannuation contribution. The per cent of taxpayers eligible for the policy is also superimposed on the graph. For instance, in the 2003-04 financial year, when the policy was introduced, about 57.8% of all taxpayers were eligible for the co-contribution policy. Combining the two statistics, of the 57.8% of all taxpayers who were eligible for the co-contribution policy in 2003-04, only 12.3% made a post-tax superannuation contribution. We do not know whether this relatively low participation rate is due to the rather modest size of the program or to lack of knowledge of the program.

Figure 2. Percentage of taxpayers who made a post-tax superannuation contribution, by eligibility for the government co-contribution policy, 1998-99 to 2015-16



Notes: Eligibility status for years prior to the introduction of the government co-contribution policy is calculated by applying the percentiles of the income distribution, at which the thresholds render a person eligible for the policy in 2003- 04, to previous financial years. The figure above is descriptive; it shows changes in the policy over time. It does not show trends in the control or treatment group.
Source: Authors' calculations using ALife.

The figure shows four general trends. First, the graph illustrates the series of changes to the policy which were introduced over time. This variation provides an ideal environment to evaluate the impact of the policy. Second, it shows that a larger share of higher income individuals – those individuals ineligible for the policy – tend to make post-tax superannuation contributions (shown by the "ineligible" line) compared to low and middle income individuals. Third, the figure suggests that the expansion of the eligibility criteria, in the 2004-05 financial year, is correlated with a higher participation among eligible taxpayers since the percentage of eligible taxpayers who made a post-tax superannuation contribution increased from 12.3% to 19.5%. Fourth, with the exception of the policy's expansion in 2004 – 05, the percentage of individuals who make a post-tax superannuation contribution has declined over time, irrespective of eligibility for the policy (illustrated by the downward slope of the "eligible" and "ineligible" lines).

In order to evaluate the impact of the government co-contribution policy on post-tax superannuation contribution participation rates and the value of those contributions, this paper proposes to use a difference-in-difference methodology. Difference-in-difference can only be applied to periods of time where: (1) a policy change was introduced to the government co-contribution policy and (2) no other policies were simultaneously introduced or changed which differentially impacted the control and treatment groups (defined below). For a non-technical description of the difference-in-difference methodology, see Box 1.

Several time periods were considered for the policy evaluation. For example, with respect to the introduction of the policy in 2003 - 04, Figure 2 illustrates an increase in the percentage of individuals who became eligible for the policy and made a post-tax contribution (from about 12.0% in 2002-03 to 12.3% in 2003-04). This would suggest, at a descriptive level, that the policy encouraged slightly more eligible individuals to make a post-tax superannuation contribution. However, the data also suggest that an *even greater* percentage of *ineligible* individuals also made a post-tax contribution when the government's co-contribution policy was introduced (from 27.5% in 2002-03 to 30.2% in 2003-04). The increase in participation among those ineligible for the policy raises concern about their relevance as a control group. The trend also suggests that other policies, disproportionately or exclusively affecting ineligible taxpayers, may have been introduced over time.

An alternate potential explanation for the significant increase in the number of ineligible individuals who made a post-tax contribution is spillover effects. If the government policy announcement caused ineligible individuals to question the adequacy of their superannuation contributions, they may have decided to make a post-tax contribution, even though they were ineligible for the policy. This is particularly the case for policies accompanied by widespread government advertising, as was the case for the introduction of the government co-contribution policy.

The Australian Budget also provides strong evidence of other policies which were simultaneously introduced alongside the government co-contribution policy which could have impacted low and high income earners differently. First, personal income tax cuts were introduced in every year between 2003-04 and 2010 – 11. Second, the superannuation surcharge – an additional tax on high income earners' employer superannuation contributions and personal deductible contributions - was gradually reduced between 2003-04 and 2005-06. Finally, in 2012-13 the low-income

superannuation contribution (LISC) was introduced. The LISC refunded tax paid on concessional (pre-tax) superannuation contributions made by employers or individuals if the taxpayer earned less than $37,000 adjusted taxable income. This policy differed in two ways from the government co-contribution. First, the policy required no additional action on the part of the taxpayer. The ATO directly calculated the taxpayer's refund on the basis of her tax return. Second, it applied to pre-tax, as opposed to post-tax contributions. Nevertheless, despite the operational differences of the LISC, it could have impacted low income individuals' savings decisions.

An inability to separate the effects of the distinct policies precludes a precise evaluation of the impact of the introduction of the government co-contribution policy in 2003-04 and in the years which followed. In other words, among low-income earners eligible for the co-contribution policy, it may be difficult to differentiate between the effects of the tax cuts and the introduction of the co-contribution policy on post-tax superannuation contributions. Similarly, while the superannuation surcharge only affected higher income earners, the change in their behaviour as a result of the introduction of this policy renders them invalid as a control group for the evaluation for this particular time period (2003-04 to 2005-06).

To circumvent the challenge of overlapping policies, a difference-in-difference approach is applied to the 2012 – 13 financial year, when the income eligibility criteria were significantly reduced, and the maximum entitlement was halved. This time period was selected since it does not seem likely that other tax policies, which were simultaneously introduced, would have affected taxpayers differently. For example, while the tax-free threshold was tripled in this financial year, it would have applied equally to all taxpayers. In addition, while the LISC was introduced during the same period, the effect that the LISC could have on the results is avoided through careful selection of the control group (described below). Finally, the absence of a widespread advertising campaign (akin to that implemented for the policy's introduction) announcing the reduction in the policy's generosity render the likelihood of spillover effects much smaller.

Three outcome variables are considered. Participation - the decision to make a post-tax superannuation contribution – and the value of the post-tax superannuation contribution made will allow for an assessment of the extent to which individuals change their behaviour in response to the policy change. The value of the post-tax contribution includes individuals who did not participate (i.e. post-tax contribution equal to zero). Participation and the value of post-tax superannuation contributions capture the effects of the policy on the extensive and intensive margins, respectively.

The third outcome variable considered is personal savings minus post-tax superannuation contributions. This outcome variable will facilitate analysis of the new savings versus reallocation of savings effects. For example, if individuals offset reduced post-tax superannuation contributions with an increase in other forms of savings, this provides evidence of a reallocation effect. By contrast, if a reduction in post-tax superannuation contributions is accompanied by no change in personal savings, this suggests total savings has declined. The construction of the outcome variable, personal savings, is described in further detail below.

The control group is defined as those taxpayers who were ineligible for the government co-contribution policy because of their income in the 2011- 12 and 2012 – 13 financial years. In other

words, the control group is defined as individuals who met the eligibility criteria specified in section four and who had incomes that exceeded $61,920 but were less than or equal to $76,920. The $76,920 upper threshold for the control group was chosen by adding $15,000 to the upper income threshold for the government co-contribution policy (determined by law) for the treatment group ($61,920 + 15,000). Since the government co-contribution policy established a $15,000 gap between the lower and higher income thresholds, a $15,000 gap was also elected to define the control group. Robustness checks, which define the control group as all individuals with income greater than $61,920, are included in the appendix. When all individuals with incomes greater than $61,920 are included the results are slightly larger, but otherwise very similar.

The treatment group is defined as individuals who were eligible for the policy in 2011 – 12 but ceased to be eligible in 2012 – 13 because of the change in the upper income threshold. This is defined as those individuals with income greater than $46,920 and less than or equal to $61,920. As a result, the evaluation measures the impact of exclusion from the policy on an individual's post-tax superannuation contributions, in terms of her: participation, value of contributions, and personal savings.

Outliers from the first and 99th percentiles are trimmed from the post-tax contribution variables to minimise their influence in the specification. The variable is also transformed into a natural log which achieves a similar effect. Robustness checks, included in the appendix, show that once the natural log transformation is undertaken, the inclusion or exclusion of outliers does not significantly affect the results.

Table 1 shows descriptive statistics for the control and treatment groups by financial year. The characteristics of the control group are not statistically different across the two years; the same conclusion applies to the treatment group. However, within years, the control and treatment groups do differ slightly. The treatment group is slightly more likely to be female and unmarried. In addition, the treatment group is more likely to make a post-tax contribution of lower value. To account for these differences, these variables are controlled for in the regression specifications. The relative stability within the control and treatment groups over time also lends support to the results since there do not appear to be significant changes to the composition of the overall population across the two periods. The relative similarities between the two groups further provides evidence of the suitability of the choice of control group.

Table 1. Summary statistics before and after the change in the government co-contribution policy

	2011 -12		2012 - 13	
	Control	**Treatment**	**Control**	**Treatment**
Made a post-tax contribution				
No	16.7%	16.5%	15.3%	14.2%
Yes	83.3%	83.5%	84.7%	85.8%
Age (mean)	41.0	40.1	40.9	40.1
(std error)	(11.35)	(12.11)	(11.46)	(12.13)
Female	40.2%	46.1%	41.4%	47.2%

Married	59.8%	54.7%	60.6%	55.4%
State				
NSW	31.0%	30.5%	30.6%	30.6%
VIC	24.8%	25.8%	25.0%	25.7%
QLD	20.2%	20.6%	20.3%	20.6%
SA	7.0%	7.7%	7.1%	7.6%
WA	11.1%	10.2%	11.4%	10.3%
TAS	2.0%	2.2%	2.0%	2.2%
NT	1.2%	1.1%	1.2%	1.0%
ACT	2.5%	1.8%	2.4%	1.8%
Not available	0.3%	0.3%	0.2%	0.2%
Post-tax contribution value (mean)	$402	$294	$377	$257
(std error)	(1145.96)	(879.60)	(1132.23)	(842.16)
N	125,020	175,137	127,231	174,103

Source: Authors' calculations using ALife.

