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Marc K. Chan, Todd Morris, Cain Polidano, Ha Vu

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Abstract:

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Zusammenfassung:

Viele Regierungen bieten Steuervergünstigungen für Altersvorsorgebeiträge an, um die Altersvorsorge zu fördern und den fiskalischen Druck der Bevölkerungsalterung zu mildern. In diesem Beitrag zeigen wir, dass Einkommensreaktionen entscheidend für das Verständnis dieser Auswirkungen sind. Anhand von Steuerregisterdaten untersuchen wir große Veränderungen der Obergrenzen für steuerbegünstigte Beiträge zu individuellen Altersvorsorgekonten in Australien. Wir stellen fest, dass höhere Obergrenzen die Beiträge zur Altersvorsorge erheblich erhöhen, wobei etwa zwei Drittel dieser Reaktion durch einen Anstieg des Arbeitseinkommens finanziert werden. Der Gewinn an Einkommensteuereinnahmen gleicht den fiskalischen Verlust durch höhere steuerbegünstigte Beiträge aus, was die Bedeutung der Berücksichtigung von Einkommens- und Arbeitsangebotsreaktionen unterstreicht.

Keywords:

Tax concessions; retirement saving; taxable income; labor supply

JEL Classification:

H2, H3

Income and saving responses to tax incentives for private retirement savings*

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Abstract

Many governments offer tax concessions for retirement contributions to boost retirement savings and alleviate the fiscal pressures of population aging. In this paper, we show that income responses are crucial for understanding these impacts. Using tax-register data, we study large changes in caps on tax-favored contributions to individual retirement accounts in Australia. We find that higher caps increase retirement contributions considerably, with around two-thirds of this response financed by increases in earned income. The gain in income tax revenue offsets the fiscal loss from higher tax-favored contributions, emphasizing the importance of taking income and labor supply responses into account.

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1 Introduction

Many governments provide tax concessions for private pension contributions in an attempt to ease fiscal pressures on public pensions and encourage greater self-provision in retirement. While such incentives can encourage contributions, their effectiveness in raising retirement savings and alleviating fiscal pressures is unclear. In particular, there are concerns that these incentives may be both ineffective in raising savings, if additional contributions simply crowd-out other forms of saving, and fiscally counterproductive by reducing tax revenue. In studying these issues, the literature has focused on saving responses and the extent of crowding out, generally assuming away or conditioning on income responses (e.g., Poterba, Venti, and Wise 1995; Engen, Gale, and Scholz 1996; Gelber 2011; Chetty et al. 2014; Messacar 2018; Andersen 2018).

In this study, we propose that income responses are crucial in determining whether tax concessions for private pension contributions meet their objectives of increasing retirement savings and alleviating pressure on public finances. Theoretically, these concessions lower the effective tax rate on income, which may generate income responses through an increase in labor supply. If this response is large, individuals may predominantly finance additional contributions by increasing earnings rather than decreasing other savings or consumption. This would have appealing fiscal and economic implications. For example, the gain in income tax revenue may offset the fiscal loss from higher tax-favored contributions, implying net increases in private retirement wealth and labor supply at no cost to public finances.

Using tax-register data from 2007 to 2017, we exploit several sharp changes in limits on concessional contributions across age and time in the Australian superannuation system (ranging \$25,000–100,000).[1] Superannuation is the fourth-largest source of private pension assets in the world (Thinking Ahead Institute 2019). It is a mandatory private pension scheme for nearly all employees,[2] allowing individuals to make concessional contributions (taxed at a flat 15% rate) and non-concessional contributions. Like in many OECD countries, contributions above the concessional cap are subject to the marginal tax rate.[3] Concessional contributions are especially attractive for high-income earners; for example, individuals who

[1] In 2017, 1 AUD ≈ 0.8 USD.
[2] For the self-employed, contributions to superannuation are voluntary but also receive preferential tax treatment.
[3] Caps apply in 11 OECD countries, including the United States, the United Kingdom, Canada, Italy, Spain, Latvia, Slovenia, Estonia, Romania and Mexico (OECD 2018).

pay the top marginal tax rate of 45% can reduce their current tax burden by 30 cents with an additional dollar of contributions.

To understand the impacts of concessional caps, we start by developing a lifecycle model to generate testable predictions. Our theoretical model endogenizes labor supply, while capturing the trade-off between saving for retirement through superannuation (which receives preferential tax treatment up to the cap) and more liquid forms of private savings that may be the source of crowd-out. In our model, the effects of a cap change depend on individuals' initial contribution levels. For example, for an increase in the cap, individuals who contribute less than the initial cap are unconstrained and experience a wealth effect at best. In contrast, those who contribute at or just above the initial cap experience a strong substitution effect that encourages further contributions. In our model, because superannuation and private savings differ in liquidity, crowding-out is imperfect and increases in the cap will raise total saving, which is financed by decreases in leisure and/or consumption.

We empirically test these predictions using longitudinal tax-register data that spans three significant cap reforms. Our difference-in-differences approach exploits these reforms, as well as large discontinuities in the cap around age 50. Specifically, our estimates compare the change in the outcomes of individuals who experience a change in their cap from one year to the next (treatment) to the change for individuals who, because of their slightly different age, experience no cap change over the same years (control). Our main estimates are based on a sub-group of individuals close to the age of 50 who are high contributors (roughly in the top 5% of their cohort) and thus potentially affected by the cap changes. Importantly, our differences-in-differences approach allows us to estimate a broad set of responses to changes in the concessional contributions cap. We quantify gross and net saving responses within superannuation, test for possible crowding out of other sources of savings, and estimate impacts on labor earnings, taxable income and tax revenue.

In this way, our paper broadens the focus of the literature on the implications of tax concessions for private pension contributions beyond the issue of crowding-out. Labor supply and taxable income responses are important for policymakers to fully appreciate the impacts on public finances and the economy. Our paper also extends a growing literature on the impacts of concessional caps on contribution decisions (Milligan 2003; Andersen 2018; Lavecchia 2018) by providing the first evidence on the role of labor supply in financing contributions. Finally, to our knowledge, this study is the first to estimate the elasticity of taxable income (and its components) with respect to the marginal tax treatment of private pension contributions. Such cross-tax elasticity estimates are important for optimal taxation analysis in the presence of multiple tax bases with different tax rates (Kleven and Schultz 2014). Despite their importance, only a handful of studies have estimated cross-tax elasticities, and only in the context of substitution between different income sources, such as personal and corporate income (Romanov 2006) and labor and capital income (Pirttilä and Selin 2011; Kleven and Schultz 2014; Mortenson 2016).

Our results suggest strong contribution and taxable income responses among individuals constrained by changes in the cap, with little crowding-out of non-concessional contributions to superannuation. For our baseline sample of high contributors, our estimates imply that a \$25,000 increase in the cap increases total contributions by \$7,000 on average (+19%) and taxable income (which is inclusive of concessional contributions) by \$4,500 (+2.2%). Importantly, the increase in taxable income is fully explained by increases in income from earned sources, confirming the labor supply response predicted by our theoretical model. Since two-thirds of the contribution response is financed by a change in earned income, the average disposable income of individuals in our sample falls by merely \$1,550 (-1%), which is financed by a decline in private savings and/or consumption.[4] Overall, we estimate that cap increases had a net zero effect on income tax revenue, with increased revenue from the increase in total taxable income offsetting the foregone tax revenue associated with increased concessional contributions.

We support these findings with additional analyses. First, we validate our empirical approach by showing that our estimates are robust to different sample restrictions and capture consistent effects of several positive and negative cap changes. Second, we verify that our empirical strategy results in precise-zero estimates for the unconstrained sample. Finally, we examine whether the impacts on contributions and income reflect net changes in outcomes or shifting across tax years (le Maire and Schjerning 2013; Kreiner, Leth-Petersen, and Skov 2016) or between spouses (Stephens and Ward-Batts 2004). We find little evidence of shifting, suggesting that our estimates mainly capture net effects on contributions and earned income.

By focusing on the responses to contribution caps, our results are naturally most informative about the responses of high contributors. This is an important group because they

[4] Individuals in the sample have an average marginal tax rate of 38%, implying $(4500 - 7000) \times (1 - 0.38) = -1550$.

are predominantly high-income individuals, they contribute a large share of total income tax revenue, and they stand to gain the most from concessional contributions. In our context, this group also consists of a relatively high proportion of self-employed individuals, who have more flexibility in adjusting contributions and labor supply. These groups typically display the largest income elasticities in response to changes in tax rates (Saez, Slemrod, and Giertz 2012), suggesting that our estimates may be an upper bound of the response in other populations. Nonetheless, a general implication of our findings is that, by failing to consider income and labor supply responses, previous studies may have over-estimated the fiscal costs and under-estimated the economic benefits of tax concessions for private pension contributions.

The rest of the paper is organized as follows. Section 2 provides more information on superannuation and how it fits into Australia's tax and retirement systems. Section 2 also explains the changes to contribution caps over our sample period. Section 3 outlines the conceptual framework, which develops testable predictions about the impact of these changes. Section 4 discusses our data and empirical strategy and presents graphical evidence of our key results. Section 5 presents the results of our regression estimates. Section 6 concludes and discusses the policy implications of our results.

2 The superannuation system

Australia introduced compulsory superannuation for all employees in 1992. According to Australian Treasurer at the time, John Dawkins, the hope was that universal superannuation would increase the standard of living in retirement, ease the pressure of an aging population on the publicly funded Age Pension and boost national savings. Since its introduction, superannuation has expanded to a point where it is now the fourth-largest source of private pension assets in the world (Thinking Ahead Institute 2019). Accompanying the introduction of compulsory superannuation, employees (but not the self-employed) were required to contribute a minimum of 3% of their earnings for *ordinary hours of work*, known as the Superannuation Guarantee.[5] Since its inception in 1992, the Superannuation Guarantee rate steadily increased throughout the 1990s and is now 9.5%.[6] On top of mandatory employer

[5] Earnings from ordinary hours of work include commissions, shift loadings and allowances. Workers are not eligible for the Superannuation Guarantee if they are paid less than \$450 per month or aged under 18 and work less than 30 hours per week.
[6] The rate remained fairly stable over our sample period, with only modest increases in the 2013/14 and 2014/15 tax years, from 9% to 9.25% and 9.25% to 9.5%. From 1 July 2021, the rate is to rise by 0.5 percentage points per year until it reaches 12% on 1 July 2025.

contributions, individuals can also make voluntary contributions up until retirement or the age of 75.

For tax purposes, the Australian Government distinguishes between concessional contributions and non-concessional contributions.[7] Concessional contributions are taxed at a flat rate of 15% upon deposit into the superannuation fund, while non-concessional contributions are generally not taxed in the superannuation fund because individuals have already paid tax on this income.[8] For employees, concessional contributions consist of the mandatory contributions under the Superannuation Guarantee and any voluntary contributions made through salary sacrifice agreements, while non-concessional contributions can be paid directly from an employee's after-tax pay or transferred from a bank account. For the self-employed, contributions to superannuation are fully deductible for income tax purposes and are taxed at 15% upon deposit and classified as concessional contributions.

The Australian Government places annual caps on the total amount of concessional contributions (detailed in Section 2.1 below). Contributions beyond the cap do not receive concessional tax treatment (even mandatory employer contributions). They are taxed at an individual's marginal tax rate and subject to an interest charge (to account for the fact that the tax liability is deferred).[9]

In practice, whether people make voluntary concessional contributions is likely to depend on their marginal tax rate and income from non-employment sources, which can only be used to make non-concessional contributions. Individuals in the top income tax bracket, who face a marginal tax rate of 45%, have the strongest incentive to make voluntary contributions. For these individuals, concessional contributions can reduce their tax liability by $0.30 for each $1 contributed up to the cap. For those at the other extreme, there are no obvious tax incentives for making voluntary concessional contributions. To avoid creating a disincentive, the Australian government refunds the 15% tax on concessional contributions up to a cap of $500

[7] Defined benefit funds are taxed differently to what is described here. These are uncommon and restricted to older funds, especially in the public service.

[8] Income tax is assessed at the individual level according to a progressive schedule with five distinct tax brackets and a top marginal tax rate of 45%. Since the 2008/09 tax year, the 45% tax rate has applied for individuals earning over $180,000 per annum. The tax year in Australia starts on July 1st.

[9] Prior to the 2013/14 tax year, excess concessional contributions were taxed at 46.5% (the top individual income tax rate of 45% plus the 1.5% Medicare levy). From 2013/14, they were taxed at the individual's marginal tax rate plus the Medicare levy. In practice, this changed little because most taxpayers who exceed the cap face the top marginal tax rate of 45%.

for low-income earners who have income below $37,000 per annum (and face a marginal tax rate of 0% or 19%).

In the accumulation phase, investment returns within superannuation are also taxed at a flat rate of 15%. This means that most taxpayers benefit from a lower tax rate on investment returns within superannuation than is the case for other assets, where returns are taxed at marginal tax rates. For most individuals, superannuation assets are managed by a professional fund and invested in a combination of stocks, property and cash.

In retirement, benefits are paid as either a lump-sum or as an income stream. As is typical for private pensions, there is a minimum age from which people can access their savings, known as the preservation age. This age is currently 58 and has been increased by one year every second financial year since 1 July 2015, with the increases due to cease at age 60 on 1 July 2024. For this study, these changes are not particularly important because we are focused on wealthier individuals who have a strong incentive to delay claiming until age 60. From 2007/08, benefits withdrawn from the fund are tax free from age 60, and individuals do not have to be permanently retired from the labor market to withdraw funds.[10] Prior to the preservation age, superannuation is very illiquid, as withdrawals are only possible under exceptional circumstances. For example, up to $10,000 can be withdrawn at a time under severe financial hardship or the entire balance can be withdrawn for compassionate reasons or if the balance is less than $200.[11]

2.1 Changes in the concessional contribution cap over time

A cap on concessional contributions limits the amount that individuals can contribute at the flat rate of 15% in each tax year (starting July 1). Historically, there were age-specific caps for those aged below 35, 35–49, and 50+ (at the end of the tax year), with the cap level significantly increasing with age. These large cap differences by age, a novel feature of the Australian context, reflected a view that people approaching retirement have greater inclination and resources to save for retirement. In 2007, under the new ‘Simpler Super’ policy, the center-right Liberal government introduced reforms to phase out age-based caps over five years.[12] As part of the phase-out, a new general cap was introduced at $50,000 from July 2007, with a ‘transitional cap’ introduced for those aged 50+ at $100,000 that was legislated to end in June

[10] At ages 60–64, individuals have to cease one (but not all) employment arrangements to access their superannuation. From age 65, individuals have full access without any employment conditions.
[11] Compassionate grounds are if the superannuant is terminally ill or incapacitated.
[12] Enacted under the Tax Assessment (Transitional Provision) Act 1997.

