Child-Related Transfers, Means Testing and Welfare*

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Abstract

Should government transfers to families with children be means-tested? We revisit this question from the unique Australian policy context, where all child-related transfers are strictly means-tested. Using household survey data, we first demonstrate that means testing effectively directs child benefits to low-income Australian families with children, comprising up to 40% of their gross total income during the childbearing period. Notably, this coincides with the distinct M-shaped labor supply pattern of Australian mothers over the life cycle. Combining these empirical facts with a dynamic general equilibrium overlapping generations model of single and married households with children, we quantify the aggregate and distributional impacts of child-related transfers. Our simulation results demonstrate the significant adverse effects of means testing on work incentives and human capital development among mothers. A structural reform that replaces the status quo means-tested system with a universal system improves female labor supply, output, and overall welfare while also garnering majority support. However, the universal system increases tax burden by 4 percentage points and negatively impacts single mothers—the intended beneficiaries—by reducing their net lifetime income and welfare. In our model, inclusion of means testing is essential for controlling fiscal costs and mitigating the adverse effects of higher taxes. Preserving the existing means-tested system and opting for incremental reforms could potentially result in modest improvements in output and welfare while ensuring a more equitable distribution of welfare gains. Hence, our findings highlight the complex trade-offs between efficiency and equity in designing child benefit programs.

JEL: E62, H24, H31

Keywords: Child Benefits; Means Testing; Female Labor Supply; Efficiency; Equity; Dynamic General Equilibrium

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1 Introduction

Advanced economies implement child benefit policies to support low-income families with dependent children, namely child-related transfers or child benefits. In practice, these transfers—including lump-sum cash transfers, child care subsidies, and child tax credits, just to name a few—are generally means-tested, though the program structures may vary significantly with respect to means-test thresholds, phase-out rates, income definitions, and other eligibility criteria, such as demographic status.

Means testing is the central policy tool for directing benefits to families in need (extensive margin) while tailoring the benefit rates (intensive margin) to their economic circumstances. In doing so, it contains the fiscal costs, thereby allowing for the pursuit of redistributive goals without overburdening taxpayers. However, since benefits phase out as private earnings increase, means testing can also create significant disincentives to work and save for benefit recipients, especially secondary earners who are predominantly women. This subsequently results in economy-wide impacts on the labor market, output and overall welfare. Questions on how to improve existing child benefit designs have been a subject of debates within macro and public finance literature and policy-making sphere. Previous studies (e.g., Guner et al. 2020) primarily focus on child benefits within U.S. policy settings. However, little is known about other designs of child-related transfer systems.[1]

This paper contributes to the literature by examining the aggregate and distributional effects of a comprehensive means-tested child-related transfer system based on the unique Australian policy setting, where child benefits are highly targeted through complex means testing rules, yet more substantial in size and broader in coverage.

Specifically, Australia has two major means-tested child benefit programs: Family Tax Benefit (FTB)—direct lump-sum transfers—and Child Care Subsidy (CCS)—subsidies to the formal child care costs. Unlike the US and many other OECD countries, Australia has a long history of running a comprehensive means-tested transfer system with the following features: (i) benefits assess family income and vary according to marital status, as well as the number and age of children; (ii) lump sum cash transfers are unconditional (no workforce participation requirements), whereas subsidies are conditional on work hours of secondary earners; and (iii) there are no child tax credits for working parents.

We first use data from the Household, Income and Labour Dynamics in Australia (HILDA) survey 2001-2020 to document the role of child-related transfers in Australia. We highlight two key empirical facts: (i) child benefits are important for low-income households during the child-bearing and rearing period, accounting for as much as 40% of their average total income; and (ii) mothers have distinct M-shaped life cycle profiles of labor supply. To explain the economic mechanisms underlying these observations, we formulate a simple partial equilibrium model and demonstrate how integrating means testing into a child benefit program impacts labor supply decisions.

We then develop a dynamic general equilibrium model featuring overlapping generations of households with exogenous heterogeneity in several dimensions, such as family structure (marital and parental status, and number and age of children), education, costs of children, and uninsurable longevity risk and idiosyncratic earnings shocks. This approach allows us to simulate a rich model with endogenous household consumption, savings, female workforce participation, and human capital formation to quantitatively examine the role of means testing embedded in the child-related transfer system. We discipline our benchmark model using 2012-18 macroeconomic aggregates and household microdata for Australia. The calibrated model serves as a laboratory for assessing the existing child benefits and potential reforms based on three criteria: (i) key macro aggregates such as labor supply and output, (ii) ex-ante overall welfare, and (iii) the distribution of welfare gains/losses (or equity). Our counterfactual analysis involves both radical and incremental reforms to the baseline system.

[1] The United States recently introduced income test to phase out child tax credits for high income families in the American Rescue Plan Act 2021. The UK added income test to its child-related transfer system since the introduction of High Income Child Benefit Charge 2013. The Netherlands has supplemented its universal child benefits with income-dependent child benefits aimed at lower- and middle-income families since 2005. Australia has a long history of operating a comprehensive means-tested child benefit system, which began with the introduction of the New Tax System (Family Assistance) Act in 1999.

In each scenario, we adjust policy parameters of the two child benefit programs (FTB and CCS) and employ income tax as a public budget balancing tool, holding other policy and structural parameters at their initial steady-state values.

In our first counterfactual, we examine whether a universal child benefit program is a superior alternative in terms of its impact on macroeconomic aggregates, overall welfare, and equity within our model.[2] To do so, we implement a radical reform, referred to as the *baseline universal program*. This reform abolishes all means testing, making the FTB and the CCS universally accessible to households with children, while maintaining the baseline payment rates and the demographic criteria. Our findings suggest that the current means-tested child benefits create significant work disincentives as their phasing-out raises the effective marginal tax rate (EMTR) for recipients. Without means testing, universal child benefits lead to increases in output and overall welfare, driven by improved labor supply and human capital of married mothers.[3] However, the universal system is inequitable. While it eliminates wage distortions associated with means testing, it significantly enlarges child benefit spending, thus necessitating much higher income taxes. This ultimately harms single mothers, the most vulnerable demographic and the intended beneficiaries of the programs. As child benefits eventually cease once children reach adulthood, single mothers—who lack family insurance via earnings of a partner—are left relying exclusively on their own labor supply and savings after their children become independent. The additional tax burden reduces their lifetime take-home income by more than the benefits they receive, causing their welfare decline.