Regression analysis is used to calculate the difference-in-difference estimates for all three outcome variables (see Box 1 for a non-technical description of the difference-in-difference methodology):

Participation

A linear probability model[2] is employed to estimate the impact of the change in the government's co-contribution policy on the likelihood of making a post-tax superannuation contribution. For all individuals in the sample, $participation_{it}$ equals 1 if an individual made a post-tax contribution greater than zero, and 0 if an individual did not make a post-tax contribution. T_{it} equals 0 in 2011 – 12, prior to the introduction of the change in policy, and 1 in 2012 – 13, when the policy changed. D_{it} equals 1 if an individual is in the treatment group and 0 if they are in the control group. The explanatory variables are binary variables, with the exception of age and age squared, which are continuous, and are included in X_{it}.

$$participation_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 D_{it} + \beta_3 T_{it} D_{it} + \beta_4 X_{it} + \varepsilon_{it} \quad (1)$$

Value of post-tax superannuation contribution

To estimate the impact of the policy change on the value of the post-tax contribution made, a model similar to equation (1) is applied by substituting participation with the natural log of the dollar value of the post-tax contribution made by individual *i* in time *t* captured by $\ln(cont)_{it}$ and applying ordinary least squares (OLS) regression. The natural log of the post-tax contributions is

[2] A linear probability model is a type of regression analysis which, in simple terms, is an ordinary least squares (OLS) regression but with a binary (0 or 1) dependent (outcome) variable, as opposed to a continuous (1,2,3,4,5,6, etc.) dependent (outcome) variable.

taken to minimize the impact of outliers. In addition, the log transformation allows for the coefficients to be interpreted as elasticities.

$$ln\ (cont)_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 D_{it} + \delta T_{it} D_{it} + \beta_3 X_{it} + \varepsilon_{it} \quad (2)$$

Personal savings

To estimate the impact of the policy change on the value of the post-tax contribution made, a model similar to equation (2) is applied to the natural log of the dollar value of post-tax superannuation contributions with the dollar value of personal savings made by individual *i* in time *t* captured by ln $(personal\_savings)_{it}$ and applying ordinary least squares (OLS) regression.

$$ln\ (personal\_savings)_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 D_{it} + \propto T_{it} D_{it} + \beta_3 X_{it} + \varepsilon_{it} \quad (3)$$

For the purposes of this paper, personal savings are distinguished from employer contributions to superannuation and labour income (wages and salaries and business income). The variable personal savings is defined by calculating the sum of reported interest income, dividend receipts from franked and unfranked dividends, franking credits received, deductible post-tax personal superannuation contributions made, and supplemental income reported on an individual's tax return. See below for more details.

Supplemental income refers to a special section of the Australian tax return which encompasses *net* income from various sources including: income from partnerships and trusts, personal services income, net income or loss from business, capital gains, deferred non-commercial losses, net farm management deposits or repayments, foreign income, rent, bonuses from life insurance companies and friendly societies, forestry managed investment scheme income and other income. For the calculation of personal savings, all forms of supplemental income are included, except net production income or loss (primary production and non-primary production) which are considered labour income.[3]

The definition of personal savings elected for this research is based on the definition of income from employment and business (in the A3 adjustments column) of the 2011-2012 tax return form. This is defined as income from employment and business as salary and wages, allowances, earnings, tips, directors' fees, employer lump sum payments, employer termination payments and net income or loss from business. To this definition, the values of attributed personal services income and employee share schemes are added to complete the definition of labour income applied in this definition. Personal savings refers to all other forms of income excluded from the aforementioned labour income definition that are included on the tax return, except superannuation contributions made by employers.

The definition of personal savings applied in this paper is based on the *net flow of taxable savings.* This definition was selected since the data only capture the flow of savings in a given year, rather than the stock. Second, the data only show the flow of *taxable* savings. Consequently, several

[3]As a robustness check, personal services income was also excluded from the definition of personal savings. Excluding personal services income does not impact our estimates. For this reason, our preferred definition of personal savings includes personal services income.

forms of income and liabilities are excluded from the definition. Australians, on average, hold much of their savings (wealth) in owner-occupied housing, the returns from which are not taxed. As a result, the value of owner-occupied housing and any capital gains from that housing are not captured in the data and are excluded from the calculation. Similarly, any monetary investments made using personal savings for improvements in untaxed investments, like home improvements for owner-occupied housing, will not be captured by the data. Other sources of untaxed savings, like gambling earnings and inheritances, are also excluded alongside personal liabilities like mortgage interest and repayments, credit card debt, or personal loans.

The objective of analyses evaluating the impact of the change in the government's co-contribution policy on personal savings is to assess the extent to which, for example, a reduction in the value of government co-contributions results in an equivalent increase in personal savings. If this effect is observed it lends support towards the reallocation effect; when an individual increases the value of their post-tax superannuation contributions, she offsets (decreases) her personal savings by an equivalent amount. If no impact on personal savings is observed, then she saves less overall.

To carry out this analysis, estimates of the impact of the change in the policy on personal savings are limited to individuals who made a post-tax superannuation contribution in the 2011-12 financial year. Since the Government only spends money on the co-contribution policy when eligible individuals spend some of their own income, the evaluation of the change in savings behaviour in response to the change in policy only applies to this subgroup (participation = 1).

The key identifying assumption underlying the application of difference-in-differences is the existence of parallel trends in the outcome variables for the control and treatment groups. Figure 3 and Figure 4 provide evidence of parallel trends between the two groups for participation and average contribution levels between 2009-10 and 2012-13. During the 2009 – 12 period, the income eligibility thresholds for the government co-contribution policy were frozen. Figure 3 shows that the participation rates of the control and treatment groups were nearly identical prior to the policy change in 2012-13. Similarly, Figure 4 shows that the average value of the post-tax contributions made by individuals in the control and treatment groups had similar trends prior to 2012-13. In 2012 -13, the average value of post-tax contributions increased by more for the control group than the treatment group. The disruption in parallel trends which only appears in the 2012-13 financial year provides evidence that the change can be attributed to the government co-contribution policy. Placebo tests conducted on income years prior to the introduction of the policy change (available in the appendix) do not find any large impacts, corroborating the evidence that the changes observed in Figure 3 and Figure 4 are due to the government co-contribution policy.

Figure 5 and Figure 6 show parallel trends of contribution levels and personal savings levels, but restricted to the population of individuals that made a post-tax superannuation contribution. Not surprisingly, the average contribution levels of those who made a post-tax superannuation contribution are higher than those observed in Figure 4. Average personal savings levels are also higher than the average post-tax superannuation contributions.

Figure 3. Percentage of individuals who made a post-tax superannuation contribution, by treatment status, 2009 - 2013