2012. The intention of the transitional cap was to give "people who were planning to retire soon an opportunity to continue to make larger concessional contributions".[13]

In this study, we exploit several cap changes that occurred between the 2008/09 and 2014/15 financial years under a newly elected center-left Labor Government. Despite its commitment to maintain the Simpler Super reforms during the 2007 Federal election campaign, Labor, following a resounding election win, announced a 50% cut to both the general and transitional caps in May 2009. This policy was effective almost immediately, reducing caps for the 2009/10 year from $50,000 to $25,000 for individuals under 50 and from $100,000 to $50,000 for individuals aged 50+ ("Reform 1" in Figure 1). In May 2011, Labor reneged on its commitment to a single cap, announcing a policy that would effectively extend the transitional cap beyond the 2011/12 year for individuals aged 50+ with 'low balances' (less than $500,000). However, in May 2012, they postponed this change until 1 July 2014. This postponement meant the end of the transitional cap on 30 June 2012, which harmonized the caps at $25,000 in the 2012/13 year ("Reform 2" in Figure 1). Behind in the polls and facing an election, Labor further tinkered with these reforms in May 2013 and decided to increase the cap to $35,000 from 2014/15 for individuals aged 50+, regardless of their superannuation balance ("Reform 3" in Figure 1).[14] In the 2014/15 year, the cap also increased for individuals under 50 from $25,000 to $30,000. However, this increase simply reflected an indexing adjustment based on wage growth since the 2009/10 year, when the general cap of $25,000 was introduced.[15]

3 Conceptual Framework

We construct a multi-period model to illustrate how the concessional contribution cap affects an individual's earnings and superannuation contributions several years before retirement. The model consists of a work phase ($t = 1, \dots, T - 1$) and a retirement phase ($t = T, \dots, T'$). In the work phase, which is the focus of our model, the individual has a superannuation balance of A_t^S and a private asset balance of A_t^P at the beginning of each period. She receives a random wage draw w_t. Based on the realization of w_t, she chooses her level of leisure $Z_t \in [0,1]$ ($Z_t = 1$ if she does not work), superannuation contribution $S_t \geq 0$,[16] and consumption C_t. Her

[13] See 2006 budget statement, https://archive.budget.gov.au/2006-07/additional/overview2.pdf.
[14] Individuals aged 60+ had access to the $35,000 cap one year earlier, in 2013/14.
[15] The cap was only allowed to change in $5,000 increments.
[16] For simplicity, our model assumes away mandatory employer contributions under the Superannuation Guarantee (i.e., individuals choose $S_t \geq 0$). Although contributions under the Superannuation Guarantee count towards the concessional contribution cap, few individuals reach the cap from these contributions alone.

superannuation contribution is accumulated toward A^S, which is not accessible until the retirement phase. However, her private asset A^P is accessible in all periods, only subject to the no-borrowing constraint $A_t^P \geq 0 \ \forall t$ in an imperfect credit market. Therefore, A^P can be used to smooth consumption by insuring against low wage shocks in the future.

Superannuation contributions S_t are taxed at a concessional rate τ_s up to the concessional contribution cap $\bar{s}_t$, which may vary with age. Contributions beyond $\bar{s}_t$ are taxed at the constant income tax rate τ ($\tau > \tau_s$). The tax on S_t is deducted from A_t^S. The individual's employment income net of superannuation contributions, given by $w_t(1 - Z_t) - S_t$, is taxed at rate τ, as is her income from the private asset A_t^P.

Assuming intertemporally separable utility and discount factor β, the individual's utility maximization problem in $t = 1, \ldots, T - 2$ can be written in Bellman equation form as follows:

$$V_t(A_t^S, A_t^P; w_t) \coloneqq \max_{0 \leq Z_t \leq 1;\, S_t \geq 0; \widetilde{A_t^P} \geq 0} u(C_t, Z_t) + \beta E_t V_{t+1}(A_{t+1}^S, A_{t+1}^P) \tag{3.1}$$

subject to the following constraints:

$$C_t + \widetilde{A_t^P} = (1 - \tau)[w_t(1 - Z_t) - S_t] + A_t^P \tag{3.2}$$

$$A_{t+1}^P = [1 + r_p(1 - \tau)]\widetilde{A_t^P} \tag{3.3}$$

$$A_{t+1}^S = [1 + r_s(1 - \tau_s)][A_t^S + [(1 - \tau_s)S_t - (\tau - \tau_s)\max\{S_t - \bar{s}_t, 0\}]] \tag{3.4}$$

The expected value function $E_t V_{t+1}(.)$ integrates out w_{t+1}, which is unknown in period t. Constraint (3.2) implies that the resources in period t, which consist of disposable employment income $\tilde{Y}_t \coloneqq (1 - \tau)[w_t(1 - Z_t) - S_t]$ and the opening balance of the private asset A_t^P, are allocated between consumption C_t and the end-of-period balance $\widetilde{A_t^P}$. The opening balance of the private asset next period, A_{t+1}^P, equals $\widetilde{A_t^P}$ rewarded by an after-tax return factor $R_p \coloneqq 1 + r_p(1 - \tau)$ (constraint (3.3)). By constraint (3.4), the end-of-period superannuation balance is equal to the opening balance A_t^S plus the after-tax superannuation contribution, which is given by the piecewise linear function $f(S_t; \tau_s, \bar{s}_t) \coloneqq (1 - \tau_s)S_t - (\tau - \tau_s)\max\{S_t - \bar{s}_t, 0\}$. The opening balance next period, A_{t+1}^S, equals the end-of-period balance this period rewarded by after-tax return factor $R_s \coloneqq 1 + r_s(1 - \tau_s)$. Note that investment returns within superannuation are taxed at the concessional rate τ_s.

We now discuss the retirement phase ($t = T, \ldots, T'$), which is an absorbing state in which the individual does not work and decumulates her assets. Because superannuation becomes liquid, there is no longer a fundamental difference between A^S and A^P. To simplify the model, we assume $R_s > R_p$, which implies the individual prefers to place all her assets in superannuation in the retirement phase. Hence we can write the value function at the start of the retirement phase as $V_T(A_T^S) := \max_{C_T,\ldots,C_{T'}} \sum_{t=T}^{T'} \beta^{t-T} u(C_t, 1)$.

This function condenses the post-retirement optimal utilities as a terminal value, from which the optimal decisions during the work phase $(t = 1, \ldots, T-1)$ are solved backward recursively.[17] The first order conditions for the optimization problem in (3.1)–(3.4) are as follows:

$$Z_t: \quad \frac{\partial u}{\partial C_t}(1-\tau)w_t \leq \frac{\partial u}{\partial Z_t} \quad \text{with equality if } Z_t^* < 1 \tag{3.5}$$

$$\widetilde{A_t^P}: \quad \frac{\partial u}{\partial C_t} = \beta R_p \frac{\partial E_t V_{t+1}(A_{t+1}^S, A_{t+1}^P)}{\partial A_{t+1}^P} \tag{3.6}$$

S_t:

Case A:[18] $(S_t^* \leq \bar{s})$
$$(1-\tau)\frac{\partial u}{\partial C_t} = \beta R_s (1-\tau_s) \frac{\partial E_t V_{t+1}(A_{t+1}^S, A_{t+1}^P)}{\partial A_{t+1}^S} \tag{3.7}$$

Case B: $(S_t^* = \bar{s})$
$$(1-\tau)\frac{\partial u}{\partial C_t} < \beta R_s (1-\tau_s) \frac{\partial E_t V_{t+1}(A_{t+1}^S, A_{t+1}^P)}{\partial A_{t+1}^S} \quad \text{and} \tag{3.8}$$
$$\frac{\partial u}{\partial C_t} > \beta R_s \frac{\partial E_t V_{t+1}(A_{t+1}^S, A_{t+1}^P)}{\partial A_{t+1}^S} \tag{3.9}$$

Case C: $(S_t^* > \bar{s})$
$$\frac{\partial u}{\partial C_t} = \beta R_s \frac{\partial E_t V_{t+1}(A_{t+1}^S, A_{t+1}^P)}{\partial A_{t+1}^S} \tag{3.10}$$

We maintain the assumption that $u(.)$ is increasing and globally concave in both arguments, $u(0,.) = -\infty$, $u(.,0) = -\infty$, $u'(0,.) = \infty$, $u'(.,0) = \infty$, and w_t follows a twice differentiable cumulative distribution function with continuous support over $\mathbb{R}_{\geq 0}$ and positive probability of $w_t = 0$. Overall, these conditions highlight trade-offs between consumption, leisure (hence work) and saving through superannuation and the private asset (with optimal choices denoted by *). FOC (3.5) captures the leisure-consumption trade-off, which holds with

[17] When $t = T-1$, the Bellman equation is
$$V_{T-1}\left(A_{T-1}^S, A_{T-1}^P; w_{T-1}\right) := \max_{0 \leq Z_{T-1} \leq 1;\, S_{T-1} \geq 0;\, \widetilde{A_{T-1}^P} \geq 0} u(C_t, Z_t) + \beta V_T(A_T^S)$$
where $\widetilde{A_{T-1}^P}^* = 0$, i.e., the private asset is shifted to superannuation or consumed.

[18] For illustration purpose, we assume $\bar{s}_t = \bar{s}$ here. See subsequent discussion for age-varying $\bar{s}_t$. Also, we do not discuss the corner solution $S_t^* = 0$ because, as is evident in discussions on the comparative statics of $\bar{s}$, the effects are qualitatively the same as Case A. Empirically, an employee has a strictly positive contribution due to the Superannuation Guarantee.

equality when the individual works ($Z_t^* < 1$). FOC (3.6) equates the marginal utility of consumption with the marginal (expected) future value of wealth in the private asset. The equality implies that the individual holds positive private assets (i.e., $\widetilde{A_t^P}^* > 0$) to insure against wage shocks.[19]

FOCs (3.7)–(3.10) are the focus of our model, characterizing the trade-off between consumption and superannuation contributions, S_t. Due to the change in the tax treatment of superannuation contributions at the concessional cap, this trade-off depends on whether S_t^* is below the cap $\bar{s}$ (Case A), at the cap (Case B), or above the cap (Case C). In Case A, an extra unit of S_t is taxed at the concessional rate τ_s, yielding an expected future value of $\beta R_s\,(1-\tau_s)\,\frac{\partial E_t V_{t+1}(A_{t+1}^S, A_{t+1}^P)}{\partial A_{t+1}^S}$ at the margin. This extra unit of S_t also reduces disposable employment income $\tilde{Y}_t$ at the income tax rate τ, resulting in a loss of current utility of $(1-\tau)\frac{\partial u}{\partial C_t}$ at the margin. FOC (3.7) equates both margins to yield S_t^*. Case B represents the kink point $\bar{s}$ where a further increase in S_t is no longer taxed at the concessional rate τ_s but instead at rate τ. For $S_t^* = \bar{s}$, both (3.8) and (3.9) must hold; (3.8) implies that the individual would increase contributions further if the cap was higher, while (3.9) implies that the individual would reduce contributions under a lower cap. In Case C, an extra unit of S_t is taxed at rate τ and reduces disposable employment income $\tilde{Y}_t$ at the same rate (and so $1-\tau$ on both sides of (3.10) cancels out).

Graphical description of the budget constraint in work phase. Before discussing comparative statics, we provide some graphical illustrations of the budget constraint. Figure 2a shows that, *conditional on labor supply* ($H_t \coloneqq 1 - Z_t$), the total tax paid in period t is a weakly decreasing function of superannuation contributions, S_t. Specifically, taxes decline with S_t at rate $\tau - \tau_s$ up to $\bar{s}$ and are constant thereafter. The figure also shows the change in tax paid if $\bar{s}$ is increased from $\bar{s}^L$ to $\bar{s}^H$ (**$A_L B_L C_L$** becomes **$A_H B_H C_H$**). The new cap does not affect the amount of tax paid for S_t up to $\bar{s}^L$, gradually decreases tax for S_t between $\bar{s}^L$ and $\bar{s}^H$, and decreases tax by a constant amount of $(\tau-\tau_s)(\bar{s}^H - \bar{s}^L)$ for $S_t \geq \bar{s}^H$. This figure suggests that an increase in the cap is likely to reduce tax revenue. However, these effects may be fully or partially offset by labor supply responses. As discussed below, we expect higher caps to lead

[19] Note that $\widetilde{A_t^P}^* = 0$ cannot be a solution as there is positive probability that $w_{t+1} = 0$ next period, in which case the utility equals negative infinity. It is optimal to have $\widetilde{A_t^P}^* > 0$ since $\frac{\partial E_t V_{t+1}(A_{t+1}^S, A_{t+1}^P)}{\partial A_{t+1}^P}\Big|_{A_{t+1}^P = 0} = \infty$.

to an increase in labor supply among constrained savers: individuals with contributions between the two caps, i.e., $S_t \in [\bar{s}^L, \bar{s}^H)$.

Figure 2b shows how superannuation contributions, S_t, lead to an increase in retirement wealth at the expense of disposable employment income in period t, $\tilde{Y}_t \coloneqq (1-\tau)[w_t H_t - S_t]$, for a given level of labor supply. $\mathbf{A_L B_L C_L}$ is the allocation frontier when the concessional contribution limit is $\bar{s}^L$. The allocation frontier becomes $\mathbf{A_H B_H C_H}$ when the limit increases to $\bar{s}^H$. $\mathbf{A_L B_L}$ and $\mathbf{A_H B_H}$ correspond to areas on the frontier in which it is relatively inexpensive to increase future retirement wealth (in terms of foregone disposable income) due to the preferential tax treatment of superannuation contributions. $\mathbf{B_L}$ and $\mathbf{B_H}$ are kink points in which S_t equals $\bar{s}^L$ and $\bar{s}^H$, respectively. As discussed below, constrained savers are likely to respond to an increase in the cap by increasing contributions (a movement to the left along the allocation frontier). However, as labor supply responses are expected to finance part of this increase (a rightward shift of the allocation frontier), the reduction in disposable income may be modest.

Comparative statics. We now consider how individuals are likely to respond to a change in the concessional cap, $\bar{s}$. We distinguish between changes that are pre-announced, changes that apply immediately and an age-specific regime, in which the cap is more generous for individuals close to retirement. For ease of exposition, we focus on the effects of an increase in the cap. The model predicts opposing impacts for a decrease in the cap.

A. Pre-announced changes. Suppose the government announces in period t that the concessional contribution cap $\bar{s}$ will be increased from $\bar{s}^L$ to $\bar{s}^H$ starting from period t', where $t' > t$. The only effects on behavior in period t are through expectations about an increase in retirement wealth due to a more generous policy in the future. We can think about this as an upward shift in the allocation frontier in Figure 2b. As we explain in more detail in Appendix A1, this positive wealth effect reduces the marginal future value of contributions to superannuation, leading to a reduction in superannuation contributions and labor supply, higher consumption, and an ambiguous effect on private savings. We note that the size of the wealth effect depends on how likely the individual was to contribute more than $\bar{s}^L$ in future periods. If $\bar{s}^L$ is already high, the individual is unlikely to gain much from a further increase in the limit, and the wealth effect is likely to be weak. Relatedly, if the majority of the individual's wealth is outside superannuation, then the wealth effect is also likely to be small.