We next study whether adjusting the universal benefit payment rate could lead to a more equitable welfare outcome. The results suggest that deviating from the baseline level neither addresses the issue of inequity nor achieves the program's aim of supporting all parents. On one hand, scaling up the universal program entails a heavier tax burden, exacerbating the financial strain on single mothers. On the other hand, reducing transfers alleviates the tax burden on single households, but leads to inadequate support that negatively impacts low-education married households. Due to early parenthood, the latter group often faces the challenge of large household size that decreases their per capita consumption while the child care costs limit their ability to work and save. The credit constraint assumption further prevents them from borrowing at early age. Consequently, young low-education couples with dependent children are often hand-to-mouth and have high marginal utilities of consumption. This underscores the role of government transfers in easing their constraints and allowing them to better smooth life cycle consumption. Reduced universal payments fail to fulfill this role.

These findings highlight the importance of balancing means-testing distortions with tax burden. A universal child benefit system, by letting benefit spending to run amok, could lead to unintended consequences for the intended recipients. Inclusion of means testing is essential for ensuring sufficient support to families in need while managing fiscal costs and mitigating the adverse effects of higher income taxes.

We then turn to the question of whether the current means-tested system could be improved by examining incremental changes to four policy parameters: payment rates and phase-out rates of the FTB and CCS. We find that most reforms bring about trade-offs between welfare and output. A notable exception is when the CCS phase-out rates are relaxed (halved), which generates modest labor supply and output gains, along with improvements in welfare for all households. This redesigned means-tested system does not compromise equity, albeit the aggregate welfare gain is relatively small compared to that of the baseline universal program. Furthermore, because married households, who constitute the majority, benefit less in this regime compared to what the baseline universal program could offer, the latter would still garner more support if both policy options were presented.

Finally, to highlight the welfare benefits of the status quo means-tested system, we consider three extreme

[2] In this study, '*Equity*' is associated with distribution of ex-ante welfare changes among demographic groups. A reform is *equitable*, thereby improving equity, if no demographic group is made worse off. The term equity thus represents a looser definition of Pareto improvement. An improved welfare outcome for a demographic group is related to the expected welfare of its newborns, but each member may still experience a welfare loss depending on heterogeneity associated with their earnings shocks.

[3] Disincentives to work embedded in the present Australian tax and transfer system have been highlighted in government policy review papers (e.g., Treasury 2023 and Treasury 2024).

policy reforms: (i) abolishing the FTB, (ii) abolishing the CCS, and (iii) abolishing both programs. We find that these reforms could potentially result in significant negative impacts on overall and parental welfare. For example, although Experiment (iii) produces consumption and output gains from increased workforce participation and human capital, these come at the expense of welfare and equity. Single mothers experience large welfare losses, equivalent to reductions in total lifetime wealth of up to 4% for those with high education and 6.5% for those with low education. Compared to couples, single mothers in our model are more susceptible to drastic declines in welfare in the event of radical policy changes for two reasons: first, they lack the family insurance provided by a partner's earnings and savings; second, their own capacity to work and save is constrained by the pecuniary and non-pecuniary costs of child care. This group is especially vulnerable in the early stages of the life cycle, when their human capital and wealth stocks are limited, making them heavily reliant on child-related transfers to bridge the gap. Their significant losses across these counterfactual reforms ultimately drive down the ex-ante welfare of all newborn households, therefore underscoring the social desirability of the public provision of child benefits within the utilitarian context of our study.

In summary, three key lessons emerge from the findings in this paper. First, the simulation results highlight the complex trade-offs between aggregate and distributive goals in designing a child benefit system. Second, they emphasize the importance of accounting for heterogeneity in family structure. As demonstrated, the welfare effects are largely driven by the losses experienced by single mothers, who, unlike couples, confront strict constraints that hamper their self-insurance capacity, making it difficult for them to adjust labor supply and savings in response to new policy environments. In models without family type, we would expect reforms that reduce or eliminate means-testing distortions to yield greater positive overall welfare effects than those observed in this research. Third, the study stresses the importance of balancing distortions from means testing with those arising from the tax burden. Specifically, by limiting fiscal costs, means testing reduces distortionary effects via the endogenous general equilibrium channel. In contrast, a universal system removes means testing, flattening effective marginal tax rates, but its financing substantially raises the tax rate. Overall, while it enhances total output and welfare, it ends up harming, rather than helping, the intended beneficiaries. In our model, incremental adjustments to the existing means-tested system, such as relaxing the CCS phase-out rate, appear to offer more balanced outcomes.

Related literature. This paper is related to a strand of literature on female labor supply (e.g., see Baker et al. 2008, Guner et al. 2012a, Guner et al. 2012b, Bick 2016, and Bick and Fuchs-Schündeln 2018). Guner et al. (2012a) and Guner et al. (2012b), for instance, model the joint labor supply of married couples and explore the disincentive effect of joint-taxation in the US. Bick and Fuchs-Schündeln (2018) study the implications of taxation on work hour differences between married men and women across 17 European countries and the U.S. Recent developments also focus on social security (e.g., Kaygusuz 2015, Nishiyama 2019, and Borella et al. 2020) and child benefits (e.g., Guner et al. 2020) in the U.S. policy settings. Our paper contributes to this literature new insights from a broad range of counterfactual policy experiments within a different fiscal setting, where income is taxed individually but child benefits are strictly means-tested based on combined family income. Methodologically, we extend the model in Guner et al. (2020) to incorporate individual earnings and longevity risks. We also deviate from Guner et al. (2020) to focus on the extensive margin of female labor supply decisions.

This study also contributes to the literature on means-tested social insurance (e.g., Feldstein 1987, Hubbard et al. 1995, Neumark and Powers 2000, Tran and Woodland 2014, Braun et al. 2017, and Iskhakov and Keane 2021). Their findings generally highlight that while means testing distorts incentives to work and save, it can be useful for balancing the insurance and incentive trade-offs, potentially improving overall welfare. We demonstrate similar mechanisms at work for welfare/distributional effects. We show that even when a universal child benefit program provides an overall welfare improvement and is favored by the majority, it can still mask undesirable distributional effects that undermine policy objectives.