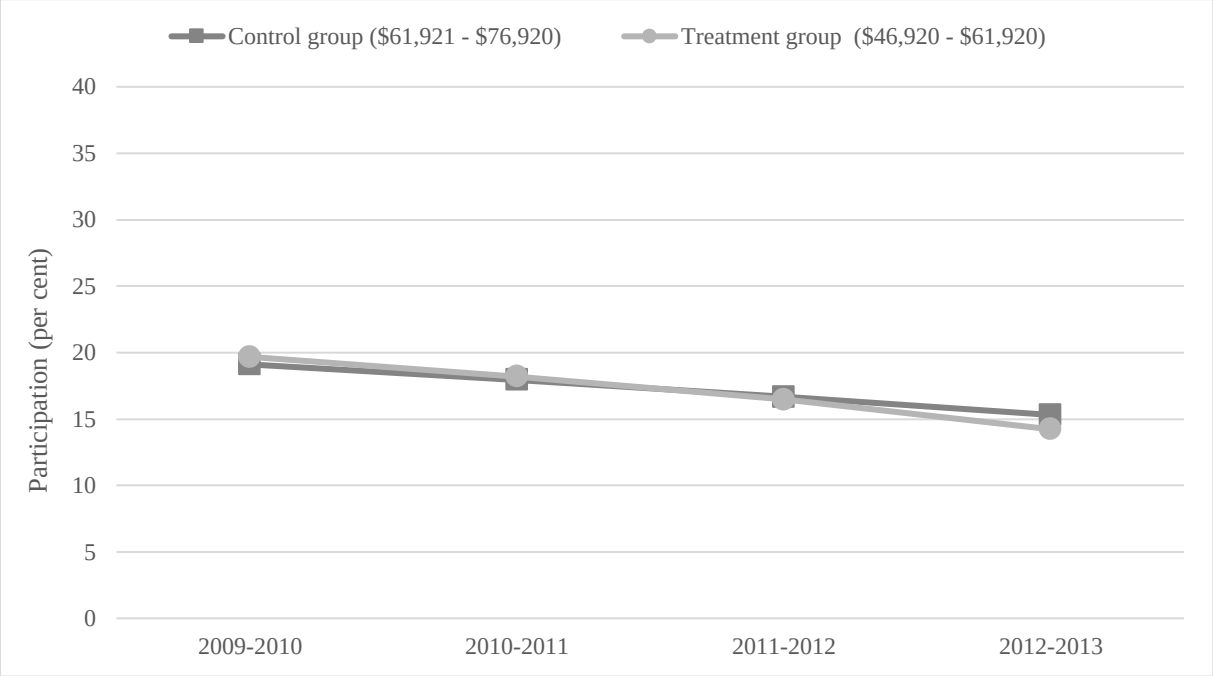
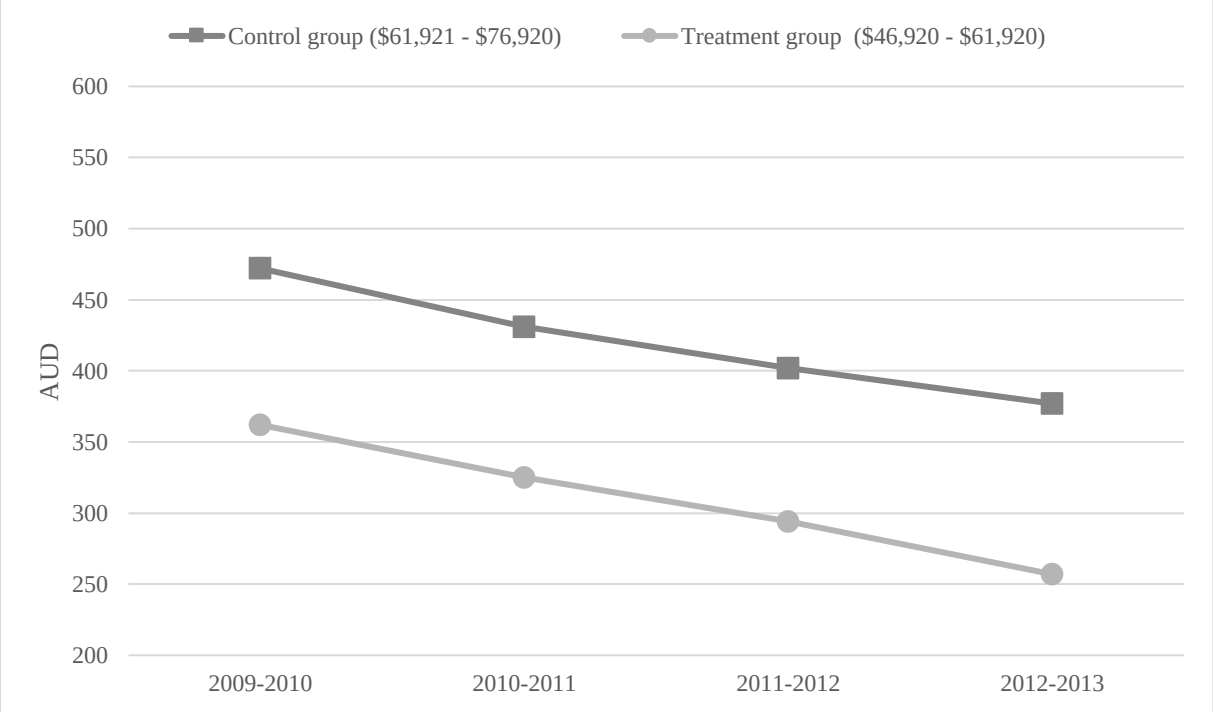
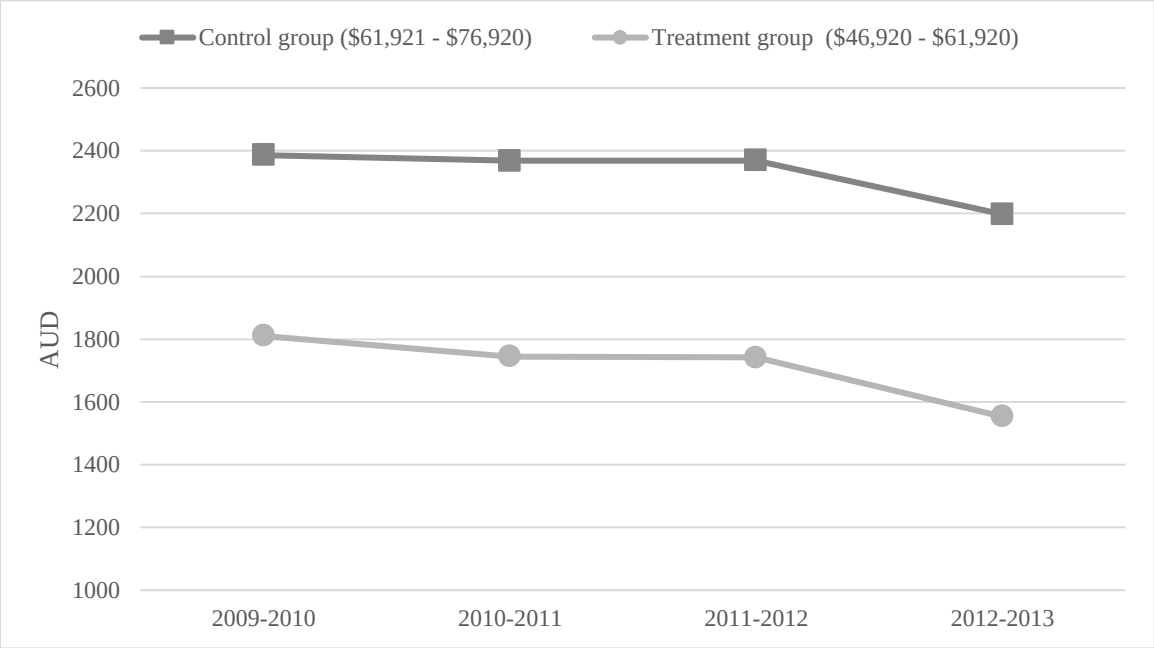


Figure 4. Average value of post-tax superannuation contributions, by treatment status, 2009 - 2013



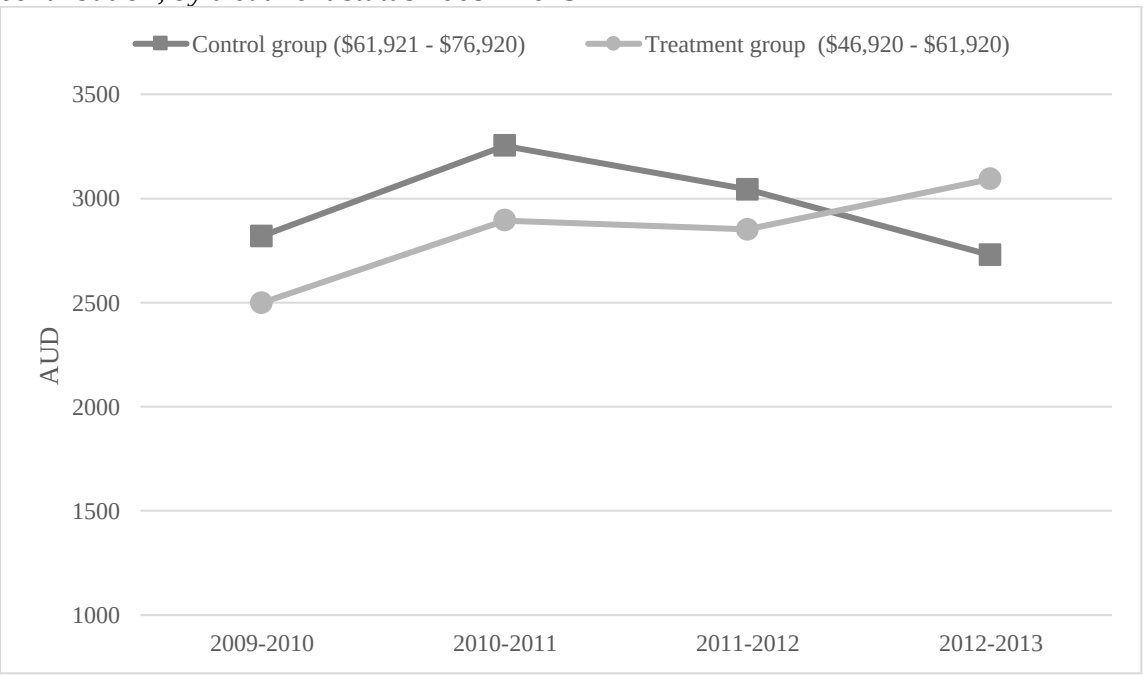
Source: Authors' calculations using ALife.

Figure 5. Average value of post-tax superannuation contributions for individuals who made a positive contribution, by treatment status 2009 - 2013



Source: Authors' calculations using ALife.
Note: This graph only includes individuals who made a post-tax superannuation contribution between 2009 – 2012. 2012 – 13 also includes individuals who made a contribution in 2011 – 12, but not in 2012 – 13.

Figure 6. Average personal savings for individuals who made a post-tax superannuation contribution, by treatment status 2009 - 2013



Source: Authors' calculations using ALife.

6. Empirical Results

Do low and middle income individuals change their savings behaviour in response to the reduction in the eligibility criteria for the government matching policy?

Table 2 shows the results from the difference-in-difference analysis on the impact of the change in the policy on individuals' participation (their likelihood to make a post-tax superannuation contribution). The results suggest that the impact of the policy is negative, and our estimates are consistent across different specifications. Decreasing the eligibility threshold for the government matching policy reduced the percentage of individuals who made a post-tax contribution by 0.9 percentage points.

The results also suggest that women and married individuals are more likely to make a post-tax contribution. The results by geographic location are mixed. Some states are more likely than residents of NSW to make a post-tax contribution (Tasmania, ACT, the Northern Territory, South Australia and Queensland), whereas others are less likely (the Victoria and Western Australia).

Table 3 shows the results from the difference-in-difference analysis on the impact of the change in the policy settings on the value of the post-tax contribution made by individuals. The results suggest that reducing the eligibility threshold for the government's $1 matching policy reduced the average value of post-tax superannuation contributions made by individuals by about 6.2%.

The results from Table 3 also suggest that women and married individuals make greater value contributions than their male and single counterparts. Finally, relative to NSW, some states make greater post-tax contributions (Tasmania, ACT, the Northern Territory, South Australia and Queensland), whereas others make smaller post-tax contributions (Victoria and Western Australia).

Table 4 limits the sample to individuals who made a post-tax superannuation contribution in 2011-12 and who are present in the dataset in 2011-12 and 2012-13. The table considers the impact of removing the $1 matching subsidy on the natural log of post-tax superannuation contributions. Not surprisingly, the impact of removing the policy is much larger among individuals who made a post-tax contribution. The results suggest that removing the $1 matching policy for the treatment group reduced the average value of post-tax superannuation contributions, among individuals who made a post-tax superannuation contribution in 2011-12, by between 16 - 17%. The effects are much larger in Table 4, compared to Table 3, because individuals who do not make a post-tax superannuation contribution (post-tax superannuation contribution= 0) are excluded from the analysis in Table 4. The sheer quantity of zeros attenuates the estimated impact of the policy in Table 3.

Table 5 and Table 6 limit the sample to that applied in Table 4 and further restrict it to individuals with reported data available on personal savings. Table 5, like Table 4, also considers the impact of removing the $1 matching subsidy on the natural log of post-tax superannuation contributions. The difference in the two tables is due to the change in the sample size as a result of the removing individuals without personal savings data. The smaller sample size in Table 5 results in a very

slightly larger impact increasing from 16 – 17% to 17 – 19%. Table 6 shows that removing the $1 matching policy for the treatment group increased average personal savings in 2012-13 among individuals who made a post-tax superannuation contribution in 2011-12 by about 11%. Without control variables, the estimated impact on savings is twice what it is when we include the control variables. Therefore, we prefer the specification with controls.