B. Immediate changes. Now suppose $t' = t$, that is, $\bar{s}^L$ increases to $\bar{s}^H$ from period t onwards. In addition to wealth effects, the change in the allocation frontier (from $\mathbf{A_L B_L C_L}$ to

$A_H B_H C_H$ in Figure 2b) generates substitution effects in period t. Let $S^*_{t,\bar{s}^L}$ denote the individual's optimal S_t in the old regime ($\bar{s}^L \forall t$). As summarized in the table at the bottom of Figure 2, the overall behavioral effects depend on $S^*_{t,\bar{s}^L}$, i.e., the individual's location in the old allocation frontier:

- Case A $\left(S^*_{t,\bar{s}^L} < \bar{s}^L\right)$: These individuals are "inframarginal" in the allocation frontier, i.e., they are not constrained by $\bar{s}^L$. Hence, they are only subject to the wealth effect as discussed above.
- Case B $\left(S^*_{t,\bar{s}^L} = \bar{s}^L\right)$: These individuals make up the first part of the key group of constrained savers; they are at the initial kink point $\bar{s}^L$ but may now contribute up to $\bar{s}^H$ at the concessional rate. Assuming that $\tau_s - \tau \ll 0$, the literature suggests that the substitution effect is likely to dominate the wealth effect (Duflo et al. 2006; Engelhardt and Kumar 2007). As explained in Appendix A, this will cause individuals to increase superannuation contributions (possibly as far as $\bar{s}^H$), decrease consumption, increase labor supply, and decrease private savings. Thus, the increase in superannuation contributions is expected to be financed by a combination of higher earnings and lower private savings and consumption.[20] The overall effect on tax paid is ambiguous, as tax receipts increase due to the increase in labor supply (depicted by an upward shift of **ABC** in Figure 2a) while the additional contributions to superannuation decrease tax receipts at the rate $\tau - \tau_s$ (a movement to the right in Figure 2a from **B_L** along **$A_H B_H$**). The net effect depends on the relative elasticities of response with respect to labor supply and superannuation contributions, as well as the relative share of tax revenue levied on income taxes (high) and superannuation contributions (low).
- Case C $\left(S^*_{t,\bar{s}^L} \in (\bar{s}^L, \bar{s}^H)\right)$: These individuals make up the second and final part of the key group of constrained savers; they are above the initial kink point but below the new kink point. The effects are similar to Case B, but the wealth effects are stronger because there is an immediate increase in superannuation balances of $(S^*_{t,\bar{s}^L} - \bar{s}^L)(\tau - \tau_s)$ even without changes in behavior.
- Case D ($S^*_{t,\bar{s}^L} \geq \bar{s}^H$): These individuals make contributions in excess of both caps and are subject to the wealth effect only. The wealth effect is larger than in Case A and Case

[20] As we expect an increase in labor supply and a decrease in consumption, total savings is expected to increase (see Appendix A1).

C because there is an immediate increase in superannuation balances of $(\bar{s}^H - \bar{s}^L)(\tau - \tau_s)$ even without changes in behavior.

C. Age-varying caps. Finally, let us consider a policy regime in which the cap varies with age, i.e., $\bar{s}_t = \bar{s}^L$ for $t < a$ and $\bar{s}_t = \bar{s}^H$ for $t \geq a$. Assume the individual knows the regime, i.e., when she makes decisions in $t < a$, she knows that the cap will be higher in the future. Let us consider the difference in behavior between $t = a$ and $t = a - 1$. Assuming that the individual is many years from retirement, i.e., $T \gg a$, the wealth effects of this regime are likely to be similar at $t = a$ and $t = a - 1$. As such, any major differences in behavior are likely to stem from the substitution effects discussed above under "*B. Immediate changes*". Moreover, these effects should be concentrated among constrained savers (Cases B and C), who have contributions between the old and new caps.[21]

Discussion. Existing models on the effects of contribution caps – and tax-favored retirement accounts more generally – emphasize the importance of substitution between asset classes and assume labor supply to be exogenous (e.g., Gale and Scholz 1994; Milligan 2003; Chetty et al. 2014). To illustrate why labor supply is important in our model, consider the example of an immediate cap increase from $\bar{s}^L$ to $\bar{s}^H$ for a constrained saver at the initial cap $\bar{s}^L$ (Case B above). If private savings and superannuation were perfect substitutes (besides the preferential tax treatment of superannuation contributions and investment income within superannuation), the individual would simply shift private assets to superannuation to minimize tax paid, with no need to sacrifice consumption or leisure.[22] However, these assets are imperfect – and potentially weak – substitutes because private savings are liquid while superannuation is not.[23] As such, increases in the cap are likely to raise total savings, which must be financed by decreases in consumption and/or leisure. To further understand the incentive for an increase in labor supply, consider the impact on effective marginal tax rates. Without any change in the cap, an additional dollar of earnings will be taxed at rate τ for constrained savers. However, when the cap increases, the effective marginal tax rate on an additional dollar falls to $\tau_{EMTR} \in [\tau_s, \tau]$, depending on how much is allocated to superannuation. For example, $\tau_{EMTR} = \tau$ if the extra contribution is \$0, and $\tau_{EMTR} = \tau_S$ if the

[21] Our empirical analysis focuses on the short-term effects of cap changes on individuals who are several years from retirement. Note that, in the long run, the wealth effects of higher caps accumulate, which may result in negative effects on labor supply and contributions near the retirement age. However, if higher caps are sustained, the theoretical predictions are ambiguous, as the substitution effects may continue to dominate the wealth effects.
[22] In fact, consumption and leisure may increase marginally in this example due to the reduced tax burden.
[23] Empirically, this is supported by the fact that over 90% of individuals contribute less than the contribution cap, even though this means that most individuals fail to minimize their tax burden.

extra contribution is \$1. Thus, the increase in the cap reduces the effective marginal tax rate (albeit endogenously) and incentivizes labor supply. This incentive is likely to be strong in our context given the large cap changes and the large gap between τ and τ_s for high earners.

4 Data and empirical approach

4.1 Data

Our principal data source is the Australian Longitudinal Information Files (ALife), a 10% random sample of the Australian Tax Office's client register of all tax filers between 1980 and 2016. For this 'broad sample', all individual tax and superannuation records since the 1996/97 financial year are made available and longitudinally linked via a unique tax file number. To examine the impacts of concessional cap changes, we restrict the sample to the 2007/08 to 2016/17 financial years. This allows us to focus on a period with larger and more salient cap changes,[24] including from the three most significant reforms to concessional caps since their introduction in 1994, and focus on a period with consistent rules around taxes on withdrawals. Importantly, ALife contains information on age in years at the end of the financial year, which is crucial for identification, and separates contributions from concessional and non-concessional sources, allowing us to examine the extent to which the changes to concessional contribution caps crowd out non-concessional contributions. See Polidano et al. (2020) for more details about the ALife data.

Besides contributions, another key outcome is employment income, which we use as our primary measure of labor supply. Our measure of employment income reflects the whole benefit package and consists of wages and salaries, allowances, personal service income, fringe benefits, contributions via employment arrangements (mandatory employer contributions and salary sacrificed amounts). As a secondary measure, we examine changes in business income from sole proprietorships, partnerships and trusts (prior to any superannuation contributions), which could reflect labor supply responses among the self-employed but may also be more prone to manipulation. Other items from individual tax returns allow us to examine additional responses. To examine substitution between superannuation contributions and other forms of savings, we use investment income (outside of superannuation) and capital gains as proxies for savings outside of superannuation. We use total (non-superannuation related) tax deductions to measure other changes in tax-minimizing behavior. Finally, to summarize the net effects on

[24] Prior to 2007/08, the caps were not set at round numbers and increased each year in line with wage growth.

taxable income and government finances, we examine changes in taxable income (which consists of all types of income, including the main components outlined above, minus deductions) and total tax paid, which is comprised of (i) progressive income tax on taxable income net of concessional contributions (ii) and the tax on concessional contributions.

To estimate the impacts of cap changes, we restrict the sample to individuals who are aged 48–51 at the end of the financial year. Our identification strategy relies on within-year variation in cap changes, which only exists because of the different caps for individuals above and below the age of 50. This means that our identifying assumptions are more plausible if we focus on individuals close to this age.[25] We also restrict our main sample to high contributors who are potentially affected by the cap changes over our sample period. Given the lowest cap during the sample period is \$25,000, we restrict our sample to individuals who have contributed at least \$23,000 to superannuation in the current and previous financial year (our regression models are estimated in first differences).[26] This sample restriction results in an unbalanced panel of 39,406 individual-year observations on 14,134 individuals, which corresponds to 5.4% of observations among individuals aged 48–51.

Restricting the sample to high contributors is supported by the data. Consistent with our theoretical model, individuals contributing less than \$23,000 do not appear to respond to changes in the concessional cap, while the responses from higher contributors are evident in the data. In Figure 3, we present the distributions of total contributions to superannuation among individuals aged 48–51, with individuals separated into groups based on their cap in the relevant year. Namely, Figure 3 shows the percent of tax filers with contributions in each \$1,000 bin for the three most common cap levels: (i) \$25,000; (ii) \$50,000; and (iii) \$100,000. We also overlay the empirical distribution functions for individuals facing each cap level. Evidently, there is clear bunching in total contributions at the relevant concessional cap, indicating that high contributors are responding to changes in the cap, but the distributions are extremely similar below \$25,000.

Table 1 summarizes the characteristics of our sample. We compare the characteristics of all tax filers aged 48–51 (column 1) with those in our main sample (column 2). On average, individuals in our sample contribute more to superannuation per year (\$37,819 vs. \$9,623),

[25] As discussed in Section 5.2, we find similar estimates with a wider age sample of 45–54-year-olds.

[26] In each year, we exclude the top 0.2% of income earners by age. To reduce the impact of outliers, we also exclude observations that have extreme absolute changes in taxable income (top 1% in the distribution) as they are likely to be driven by factors other than the cap changes.

have higher taxable incomes ($204,674 vs. $78,709) and pay much more income tax ($58,366 vs. $17,594). These characteristics make individuals in our sample an important group from a public finance perspective; despite making up only 5.4% of the population (for their age), they make 21.2% of superannuation contributions and contribute 17.9% of income tax revenue. Like the rest of the population, individuals in our sample derive most of their taxable income from employment income (79%), with business income making up the second largest component (17.9%). In terms of demographics, individuals in our sample are more likely to be male (65.7% vs. 50.0%), married (77.5% vs. 63.5%), have income from a trust or business (47.7% vs. 21.2%), and be in the top income tax bracket (46.1% vs. 6.1%).

Before describing our regression framework, we present graphical evidence of the broader response to changes in the cap from high contributors. Figure 4a shows, for the main sample, how changes in the concessional cap from year $t-1$ to t are associated with changes in the key outcomes over the same years. We plot the mean change in the key outcomes (total contributions, taxable income, employment income and tax paid) for individuals impacted by different cap changes, subtracting common changes in outcomes among individuals who experience no change in the cap. Evidently, there is a positive correlation between the change in the concessional cap and the change in total contributions, as previously implied by the bunching at the caps in Figure 3. For example, high contributors who experience a $25,000 decrease in the cap reduce their contributions by around $12,500 on average, while those who experience an increase in the cap of the same magnitude increase their contributions by around $11,000. We also see a slightly weaker but clearly positive relationship between the change in the cap and the change in taxable income, and this relationship seems to be largely explained by changes in employment income. This provides suggestive evidence that, when the cap increases, high contributors finance part of their additional contributions through an increase in earned income. Finally, we see little association between the change in the cap and the change in tax paid. This suggests that changes in tax revenue from changes in the amount contributed to superannuation are roughly offset by changes in total taxable income. Figure 4b shows the analogous figure for the unconstrained (and larger) sample of low-to-medium contributors. As expected, there are no meaningful associations between changes in the cap and changes in outcomes for this group.

4.2 Empirical strategy

Our identification strategy exploits the considerable variation in the concessional cap over time and around the age of 50. We use a differences-in-differences approach that compares the one-year change in outcomes for individuals who experience a change in the concessional cap (treatment) to the change for individuals who, because of their slightly different age, experience no change in the concessional cap in the same years (control). Our main sample consists of high contributors who experience a combination of substitution effects and changes in expected/actual retirement wealth. However, the wealth effects of changes in the cap are likely to be absorbed by our identification strategy, leaving the substitution effects as the dominant identified mechanism.[27]

We implement our baseline empirical strategy by estimating the following regressions:

$$\Delta Y_{it} = \delta \Delta \mathrm{Cap}_{it} + \gamma_{\mathrm{t}} + \mathrm{FE\_age}_{it} + \beta \Delta X_{it} + \epsilon_{it} \tag{4.1}$$

where i indexes an individual taxpayer and t the tax year; ΔY_{it} is the change in the variable of interest for individual i from $t-1$ to t; γ_t are a set of year fixed effects, to control for unobserved factors affecting ΔY_{it} over time; $\mathrm{FE\_age}_{it}$ is a set of fixed effects for age in years to control for age-specific factors affecting ΔY_{it}; ΔX_{it} controls for changes in individual factors that may affect ΔY_{it}, including a change in marital status, business ownership, and investment property ownership. We also include a female dummy to allow for sex-specific trends in ΔY_{it}.[28]

The key explanatory variable identifying the treatment effect is $\Delta \mathrm{Cap}_{it}$, the change in the concessional cap for individual i from year $t-1$ to t, divided by \$1,000. Its coefficient, δ, estimates the average causal effect of a \$1,000 change in the cap on Y_{it} among high contributors. As we include year fixed effects, δ is identified from within-year variation in $\Delta \mathrm{Cap}_{it}$, which exists because of the different limits over time for people below and above the age of 50. Figure 5 shows this variation visually, plotting the concessional cap in each year by birth cohort for people aged 48–51. Evidently, there is considerable within-year variation in cap changes across cohorts. For example, from 2007/08 to 2008/09, the cap was constant at

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[27] This is obvious in the case of cap changes from age-based limits since these are known in advance. In the case of a policy-induced change, the wealth effects are likely to be similar for adjacent cohorts. For example, from 2008/09 to 2009/10, the cap decreased from \$100,000 to \$50,000 for people over 50. This meant that individuals born between July 1958 and June 1959 (the 1959 cohort) had their cap decrease from \$100,000 to \$50,000, while the 1960 cohort had a constant cap level of \$50,000. However, both cohorts would have expected a cap of \$100,000 in 2009/10, as the 1960 cohort turned 50 in that year. Thus, the reform would have had similar wealth effects for both cohorts, and differences in ΔY_{it} for these cohorts from 2008/09 to 2009/10 are likely to reflect the substitution effects of the reduction in the cap for the 1959 cohort.

[28] Most of the identification comes from the fixed effects. The estimates are similar without controls.

\$100,000 for people born between July 1957 and June 1958 (the "1958" cohort); the cap increased from \$50,000 to \$100,000 for the 1959 cohort, as they turned 50; and the cap was constant at \$50,000 for the 1960 cohort. If we restricted the sample to these two years, equation (4.1) would compare changes in Y_{it} from 2007/08 to 2008/09 for the 1959 cohort (treatment) to the 1958 and 1960 cohorts (control). Pooling all years from 2007/08 to 2016/17 utilizes similar comparisons for other years, allows us to flexibly control for age, and scales the effects by the size of the cap change.[29]

Allowing for non-linear and asymmetric impacts. We also estimate regressions that relax the assumption that the effects are linear and symmetric in the size of the cap change:

$$\begin{aligned}\Delta Y_{it} = \quad & \Delta\text{Cap}_{it}\{\delta_1 \mathbf{1}(\Delta\text{Cap}_{it} = -50K) + \delta_2 \mathbf{1}(\Delta\text{Cap}_{it} = -25K) + \delta_3 \mathbf{1}(\Delta\text{Cap}_{it} \in \{5K,\ 10K\}) \\ & + \delta_4 \mathbf{1}(\Delta\text{Cap}_{it} = 25K) + \delta_5 \mathbf{1}(\Delta\text{Cap}_{it} = 50K)\} + \gamma_t + \text{FE\_age}_{it} + \beta\Delta X_{it} + \epsilon_{it}\end{aligned} \tag{4.2}$$

where these regressions modify equation (4.1) by interacting the key variable ΔCap_{it} with five dummy variables for the size of the cap change. In these regressions, the reference category is individuals who have no change in the cap. Because the δ_k coefficients are scaled by the size of the cap change, we can compare these coefficients to assess the assumptions of linear and symmetric impacts.[30] For example, linear effects would imply that $\delta_1 = \delta_2$ and $\delta_4 = \delta_5$, while symmetric effects would imply that $\delta_1 = \delta_5$ and $\delta_2 = \delta_4$. This regression also allows us to examine whether our results are being driven by a particular change in the cap. However, a limitation of this specification is that there is a larger proportion of inframarginal individuals in the sample for the larger cap changes, which makes it difficult to study whether the responses of constrained savers are heterogeneous across the cap changes.