Additionally, our paper relates to the international empirical literature on taxes, transfers, and female labor supply (e.g., Blau and Robins 1988; Averett et al. 1997; Lundberg et al. 1997; Blundell et al. 1998, and Geyer et al. 2015). In the U.S. context, Blau and Robins (1988) and Averett et al. (1997) find that women's labor supply responds to the effective wages, thus affected by child benefits. Eissa and Hoynes (2004) show that the family-income tested Earned Income Tax Credit (EITC) significantly reduces participation among married mothers. Blundell et al. (1998) study the UK tax reforms in the 1980s and demonstrate that they led to moderate compensated wage elasticities for women and additional negative income effects for mothers, suggesting efficiency and welfare costs. Furthermore, child benefits can have undesirable long-term effects on mothers by affecting their human capital accumulation and earnings potential (Lundberg et al. 1997). For Australia, Doiron and Kalb (2005), Breunig et al. (2011), Breunig et al. (2012), Gong and Breunig (2017), and Hérault and Kalb (2022) reveal similar findings. These micro/empirical evidence motivates us to build a structural micro-founded macro model to study the implications of the Australian design of child benefits on macroeconomic aggregates, welfare, and equity.

Finally, our work adds to the growing body of research on the macroeconomic impacts of fiscal policies in Australia, as seen in studies by Tran and Woodland (2014), Kudrna et al. (2022), Tran and Zakariyya (2022), and Tin and Tran (2023).

The paper hereinafter proceeds as follows. Section 2 presents stylized facts. Section 3 discusses a simple theoretical model for intuitions. Section 4 gives a full description of the dynamic general equilibrium model. Section 5 reports the internal and external calibration procedures, and the benchmark model performance. Section 6 reports main results and discussion, and Section 7 provides an an extended analysis. Section 8 concludes. The Appendix provides supplementary results and statistics, detailed information on the child-related transfer programs, and the algorithm to solve the model.

2 Child-related transfers and life cycle labor supply in Australia

In this section, we outline the institutional features of the two child-related transfer programs, alongside selected empirical life cycle labor supply facts based on the Household, Income and Labour Dynamics in Australia (HILDA) Survey Restricted Release 20 (2001-2020). We also supplement our empirical analysis with data provided in 2021 Child Care Package Evaluation report by the Australian Institute of Family Studies (AIFS). A detailed description, along with additional tables and figures, are provided in the Appendix. All dollar values are converted to 2018 Australian dollars (AUD), unless otherwise stated.

2.1 Family Tax Benefit (FTB) and Child Care Subsidy (CCS) programs

Transfers directed towards families in Australia accounted for 2-2.5% of GDP over the past decade. There are two major child-related transfer programs: the Family Tax Benefit (FTB) and the Child Care Subsidy (CCS), which together constitute 70% of the family transfers. The FTB and CCS are not mutually exclusive, with each delivering benefits to approximately one million families, representing over 50% of families with children under 16 years old. These programs are also highly targeted with emphasis on supporting low-income single-earner couple parents and single parents. The support is administered through a range of instruments, including strict means testing based on family and/or secondary earner incomes, and adjustable payment rates and income-test thresholds that vary according to the number and age of dependent children.[4]

The FTB consists of two parts. The FTB part A (FTB-A) assesses joint family income, with the maximum and base payments per child decreasing with the age of dependent children. The FTB part B (FTB-B) provides

[4]More precisely, as of June 2018, 1.4 million families were receiving FTB payments, 77% of whom received both FTB-A and FTB-B (AIHW report 2022). In the December quarter of 2018, the CCS covered 974,600 families (Child Care in Australia report 2018). This study excludes the Paid Parental Leave program, which represents a smaller share of family assistance expenditure. Further detail of all government payments for families in Australia is available on the government agency Service Australia. Appendix Section B provides a summary of the FTB and CCS programs, including benefit calculation methods, qualification criteria, and how payment rates vary based on marital and parental statuses, the number and age of children, and household income.

extra support to single parents and single-earner couple parents. It assesses the primary earner's income to determine eligibility (extensive margin) and secondary earner's income to adjust benefits and phase-out rates (intensive margin). The FTB-B is paid per family, and similar to the FTB-A, families having younger children receive higher payments.

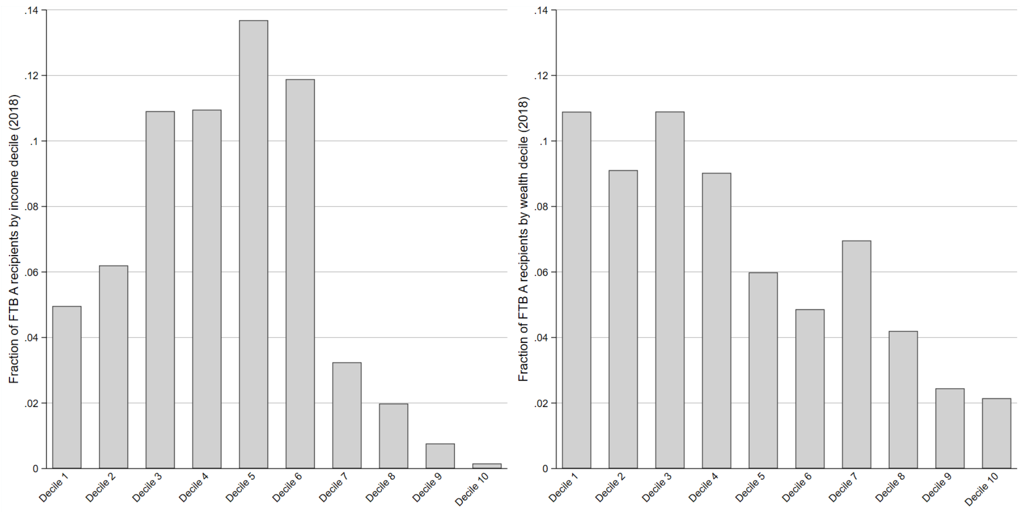

Figure 1: **FTB-A recipients in 2018. Left**: By income decile, **Right**: By wealth decile.