Table 2. DiD results of the impact of the policy change on participation (likelihood to make a post-tax superannuation contribution)

	Dependent variable: participation					
	est1	**est2**	**est3**	**est4**	**est5**	**est6**
	b/se	b/se	b/se	b/se	b/se	b/se
time	-.0136824***	-.0140556***	-.013485***	-.013688***	-.0139043***	-.0137586***
	(0.00146)	(0.00146)	(0.00145)	(0.00145)	(0.00145)	(0.00143)
treatment	-0.0019652	-.003869**	0.0004026	-0.0011532	-0.000673	-0.0009674
	(0.00138)	(0.00138)	(0.00136)	(0.00136)	(0.00136)	(0.00135)
time* treatment	-.0088764***	-.008856***	-.0090213***	-.0088802***	-.0088256***	-.0089259***
	(0.00190)	(0.00190)	(0.00188)	(0.00188)	(0.00188)	(0.00186)
female		.0324985***	.0285841***	.0291839***	.0297985***	.0305566***
		(0.00095)	(0.00094)	(0.00094)	(0.00094)	(0.00093)
age			.0048645***	-.0016878***	-.0030015***	-.0027595***
			(0.00004)	(0.00031)	(0.00032)	(0.00031)
age squared				.0000789***	.0000922***	.0000896***
				(0.00000)	(0.00000)	(0.00000)
married					.0188661***	.0148198***
					(0.00097)	(0.00096)
NSW						0
						.
VIC						-.0084509***
						(0.00112)
QLD						.1173698***
						(0.00144)
SA						.0511268***
						(0.00195)
WA						-.0322025***
						(0.00137)
TAS						.0994382***
						(0.00378)
NT						.0762827***
						(0.00496)
ACT						.1423708***
						(0.00396)
Constant	.1668133***	.1537474***	-.0439888***	.0815738***	.0999495***	.068923***
	(0.00105)	(0.00111)	(0.00191)	(0.00604)	(0.00612)	(0.00610)
N	601,491	601,491	601,491	601,491	601,491	599,985
R2	0.0007827	0.0027514	0.0278335	0.0286213	0.0292093	0.0522265

*p < 0.05 ** p < 0.01 *** p < 0.001

Source: Authors' calculations using ALife.

Table 3. DiD results of the impact of the policy change on the value of post-tax superannuation contributions

	Dependent variable: ln(cont)					
	est1	**est2**	**est3**	**est4**	**est5**	**est6**
	b/se	b/se	b/se	b/se	b/se	b/se
time	-.1013521***	-.1041144***	-.0999543***	-.1016301***	-.1031687***	-.1019128***
	(0.01091)	(0.01091)	(0.01082)	(0.01082)	(0.01082)	(0.01066)
treatment	-.0629176***	-.0770083***	-.0458641***	-.0587086***	-.0552928***	-.05656***
	(0.01013)	(0.01012)	(0.01002)	(0.01003)	(0.01003)	(0.00991)
time* treatment	-.062548***	-.0623973***	-.0636023***	-.0624377***	-.0620492***	-.0628471***
	(0.01398)	(0.01397)	(0.01381)	(0.01380)	(0.01380)	(0.01363)
female		.2405367***	.2119967***	.2169486***	.2213208***	.2262656***
		(0.00695)	(0.00686)	(0.00685)	(0.00685)	(0.00677)
age			.0354671***	-.0186283***	-.0279735***	-.0259751***
			(0.00030)	(0.00226)	(0.00231)	(0.00230)
age squared				.0006515***	.0007457***	.0007247***
				0.0000276	(0.00003)	(0.00003)
married					.1342108***	.103657***
					(0.00711)	(0.00703)
NSW						0
						.
VIC						-.0605122***
						0.0080365
QLD						.8793201***
						0.0106108
SA						.3802449***
						(0.01422)
WA						-.2434478***
						(0.00978)
TAS						.737503***
						(0.02773)
NT						.6380116***
						(0.03795)
ACT						1.165521***
						(0.03076)
Constant	1.227658***	1.130951***	-.3107417***	.7258905***	.8566133***	.6164717***
	(0.00788)	(0.00827)	(0.01410)	(0.04436)	(0.04496)	(0.04475)
N	601,491	601,491	601,491	601,491	601,491	599,985
R2	0.0010116	0.0030357	0.0280613	0.0290692	0.0296277	0.0544278

*p < 0.05 ** p < 0.01 *** p < 0.001

Source: Authors' calculations using ALife.

Table 4. Did results of the impact of the policy change on the value of post-tax superannuation contributions, limited to individuals who made a positive contribution in 2011-12

	Dependent variable: ln(cont)					
	est1	est2	est3	est4	est5	est6
	b/se	b/se	b/se	b/se	b/se	b/se
time	-1.073689***	-1.073808***	-1.075199***	-1.078212***	-1.077114***	-1.073202***
	(0.02520)	(0.02520)	(0.02520)	(0.02519)	(0.02518)	(0.02502)
treatment	-.2898555***	-.2916152***	-.2956146***	-.3009804***	-.301812***	-.2760888***
	(0.01246)	(0.01251)	(0.01253)	(0.01254)	(0.01254)	(0.01254)
time* treatment	-.1487918***	-.1488539***	-.1639039***	-.1620036***	-.1620925***	-.1702562***
	(0.03434)	(0.03434)	(0.03435)	(0.03435)	(0.03434)	(0.03416)
female		0.0241589	0.0206649	0.0275982	0.0226153	-0.005905
		(0.01713)	(0.01711)	(0.01718)	(0.01721)	(0.01721)
age			.0089453***	-.0201193***	-.0149176*	-0.0091465
			(0.00077)	(0.00565)	(0.00579)	(0.00579)
age squared				.0003414***	.0002895***	.0002623***
				(0.00007)	(0.00007)	(0.00007)
married					-.0815321***	-.0945879***
					(0.01835)	(0.01826)
NSW						0
						.
VIC						-0.0463683
						(0.02620)
QLD						.3493971***
						(0.02293)
SA						.2211612***
						(0.03179)
WA						-.2794943***
						(0.04131)
TAS						.3173865***
						(0.04697)
NT						.7234455***
						(0.06682)
ACT						.7733093***
						(0.04627)
Constant	7.376479***	7.365556***	6.973057***	7.545152***	7.47695***	7.132903***
	(0.00990)	(0.01266)	(0.03616)	(0.11495)	(0.11623)	(0.11825)
N	68,234	68,234	68,234	68,234	68,234	68,192
R2	0.0659672	0.0659944	0.0679796	0.0683428	0.0686089	0.0786806

*p < 0.05 ** p < 0.01 *** p < 0.001

Source: Authors' calculations using ALife.

Table 5. Did results of the impact of the policy change on the value of post-tax superannuation contributions, limited to individuals who made a positive contribution in 2011 - 12 and have personal savings data

	Dependent variable: ln(cont)					
	est1	est2	est3	est4	est5	est6
	b/se	b/se	b/se	b/se	b/se	b/se
time	-1.038198***	-1.038262***	-1.038439***	-1.042116***	-1.041203***	-1.038428***
	(0.02693)	(0.02693)	(0.02693)	(0.02691)	(0.02690)	(0.02674)
treatment	-.3059988***	-.3074435***	-.3110588***	-.3172334***	-.3180711***	-.2929166***
	(0.01322)	(0.01328)	(0.01329)	(0.01329)	(0.01329)	(0.01330)
time* treatment	-.1666267***	-.1667393***	-.1838477***	-.1812158***	-.1809592***	-.1882399***
	(0.03653)	(0.03652)	(0.03654)	(0.03653)	(0.03653)	(0.03634)
female		0.020549	0.016233	0.0241558	0.0189685	-0.0084308
		(0.01819)	(0.01817)	(0.01824)	(0.01827)	(0.01829)
age			.0089998***	-.0240849***	-.0187402***	-.011901**
			(0.00081)	(0.00588)	(0.00603)	(0.00604)
age squared				.0003894***	.0003359***	.0002969***
				(0.00007)	(0.00007)	(0.00007)
married					-.0854468***	-.09834***
					(0.01932)	(0.01923)
NSW						0
						.
VIC						-.060295**
						(0.02776)
QLD						.3498044***
						(0.02434)
SA						.1999863***
						(0.03378)
WA						-.250576***
						(0.04373)
TAS						.3361562***
						(0.04895)
NT						.7417416***
						(0.07147)
ACT						.7141234***
						(0.05064)
Constant	7.376043***	7.366714***	6.973114***	7.621211***	7.551443***	7.19017***
	(0.01057)	(0.01347)	(0.03797)	(0.11920)	(0.12056)	(0.12295)
N	58,964	58,964	58,964	58,964	58,964	58,931
R2	0.0658146	0.0658348	0.0679577	0.0684591	0.0687658	0.0785773

*p < 0.10 ** p < 0.05 *** p < 0.01
Source: Authors' calculations using ALife.