Impacts on constrained savers. To address this issue, we estimate regressions that focus on the key group of constrained savers, who have total contributions between the old and new caps. These individuals are the key group for testing the predictions of our theoretical model. As shown in Section 3, increases in the cap create a substitution effect among these individuals that increases the marginal incentive to make contributions and earn income. In contrast, there is no substitution effect among inframarginal individuals or very high contributors who experience a windfall gain but no change in their tax rate on marginal contributions.

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[29] We estimate all regressions by OLS and cluster standard errors at the individual level.

[30] The effects may be asymmetric for institutional reasons, as decreases in the cap are driven by sudden reforms while increases in the cap result mainly from individuals reaching the age of 50. The estimated effects may be non-linear in the size of the cap change due to effect heterogeneity, given that the larger cap changes affect a wealthier population.

We note that the constrained group depends on the specific cap change; it consists of people with contributions of [\$50,000, \$100,000] for the $\pm$\$50,000 cap changes, and of [\$25,000, \$50,000] for the $\pm$\$25,000 cap changes. To examine the effects on these individuals, we restrict the sample to the 2007/08 to 2013/14 years and construct two subgroups for inclusion in the sample.[31] In subgroup 1, we select individuals with total contributions between $[\$50{,}000 - \epsilon, \$100{,}000 + \epsilon]$ in both $t-1$ and t <u>and</u> $\Delta\text{Cap}_{it} \in \{0\text{K}, \pm 50K\}$. In subgroup 2, we select individuals with total contributions between $[\$25{,}000 - \epsilon, \$50{,}000 + \epsilon]$ in both $t-1$ and t <u>and</u> $\Delta\text{Cap}_{it} \in \{0\text{K}, \pm 25K\}$. In both subgroups, we set ϵ=\$2,000 to allow for possible optimization errors in the total level of contributions.[32]

The estimation equations, which are based on equations (4.1) and (4.2), are:

$$\Delta Y_{it} = \delta \Delta\text{Cap}_{it} + G_{1,t} + G_{2,t} + \text{FE\_age}_{it} + \beta \Delta X_{it} + \epsilon_{it} \tag{4.3}$$

$$\begin{aligned} \Delta Y_{it} = \quad & \Delta\text{Cap}_{it}\{\delta_1 \mathbf{1}(\Delta\text{Cap}_{it} = -50K) + \delta_2 \mathbf{1}(\Delta\text{Cap}_{it} = -25K) + \delta_3 \mathbf{1}(\Delta\text{Cap}_{it} = 25K) \\ & + \delta_4 \mathbf{1}(\Delta\text{Cap}_{it} = 50K)\} + G_{1,t} + G_{2,t} + \text{FE\_age}_{it} + \beta \Delta X_{it} + \epsilon_{it} \end{aligned} \tag{4.4}$$

where $G_{1,t}$ and $G_{2,t}$ are subgroup-by-year fixed effects, replacing the year fixed effects in equations (4.1) and (4.2). These fixed effects mean that the estimated δ coefficients are identified from variation within subgroups in the same year, e.g., the control group for constrained savers who experience a +\$50,000 cap change is individuals with contributions in the same range who experience no change in the cap. We expect the estimates of δ to grow, as our theoretical model predicts that constrained savers will drive the responses to cap changes.

As part of our robustness checks, we also present results from models that examine intertemporal and intra-household shifting behaviors, since such behaviors would threaten the interpretation of our results as net economic responses to the cap changes. As explained later in Section 5.4, we find little evidence of either type of shifting.

5 Results

The main aim of this paper is to test theoretical predictions about how concessional caps affect superannuation contributions, taxable income through changes in earnings, income tax revenue, and crowding-out of other forms of savings. In Section 5.1, we present estimates from

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[31] We omit the later years in which there were only smaller cap changes of +\$5,000 or +\$10,000. In 2014/15, the cap increased by \$5,000 for some individuals and \$10,000 for others, but no cohort had no cap change. This makes it difficult to conceptualize what it means to have contributions between the new and old cap.

[32] The estimates are similar with different values of ϵ (see Appendix Table A4).

the base model (equation 4.1). In Section 5.2, we present estimates from extended models that allow the effects to differ across cap changes and subgroups, including placebo groups and the key group of constrained savers. In Section 5.3, we quantify the responses from this group in terms of contribution and income elasticities and discuss these in relation to the existing literature. In Section 5.4, as part of robustness checks, we check that our findings reflect 'real' economic responses rather than resource-shifting to minimize tax. Specifically, we examine whether individuals shift their resources between tax years or to their spouse to take advantage of the tax concessions.

5.1 Main estimates

We present our main estimates in Panel A of Table 2. For each \$1,000 increase in the cap, we estimate that individuals increase their total contributions to superannuation by \$280. This effect is entirely explained by an increase in concessional contributions of \$293. Non-concessional contributions are estimated to fall by \$13, but this estimate is statistically indistinguishable from zero at conventional levels. The point estimate indicates that non-concessional contributions fall by less than 5 cents for each additional dollar of concessional contributions. This modest or zero level of crowding out *within superannuation* is interesting as non-concessional contributions would seem to be a close substitute for concessional contributions, offering the same tax benefits in the accumulation phase and (lack of) liquidity.

Importantly, the estimates show large positive effects on taxable income. For each \$1,000 change in the cap, taxable income increases by \$180. This appears to be driven by labor supply responses, with increases in both sources of earned income – employment income (\$113) and business income (\$77) – but little effect on other components of taxable income, such as investment income, capital gains and deductions (see Appendix Table A1). Overall, these estimates indicate that the increase in earned income is enough to fund around two-thirds of the net increase in superannuation contributions (0.64=180/280). Conversely, this estimate implies that 36% of the increase in contributions is financed by decreases in private savings outside of superannuation and/or consumption. Consistent with this secondary or tertiary role for asset shifting, we do not find any strong evidence that individuals are liquidating/foregoing other investments, with modest negative estimates for investment income and capital gains ($p > 0.05$ for both).[33] We also only see weak evidence of a decrease in deductions

[33] One issue with using these outcomes as a proxy for private saving is that any effects may show up with a lag, particularly if assets are shifted into superannuation near the end of the financial year. We revisit this issue in Section 5.4 but continue to see little evidence of any economically meaningful effects on these outcomes.

($p > 0.05$), which is an interesting finding as deductions in Australia can be sensitive to income tax rates (Hamilton 2018).

Overall, the estimates reveal no statistically significant effect on tax paid, with the point estimate indicating an increase of just \$3 per \$1,000 change in the cap. This estimate is a precise zero and suggests that the lower tax revenue from an increase in concessional contributions is fully offset by the increase in taxable income.[34]

To put the magnitude of these estimates into perspective, we report the means of the dependent variables and the implied effect of a \$25,000 increase in the cap in Table 2. For total contributions, the implied increase is \$7,000 (or around 19%). For taxable income, the implied increase is \$4,500 (or around 2.2%). These are economically large responses.

We also examine the broader implications of our estimates on government finances and retirement wealth. Specifically, in Appendix A2, we provide back-of-the-envelope calculations of the long-term implications of the government raising the cap by \$25,000 for individuals aged 45–54. This 10-year scenario allows us to calculate broader fiscal impacts of cap changes that are not captured by our main estimates, including taxes levied on investment income accrued inside and outside superannuation as well as taxes levied on consumption.[35] We show that these factors do not change our conclusion that tax revenue is relatively unaffected by the cap changes. There is also a significant benefit to high contributors in terms of retirement wealth. Our calculations indicate that high contributors will have an additional \$80,000 in superannuation wealth by the time they turn 55 and at most one-fourth of this increase comes at the expense of other forms of wealth (in the case where there is no short-term change in consumption). This net increase in retirement wealth of approximately \$60,000 is funded by an increase in earned income of \$4,500 per year for 10 years (and associated investment returns).

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[34] This 'full offset' is consistent with the average marginal tax rate of individuals in the sample and the size of the estimates for concessional contributions and taxable income. While each additional dollar of concessional contributions reduces tax paid by roughly 23 cents because it is taxed at 15% instead of 38% (holding income fixed), total taxable income rises by around 61 cents for each additional dollar of concessional contributions (0.61=180/293), resulting in a 23-cent increase in tax paid (0.38×0.61).

[35] Changes in the cap may also have long-term effects on retirement timing. However, that question is beyond the scope of our analysis and cannot be answered adequately with our data. We do not expect any significant effects on retirement decisions at ages 45–54 because individuals can only withdraw superannuation at these ages under exceptional circumstances.

5.2 Estimates from extended models

Allowing for non-linear and asymmetric impacts. We first present estimates from the extended model (equation 4.2) in Panel B of Table 2. By allowing the effects to differ across cap changes, this specification enables us to see whether the main estimates are driven by a particular cap change. Overall, the estimates verify the robustness of the key results. The estimates are consistently positive and statistically significant for total contributions, taxable income and employment income, while the estimates for tax paid are consistently close to zero for all cap changes. The estimates for business income are relatively sensitive, with positive and significant estimates for the +$25,000 and +$50,000 cap changes but not for the other cap changes. Overall, the estimates are qualitatively similar across the different cap changes. While the estimates show non-linear patterns for total contributions, with larger estimates for the cap changes of ±$25,000 than ±$50,000, this pattern is less clear for the three income measures. Moreover, the estimates show broadly similar impacts of increases and decreases in the cap of the same magnitude, although there is suggestive evidence of stronger responses to cap decreases for total contributions and taxable income, particularly for the ±$50,000 changes.

Other robustness checks. To examine whether our estimates are driven by spurious cohort-by-year or cohort-by-age effects, we estimate placebo regressions on the sample of low-to-medium contributors, who are not constrained by the cap changes. We do not expect these individuals to respond to cap changes. All of the estimates are precise zeros, supporting the robustness of our empirical strategy (see Appendix Table A2).

We also estimate the effects on a larger age sample (45–54), which increases our sample size but makes the identifying assumptions slightly harder to justify. The estimates remain similar in magnitude to those in Section 5.1 and indeed become more precise (see Appendix Table A3). For this sample, we also see statistically significant evidence of a crowding out of non-concessional contributions. However, this effect remains modest, with the point estimates indicating that each additional dollar of concessional contributions reduces non-concessional contributions by just 7 cents.

Impacts on constrained savers. Next, we examine whether these effects are driven by constrained savers, who experience a substitution effect that increases the marginal incentive to make contributions and earn income. In Table 3, we present estimates of equations (4.3) and (4.4). As expected, by focusing on the key group of constrained savers, the estimates are considerably larger – around twice as large – than in Table 2. For example, the estimates from the linear model in Panel A indicate that constrained savers increase their contributions by \$12,150 (+34.1%) and their total taxable income by \$9,575 (4.9%) in response to a \$25,000 increase in the cap. These increases are again predominantly explained by an increase in concessional contributions and earned income, with estimated increases in employment income of \$4,950 and business income of \$1,875.[36] The increase in concessional contributions partly crowds out non-concessional contributions, although the effect remains modest, with non-concessional contributions falling by 10 cents for each additional dollar of concessional contributions. There remains little evidence of any significant effects on tax revenue.

Panel B presents the estimates based on equation (4.4), which allows for heterogeneous responses from constrained savers based on the size and direction of the cap change. The estimates are consistently positive and statistically significant for total contributions, taxable income and employment income, while the estimates for business income remain sensitive to the particular cap change. The estimates for tax paid are consistently close to zero across the different cap changes. Contrary to the estimates in Table 2, the estimates for total contributions and taxable income are larger for the $\pm$\$50,000 changes than the $\pm$\$25,000 changes. This pattern may reflect differences in the types of individuals constrained by these changes, as individuals constrained by the larger changes are wealthier, and highlights the importance of restricting the sample to constrained savers for understanding effect heterogeneity. We continue to see only suggestive evidence of different responses to increases and decreases in the cap, with some evidence of larger effects on total contributions and taxable income for decreases in the cap, particularly for the $\pm$\$50,000 changes.

5.3 Elasticities among constrained savers

To quantify the magnitude of these responses, we construct elasticities with respect to the net-of-tax rate on marginal contributions to superannuation. Cap changes induce a large change in this rate among constrained savers; for an increase in the cap, the net-of-tax rate on marginal contributions increases from $1 - \tau$, which is equal to 0.595 on average, to $1 - \tau_s = 0.85$, an increase of 42.8%.

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[36] Most of the remaining effect on taxable income appears to be explained by an increase in investment income. Appendix Table A5 shows an estimated increase in investment income of \$1,875 ($p < 0.05$) for an increase in the cap of \$25,000. However, this effect is not robust. For the wider age sample (45–54), the estimated effect on investment income is less than half the size and statistically indistinguishable from zero, while the estimates for other employment income and business income remain similar in magnitude and statistically significant.

Table 3 presents the elasticities implied by our estimates.[37] For total contributions, the implied elasticities are close to one, ranging from 0.79 to 1.08. This means that constrained savers would raise their contributions by 7.9–10.8% in response to a 10% increase in the net-of-tax rate on marginal contributions. For taxable income and employment income, the elasticities are larger for reductions in the cap and the ±\$50,000 changes, ranging from 0.08 to 0.38 and 0.06 to 0.30, respectively.

To our knowledge, we provide the first estimates of the elasticity of taxable income (and its components) with respect to the net-of-tax rate on marginal contributions to private pensions. Given that most countries have multiple tax bases that are taxed at different rates, such cross-tax elasticities are important for understanding the efficiency of taxation. Yet only a handful of studies have managed to estimate such effects (Romanov 2006; Pirttilä and Selin 2011; Kleven and Schultz 2014; Mortenson 2016). We find positive and relatively large elasticities for gross employment income (0.06–0.30) and taxable income inclusive of contributions (0.08–0.38), indicating that the concessional tax treatment of superannuation contributions considerably reduces the distortionary effects of income taxes on labor supply decisions.[38]

These sizeable taxable income elasticities demonstrate that earnings should not be assumed to be exogenous with respect to the tax treatment of private pensions. Nonetheless, they may provide an upper bound of these responses. Our elasticities are based on local treatment effects for a population with high incomes and a high level of self-employment, groups that consistently show the highest elasticities (Saez, Slemrod, and Giertz 2012). Our estimates are also identified off very large changes in marginal tax rates (up to 30 percentage points), which typically result in larger elasticities due to hours constraints and adjustment costs (Chetty, Friedman, Olsen, and Pistaferri 2011; Kleven and Schultz 2014).