Family Tax Benefit Part A (FTB-A) The FTB-A concentrates among low-income families. The left panel of Figure 1 indicates that a sizeable fraction of households in the first six income deciles, up to 15% for the median households, received the benefits in 2018. Surprisingly, possibly due to the absence of assets test, a small proportion of relatively wealthy households also met the eligibility criteria for the benefits, as portrayed in the right panel.[5] Nonetheless, Figure 5 on life cycle facts indicates that the total income share of FTB is significant only for low-income households.

At the intensive margin, the FTB-A alone represents a significant sum of inflation-indexed transfers (Figures C.1 and C.2). Qualified families with a child aged 0-15 years old could receive up to $7,000 per child, with the average FTB-A benefits per family at $8,500 per annum (Figure C.6). Moreover, because the scheme predominantly targets single-earner families, especially single parents, single parent households claimed larger benefits compared to couples (Figure C.7).

Family Tax Benefit Part B (FTB-B) The proportion of FTB-B claimants fell over time, down by nearly half by 2018 (Figure 2). This decline can be attributed to the $150,000 (current AUD) income-test threshold for primary earners introduced in 2009, and the subsequent tightening in 2016 as the threshold decreased further to $100,000 (current AUD). Nonetheless, because the primary earner's income test exclusively determines eligibility (controlling the extensive margin), it had no discernible effect on the average benefit rate for recipients.[6] Over the past decade, eligible single parents could expect to receive over $3,500, while couple parents could expect just under $3,000 (Figure C.13). Thus, although the FTB-A is the larger of the two benefits, the FTB-B still offers a non-trivial amount.

[5]Household wealth is defined in HILDA as its net worth where net worth is total assets net of total debts. Total assets contain two primary components: (i) financial assets (e.g., own and joint bank accounts, children's bank accounts, superannuation, cash investments, equity investments, trust funds, and life insurance), and non-financial assets (e.g., property assets, home assets, other property assets, business assets, collectibles, and vehicles). Total debts comprise credit card debt, joint credit cards, own credit cards, student debt (HECS), other personal debt, business debt, property debt, home debt, other property debt, and overdue household and bills.

[6]In 2018, a household with the primary earner earning below $100,000 may be eligible for the FTB-B subject to the secondary earner's income test.

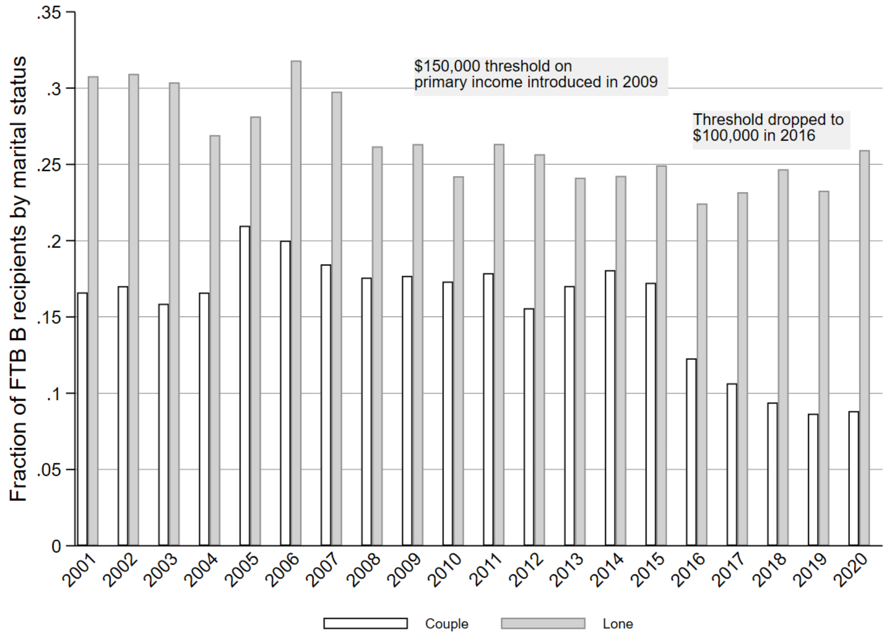

Figure 2: **Proportion of FTB-B recipients by marital status.**

Child Care Subsidy (CCS) The CCS program's primary function is to subsidize the cost of formal child care services—including out-of-school hours care (OSHC) for children up to 13 years old—and is paid directly to service providers. The base subsidy rate is determined through means testing family income. A distinctive feature, setting the CCS apart from the FTB, is the activity test on secondary earner's work hours to adjust the base subsidy rate. Secondary earner parents who engage in recognized activities, such as employment, training, or volunteering, for 48 hours or more per fortnight can receive full subsidies covering up to 85% of the formal child care costs. As their work hours fall, so does the base subsidy rate.

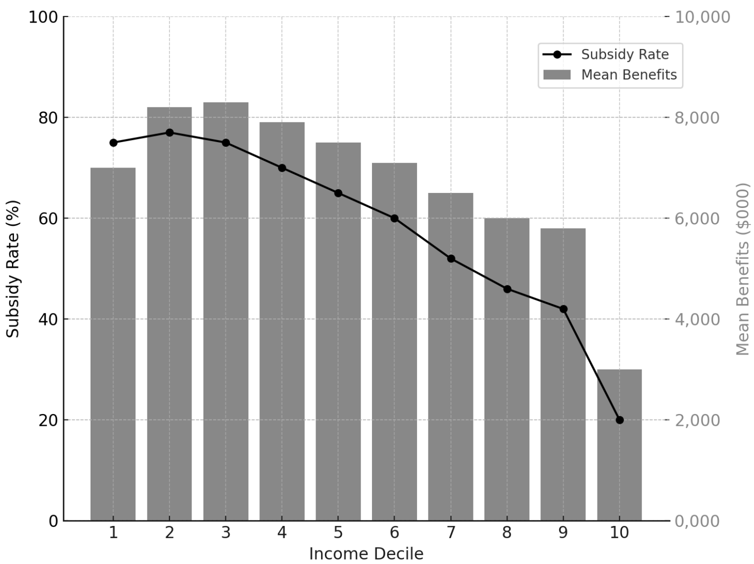

Figure 3: **Child Care Subsidy rates and Mean Benefits (Subsidies) by income decile.**
Notes: This figure uses data from Table 61 in the 2021 report by the AIFS. The lowest decile earned at most $31,399. *The top decile earned* $240,818 *or more.*

The distribution of effective subsidy rates underscores the program's extensive coverage. According to the 2021 AIFS report, of the families recorded using child care, approximately 32% received a subsidy rate between 75-95%, 43% received between 50-75%, 18% received a rate below 50%, and only a small remainder received no subsidy at all. In fact, significant proportions of child care users across the income distribution receive some degree of subsidies (Figure C.14).