Table 6. Did results of the impact of the policy change on the value of personal savings, limited to individuals who made a post-tax superannuation contribution in 2011-12

	Dependent variable: ln(personal savings)					
	est1	est2	est3	est4	est5	est6
	b/se	b/se	b/se	b/se	b/se	b/se
time	-.1364209***	-.1387174***	-.1398397***	-.1514222***	-.1532197***	-.1527642***
	(0.04433)	(0.04405)	(0.04331)	(0.04326)	(0.04327)	(0.04312)
treatment	-0.0570362	-.1095515***	-.1324497***	-.1518974***	-.1502478***	-.1808468***
	(0.04203)	(0.04184)	(0.04113)	(0.04114)	(0.04114)	(0.04107)
time* treatment	.2055904***	.2014995***	0.0931385	.101428*	.1009227*	.108415*
	(0.05855)	(0.05821)	(0.05721)	(0.05716)	(0.05715)	(0.05692)
female		.7469832***	.7196464***	.7446003***	.7548144***	.7949485***
		(0.02878)	(0.02826)	(0.02830)	(0.02839)	(0.02840)
age			.0570028***	-.0472019***	-.0577263***	-.0710652***
			(0.00115)	(0.00890)	(0.00906)	(0.00907)
age squared				.0012265***	.0013319***	.0014223***
				(0.00011)	(0.00011)	(0.00011)
married					.1682525***	.1847238***
					(0.03004)	(0.02993)
NSW						0
						.
VIC						.1079827**
						(0.04305)
QLD						-.6576018***
						(0.03756)
SA						-.1787628***
						(0.05524)
WA						0.0516164
						(0.06521)
TAS						-.2851739***
						(0.07600)
NT						-1.132968***
						(0.11558)
ACT						-.3769474***
						(0.08013)
Constant	4.330618***	3.991509***	1.498535***	3.539799***	3.677179***	4.304633***
	(0.03305)	(0.03535)	(0.06016)	(0.18032)	(0.18153)	(0.18423)
N	58,964	58,964	58,964	58,964	58,964	58,931
R2	0.000265	0.0115864	0.0476797	0.049788	0.050292	0.0590244

*p < 0.10 ** p < 0.05 *** p < 0.01

Source: Authors' calculations using ALife.

Is the reduction in post-tax superannuation contributions reallocated towards others forms of saving or consumed?

The results from section 6 show that low and middle income individuals respond to superannuation savings subsidies. When the $1 matching subsidy was removed for the treatment group in 2012-13, 0.9% of individuals stopped making a post-tax contribution. In addition, the value of post-tax superannuation contributions declined by about 6.2%. However, the question remains as to whether the observed reduction in post-tax superannuation contributions changed individuals' savings behaviour. In other words, when the government removed the matching policy for the treatment group, did people decide to save the same amount they would have otherwise saved, but in a different form of savings (stocks, bonds, etc.). Alternatively, did they opt to consume more and save less?

This analysis focuses on individuals who made a post-tax superannuation contribution in 2011-12, who were present in the data in 2011-12 and 2012-13, and who reported personal savings data (the sample applied in Table 5 and Table 6). Using difference-in-difference, Table 5 showed that conditional on making a post-tax superannuation contribution in 2011-12, decreasing the eligibility criteria *reduced* the value of post-tax superannuation contributions made by individuals who became ineligible for the policy by between 17 – 19%. In a separate difference-in-difference estimation, the results show that these same individuals simultaneously *increased* their personal savings by about 11% when they became ineligible for the matching policy. The drop in post-tax superannuation savings combined with the increase in personal savings points to a reallocation effect.

Much of the recent academic literature which evaluates whether savings policies induce new savings, or a reallocation effect rely on complex estimations and the combination of multiple data sources to isolate the effect. Part of the challenge of these estimations relates to the data available. In particular, what administrative data bring in their sample size and measurement accuracy, they often lack in terms of their availability of data on all forms of savings and wealth. Similarly, what survey data provide in terms of their coverage of data on savings and wealth, they may lack in terms of measurement accuracy and sample size. In addition, measures of savings are notoriously volatile which present additional measurement challenges for researchers. These issues require further research in Australia.

In the interim, we rely on our causal estimates from the difference in difference analysis above to show evidence of a reallocation effect. The drop in post-tax superannuation savings combined with the increase in personal savings points to a reallocation effect. In addition, we calculate a simple elasticity at the average to measure the magnitude of the reallocation effect. The intuition for this elasticity is explained below.

Table 7 shows a stylized example of the elasticity calculation. Column (a) shows the average personal savings and post-tax superannuation contributions of a fictional person who was eligible for the government's co-contribution policy in period 1. In period 2, the fictional person was no longer eligible for the policy. As a result, she reduced her post-tax superannuation contribution by $50 in period 2 and she increased her personal savings by $50. This simple example immediately shows a complete reallocation effect. Instead of contributing $50 extra to superannuation she

moved it to other forms of personal savings. To calculate the elasticity, the per cent change between periods 1 and 2 is calculated and divided by each other (column e). When the simple elasticity is corrected by the base, we derive the -$1 elasticity. In this fictional example, a $1 increase in the co-contribution policy is offset by a $1 decrease in total savings.

Table 7. Fictional example of the elasticity calculation

	Period 1	Period 2	Change	Per cent change	Simple elasticity	Base corrected elasticity
	(a)	(b)	(c)	(d)	(e)	(f)
Personal savings	$2000	$2050	$50	2.5%	2.5/-28.6= -0.09	-0.09 *2000/ 175= -1
Post-tax superannuation contribution	$175	$125	-$50	-28.6%		

Source: Authors' calculations using fictional data.

Table 8 shows the same calculation using the average personal savings and post-tax superannuation contribution of individuals in the treatment group who made a post-tax superannuation contribution in 2011-12. The results show that a $1 increase in superannuation post-tax superannuation contributions leads to a $0.77 reduction in personal savings. In other words, the results largely show that savings are mostly reallocated from one savings instrument to another, but there is also less savings per dollar.

Table 8. New savings or reallocation effect?

	2011-12	2012-13	Change	Per cent change	Simple elasticity	Base corrected elasticity
	(a)	(b)	(c)	(d)	(e)	(f)
Personal savings	$2851	$3024	$173	6.07%	-0.47	-0.77
Post-tax superannuation contribution	$1742	$1518	-$224	-12.8%		

Source: Authors' calculations using summary statistics from ALife.

The international literature points to some explanations which could explain the more sizeable reallocation result. In particular, individuals who respond to voluntary tax concessions, like the matching program, tend to be active savers. They tend to be financially informed individuals who reallocate their savings to maximize their return. These results however, while suggestive, do have limitations and require more sophisticated statistical analysis to confirm. In addition, they likely underestimate the magnitude of the reallocation effect.

In particular, as previously described, the measure of savings captured in ALife represents the *net flow of taxable savings.* As a result, if individuals reallocate savings from the government co-

contribution policy (when they became ineligible) towards non-taxable forms of savings, like owner-occupied housing, this will not be captured in the data. The *net flow of taxable savings* is also based on reported income flows in a financial year, rather than stocks or the difference in stock over time. As a result, if individuals reallocate savings towards taxable forms of savings which are taxed on realization, like stocks, this will also be excluded from the calculation until the stock is sold and a capital gain (or loss) realized.

Additional analyses combining complementary data sources could be used in the future to refine and confirm the estimates provided here. For example, the Household Income and Labour Dynamics in Australia (HILDA) survey could shed more light on both the stock of wealth and non-taxable savings. Similarly, the Multi-Agency Data Integration Project (MADIP) could help to better identify some of the other characteristics of individuals who are eligible for the co-contribution policy, which are not available in ALife, to better understand whether they correspond to the profile of active savers identified in the international literature. These remain areas for future research.

7. Discussion and conclusions

Does the government's co-contribution policy influence the savings behaviour of low and middle income individuals?

The Australian government's co-contribution policy was introduced to boost the superannuation balances of low and middle income individuals. Results from this research indicate that non-mandatory tax subsidies for superannuation, like the government co-contribution policy, do influence the savings behaviour of low and middle income individuals.

In the 2012-13 financial year, the subsidy was removed for individuals with incomes between $46,920 and $61,920. The response of these individuals was two-fold. First, some individuals in this subgroup stopped making post-tax superannuation contributions. The results from this research show that the percentage of individuals who made a post-tax superannuation contribution declined by 0.9 percentage points.[4] Second, individuals responded by making smaller post-tax superannuation contributions. The results suggest that, on average, individuals decreased the value of their contributions by 6.2%. Conditional on making a post-tax contribution in 2011-12, this represents a reduction of individuals' contributions by between 17 and 19 per cent.

These results are consistent with the international literature. First, while the literature tends to diverge with respect to the effectiveness of the matching rate, with a few exceptions, most studies find a positive (negative) effect of the existence (elimination) of matching programs on individuals' participation. Similarly, this research shows that removing the matching policy for a group of participants decreased the percentage of individuals who made a post-tax superannuation contribution (i.e. it decreased the percentage of individuals who participated in the policy).

[4]This is the difference in difference estimate. The control group's participation declined from about 16.7% to 15.3%, while the participation of those who became ineligible declined from 16.5 to 14.2 (a bigger decline). The difference of the two differences represents the 0.9% decline.

Second, the closest studies to this group's population of interest (Duflo et al. 2006; Saez 2009), which focus on low and middle income families, find relatively small impacts, in terms of the percentage of individuals who actually participate. For example, in their randomized control trial, Duflo et al. (2006) found that take-up rates reached a maximum of 14%. Extending the analyses from Duflo et al. (2006), Saez (2009) finds that even when a matching program is presented in ways that should increase uptake, participation rates remain modest at close to 15%. Similarly, this research shows that uptake in the Australian context is also modest. At its highest level in 2004-05, 19.5% of eligible individuals made a post-tax superannuation contribution. By 2015 – 16, the percentage had decreased to 8.5%. As a percentage of all eligible taxpayers[5], these numbers are 25% and about 17%. While part of the decline in the percentage of individuals who make a post-tax superannuation contribution can be attributed to changes in the policy's eligibility and generosity over time, in general, the participation rates are modest and align with the international literature.

Does the government's co-contribution policy generate new savings or induce a reallocation of existing savings?

This research primarily finds evidence of a reallocation of savings effect and of a smaller new savings effect. The results suggest that removing the matching policy for the treatment group *reduced* the value of post-tax superannuation contributions made by individuals who became ineligible for the policy by between 17 – 19%. In a separate difference-in-difference estimation, the results show that these same individuals simultaneously *increased* their personal savings by about 11% when they became ineligible for the matching policy. The drop in post-tax superannuation savings combined with the increase in personal savings points to a reallocation effect. However, the effect is not one-to-one and there is a drop in overall savings as well. The results show that a $1 increase in superannuation post-tax superannuation contributions leads to a $0.77 reduction in personal savings.