To further examine heterogeneity, Table 4 shows the effects by demographic subgroups of constrained savers. To simplify the comparisons between groups, we present the estimates from the linear specification (equation 4.3) along with the implied elasticity of a +\$25,000 cap change. The estimates show consistent effects for all subgroups on the key outcomes (total contributions, taxable income and employment income), with the largest responses among

[37] We calculate these elasticities using the specific marginal tax rate for each group. On average, marginal tax rates are slightly higher for individuals constrained by the larger cap changes (ranging from 40.0% to 42.7%).
[38] The cross-tax elasticities of taxable income net of concessional contributions are mildly negative (-0.12 to 0.00, not shown), implying only modest substitution between the two tax bases overall.

women and business owners. For example, the implied taxable income elasticity is more than twice as high for women relative to men (0.194 vs. 0.083), and around one-third larger for business owners than employees (0.130 vs. 0.095). The responses are similar among married and unmarried individuals.

5.4 Exploring alternative explanations

In this section, we check that our estimates capture 'real' economic responses rather than resource-shifting to minimize tax. One possibility is that individuals may shift their resources between tax years to take advantage of the tax concessions (le Maire and Schjerning 2013; Kreiner, Leth-Petersen, and Skov 2016). Another possibility is resource-shifting between spouses (Stephens and Ward-Batts 2004).

Intertemporal shifting. Individuals may shift their contributions and income intertemporally to take advantage of an anticipated cap change. For example, they may delay income and contributions until the cap increases to minimize tax. This re-allocation of resources across time does not reflect an aggregate increase in contribution and income, which we are primarily interested in. As discussed in Section 2.1, reductions in the cap are difficult to anticipate, while increases in the cap, which mainly result from individuals reaching the age of 50, are somewhat easier to anticipate. Given the potential for anticipation, it is worthwhile to examine whether such responses are present, and whether we have overestimated the net effects on contributions and income from changes in the cap.

To help understand the nature of intertemporal shifting behavior and our hypotheses, consider an individual who contributes $30,000 per annum to superannuation when facing a cap of $25,000 every year. Now suppose that this individual learns that the cap will increase next year from $25,000 to $50,000. This individual may respond by shifting, say, $5,000 of contributions from this year to next year in order to reduce tax. That is, the individual may contribute $25,000 this year, $35,000 next year, and $30,000 in subsequent years. In this case, the cap increase has no *net* impact on contributions, even though contributions increase by $10,000 in the year the cap is increased.

To examine such behavior, we use our expanded age sample (45–54) and augment equation (4.1) with ΔCap_{it-1}, the change in the cap last year for individual i, and ΔCap_{it+1}, the change in the cap next year. Specifically, we estimate the following regressions:

$$\Delta Y_{it} = \delta_0 \Delta \text{Cap}_{it} + \delta_{-1} \Delta \text{Cap}_{it-1} + \delta_1 \Delta \text{Cap}_{it+1} + \gamma_{\text{t}} + \text{FE\_age}_{it} + \beta \Delta X_{it} + \epsilon_{it} \tag{5.1}$$

If the outcomes are entirely driven by intertemporal shifting, we would expect $\delta_{-1} = \delta_1$ and $\delta_0 = -(\delta_{-1} + \delta_1)$. (In the example above, $\delta_{-1} = \delta_1 = -5000$ and $\delta_0 = 10000$.) If there is no intertemporal shifting and no lagging effects, we would expect $\delta_{-1} = \delta_1 = 0$. Overall, if our estimates mainly reflect net impacts on contributions, we would expect the estimate on δ_0 to be much larger in magnitude than δ_{-1} and δ_1.

We find little evidence of intertemporal shifting (see Appendix Table A6). For total contributions, taxable income and employment income, the estimates of δ_{-1} and δ_1 are all close to zero and statistically insignificant. The only outcome that shows a pre-emptive response is concessional contributions, where δ_1 is mildly negative. However, δ_{-1} is mildly *positive*, which is not consistent with the intertemporal shifting hypothesis.

Intra-household shifting. Cap changes may create spillovers between spouses. For example, consider a married couple (A and B) who are both high contributors. Suppose the cap increases for B, who responds by increasing their contributions and taxable income. In a unitary household, part of these responses may reflect a shift in contributions and income from A to B to take advantage of the larger tax concession. In a collective household, where there is bargaining over the allocation of resources, there may be other incentives. For example, in reaction to B's increase in contributions (and reduction in disposable income), A may do the same to "protect" his/her share of resources.

In Section 5.3, we showed that our key findings are robust in the subsample of unmarried individuals (see Table 4), which suggests that intra-household shifting is not driving our estimates. We provide further support by examining married individuals below. We consider two empirical approaches to examine the extent of intra-household shifting. First, we estimate the following model:

$$\Delta Y_{it} = \omega \Delta \mathrm{SpCap}_{\mathrm{it}} + \gamma_{\mathrm{t}} + \mathrm{FE\_age}_{it} + \mathrm{FE\_SpAge}_{it} + \beta \Delta X_{it} + \epsilon_{it} \tag{5.2}$$

for the subsample of married individuals (from the main sample) who experience no cap change ($\Delta Cap_{it} = 0$). The cap change of the spouse is denoted by $\Delta \mathrm{SpCap}_{it}$, which is known because our data contains information on the age of the spouse in years.[39] We control for spousal age with a set of fixed effects, $\mathrm{FE\_SpAge}_{it}$. If there are no spousal spillovers, we would expect $\omega = 0$; if contribution/income shifting is important in a unitary household, we would expect $\omega < 0$.

[39] Although we have information on spousal age, it is not possible to link the tax records of spouses in our data.

The above approach excludes married individuals who experience a cap change themselves. Our second approach uses the full subsample of married individuals and examines in a more general manner whether the direct effects of a cap change on married individuals are larger when there is a stronger incentive for shifting, i.e., when the study individual's cap increases relative to their partner's. Specifically, we estimate the following regressions:

$$\Delta Y_{it} = \Delta \text{Cap}_{it}(\delta + \omega \mathbf{1}\{\Delta \text{Cap}_{it} \times \Delta \text{SpGap}_{it} > 0\}) + \gamma_{\text{t}} + \text{FE\_age}_{it} + \text{FE\_SpAge}_{it} + \beta \Delta X_{it} + \epsilon_{it} \quad (5.3)$$

where $\text{SpGap}_{it} = \text{Cap}_{it} - \text{SpCap}_{it}$, the difference between the cap for study individual i and their spouse in year t. The indicator variable, $\mathbf{1}\{\Delta \text{Cap}_{\text{it}} \times \Delta \text{SpGap}_{\text{it}} > 0\}$, is equal to one if: (a) the cap increases for individual i <u>and</u> the spousal cap gap increases; or (b) i's cap falls <u>and</u> the spousal cap gap falls. For example, the indicator variable would equal 1 if $\Delta \text{Cap}_{\text{it}} = 25{,}000$ and $\Delta \text{SpGap}_{\text{it}} = 15{,}000$, i.e., if the individual's cap increases by $25,000 and the spouse's cap increases by $10,000. If contribution/income shifting is important in a unitary household, we would expect ω to be strongly positive. In the above example, this implies that the spouse may shift contributions to the study individual to take advantage of tax concessions, relative to the case where both caps increase by $25,000 ($\Delta \text{SpGap}_{\text{it}} = 0$).

The estimates of (5.2) and (5.3) do not support contribution and income shifting as in a unitary household (see Appendix Table A7). In approach 1, we fail to find any statistically significant spousal spillovers except for concessional contributions, where the estimate of ω is mildly *positive*, i.e., of a different sign to the predictions for a unitary household. In approach 2, the estimates of ω are *negative* for most outcomes and much smaller than δ in magnitude; again in contrast to the predictions for a unitary household. Overall, this analysis suggests that intra-household shifting behavior plays at best a limited role in driving our estimates. This mitigates the concern that the increases in contributions and income among married individuals are muted by spousal responses.

6 Conclusion

Many governments offer tax concessions for private pension contributions in an attempt to raise retirement savings, encourage self-reliance in retirement and alleviate the fiscal pressures of an aging population. However, there are concerns about the cost-effectiveness of such measures because they may erode the income tax base and lead to a reallocation of private wealth without raising it. For the former, changes in income tax revenue depend crucially on how people respond to the resulting reduction in their effective tax rate, especially through changes in labor supply. To date, the literature has overlooked this issue, with most studies focusing on the impacts on saving responses (Poterba, Venti, and Wise 1995; Engen, Gale, and Scholz 1996; Gelber 2011; Chetty et al. 2014; Messacar 2018; Andersen 2018).

In a first attempt to address this issue, this study suggests that labor supply responses are an important consideration in understanding the cost-effectiveness of tax concessions for private pension contributions. Based on the predictions of a theoretical model and supportive empirical results that take advantage of several large changes to contribution caps, we find that higher contribution caps induce strong labor supply responses before retirement among high-income earners. The resulting increase in income tax revenue is enough to fully offset tax losses from the additional tax concessions on contributions. We estimate cross-tax employment income elasticities between 0.06 and 0.3, which suggests that the labor supply of high-income earners is sensitive to the tax treatment of private savings. While these responses are restricted to the high-income earners who are affected by the contribution caps, a general implication of our findings is that overlooking labor supply responses to tax incentives for private savings may over-estimate the fiscal cost of these measures. That said, we do not account for any long-term impacts on retirement decisions, which are also important to understand. This is a promising area for future research.

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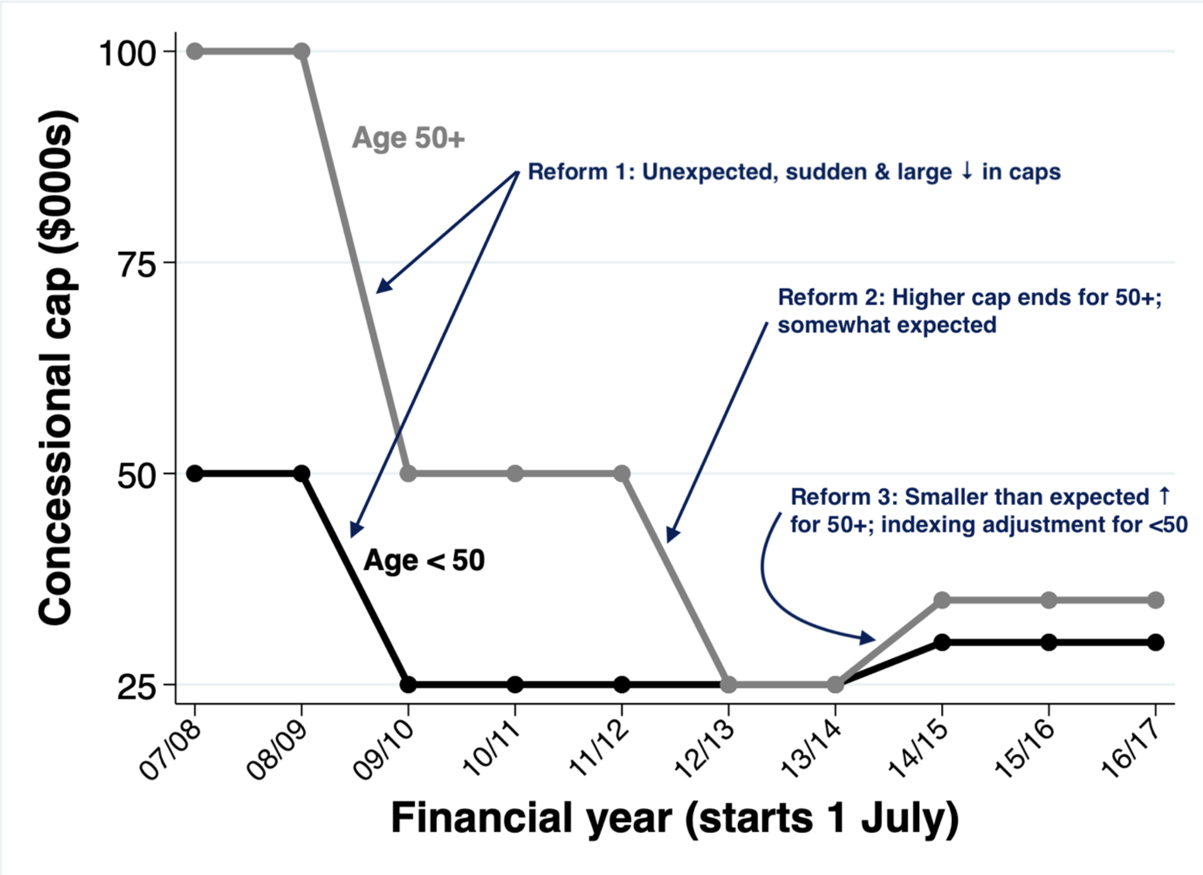
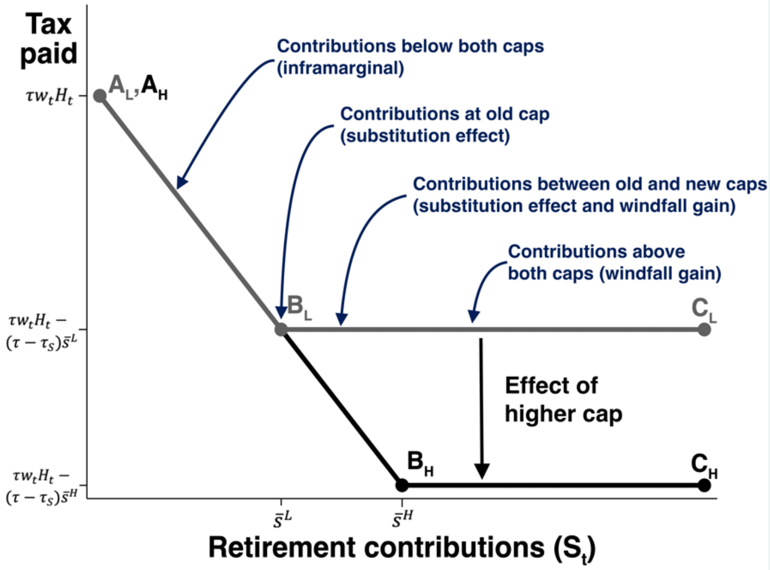
Figure 1: Concessional contribution caps in Australia by age over the sample period



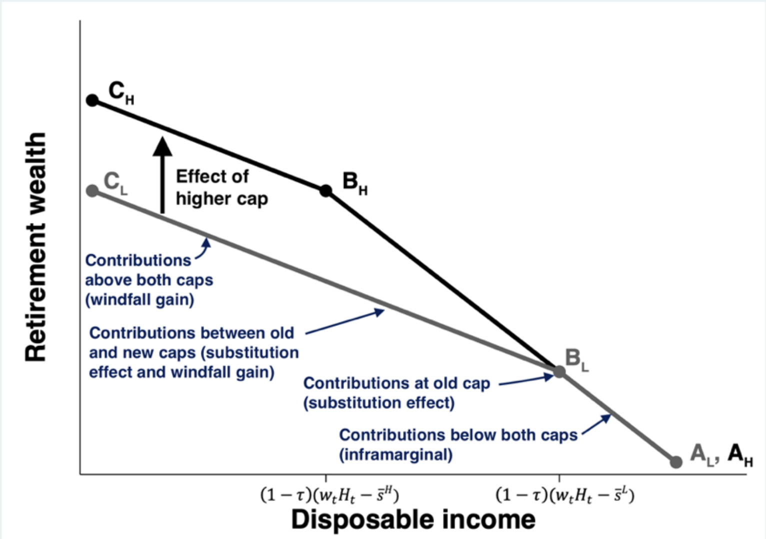
Notes: This figure shows how the concessional contribution caps have changed by age and time over our sample period. Individuals aged 60+ had access to the cap of $35,000 one year earlier (in 2013/14), but otherwise all individuals aged 50+ had the same cap in each year. See Section 2 for more details on the three reforms.