At the intensive margin, the CCS subsidies are significant. As demonstrated by Figure 3, the average annual benefits were well above $7,000 for those at or below the median income.[7] We also observe that the subsidy rate exhibits a progressive trend, decreasing as income increases, yet high-income families (excluding the top income) still received approximately $6,000. This substantial disbursement to better-off families may result from (i) the generous income-test thresholds, and (ii) the activity test aiming at fostering workforce participation.[8] In other words, although higher-income families may receive smaller hourly subsidy rates, they can still accrue substantial subsidies if the secondary earner works full-time.[9] For the same reason, the lower benefits for the bottom-decile families compared to their peers in adjacent deciles may occur due to the differences in work hours.

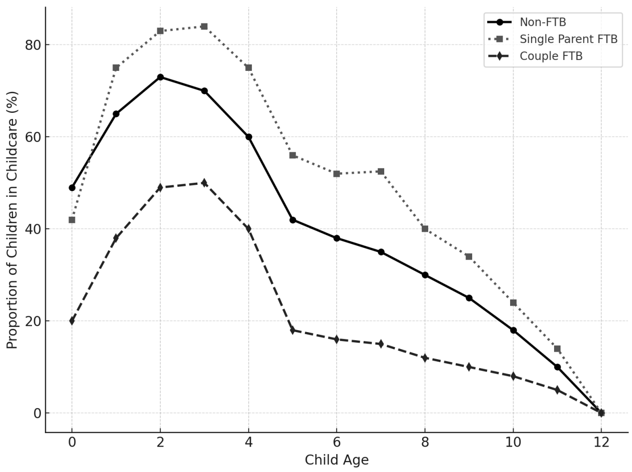

Figure 4: **Proportion of children in child care by child age and FTB receipt.**
Notes: This figure uses data from Figure 95 in the 2021 report by the AIFS.

Furthermore, as evident in Figure 4, a significant portion of FTB recipients uses child care services. The usage profiles are roughly hump-shaped for both FTB and non-FTB recipients, with the greatest incidence of child care usage during the first five years post-birth. Single FTB parents, in particular, have the highest proportion of children in child care. Since FTB and CCS benefits are not mutually exclusive, it is important that we examine their joint effects and explore potential reforms.

2.2 Stylized facts

Fact 1: Child benefits are important income sources. The preceding subsection illustrates that child benefits are generous. Accompanying this fact is Figure 5 which shows hump-shaped life cycle profiles of FTB share of gross household income, peaking during the child-bearing and rearing years and being most significant for low-income households. In particular, for recipients in their late 20s to early 40s in the first and second quintiles, the FTB benefits comprise approximately one-third and one-fifth of their gross total income, respectively. At its peak, the FTB makes up over 40% of the bottom quintile households' total income.

[7] For the lowest decile (earning less than $31,399), these benefits constitute at least 20% of their gross income

[8] The CCS schedule's cut-out point is above $350,000, which is more than the family income cut-off of $240,818 to be in the tenth decile.

[9] Families with an income in excess of $186,958 face an annual cap of $10,190 on the CCS per child. However, based on Table 28 in the 2021 AIFS report, only 1.7% of couple parents and 0.1% of single parents are estimated to have been affected by the cap. Among the affected couple parents, the vast majority are dual-earner families living in a capital city. Table 29 of the report further shows that even when we consider the subset with income between $186,958 (cap threshold) and $351,247 (cut-out point of CCS), only 8.7% are impacted by the annual fee cap.

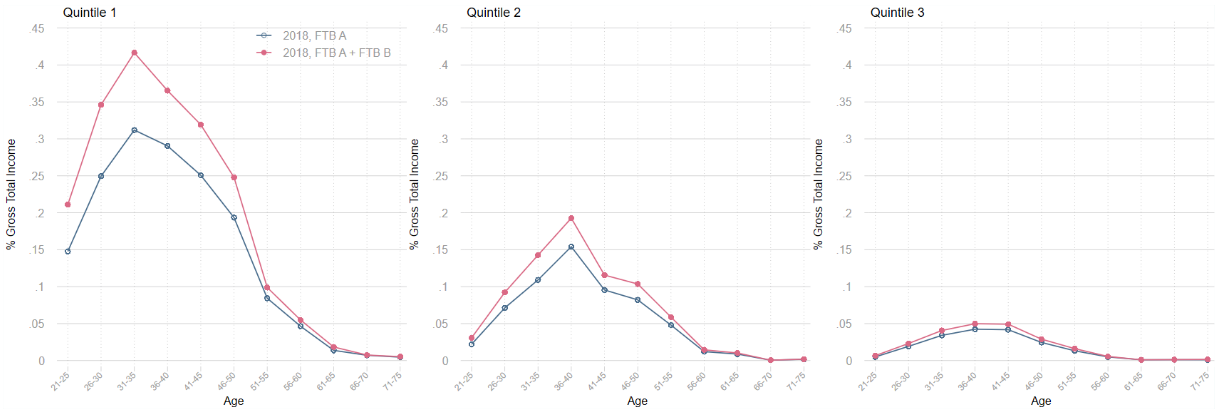

Figure 5: **Age profiles of FTB share of gross household income for the first three quintiles by family market income in 2018.**

Fact 2: Distinct age-profiles of labor supply of mothers. The presence of dependent children correlates with distinct life cycle profiles of labor force participation and full-time employment of mothers.[10] As illustrated in Figure 6, fathers consistently show higher workforce participation than their childless counterparts. The puzzle, however, concerns the participation of women. For the first 20 years of their adult lives, mothers' workforce participation is 10-15 percentage point (*pp*) lower than childless women's. The gap widens in their early 30s and narrows as both groups enter their 40s, at which point their participation rates converge and follow a similar trajectory thereafter.