These results however, while suggestive and intuitively plausible, do have limitations and require more sophisticated statistical analysis to confirm them. In addition, they likely underestimate the magnitude of the reallocation effect. In particular, as previously described, the measure of savings captured in ALife, the *net flow of taxable savings,* is an incomplete measure of all savings. For example, if individuals reallocated savings from the government co-contribution policy (when they became ineligible) towards non-taxable forms of savings, like owner-occupied housing, this would not be captured in the data and would underestimate the magnitude of the reallocation effect. Additional analyses combining complementary data sources, like HILDA and MADIP, could be used in the future to refine and confirm the estimates.

Compared to the international literature, most studies have mainly found either a null relationship or a positive relationship between financial incentives to save and the total amount of savings. While the evidence regarding this research question is not entirely conclusive, there is a much stronger consensus that asset reallocation in response to tax incentives occurs (OECD 2018). The Australian literature has very few studies on the impact of tax incentives on *voluntary* savings,

[5] All taxpayers refer to all taxpayers who met the eligibility criteria for the policy, except for the income threshold. Taxpayers of all income levels are included in this definition of "all taxpayers".

which should be distinguished from policies mandating *compulsory* savings like superannuation; the two types of studies are not directly comparable.

The recent literature on the effectiveness of savings policies differentiates between the impact that mandatory savings policies (like superannuation) have on savers, compared to voluntary savings policies (like the government co-contribution policy). Chetty et al. (2014) explains the phenomenon of active and passive savers. Passive savers do not change their savings behaviour (i.e. reallocate assets or change the value) in response to increases in compulsory savings policies. By contrast, active savers reallocate their assets and/or the change the amount they save in response to changes in compulsory savings plans. Since the majority of savers tend to be passive, compulsory savings policies are likely to generate more new savings compared to voluntary savings policies which induce a much greater reallocation effect.

Connolly (2007) evaluates the expansion of compulsory superannuation in Australia and consistent with the more recent literature about the predicted effect of *compulsory* savings policies, finds evidence of a significant new savings effect. For each dollar placed in superannuation accounts, total household wealth is increased by between 70 and 90 cents. Whelan et al. (2018) focus on *voluntary* savings generated by high-income earners in Australia due to the 2005 removal of the superannuation surcharge. The authors conclude the reduction in taxes led to an increase in superannuation contributions of 1.7 percentage points. In this respect, both the Whelan et al. (2018) and this research conclude that voluntary savings subsidies influence savings behaviour. However, the Whelan et al. (2018) analysis did not consider whether the increased savings were new savings or a reallocation effect.

In conclusion, the government's co-contribution policy has impacted the savings behaviour of a modest percentage of low and middle income individuals. While the matching program certainly increased the superannuation balances of this small minority, the majority of low and middle income individuals remained unaffected. If boosting superannuation balances is an explicit policy goal, recent international literature suggests that compulsory savings policies tend to be more effective than tax subsidies for retirement savings. While the Australian literature in this area is limited – and more is required – this research provides some evidence in support of this hypothesis and of its relevance in Australia.

Box 1. A non-technical description of the difference-in-difference methodology

Difference-in-difference is one method which can be applied to evaluate the impact of public policies. It is also the approach applied in this paper. This box describes this methodology in a non-technical manner, to facilitate understanding and interpretation of the results in this paper.

Defining a control and treatment group

Difference-in-difference relies on the existence of a control and treatment group. The control group refers to the group of individuals who are not affected by the introduction or change in public policy. The treatment group refers to individuals who are impacted by the introduction or a change in public policy. The control group is used to infer what the behaviour of the treatment group would have been in the absence of the policy; this is also referred to as the counterfactual. Note that this behaviour is unobserved—we only see how the treatment group behaved under the policy change, not how they would have behaved had the policy not changed.

For example, Card and Krueger (1994) used the difference-in-difference methodology to evaluate the impact of an increase in the minimum wage on employment by looking at the increase in the minimum wage which took place in New Jersey in April 1992. To do so, they collected data on fast-food chain restaurants (their employment levels, staff size, wage levels, etc.) in a metropolitan area of New Jersey that bordered (and included) another state, Pennsylvania. However, the minimum wage only increased in New Jersey, not Pennsylvania. As a result, similar workers shared a labour market (one single metropolitan area), but were subject to different minimum wage legislation because of the unique geography of the metropolitan area (it existed in both states). In this example, the control group included workers in fast-food chain restaurants in Pennsylvania; these workers were not impacted by the increase in the minimum wage which occurred in New Jersey. The treatment group was represented by workers in fast-food chain restaurants in New Jersey, who were impacted by the increase in the minimum wage.

In this paper, we evaluate the impact of a change in the government's co-contribution policy which occurred between 2011-12 and 2012-13. During this period, the higher income threshold was significantly reduced. As a result, we observe the savings behaviour of individuals who were eligible for the policy in 2011-12 (when they were eligible for the policy) and again in 2012-13 (when they were no longer eligible for the policy). To evaluate the change, we identify a control group, represented by individuals who were not impacted by the government's policy. This group includes high income individuals who were not eligible for the policy in either year because of their income level. The treatment group includes individuals who were eligible in 2011-12, but who were no longer eligible in 2012-13. Specifically, the control group is defined by individuals with incomes greater than $61,920. The treatment group is defined by individuals with income between $46,920 and up to $61,920.

The objective of defining a control group is to identify a group of the population which mimics what the behaviour of the individuals affected by the policy (the treatment group) would have been in the absence of the policy. In an ideal experiment, this would be achieved through random assignment. For example, one would take a representative group of the population and randomly assign who would be eligible for a government co-contribution (treatment group) and who would

be ineligible (the control group). Random assignment allows one to directly compare the outcomes of the two groups in order to evaluate the policy because the characteristics of the two groups are, on average, exactly the same. As a result, the difference in outcomes can be entirely attributed to receiving the treatment (being randomly assigned to eligibility for a co-contribution).

The real world does not always allow for random assignment. As a result, economists employ other techniques and tests to identify an appropriate control group in the absence of random assignment. A first approach is to compare the observable characteristics of a proposed control and treatment group. If the characteristics between the two groups are similar, it suggests their response to a policy might also be similar. This is done in Table 1 which compares the characteristics of the control and treatment group. The table shows that the characteristics of the two groups are very similar. In addition, it shows us that some of the small differences between the two groups, like the fact the treatment group is slightly more likely to be female and unmarried, should be accounted for in our analysis (which can be done statistically with regression analysis).

A second technique used to validate the choice of a control group is to compare the trends in the outcome variables of the control and treatment group over time. This is described in more detail below.

Defining the outcome (dependent) variables

Once a control and treatment group have been defined, the outcome (dependent) variables also need to be defined. Outcome variables answer policy questions. For example, "What is the impact of an increase in the minimum wage on _____?". In Card and Krueger's (1994) paper, some of the outcome variables – the blank space in the previous question – included: employment and wages.

In this paper, we evaluate the impact of the change in the government's co-contribution policy on savings behaviour. In particular, we answer two questions: (1) If the matching policy is eliminated, do people stop making post-tax superannuation contributions entirely? (2) If the matching policy is eliminated, do people decrease (or increase) the value of post-tax contributions that they make? These two questions are answered using two outcome variables: (1) the percentage of individuals who made a positive (non-zero) post-tax superannuation contribution and (2) the value of the post-tax contribution made by the individual. Both of these variables can be calculated using the ALife dataset.

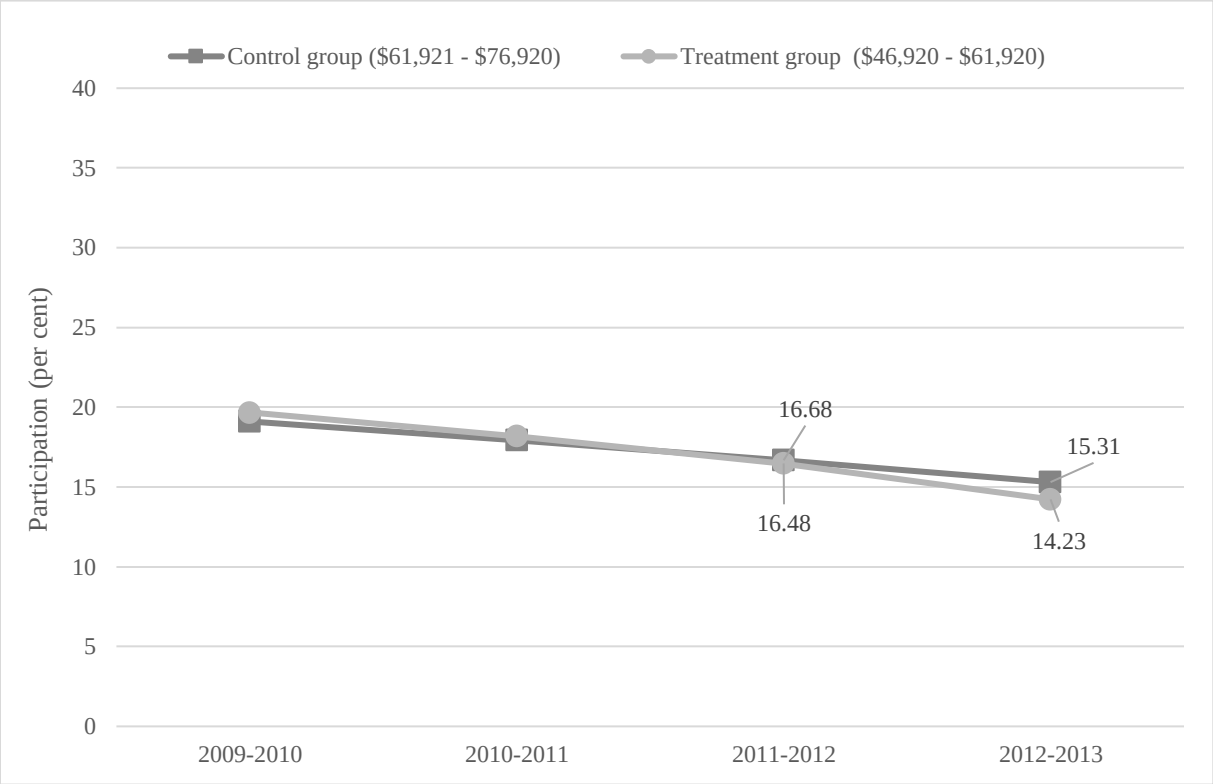
Graphing the outcome (dependent) variables by control and treatment group

Figure 3 and Figure 4 graph the outcome variables for both the control and treatment group. Figure 3 is reproduced below to explain, in greater detail, how the difference-in-difference methodology is applied. As Figure 3 shows the trends (the slopes) of the two lines are parallel. There levels are even very similar, which is why the lines appear on top of each other (though similar levels is not a requirement for the analysis). The data show that among individuals who were never eligible for the matching program (the control group) the percentage of individuals who made a post-tax contribution decreased from 16.68% of individuals to 15.31% of individuals between 2011 – 12. The control group's participation declined by (16.68 – 15.31) 1.38 percentage points. Among individuals affected by the change in eligibility (the treatment group), the percentage of individuals

who made a post-tax superannuation contribution declined from 16.48% of individuals to 14.23%. The treatment group's participation declined by (16.48 -14.23) 2.25 percentage points.