Figure 2: Illustration of the key tradeoffs and predictions of the model

(a) Relationship between tax paid and contributions



(b) Relationship between retirement wealth and disposable income

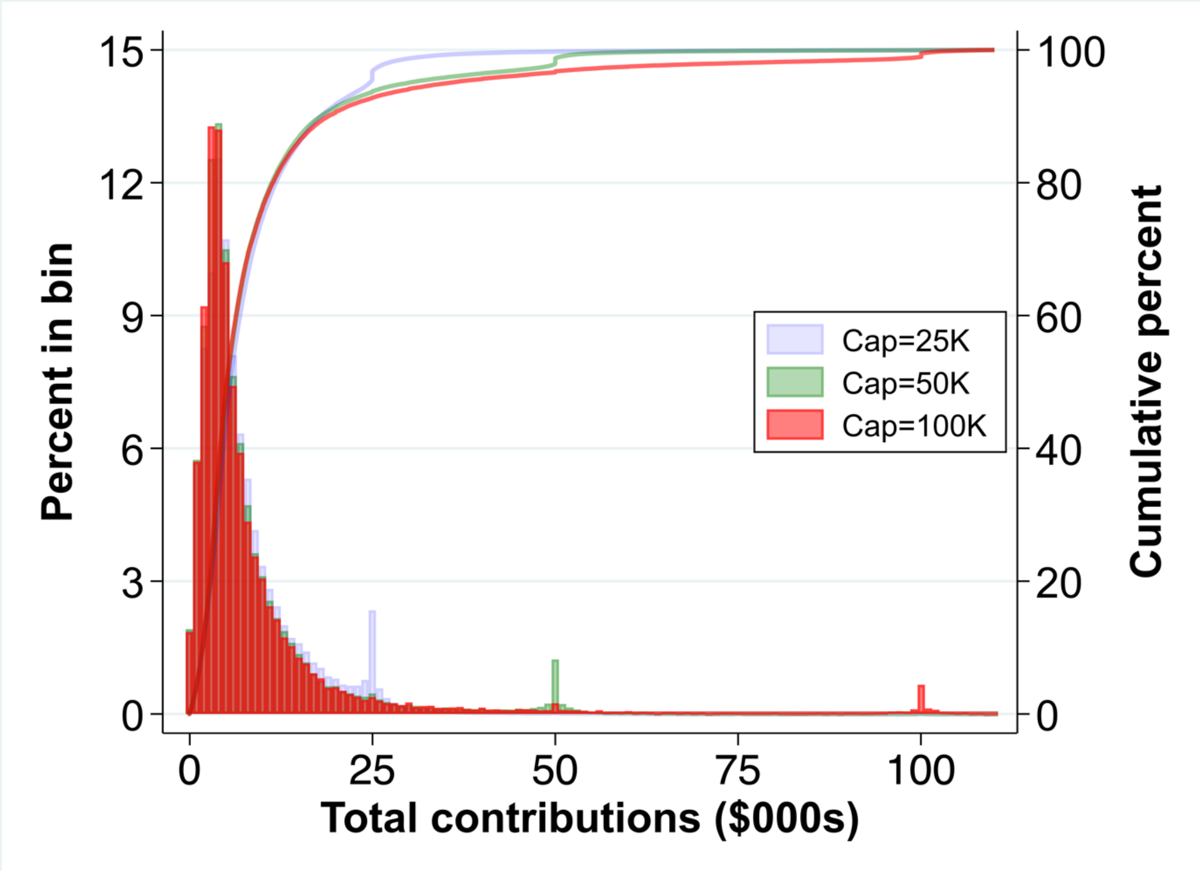


Summary of actual and expected impacts of an increase in the cap from $\bar{s}^L$ to $\bar{s}^H$

	Direct effect on		Expected effect on		
Initial contributions	Exp. retirement wealth	Marginal tax rate on contributions	Retirement contributions	Labor earnings	Private savings
$< \bar{s}^L$	positive	zero	small neg.	small neg.	uncertain
$\in [\bar{s}^L, \bar{s}^H)$	**positive**	**negative**	**positive**	**positive**	**negative**
$\geq \bar{s}^H$	positive	zero	small neg.	small neg.	uncertain

Notes: These figures show in (a) how superannuation contributions reduce an individual's tax burden up to the cap but have no effect thereafter and in (b) how superannuation contributions increase retirement wealth at the expense of disposable income in the current period. In each figure, the direct effect of an increase in the cap is illustrated by a shift from the gray line to the black line. The table above summarizes the predicted impacts of an increase in the cap. The model predicts opposing impacts for a decrease in the cap. See Section 3 for more details.

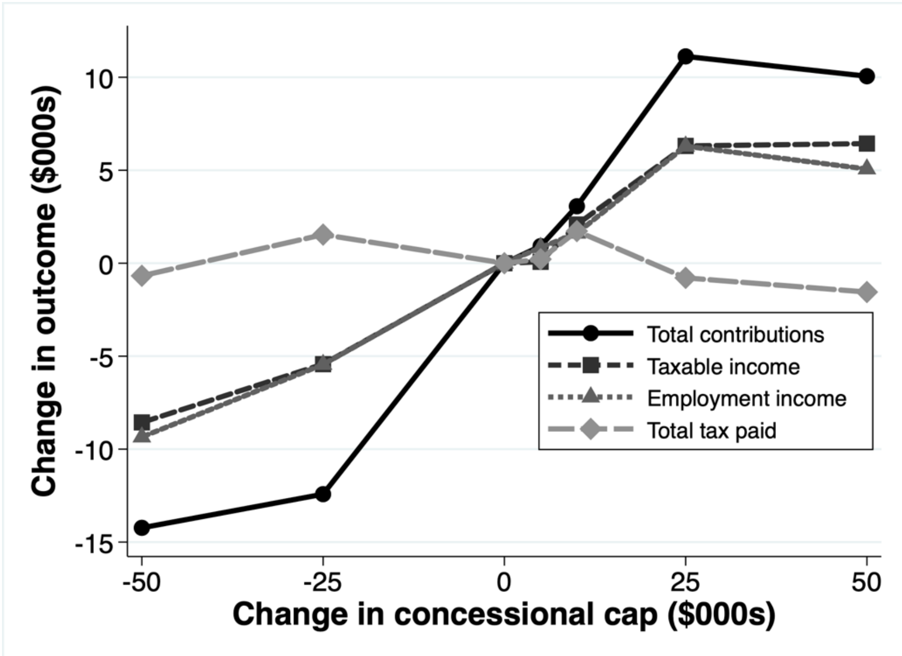
Figure 3: Histogram of total superannuation contributions by the concessional cap level



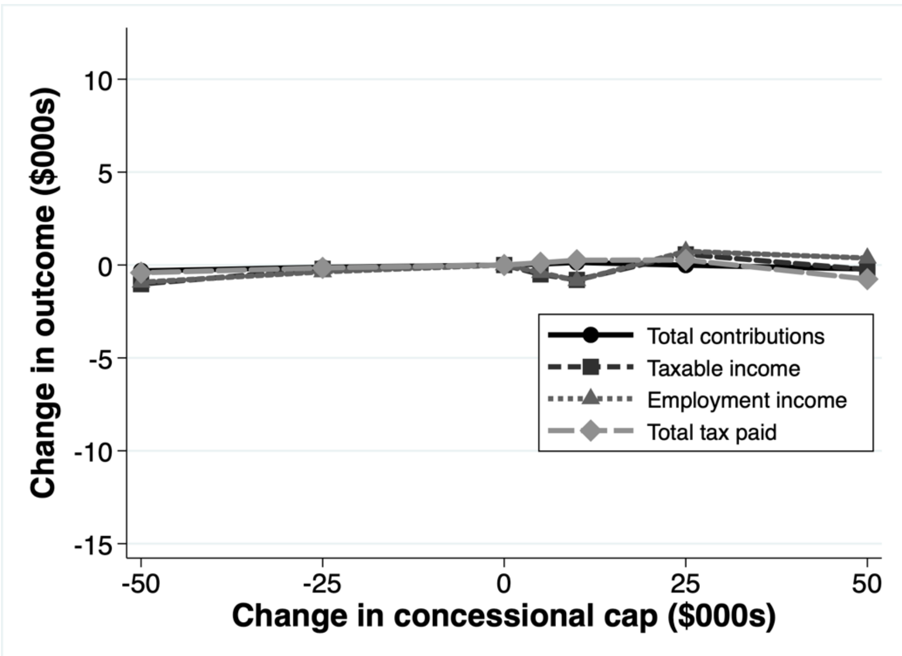
Notes: This figure shows histograms of total superannuation contributions for individuals aged 48–51 with $1,000 bins. We present the histograms for individuals facing the three most common concessional contribution caps. We also overlay the cumulative distributions with respect to each cap level. These lines correspond to the right axis. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2013/14 years.

Figure 4: Mean changes in outcomes by changes in the concessional cap

(a) Main sample (high contributors)

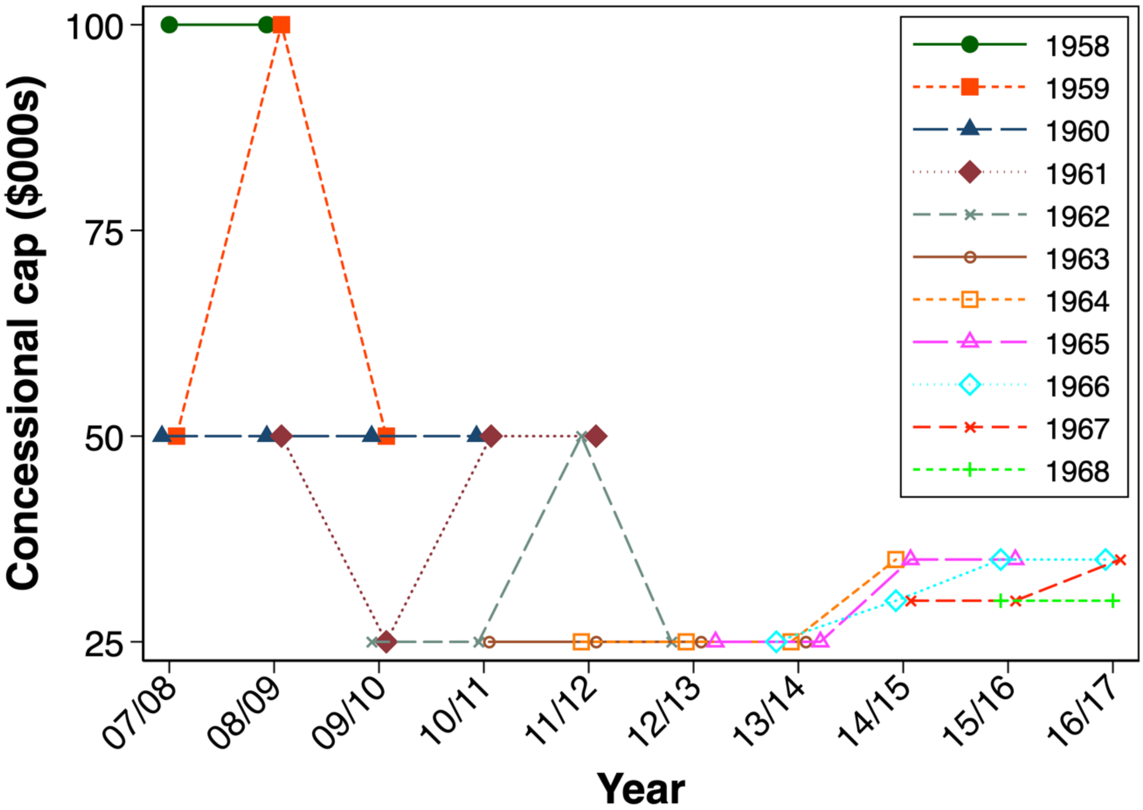


(b) Unconstrained sample (low-to-medium contributors)



<u>Notes</u>: These figures show how mean changes in the key outcomes (from year $t-1$ to t) are correlated with changes in the concessional cap. To account for common changes in outcomes, we subtract the mean change in the relevant outcome for individuals who experience no change in the cap. (a) shows this relationship for our main sample of high contributors, which consists of individuals who contributed at least $23,000 in year t and $t-1$. (b) shows the relationship for lower contributors, who contributed less than $23,000 in both years. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2016/17 years. We restrict the sample to individuals aged 48 to 51.

Figure 5: Concessional contribution caps over time for cohorts in the baseline sample



Notes: This figure shows how the concessional cap has changed over time for different birth cohorts in our sample of 48–51-year-olds. Cohorts run from July to June, e.g., "1958" corresponds to individuals born between July 1957 and June 1958.

Table 1: Descriptive statistics: Means and standard deviations

	Population aged 48–51 (1)	Main sample: High contributors (2)
Contribution, income and tax variables		
Total contributions	9,623	37,819
	(19,139)	(22,348)
Tax-favored (concessional) contributions	7,920	32,925
	(9,000)	(13,237)
Other (non-concessional) contributions	1,703	4,894
	(15,746)	(17,772)
Taxable income	78,709	204,674
	(68,117)	(132,124)
Employment income	74,459	160,866
	(60,609)	(130,845)
Business income	4,804	35,250
	(33,826)	(96,652)
Investment Income	1,714	12,318
	(19,561)	(51,319)
Net capital gain	800	2,495
	(10,459)	(15,786)
Deductions: excluding superannuation	2,992	6,684
	(6,313)	(13,149)
Total tax paid	17,594	58,366
	(25,112)	(58,362)
Marginal tax rate	29.3%	38.1%
Average tax rate	22.4%	28.5%
Demographics		
Age in years	49.5	49.6
Married	63.5%	77.5%
Male	50.0%	65.7%
In top tax bracket	6.1%	46.1%
Has investment property	20.3%	37.8%
Has trust/business income	21.2%	47.7%
Observations	729,495	39,406
Individuals	226,266	14,134

Notes: This table summarizes the characteristics of our main sample and compares it to the broader population of individuals aged 48–51. The table presents the means and standard deviations of key variables (in parentheses). The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2016/17 years.