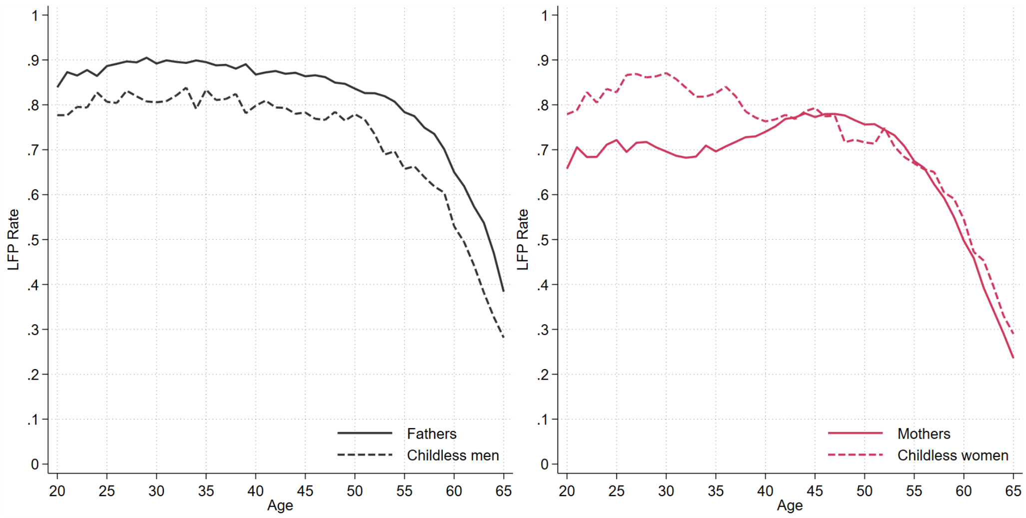

Figure 6: **Age profiles of labor force participation. Left:** fathers (solid) and childless men (dashed). **Right:** mothers (solid) and childless women (dashed).

Notes: The age profiles stitch together 20-year snapshots of life cycle for selected cohorts. The youngest cohort is cohort 12 aged 20-39 in the data, and the oldest cohort is cohort 12 aged 75-94.

Figure 7 depicts similar patterns for the life cycle profiles of full-time employment share. The full-time share profiles of fathers and childless men mirror their labor force participation profiles while the divergence between those of mothers and childless women is more pronounced. The profile of mothers sketches a distinct M-shaped pattern, resulting in the largest difference between mothers and their childless counterparts occurring between age 35 and 40. During this period, nearly 80% of working childless women have full-time jobs, contrasting sharply with just 45% of working mothers. This disparity narrows with age but never completely closes. Since

[10] Our definition of a parent is an individual with at least one dependent child, aligning with the model's definition of parenthood. An alternative definition, considering parents as those who have had a child regardless of the child's dependency or co-residence status, makes the labor force participation gap between fathers and non-fathers negligible and that between mothers and non-mothers even more pronounced.

the participation profile of mothers in Figure 6 is relatively stable, the recession that creates the M-shaped full-time share profile must be driven largely by a transition from full-time to part-time employment.[11]

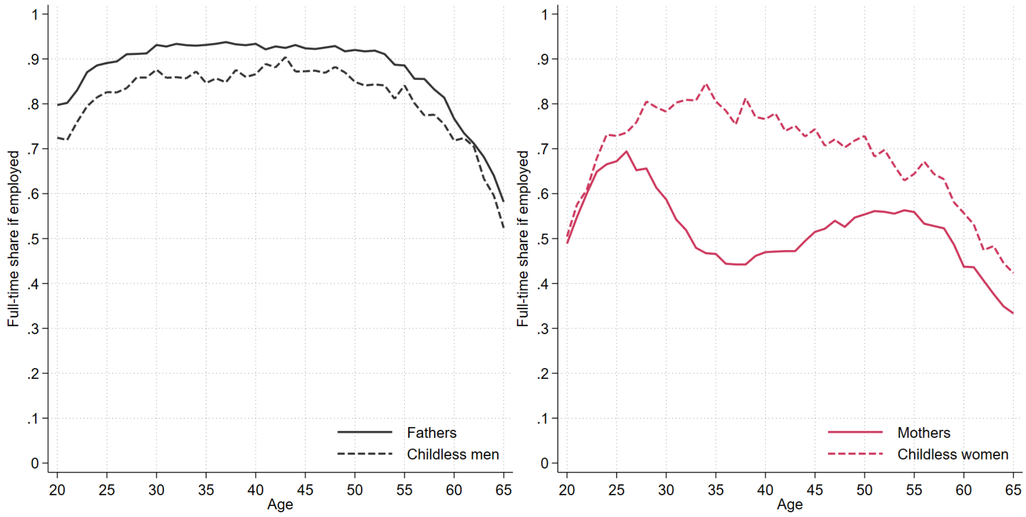

Figure 7: **Age profiles of full-time share of employment. Left:** fathers (solid) and childless men (dashed). **Right:** mothers (solid) and childless women (dashed).

In summary, the generosity and significance of means-tested child benefits for parents, together with the empirical evidence on mothers' labor supply, warrant further investigation into the extent to which the individual and joint effects of the two child benefit programs influence female labor supply behavior, output, welfare, and equity. The analytical and quantitative analyses in subsequent sections assess the current means-tested child benefit system and consider how alternative designs may alter aggregate and distributional outcomes.

3 A simple partial equilibrium model

In this section, we formulate a simple theoretical model to highlight how the inclusion of child care subsidies and means-tested transfers, the central features of child benefit programs, can affect female labor supply, household consumption, output, and welfare.