The results show that while the percentage of individuals who made a post-tax decreased for both groups between 2011 – 12 and 2012 – 13, it declined by even more for the treatment group. To calculate the difference-in-difference estimate, one subtracts the difference from the differences (1.38 – 2.25) = -0.9 percentage points. The difference in difference methodology shows that changing the eligibility criteria reduced the percentage of individuals who made a post-tax contribution in the treatment group, relative to the control group by -0.9 percentage points.

Figure 3. Percentage of individuals who made a post-tax superannuation contribution, by treatment status, 2009 - 2013



Source: Authors' calculations using ALife.

This methodology is applied to all of the different outcome variables mentioned in this paper (contribution levels and personal savings, in addition to participation). Regression analysis is another tool used to apply the difference-in-difference methodology. This is exactly why our -0.9 estimate matches the coefficient on the time*treatment variable in the est1 column of Table 2. The added value of regression analysis, in this context, is being able to take into account other variables that might affect our results (like the age of participants, sex, place of residence, etc.). Doing so, allows one to estimate an even more precise result of the impact of the policy. In this case, adding in these additional variables in Table 2 does not change the coefficient on the time*treatment variable very much. Ordinary least squares (OLS) and linear probability models are forms of regression analysis which allow one to estimate the difference-in-difference estimate (the -0.9).

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Appendix

A. Eligibility criteria for the government co-contribution policy

Eligibility criteria	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
At least one or more eligible super contributions made by the individual	X	X	X	X	X	X	X	X	X	X	X	X	X
Worker Coverage													
The person has employer-supported superannuation for the income year	X												
10% or more of a person's total income for the income year is attributable to eligible employment of the person		X	X	X									
10% or more of a person's total income for the year is attributable to either or both of the following: (i) activities covered under subsection (2) or (ii) carrying on a business (within the meaning of the Income Tax Assessment Act)					X	X	X	X	X	X	X	X	
The person's total income is less than the higher income threshold	X	X	X	X	X	X	X	X	X	X	X	X	X
Income tax details													
An income tax return for the person is lodged in the income year	X	X	X	X	X	X	X	X	X	X	X	X	X
The person's non-concessional contributions for the financial													X

year do not exceed the person's non-concessional contribution for the financial year													
Immediately before the start of the financial year, the person's total superannuation balance is less than the general transfer balance cap for the financial year													X
Age													
The person is less than 71 years old at the end of the income year	X	X	X	X	X	X	X	X	X	X	X	X	X
Migration eligibility													
The person does not hold an eligible temporary resident visa at any time during the income year	X	X	X	X	X								
The person does not hold an eligible temporary resident visa at any time during the income year (unless they are a New Zealand citizen or another specified visa category).						X	X	X	X	X	X	X	

Definition of total income for eligibility	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**
Total Income = assessable income + reportable fringe benefits	X	X	X										
Total Income = assessable income + reportable fringe benefits + the person's reportable superannuation					X	X	X						

contributions – business deductions *A business operator's total income is reduced by amounts for which the person is entitled to a deduction as a result of carrying on a business (within meaning of Income Tax Assessment Act 1997)													
Total Income = assessable income + reportable fringe benefits + the person's reportable superannuation contributions – excess concessional contributions – business deductions								X	X	X	X	X	X

B. Robustness Checks

Table B1. Robustness check using all individuals with incomes exceeding $61,920 as the control group. DiD results of the impact of the policy change on participation (likelihood to make a post-tax superannuation contribution)

Dependent variable: participation

	est1	est2	est3	est4	est5	est6
	b/se	b/se	b/se	b/se	b/se	b/se
time	-.0092338***	-.0093894***	-.0094597***	-.0095546***	-.0098642***	-.0096719***
	(0.00083)	(0.00083)	(0.00082)	(0.00082)	(0.00082)	(0.00081)
treatment	-0.000303	-.0044203***	.0080009***	.0055973***	.0064412***	.0053916***
	(0.00108)	(0.00108)	(0.00107)	(0.00107)	(0.00107)	(0.00106)
time* treatment	-.0133028***	-.0134796***	-.0129898***	-.0129523***	-.0127821***	-.0128458***
	(0.00148)	(0.00148)	(0.00146)	(0.00146)	(0.00146)	(0.00144)
female		.0304602***	.0281689***	.0284262***	.0295233***	.0284972***
		(0.00073)	(0.00072)	(0.00072)	(0.00072)	(0.00071)
age			.0053659***	-0.0001498	-.0012392***	-.0008662***
			(0.00003)	(0.00023)	(0.00024)	(0.00024)
age squared				.0000654***	.0000764***	.0000724***
				(0.00000)	(0.00000)	(0.00000)
married					.0152214***	.0114467***
					(0.00073)	(0.00072)
NSW						0
						.
VIC						-.0085069***
						(0.00083)
QLD						.111035***
						(0.00106)
SA						.056683***
						(0.00152)
WA						-.0312799***
						(0.00095)
TAS						.0994997***
						(0.00299)
NT						.0916437***
						(0.00364)
ACT						.2561185***
						(0.00289)
Constant	.1684805***	.1585661***	-.068504***	.0401337***	.0548253***	.02109***
	(0.00060)	(0.00064)	(0.00138)	(0.00463)	(0.00470)	(0.00468)
N	1,148,142	1,148,142	1,148,142	1,148,142	1,148,142	1,144,556
R2	0.0004673	0.0020359	0.0286215	0.0291063	0.0294571	0.057867

*p < 0.05 ** p < 0.01 *** p < 0.001

Source: Authors' calculations using ALife.

Table B2. Robustness check using all individuals with incomes exceeding $61,920 as the control group. DiD results of the impact of the policy change on the value of post-tax superannuation contributions

	Dependent variable: ln(cont)					
	est1	est2	est3	est4	est5	est6
	b/se	b/se	b/se	b/se	b/se	b/se
time	-.0648657***	-.066078***	-.0666276***	-.0674677***	-.0696611***	-.0680904***
	(0.00644)	(0.00644)	(0.00636)	(0.00636)	(0.00636)	(0.00625)
treatment	-.0834259***	-.115498***	-.0184375*	-.0397331***	-.0337545***	-.0385384***
	(0.00796)	(0.00798)	(0.00788)	(0.00790)	(0.00791)	(0.00784)
time* treatment	-.098697***	-.1000742***	-.0962465***	-.0959149***	-.0947091***	-.095037***
	(0.01097)	(0.01096)	(0.01078)	(0.01077)	(0.01077)	(0.01066)
female		.2372709***	.2193667***	.2216462***	.2294185***	.218269***
		(0.00555)	(0.00548)	(0.00547)	(0.00548)	(0.00539)
age			.0419299***	-.0069399***	-.0146575***	-.0117211***
			(0.00024)	(0.00177)	(0.00182)	(0.00181)
age squared				.0005798***	.0006578***	.0006261***
				(0.00002)	(0.00002)	(0.00002)
married					.1078309***	.0790039***
					(0.00557)	(0.00549)
NSW						0
						.
VIC						-.0682465***
						(0.00629)
QLD						.8121109***
						(0.00796)
SA						.4340478***
						(0.01156)
WA						-.2535328***
						(0.00712)
TAS						.7475442***
						(0.02272)
NT						.7606823***
						(0.02876)
ACT						2.231537***
						(0.02415)
Constant	1.281129***	1.203901***	-.5704559***	.3920824***	.4961597***	.2387532***
	(0.00466)	(0.00493)	(0.01045)	(0.03499)	(0.03551)	(0.03542)
N	1,148,142	1,148,142	1,148,142	1,148,142	1,148,142	1,144,556
R2	0.0008207	0.0024633	0.0304801	0.0311368	0.0314407	0.0625089

*p < 0.05 ** p < 0.01 *** p < 0.001

Source: Authors' calculations using ALife.