Table 2: Main estimates on high contributors

	Dependent variable: Change in						
	Contributions			Income			Tax paid
	Total (1)	Tax favored (2)	Other (3)	Taxable (4)	Employment (5)	Business (6)	Total (7)
Panel A: Linear and symmetric effects of cap changes							
Δ cap (\$000s)	280***	293***	-13	180***	113***	77***	3
	(20)	(13)	(16)	(36)	(29)	(27)	(15)
Effect of \$25K increase	7,000	7,325	-325	4,500	2,825	1,925	75
Dependent mean at $t-1$	36,731	32,146	4,585	201,809	159,318	34,864	57,525
R-squared	0.058	0.313	0.005	0.006	0.010	0.022	0.003
Panel B: Allowing for non-linearities and asymmetries							
$\mathbf{1}(\Delta \text{ cap} \in \{\$5\text{K}, \$10\text{K}\}) \times \Delta \text{ cap (\$000s)}$	278**	489***	-211	465	71	176	129
	(136)	(20)	(134)	(313)	(240)	(241)	(135)
$\mathbf{1}(\Delta \text{ cap} = \$25\text{K}) \times \Delta \text{ cap (\$000s)}$	446***	505***	-59	245***	170***	131**	-23
	(37)	(12)	(35)	(76)	(57)	(59)	(31)
$\mathbf{1}(\Delta \text{ cap} = -\$25\text{K}) \times \Delta \text{ cap (\$000s)}$	499***	567***	-68**	265***	143**	9	-39
	(35)	(11)	(33)	(72)	(56)	(53)	(30)
$\mathbf{1}(\Delta \text{ cap} = \$50K) \times \Delta \text{ cap (\$000s)}$	209***	251***	-42**	153***	64	103***	10
	(25)	(17)	(19)	(47)	(39)	(35)	(19)
$\mathbf{1}(\Delta \text{ cap} = -\$50\text{K}) \times \Delta \text{ cap (\$000s)}$	306***	288***	19	219***	153***	50	18
	(24)	(15)	(20)	(48)	(38)	(35)	(20)
Dependent mean at $t-1$	36,731	32,146	4,585	201,809	159,318	34,864	57,525
R-squared	0.062	0.335	0.005	0.007	0.011	0.022	0.004

** denotes $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered by individual. N=25,225.

Notes: This table presents causal estimates of the impact of changes in the concessional contributions cap from equation (4.1) in Panel A and (4.2) in Panel B. All regressions include a full set of year and age fixed effects, as well as controls for changes in marital status, business ownership, and investment property ownership and a female dummy that allows for different trends for men and women. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2016/17 years. We restrict the sample to individuals aged 48 to 51 with contributions of at least \$23,000 in year t and $t-1$.

Table 3: Estimated effects on the constrained sample

	Dependent variable: Change in						
	Contributions			Income			Tax paid
	Total (1)	Tax favored (2)	Other (3)	Taxable (4)	Employment (5)	Business (6)	Total (7)
Panel A: Linear and symmetric effects of cap changes							
Δ cap (\$000s)	486***	542***	-56***	383***	198***	75	8
	(15)	(14)	(7)	(57)	(41)	(45)	(24)
Effect of \$25K increase	12,150	13,550	-1,400	9,575	4,950	1,875	200
Dependent mean at $t-1$	35,606	33,462	2,144	194,685	154,222	33,273	53,922
R-squared	0.374	0.493	0.048	0.011	0.017	0.021	0.006
Panel B: Allowing for non-linearities and asymmetries							
$\mathbf{1}(\Delta \text{ cap} = \$25\text{K})$	375***	454***	-78***	272***	145**	108	-0
$\times\, \Delta$ cap (\$000s)	(15)	(12)	(9)	(87)	(66)	(67)	(36)
Implied effect	9,375	11,350	-1,950	6,800	3,625	2,700	0
Dep. mean at $t-1$	27,493	24,759	2,734	190,148	149,476	32,378	53,202
Elasticity wrt $1-\tau^*$	0.792	1.053	-1.829	0.084	0.056	0.207	0.000
$\mathbf{1}(\Delta \text{ cap} = -\$25\text{K})$	450***	533***	-83***	243***	158**	-77	-33
$\times\, \Delta$ cap (\$000s)	(15)	(8)	(12)	(81)	(62)	(59)	(34)
Implied effect	-11,250	-13,325	2,075	-6,075	-3,950	1,925	825
Dep. mean at $t-1$	38,041	37,475	566	191,866	154,622	28,512	51,715
Elasticity wrt $1-\tau^*$	0.959	1.158	-10.194	0.100	0.083	-0.212	-0.050
$\mathbf{1}(\Delta \text{ cap} = \$50K)$	484***	514***	-30**	357***	164**	175**	-5
$\times\, \Delta$ cap (\$000s)	(31)	(30)	(14)	(91)	(66)	(70)	(37)
Implied effect	24,200	25,700	-1,500	17,850	8,200	8,750	-250
Dep. mean at $t-1$	53,370	49,205	4,165	192,282	119,241	56,890	51,001
Elasticity wrt $1-\tau^*$	0.946	1.067	-0.996	0.195	0.139	0.351	-0.011
$\mathbf{1}(\Delta \text{ cap} = -\$50\text{K})$	570***	620***	-50***	589***	293***	92	64
$\times\, \Delta$ cap (\$000s)	(29)	(24)	(19)	(105)	(78)	(84)	(45)
Implied effect	-28,500	-31,000	2,500	-29,450	-14,650	-4,600	-3,200
Dep. mean at $t-1$	80,324	77,865	2,460	220,214	144,645	55,678	52,762
Elasticity wrt $1-\tau^*$	1.075	1.201	-3.525	0.383	0.303	0.222	0.173
R-squared	0.377	0.495	0.050	0.012	0.017	0.022	0.006

** denotes $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered by individual. N=13,287.

Notes: This table presents causal estimates of the impact of changes in the concessional contributions cap on individuals with contributions between the new and old caps from equations (4.3) in Panel A and (4.4) in Panel B. All regressions include year and age fixed effects, controls for changes in marital status, business ownership, and investment property ownership, and a female dummy. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2013/14 years. We restrict the sample to individuals aged 48 to 51 with contributions in the relevant range. See Section 4.2 for more details.

Table 4: Effect heterogeneity among the constrained sample

	Dependent variable: Change in						
	Contributions			Income			Tax paid
	Total (1)	Tax favored (2)	Other (3)	Taxable (4)	Employment (5)	Business (6)	Total (7)
Men (N=8,941)							
Δ cap ($000s)	449***	511***	-62***	304***	152***	58	-24
	(18)	(18)	(8)	(75)	(57)	(53)	(34)
Dep. mean at $t-1$	35,416	33,141	2,275	213,345	178,215	31,257	62,774
Crude elasticity	0.740	0.899	-1.590	0.083	0.050	0.108	-0.022
Women (N=4,346)							
Δ cap ($000s)	554***	595***	-42***	520***	267***	109	63**
	(26)	(24)	(13)	(85)	(53)	(82)	(32)
Dep. mean at $t-1$	35,997	34,121	1,876	156,294	104,860	37,419	35,711
Crude elasticity	0.898	1.017	-1.306	0.194	0.149	0.170	0.103
Married in $t-1$ (N=9,602)							
Δ cap ($000s)	499***	560***	-61***	347***	213***	82	-3
	(18)	(17)	(9)	(66)	(47)	(54)	(28)
Dep. mean at $t-1$	35,364	33,218	2,146	194,538	152,933	34,452	53,559
Crude elasticity	0.823	0.983	-1.658	0.104	0.081	0.139	-0.003
Unmarried in $t-1$ (N=3,685)							
Δ cap ($000s)	469***	509***	-40***	498***	171**	58	53
	(28)	(27)	(12)	(110)	(87)	(78)	(47)
Dep. mean at $t-1$	36,236	34,098	2,139	195,067	157,579	30,200	54,867
Crude elasticity	0.755	0.871	-1.091	0.149	0.063	0.112	0.056
Employees in $t-1$ (N=6,836)							
Δ cap ($000s)	400***	470***	-70***	318***	192***	-35	17
	(21)	(19)	(9)	(76)	(66)	(21)	(31)
Dep. mean at $t-1$	33,566	31,404	2,162	194,727	190,939	0	56,318
Crude elasticity	0.695	0.873	-1.889	0.095	0.059	N/A	0.018
Any business/trust income in $t-1$ (N=6,451)							
Δ cap ($000s)	547***	595***	-48***	435***	191***	167**	3
	(21)	(20)	(11)	(83)	(53)	(80)	(36)
Dep. mean at $t-1$	37,768	35,643	2,125	194,639	115,313	68,531	51,383
Crude elasticity	0.845	0.974	-1.318	0.130	0.097	0.142	0.003

** denotes $p < 0.05$, *** $p < 0.01$. 'Crude elasticity' is the implied elasticity with respect to the net-of-tax rate on marginal contributions to superannuation for an increase in the cap of $25,000. Standard errors in parentheses are clustered by individual.

Notes: This table presents causal estimates of the impact of changes in the concessional contributions cap on individuals with contributions between the new and old caps from equation (4.3). All regressions include year and age fixed effects, controls for changes in marital status, business ownership, and investment property ownership, and a female dummy. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2013/14 years. We restrict the sample to individuals aged 48 to 51 with contributions in the relevant range. See Section 4.2 for more details.

Web Appendix for "Income and saving responses to tax incentives for private retirement saving"

Marc K. Chan Todd Morris Cain Polidano Ha Vu

A1. Full explanation of comparative statics

Pre-announced changes.

As discussed in Section 3, suppose the government announces in period t that the concessional contribution cap $\bar{s}$ will be increased from $\bar{s}^L$ to $\bar{s}^H$ starting from period t', where $t' > t$. The only effects on behavior in period t are through expectations about an increase in future retirement wealth. However, the effects depend on individuals' initial level of superannuation contributions in period t, $S^*_{t,\bar{s}^L}$:

- Case A_1 $\left(S^*_{t,\bar{s}^L} < \bar{s}^L\right)$: The right-hand side (RHS) of (3.7) decreases as the increase in expected retirement wealth reduces $\frac{\partial E_t V_{t+1}(A^S_{t+1}, A^P_{t+1})}{\partial A^S_{t+1}}$. This will increase consumption C_t, which leads to an increase in leisure Z_t from (3.5), and a decrease in superannuation contributions S_t from (3.7). The net change in the private asset balance, $P_t \coloneqq \widetilde{A^P_t}^* - A^P_t$, is ambiguous, as both the left-hand side (LHS) and RHS of (3.6) decrease. The LHS falls because of an increase in consumption, while the RHS falls because the increase in expected retirement wealth reduces $\frac{\partial E_t V_{t+1}(A^S_{t+1}, A^P_{t+1})}{\partial A^P_{t+1}}$. However, as consumption and leisure both increase, the effect on total savings, $P_t + (1-\tau_s)S_t$, is negative from (3.2).[40] Overall, the individual saves less, consumes more and works less. The net effect on tax paid in period t is ambiguous, as tax receipts fall due to the decrease in labor supply (a downward shift in **A_LB_LC_L** in Figure 2a), but less income is contributed to superannuation (a movement to the left along **A_LB_L** in Figure 2a).
- Case B_1 $\left(S^*_{t,\bar{s}^L} = \bar{s}^L\right)$: The RHS of (3.8) and (3.9) decrease due to the increase in expected retirement wealth. This may either have no effect on superannuation contributions S_t or cause the individual to decrease contributions to below $\bar{s}^L$ (and satisfy (3.7)). If S_t falls, we would expect the same effects as in Case A_1. If S_t does not change, we would expect an increase in consumption and a decrease in private savings

[40] Note that (3.2) implies a decrease in $P_t + (1-\tau)S_t$, but since S_t falls and $(1-\tau_s) > (1-\tau)$, this also implies a fall in $P_t + (1-\tau_s)S_t$.

(as the RHS of (3.6) falls due to the increase in expected retirement wealth), and an increase in leisure from (3.5). This would lead to a decrease in tax paid. Overall, we expect (weak) decreases in retirement contributions and total savings, higher consumption, and a decrease in labor supply. The net impacts on tax paid are ambiguous but most likely negative. This group are likely to have high future earnings, so the wealth effects are likely to be larger than in Case A_1.

- Case C_1 $\left(S^*_{t,\bar{s}^L} > \bar{s}^L\right)$: The RHS of (3.10) decreases due to the increase in expected retirement wealth. The effects are similar to Case A_1: an increase in consumption and leisure, a decrease in superannuation contributions, ambiguous effects on private savings, and a decrease in total savings (here equal to $P_t + (1-\tau_s)S_t - (\tau - \tau_s)\max\{S_t - \bar{s}^L, 0\}$). This leads to a decrease in tax paid, since the reduction in superannuation contributions is tax neutral (a movement to the left along $\mathbf{B_L C_L}$ in Figure 2a). This group are likely to have very high future earnings, so the wealth effects are likely to be larger than in Case A_1 and B_1.

Immediate changes.

Now suppose that $t' = t$, that is, $\bar{s}^L$ increases to $\bar{s}^H$ from period t onwards. In addition to wealth effects, the change in the allocation frontier (from $\mathbf{A_L B_L C_L}$ to $\mathbf{A_H B_H C_H}$ in Figure 2b) generates substitution effects in period t. Let $S^*_{t,\bar{s}^L}$ denote the individual's optimal S_t in the old regime ($\bar{s}^L \forall t$). As summarized in the text, the overall behavioral effects depend on $S^*_{t,\bar{s}^L}$, i.e., the individual's location in the old allocation frontier. Here, we include a full discussion of the comparative statics for individuals in the key groups, who initially contributed between the old and new caps (Cases B and C):

- Case B $\left(S^*_{t,\bar{s}^L} = \bar{s}^L\right)$: These individuals are at the initial kink point ($\bar{s}^L$) but may now contribute up to $\bar{s}^H$ at the concessional rate. Assuming that $\tau_s - \tau \ll 0$, the substitution effect is likely to dominate the wealth effect. Namely, with the increase in the cap, FOCs (3.8) and (3.9) become (3.7) at the existing level of contributions, $S^*_{t,\bar{s}^L}$. At $S^*_{t,\bar{s}^L}$, the LHS of (3.7) will be smaller than the RHS, and this will cause individuals to increase superannuation contributions S_t (possibly as far as $\bar{s}^H$) by decreasing consumption C_t, so that (3.7) holds. This decrease in consumption will increase the LHS of (3.5), causing a decrease in leisure and thus an increase in labor supply. The decrease in consumption will also increase the LHS of (3.6), leading to a decrease in private savings. However, as labor supply increases and consumption decreases, total savings must increase from (3.2).[41] The overall effect on tax paid in period t is ambiguous, as tax receipts increase due to the increase in labor supply (an upward shift of **ABC** in Figure 2a) while the additional contributions to superannuation decrease tax receipts at the rate $\tau - \tau_s$ (a movement to the right in Figure 2a from $\mathbf{B_L}$ along $\mathbf{A_H B_H}$). The net effect depends on the relative elasticities of response with respect to labor supply and superannuation contributions. While superannuation contributions are likely to be more elastic than employment income, taxes on superannuation contributions make up a relatively small share of total tax receipts. As such, a small earnings elasticity may offset a large proportion of the decrease in tax receipts from additional superannuation contributions.

- Case C $\left(S^*_{t,\bar{s}^L} \in (\bar{s}^L, \bar{s}^H)\right)$: These individuals are above the initial kink point but below the new kink point. The effects are similar to Case B (with FOC (3.10) initially becoming FOC (3.7)), but the wealth effects are stronger because the individual enjoys an immediate increase in her superannuation balance of $(S^*_{t,\bar{s}^L} - \bar{s}^L)(\tau - \tau_s)$ even if she does not change her behavior.

A2. Broader effects on tax revenue and retirement wealth

Our estimates showed that cap changes had no effect on tax revenue in the short run via income tax and the flat tax treatment of contributions. However, they do not capture the effects on tax revenue due to long-term changes in investment income (both inside and outside superannuation) and changes in consumption tax revenue. We examine the potential importance of these broader impacts here by deriving bounds of fiscal cost estimates in a 10-year scenario. We also use this scenario to examine the long-term effects on retirement wealth.