Consider a representative couple-parent household making a static decision on joint consumption c and female labor supply n^f. The husband's labor supply n^m is perfectly inelastic. Labor is awarded at a unit wage rate, and both spouses pay a flat tax rate of τ. For tractability, we simplify the two child benefit schemes as follows. First, we abstract from means testing for the Child Care Subsidy (CCS), and assume the CCS subsidizes the wife's labor earnings at a rate s, such that $CCS(n^f) = sn^f$. Second, we assume the Family Tax Benefit (FTB) is a single-tier means-tested program that assesses family income $n^m + n^f$, with a maximum payout of $\bar{tr}$, income-test threshold $\bar{y}$, and phase-out rate ω. More specifically, the FTB transfers are based on the following payment schedule: $FTB(n^f) = \max\left\{\min\left\{\bar{tr} - \omega(n^m + n^f - \bar{y}),\ \bar{tr}\right\},\ 0\right\}$.

Let $u(c, 1-n^f)$ denote a well-behaved utility function of consumption c and female leisure $1-n^f$ such that the following properties $u' > 0$, $u'' < 0$, $\lim_{x\to 0} u' = \infty$, $\lim_{x\to\infty} u' = 0$ hold true for all its argument $x \in \{c, 1-n^f\}$. The household problem is expressed as $\max_{c,\,n^f}\left\{u(c, 1-n^f)\right\}$ s.t. $c = (1-\tau)(n^m + n^f) + CCS(n^f) + FTB(n^f)$.

means testing creates non-linearities in the budget constraint. We consider three cases corresponding to three benefit schedule's zones (1), (2) and (3) as shown in Figure 8.[12]

[11] Appendix Figure D.1 shows comparable evolution of parent and non-parent life cycle profiles of work hours. Unlike childless women, who average 35-40 work hours per week for most of their working lives, mothers seldom exceed a 35-hour weekly average. In Subsection D, we also report similar findings on their estimated earnings profiles.

[12] We abstract from considering the kink at $\bar{y}$ and the cut-out point. Depending on the household's budget constraint and preferences, the kink might lead to a high density of households having income just below $\bar{y}$ to maintain eligibility for maximum transfer $\bar{tr}$ (i.e., bunching).

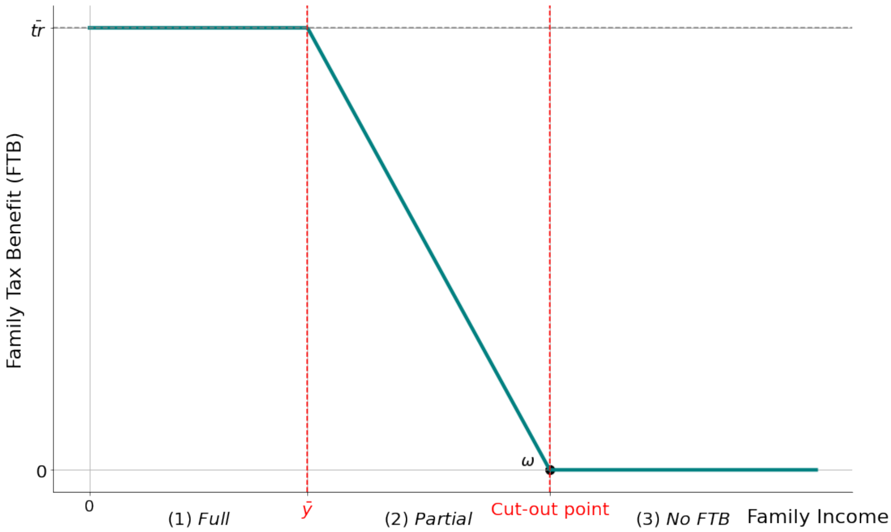

Figure 8: **Example means-tested Family Tax Benefit (FTB) schedule.**
Notes: The slope of the benefit schedule, ω, in the phase-out zone (2), between $\bar{y}$ and the cut-out point, is the taper or phase-out rate.

Case (1)-Full benefit. $n^m + n^f \leq \bar{y}$: Family income is less than the threshold $\bar{y}$ and the household receives the maximum FTB transfer, $\bar{tr}$. The optimal consumption and the marginal rate of substitution of female leisure for consumption (i.e., the price of consumption relative to leisure) are $c = (1-\tau)(n^m + n^f) + sn^f + \bar{tr}$ and $MRS = \dfrac{u'_c}{u'_{1-n^f}} = \dfrac{1}{(1-\tau+s)}$, respectively.

Case (2)-Partial benefit. $n^m + n^f > \bar{y}$ and $\bar{tr} - \omega(n^m + n^f - \bar{y}) > 0$: Family income is in the phase-out zone and the household receives a partial FTB transfer, $\bar{tr} - \omega(n^m + n^f - \bar{y})$. The optimal consumption and the marginal rate of substitution are $c = (1-\tau)(n^m + n^f) + sn^f + \bar{tr} - \omega(n^m + n^f - \bar{y})$ and $MRS = \dfrac{u'_c}{u'_{1-n^f}} = \dfrac{1}{(1-\tau-\omega+s)}$, respectively.

Case (3)-No benefit. $n^m + n^f > \bar{y}$ and $\bar{tr} - \omega(n^m + n^f - \bar{y}) \leq 0$: Family income is above the cut-out point and the household receives no FTB transfer. The optimal consumption and the marginal rate of substitution are $c = (1-\tau)(n^m + n^f) + sn^f$ and $MRS = \dfrac{u'_c}{u'_{1-n^f}} = \dfrac{1}{(1-\tau+s)}$, respectively.

There are some notable observations. First, across the three cases, transfers can affect female labor decisions through two channels: (i) the combined income effect (IE) and substitution effect (SE) arising from distortions to the MRS, and (ii) the direct IE via the budget constraint. Specific elements such as the total tax burden $\tau(n^m + n^f)$, subsidy sn^f, and full transfer $\bar{tr}$ in Case (1), as well as the partial transfer $\bar{tr} - \omega(n^m + n^f - \bar{y})$ in Case (2), are IEs that directly enter the household budget constraint. When the household receives full transfer $\bar{tr}$ as in Case (1) or no transfer at all as in Case (3), only τ and s contribute to the effective marginal tax rate ($EMTR$), distorting decisions at the margin. However, in the benefit phase-out zone of Case (2), the phase-out rate ω adds to the $EMTR$, behaving as an implicit tax on the joint family income above $\bar{y}$.

Second, as the $EMTR$ changes from $\tau - s$ to $\tau + \omega - s$ when the household income falls within the phase-out zone (2), the phase-out rate ω can partially or completely counteract the work incentive effect of the subsidy s. Therefore, understanding the interaction between policies is crucial for analyzing household behavior.