Table B3. Placebo tests 2010-11. DiD results of the impact of the policy change on participation (likelihood to make a post-tax superannuation contribution)

	Dependent variable: participation					
	est1	est2	est3	est4	est5	est6
	b/se	b/se	b/se	b/se	b/se	b/se
time	-.0117689***	-.0122394***	-.0110422***	-.0113461***	-.0112236***	-.0113043***
	(0.00161)	(0.00160)	(0.00159)	(0.00159)	(0.00159)	(0.00156)
treatment	.0056289***	.0034305*	.009851***	.0085726***	.0090837***	.008234***
	(0.00152)	(0.00152)	(0.00150)	(0.00150)	(0.00150)	(0.00148)
time* treatment	-0.0030089	-0.0028828	-0.0040508	-0.0039902	-.004066*	-0.0039202
	(0.00209)	(0.00209)	(0.00207)	(0.00207)	(0.00207)	(0.00204)
female		.0384712***	.0352997***	.0357114***	.0368628***	.0374584***
		(0.00106)	(0.00104)	(0.00104)	(0.00104)	(0.00103)
age			.0054276***	0.0004255	-.0008124*	-0.0006382
			(0.00005)	(0.00035)	(0.00035)	(0.00035)
age squared				.0000602***	.0000726***	.0000711***
				(0.00000)	(0.00000)	(0.00000)
married					.0184423***	.0142705***
					(0.00107)	(0.00106)
NSW						0
						.
VIC						-.0045337***
						(0.00125)
QLD						.126387***
						(0.00156)
SA						.0631588***
						(0.00215)
WA						-.0321328***
						(0.00154)
TAS						.1166529***
						(0.00404)
NT						.1133769***
						(0.00554)
ACT						.1891473***
						(0.00424)
Constant	.1911385***	.1765572***	-.0466801***	.0497984***	.0664356***	.0308916***
	(0.00116)	(0.00122)	(0.00213)	(0.00684)	(0.00691)	(0.00685)
N	573,800	573,800	573,800	573,800	573,800	572,765
R2	0.0003323	0.0026877	0.028695	0.0290765	0.0295614	0.0541155

*p < 0.05 ** p < 0.01 *** p < 0.001

Source: Authors' calculations using ALife.

Table B4. Placebo tests 2010-11. DiD results of the impact of the policy change on the value of post-tax superannuation contributions

Dependent variable: ln(cont)

	est1	est2	est3	est4	est5	est6
	b/se	b/se	b/se	b/se	b/se	b/se
time	-.0948893***	-.0984318***	-.0895929***	-.0922338***	-.0914034***	-.0917042***
	(0.01204)	(0.01203)	(0.01192)	(0.01192)	(0.01192)	(0.01171)
treatment	-0.0165103	-.0330633**	0.0143394	0.0032332	0.0066969	0.0014739
	(0.01122)	(0.01121)	(0.01109)	(0.01110)	(0.01111)	(0.01094)
time* treatment	-0.0171232	-0.0161735	-0.024797	-0.0242702	-0.0247838	-0.0238351
	(0.01546)	(0.01544)	(0.01525)	(0.01525)	(0.01525)	(0.01503)
female		.2896719***	.2662569***	.2698332***	.2776364***	.280761***
		(0.00775)	(0.00765)	(0.00764)	(0.00766)	(0.00755)
age			.0400725***	-0.0033858	-.0117751***	-.0102282***
			(0.00033)	(0.00254)	(0.00260)	(0.00257)
age squared				.0005229***	.0006068***	.0005938***
				(0.00003)	(0.00003)	(0.00003)
married					.1249878***	.0936315***
					(0.00787)	(0.00778)
NSW						0
						.
VIC						-.0355742***
						(0.00902)
QLD						.9430665***
						(0.01146)
SA						.4694125***
						(0.01572)
WA						-.2490405***
						(0.01103)
TAS						.8679684***
						(0.02981)
NT						.9113219***
						(0.04218)
ACT						1.558927***
						(0.03316)
Constant	1.417031***	1.30724***	-.3409354***	.4972606***	.6100143***	.3364895***
	(0.00875)	(0.00913)	(0.01575)	(0.05026)	(0.05080)	(0.05033)
N	573,800	573,800	573,800	573,800	573,800	572,765
R2	0.0003572	0.0028467	0.0292755	0.0298123	0.0302275	0.0569264

*p < 0.05 ** p < 0.01 *** p < 0.001

Source: Authors' calculations using ALife.

Table B5. Placebo tests 2011-12. DiD results of the impact of the policy change on participation (likelihood to make a post-tax superannuation contribution)

Dependent variable: participation

	est1	est2	est3	est4	est5	est6
	b/se	b/se	b/se	b/se	b/se	b/se
time	-.0125563***	-.0129514***	-.0120634***	-.0122987***	-.0121812***	-.0123518***
	(0.00153)	(0.00153)	(0.00151)	(0.00151)	(0.00151)	(0.00149)
treatment	0.0026199	0.0006489	.0056442***	.0041838**	.0046531**	.0038526**
	(0.00145)	(0.00144)	(0.00143)	(0.00143)	(0.00143)	(0.00141)
time* treatment	-.0045852*	-.0047577*	-.005281**	-.0052457**	-.0052313**	-.0046773*
	(0.00200)	(0.00199)	(0.00197)	(0.00197)	(0.00197)	(0.00195)
female		.0365914***	.0330245***	.0335699***	.0344984***	.0352047***
		(0.00100)	(0.00099)	(0.00099)	(0.00099)	(0.00098)
age			.0051301***	-.0008668**	-.0021937***	-.0020302***
			(0.00004)	(0.00032)	(0.00033)	(0.00033)
age squared				.0000722***	.0000855***	.000084***
				(0.00000)	(0.00000)	(0.00000)
married					.0194654***	.0152982***
					(0.00102)	(0.00101)
NSW						0
						.
VIC						-.0065423***
						(0.00118)
QLD						.1231011***
						(0.00150)
SA						.0565946***
						(0.00205)
WA						-.0323198***
						(0.00146)
TAS						.1101191***
						(0.00392)
NT						.0945355***
						(0.00523)
ACT						.1620351***
						(0.00410)
Constant	.1793696***	.1650533***	-.0445935***	.0706122***	.0888295***	.0563601***
	(0.00111)	(0.00116)	(0.00201)	(0.00640)	(0.00648)	(0.00644)
N	592,423	592,423	592,423	592,423	592,423	591,006
R2	0.0004147	0.0026984	0.0280427	0.0286435	0.0292201	0.0529135

*p < 0.05 ** p < 0.01 *** p < 0.001

Source: Authors' calculations using ALife.

Table B6. Placebo tests 2011-12. DiD results of the impact of the policy change on the value of post-tax superannuation contributions

Dependent variable: ln(cont)

	est1	est2	est3	est4	est5	est6
	b/se	b/se	b/se	b/se	b/se	b/se
time	-.0944836***	-.0974196***	-.0909103***	-.0928811***	-.0920617***	-.0935018***
	(0.01142)	(0.01142)	(0.01132)	(0.01132)	(0.01132)	(0.01114)
treatment	-.0336336**	-.0482776***	-0.0116609	-.0238945*	-.0206232*	-.0258048*
	(0.01063)	(0.01063)	(0.01051)	(0.01052)	(0.01052)	(0.01038)
time* treatment	-.029284*	-.0305659*	-.0344016*	-.0341065*	-.0340062*	-.0295811*
	(0.01468)	(0.01467)	(0.01450)	(0.01449)	(0.01449)	(0.01430)
female		.2718656***	.2457191***	.2502885***	.2567608***	.2611041***
		(0.00734)	(0.00724)	(0.00723)	(0.00724)	(0.00715)
age			.0376056***	-.0126321***	-.0218819***	-.0204447***
			(0.00032)	(0.00238)	(0.00244)	(0.00242)
age squared				.0006048***	.0006975***	.0006844***
				(0.00003)	(0.00003)	(0.00003)
married					.1356906***	.1043624***
					(0.00747)	(0.00738)
NSW						0
						.
VIC						-.0494861***
						(0.00851)
QLD						.9207726***
						(0.01102)
SA						.4201919***
						(0.01492)
WA						-.2496575***
						(0.01042)
TAS						.8147564***
						(0.02878)
NT						.7751262***
						(0.03992)
ACT						1.330159***
						(0.03192)
Constant	1.322142***	1.215775***	-.3210104***	.6441042***	.7710947***	.5211843***
	(0.00827)	(0.00866)	(0.01481)	(0.04700)	(0.04754)	(0.04726)
N	592,423	592,423	592,423	592,423	592,423	591,006
R2	0.0004878	0.0028517	0.0283872	0.0291778	0.0297031	0.0554133

*p < 0.05 ** p < 0.01 *** p < 0.001

Source: Authors' calculations using ALife.

Table B7. 2012-13 Sensitivity to outliers. DiD results of the impact of the policy change on the value of post-tax superannuation contributions, with outliers included

Dependent variable: ln(cont)

	est1	est2	est3	est4	est5	est6
	b/se	b/se	b/se	b/se	b/se	b/se
time	-.1000051***	-.1031167***	-.0979483***	-.1013715***	-.1033917***	-.102195***
	(0.01148)	(0.01147)	(0.01131)	(0.01130)	(0.01130)	(0.01115)
treatment	-.0834201***	-.0991579***	-.0586445***	-.0839406***	-.0795987***	-.0796605***
	(0.01061)	(0.01060)	(0.01043)	(0.01044)	(0.01044)	(0.01032)
time* treatment	-.0606658***	-.060511***	-.0621439***	-.0598789***	-.0593424***	-.0600756***
	(0.01470)	(0.01469)	(0.01443)	(0.01441)	(0.01440)	(0.01425)
female		.2695017***	.2315476***	.2411332***	.2467011***	.2508359***
		(0.00731)	(0.00717)	(0.00715)	(0.00715)	(0.00708)
age			.045179***	-.0616139***	-.0734657***	-.0716013***
			(0.00032)	(0.00241)	(0.00247)	(0.00246)
age squared				.0012831***	.001402***	.0013827***
				(0.00003)	(0.00003)	(0.00003)
married					.1718999***	.1419577***
					(0.00739)	(0.00732)
NSW						0
						.
VIC						-.0552245***
						(0.00855)
QLD						.8547758***
						(0.01094)
SA						.3609378***
						(0.01473)
WA						-.2682929***
						(0.01042)
TAS						.7126292***
						(0.02842)
NT						.597011***
						(0.03857)
ACT						1.286337***
						(0.03175)
Constant	1.33242***	1.223845***	-.6193563***	1.431228***	1.596732***	1.364121***
	(0.00826)	(0.00867)	(0.01487)	(0.04673)	(0.04741)	(0.04732)
N	607,565	607,565	607,565	607,565	607,565	606,038
R2	0.0010078	0.0032832	0.0400294	0.0435725	0.0443914	0.066468

*p < 0.05 ** p < 0.01 *** p < 0.001

Source: Authors' calculations using ALife.