The 10-year scenario is described as follows. Suppose that individuals have access to a higher cap (+\$25,000) for ten years at ages 45–54. All else being equal, our baseline estimates in Table 2 imply that these individuals will have contributed an additional \$70,000 (= $\$7000 \times 10$) by age 55, resulting in an additional \$59,500 in their superannuation accounts after 15% has been deducted in tax.[42] Assuming a gross annual rate of return of 6.4%, these

[41] Note that (3.2) implies an increase in $P_t + (1-\tau)S_t$, where $P_t \coloneqq \widetilde{A_t^P}^* - A_t^P$, if there is an increase in labor supply and a decrease in consumption. Since S_t increases and $(1-\tau_s) > (1-\tau)$, this also implies an increase in total savings, defined as $P_t + (1-\tau_s)S_t - (\tau - \tau_s)\max\{S_t - \bar{s}^L, 0\}$.

[42] Our estimates on the full age 45–54 sample are extremely similar (see Appendix Table A3). We use the baseline estimates for the age 48–51 sample to be consistent with the main text.

contributions would result in a pre-tax investment income of $24,763 over ten years, or a post-tax return of $21,049 after deducting $3,714 in tax at 15% rate. This $3,714 of additional tax revenue on investment income inside superannuation, which is *not* captured by our baseline estimates, constitutes the first component of the broader fiscal impact.

To derive other components, we first need to know how much the additional contributions are crowded out by private saving. According to our baseline estimates, taxable income rises by $4,500 per annum in response to the cap change. This implies that the disposable income falls by $1,550 ($= (\$7{,}000 - \$4{,}500) \times (1 - 0.38)$) per annum, which is financed by lower private savings and/or consumption.

Suppose the $1,550 is entirely financed by lower private savings, e.g., the individual sells $1,550 in stocks every year in order to maintain the same level of consumption.[43] Assuming that these stocks have a gross yield of 6.4%, the foregone pre-tax investment income from these stocks is $6,160 over ten years. This income would have been taxed at marginal tax rates, which are equal to 38% on average in the sample. Thus, the foregone tax on investment income in stocks over ten years is $2,340 ($= \$6{,}160 \times 0.38$). This constitutes the second component of the broader fiscal impact. In this case, the total broader fiscal impact is the sum of components 1 and 2, which is +$1,374 ($= \$3{,}714 - \$2{,}340$) over ten years. This impact is very small compared to the total tax paid by these individuals over ten years of approximately $575,250.

Now suppose the $1,550 is entirely financed by lower consumption. This would lead to a decrease in consumption tax revenue of $155 per year (due to a 10% VAT), or $1,550 over ten years. This constitutes the third component of the broader fiscal impact. In this case, the total broader fiscal impact is the sum of components 1 and 3, which is +$2,164 ($= \$3{,}714 - \$1{,}550$) over ten years. Again, this impact is small and slightly positive. If anything, this estimate may underestimate the broader fiscal benefit if increases in retirement wealth lead to long-term increases in consumption tax revenue.

To examine the long-term effects on retirement wealth, recall that at the end of the 10-year scenario, the superannuation balance increases by $80,549 ($= \$59{,}500 + \$21{,}049$). In addition, if private saving crowds out the fall in disposable income entirely, the stock balance will drop by $19,319 ($= 1{,}550 \times 10 + 6{,}160 \times (1 - 0.38)$), which offsets merely one-fourth of the increase in superannuation wealth.

[43] We ignore capital gains taxation from stock sales in these calculations for simplicity.

Overall, this analysis, combined with our regression estimates, provides little evidence that reductions in the cap have had any meaningful benefit on public finances. It also shows that reductions in the cap can result in significant long-term decreases in retirement wealth among high-income individuals.

Table A1: Main estimates on other outcomes

	Dependent variable: Change in		
	Investment income (1)	Net capital gain (2)	Total deductions (3)
Δ cap ($000s)	-2	-30	-11
	(19)	(16)	(6)
Effect of $25K increase	-50	-750	-275
Dependent mean at $t-1$	11,908	2,577	6,635
R-squared	0.006	0.007	0.002

** denotes $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered by individual. N=25,225.

Notes: This table presents causal estimates of the impact of changes in the concessional contributions cap from equation (4.1). All regressions include a full set of year and age fixed effects, as well as controls for changes in marital status, business ownership, and investment property ownership and a female dummy that allows for different trends for men and women. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2016/17 years. We restrict the sample to individuals aged 48 to 51 with contributions of at least $23,000 in year t and $t-1$.

Table A2: Placebo estimates on low-to-medium contributors

	Dependent variable: Change in						
	Contributions			Income			Tax paid
	Total (1)	Tax favored (2)	Other (3)	Taxable (4)	Employment (5)	Business (6)	Total (7)
Δ cap ($000s)	1.6	0.6	1.0	-3.0	3.3	-1.9	-0.3
	(2.3)	(0.4)	(2.2)	(4.4)	(3.3)	(2.1)	(1.6)
Effect of $25K increase	40	15	25	-75	82.5	-47.5	-7.5
Dependent mean at $t-1$	6,930	5,938	992	68,869	67,893	2,531	14,476
R-squared	0.0004	0.0044	0.0002	0.0008	0.0163	0.0221	0.0018

** denotes $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered by individual. N=505,896.

Notes: This table presents placebo estimates of the impact of changes in the concessional contributions cap on the sample of low-to-medium contributors from equation (4.1). All regressions include a full set of year and age fixed effects, as well as controls for changes in marital status, business ownership, and investment property ownership and a female dummy that allows for different trends for men and women. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2016/17 years. We restrict the sample to individuals aged 48 to 51 with contributions less than $23,000 in year t and $t-1$.

Table A3: Main estimates on wider age sample (45–54)

	Dependent variable: Change in						
	Contributions			Income			Tax paid
	Total	Tax favored	Other	Taxable	Employment	Business	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Linear and symmetric effects of cap changes							
Δ cap (\$000s)	295***	316***	-21**	185***	87***	73***	-7
	(13)	(8)	(11)	(25)	(20)	(18)	(10)
Effect of \$25K increase	7,375	7,900	-525	4,625	2,175	1,825	-175
Dependent mean at $t-1$	38,764	34,041	4,723	198,277	157,610	33,072	55,670
R-squared	0.056	0.318	0.004	0.007	0.012	0.024	0.004
Panel B: Allowing for non-linearities and asymmetries							
$\mathbf{1}(\Delta \text{ cap} \in \{\$5\text{K}, \$10\text{K}\}) \times$ Δ cap (\$000s)	282***	536***	-255***	157	9	55	-121
	(80)	(14)	(79)	(185)	(143)	(147)	(80)
$\mathbf{1}(\Delta \text{ cap} = \$25\text{K}) \times$ Δ cap (\$000s)	472***	526***	-54**	190***	154***	117**	-56**
	(29)	(11)	(26)	(58)	(44)	(47)	(23)
$\mathbf{1}(\Delta \text{ cap} = -\$25\text{K})$ $\times \Delta$ cap (\$000s)	533***	620***	-87***	275***	168***	64**	-46***
	(20)	(6)	(19)	(41)	(32)	(30)	(17)
$\mathbf{1}(\Delta \text{ cap} = \$50K)$ $\times \Delta$ cap (\$000s)	221***	266***	-45***	153***	63	76***	2
	(21)	(15)	(15)	(38)	(32)	(28)	(16)
$\mathbf{1}(\Delta \text{ cap} = -\$50\text{K})$ $\times \Delta$ cap (\$000s)	310***	318***	-8	199***	88***	67***	-8
	(15)	(8)	(13)	(29)	(22)	(21)	(12)
Dependent mean at $t-1$	38,764	34,041	4,723	198,277	157,610	33,072	55,670
R-squared	0.060	0.341	0.005	0.007	0.012	0.024	0.004

** denotes $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered by individual. N=78,356.

Notes: This table presents causal estimates of the impact of changes in the concessional contributions cap from equation (4.1) in Panel A and (4.2) in Panel B. All regressions include a full set of year and age fixed effects, as well as controls for changes in marital status, business ownership, and investment property ownership and a female dummy that allows for different trends for men and women. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2016/17 years. We restrict the sample to individuals aged 45 to 54 with contributions of at least \$23,000 in year t and $t-1$.

Table A4: Sensitivity of the estimated effects on the constrained sample with respect to ϵ

	Dependent variable: Change in						
	Contributions			Income			Tax paid
	Total (1)	Tax favored (2)	Other (3)	Taxable (4)	Employment (5)	Business (6)	Total (7)
Baseline: ϵ = \$2,000 (N=13,287)							
Δ cap (\$000s)	486***	542***	-56***	383***	198***	75	8
	(15)	(14)	(7)	(57)	(41)	(45)	(24)
Dep. mean at $t-1$	35,606	33,462	2,144	194,685	154,222	33,273	53,922
ϵ = \$500 (N=10,686)							
Δ cap (\$000s)	478***	542***	-64***	361***	188***	106**	-2
	(17)	(16)	(8)	(65)	(46)	(53)	(29)
Dep. mean at $t-1$	36,608	34,198	2,410	199,392	154,851	36,456	55,493
ϵ = \$1,000 (N=11,794)							
Δ cap (\$000s)	483***	542***	-60***	368***	198***	90	4
	(16)	(15)	(8)	(61)	(43)	(50)	(27)
Dep. mean at $t-1$	36,151	33,879	2,272	197,229	153,841	35,447	54,725
ϵ = \$5,000 (N=18,323)							
Δ cap (\$000s)	429***	482***	-53***	285***	181***	65	-12
	(13)	(13)	(6)	(46)	(36)	(36)	(20)
Dep. mean at $t-1$	33,061	31,129	1,932	185,633	154,073	26,903	51,274

** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered by individual.

Notes: This table presents causal estimates of the impact of changes in the concessional contributions cap on individuals with contributions between the new and old caps from equation (4.3). All regressions include year and age fixed effects, controls for changes in marital status, business ownership, and investment property ownership, and a female dummy. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2013/14 years. We restrict the sample to individuals aged 48 to 51 with contributions in the relevant range.

Table A5: Comparing the estimates for the constrained sample with baseline and wider age samples

	Dependent variable: Change in							
	Contributions			Income				Tax paid
	Total (1)	Tax Favored (2)	Other (3)	Taxable (4)	Employment (5)	Business (6)	Investment (7)	Total (8)
	Panel A: Baseline sample, ages 48–51 (N=13,287)							
Δ cap ($000s)	486***	542***	-56***	383***	198***	75	75**	8
	(15)	(14)	(7)	(57)	(41)	(45)	(32)	(24)
Effect: $25K increase	12,150	13,550	-1,400	9,575	4,950	1,875	1,875	200
Dep. mean at $t-1$	35,606	33,462	2,144	194,685	154,222	33,273	12,148	53,922
R-squared	0.374	0.493	0.048	0.011	0.017	0.021	0.009	0.006
	Panel B: Age 45–54 sample (N=40,577)							
Δ cap ($000s)	509***	576***	-67***	312***	190***	64**	32	-19
	(8)	(7)	(4)	(39)	(28)	(30)	(20)	(17)
Effect: $25K increase	12,725	14,400	-1,675	7,800	4,750	1,600	800	-475
Dep. mean at $t-1$	37,968	35,982	1,985	191,207	152,658	31,738	11,360	51,960
R-squared	0.376	0.495	0.034	0.011	0.018	0.024	0.009	0.005

** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered by individual.

Notes: This table presents causal estimates of the impact of changes in the concessional contributions cap on individuals with contributions between the new and old caps from equation (4.3). All regressions include year and age fixed effects, controls for changes in marital status, business ownership, and investment property ownership, and a female dummy. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2013/14 years.

Table A6: Anticipation and dynamics

	Dependent variable: Change in									
	Contributions			Income and deductions						Tax paid
	Total	Tax favored	Other	Taxable	Employment	Business	Investment income	Net capital gain	Total deductions	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Δ cap ($000s) this year	295***	318***	-23**	188***	84***	72***	-3	10	-10**	-9
	(13)	(8)	(11)	(25)	(20)	(18)	(12)	(11)	(4)	(10)
Δ cap ($000s) last year	16	32***	-16	-8	-5	-6	-4	19**	3	-16
	(11)	(6)	(9)	(21)	(17)	(16)	(11)	(10)	(4)	(9)
Δ cap ($000s) next year	-20	-35***	15	24	-10	3	1	20	-4	8
	(13)	(5)	(11)	(28)	(23)	(22)	(15)	(13)	(5)	(12)
Dependent mean at $t-1$	38,764	34,041	4,723	198,277	157,610	33,072	11,504	2,606	6,480	55,670
R-squared	0.056	0.319	0.004	0.007	0.012	0.024	0.007	0.006	0.001	0.004

** denotes $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered by individual. N=78,356.

Notes: This table presents causal estimates of the impact of changes in the concessional contributions cap from equation (5.1). All regressions include a full set of year and age fixed effects, as well as controls for changes in marital status, business ownership, and investment property ownership and a female dummy that allows for different trends for men and women. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2016/17 years. We restrict the sample to individuals aged 45 to 54 with contributions of at least $23,000 in year t and $t-1$.

Table A7: Examining intra-household spillovers among married individuals

	Dependent variable: Change in						
	Contributions			Income			Tax paid
	Total (1)	Tax favored (2)	Other (3)	Taxable (4)	Employment (5)	Business (6)	Total (7)
	Panel A: Baseline estimates for married individuals (N=19,344)						
Δ cap (\$000s)	320***	325***	-4	168***	128***	89***	-9
	(24)	(16)	(19)	(43)	(35)	(33)	(17)
Dependent mean at $t-1$	36,388	31,743	4,645	203,149	159,247	36,416	57,939
R-squared	0.060	0.337	0.005	0.007	0.011	0.024	0.004
	Panel B: Heterogeneity based on spousal cap changes (N=19,344)						
Δ cap (\$000s)	394***	448***	-54***	249***	219***	-2	30
	(23)	(17)	(18)	(39)	(32)	(32)	(16)
Δ cap (\$000s) $\times$ $\mathbf{1}(\Delta\text{cap} \times \Delta\text{SpGap} > 0)$	-81***	-75***	-5	-85	-55	29	-48**
	(29)	(20)	(22)	(48)	(40)	(38)	(19)
Dependent mean at $t-1$	36,388	31,743	4,645	203,149	159,247	36,416	57,939
R-squared	0.061	0.329	0.006	0.010	0.013	0.025	0.006
	Panel C: Spousal spillovers among married individuals with no cap change (N=11,417)						
Δ Spouse's Cap (\$000s)	39	26***	13	-1	-43	-50	0
	(25)	(9)	(23)	(50)	(36)	(36)	(20)
Dependent mean at $t-1$	36,333	31,721	4,612	203,285	160,378	36,017	58,114
R-squared	0.007	0.014	0.006	0.007	0.008	0.026	0.006

** denotes $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses are clustered by individual.

Notes: This table presents causal estimates of the impact of changes in the concessional contributions cap on married individuals in Panel A from equation (4.1). In Panel B, we examine heterogeneity in these effects with respect to the change in relative caps between spouses. In Panel C, we examine spousal spillovers among married individuals who experience no cap change themselves. All regressions include a full set of year and age fixed effects, as well as controls for changes in marital status, business ownership, and investment property ownership and a female dummy that allows for different trends for men and women. The sample comes from a 10% random sample of longitudinal tax records in Australia for the 2007/08 to 2016/17 years. We restrict the sample to married individuals aged 48 to 51 with contributions of at least \$23,000 in year t and $t-1$.