Third, the means-testing parameters $\bar{tr}$, $\bar{y}$, and ω, and the husband's income n^m determine a household's budget constraint and MRS, therefore jointly affecting the wife's incentive to work. To see this, note that the household will receive benefits as long as $\bar{tr} - \omega\left(n^m + n^f - \bar{y}\right) > 0$. This condition can be re-written as $n^f < \frac{\bar{tr}}{\omega} + \bar{y} - n^m$, which defines the upper bound of the wife's income zone over which the FTB applies. The term $\frac{\bar{tr}}{\omega} + \bar{y}$ determines the statutory cut-out point for the benefit. All else being equal, raising the maximum payment rate $\bar{tr}$, lowering the phase-out rate ω, or increasing the threshold $\bar{y}$ expands the FTB's coverage and its effect on the wife's labor supply. Moreover, because the transfer assesses joint income, the effective cutout point is also influenced by the male income n^m. A sufficiently large n^m could place the family income in the phase-out zone as in Case (2) or entirely outside the FTB eligibility zone as in Case (3). In the former scenario, the wife's work decision at the margin would face a higher $EMTR$ due to the phase-out rate ω, while in the latter, the FTB is irrelevant to her decision. In contrast, if n^m is such that $n^m + n^f < \bar{y}$ as in Case (1), then the female work decision is not distorted by ω but is still affected by the positive IE from $\bar{tr}$.

To see more clearly the labor supply, output, and welfare impacts, consider Case (2) and suppose the household's preference is represented by a Cobb-Douglas utility function: $u(c, 1-n^f) = c^\nu (1-n^f)^{1-\nu}$, where ν denotes the taste-for-consumption parameter.

For a household whose joint income lies in the phase-out zone (2), the first-order conditions and budget constraint give us the following expressions for n^f and $ln(u)$.

$$n^f = \nu - \frac{1-\nu}{\underbrace{1-EMTR}_{(a)\text{ price distortion}}} \left[\underbrace{(1-\tau)n^m + FTB(0)}_{(b)\text{ direct positive IE}} \right], \tag{1}$$

$$\begin{aligned} ln(u) &= \nu ln(\nu) + (1-\nu)ln(1-\nu) - \overbrace{(1-\nu)ln(1-EMTR)}^{(c)\text{ price distortion on leisure}} \\ &\quad + ln\left[\underbrace{(1-EMTR)}_{\text{(d) IE via price distortion}} + \underbrace{(1-\tau)n^m + FTB(0)}_{(e)\text{ direct positive IE}} \right], \end{aligned} \tag{2}$$

where $EMTR = \tau + \omega - s$, and $FTB(0)$ denotes $FTB(n^f) = \bar{tr} - \omega(n^m + n^f - \bar{y})$ when $n^f = 0$. Welfare is captured by the utility $u := u(c, 1-n^f)$, and given that n^m is fixed, the female labor supply n^f can be used as a proxy for output.

There are two main channels through which means-tested child benefits affect female labor supply and welfare. The first channel involves the direct positive IE—the male after-tax income $(1-\tau)n^m$ and the maximum possible transfer if the wife stays at home $FTB(0)$—that reduces female labor supply n^f, as seen in term (b) of Equation (1). On the contrary, this increases welfare, as shown by term (e) of Equation (2). The second channel stems from the $EMTR$'s price distortions, represented by term (a) in in Equation (1), and terms (c) and (d) in Equation (2). The $EMTR$ adversely impacts efficiency by distorting labor supply but has an ambiguous effect on welfare. On one hand, its SE causes the household to substitute away from consumption towards leisure. Thus, for $0 < EMTR < 1$, a higher $EMTR$ in term (c) contributes positively to welfare, with its effect weighted by the household's taste for leisure $(1-\nu)$. On the other hand, the $EMTR$'s negative IE, represented by term (d), diminishes both consumption and leisure, thereby reducing welfare. For instance, a higher ω reduces the positive IE of transfers and thus welfare via terms (d) and (e), but increases leisure via term (c). The net welfare effect is therefore ambiguous, warranting quantitative investigation.

These analytical results also emphasize the significance of the financing mechanism of transfers. Because the tax rate τ is a part of the price distortion and the direct IE in Equation (1) and (2), a high τ could negate the intended positive effects of child benefits. This necessitates exploration in a General Equilibrium (GE) environment, with income tax as an endogenous policy variable to maintain public budget balance.

Furthermore, our static and deterministic analytical model does not allow for welfare changes through the reallocation of leisure and consumption over the life cycle, nor does it account for insurance against earnings shocks or the impact of today's labor supply on tomorrow's earnings ability. A suitable quantitative framework should incorporate these features. Additionally, since child benefits and tax burdens vary across the socioeconomic and demographic spectrum—with parents of dependent children receiving the benefits, while non-parents bear the tax burden—this calls for a heterogeneous-agent environment to capture the full extent of the distributional effects.

In response to these considerations, we develop a dynamic general equilibrium model with overlapping generations of households making joint consumption, savings, and female labor force participation decisions. Our model incorporates rich household heterogeneity—including family type, education, female human capital formation, uninsurable longevity risk and idiosyncratic earnings shocks, children, and child-related costs—to explore the welfare, distributional, and aggregate macro implications of means-tested child benefits and potential reforms. We encapsulate the non-linearities introduced by means-testing and demographic criteria in the current system and consider realistic policy counterfactuals by integrating the actual FTB and CCS plans into our model. The next section details the quantitative environment.

4 A dynamic general equilibrium model

We study a small open economy model populated by a continuum of overlapping generations of households, a representative firm with constant returns to scale (CRS) technology, and a government committed to balancing its budget every period. Time begins at $t = 0$ when the model economy is at the initial steady state, and ends at $t = T$. One model period corresponds to one year.

4.1 Demographics

Every period t, a new cohort of households aged $j = 1$ (equivalent to a real age of 21) enters the economy. Each adult member of gender $i \in \{m, f\}$ in a household born at time t survives each subsequent period $t+j-1$ with a time-invariant conditional survival probability $\psi_{j,i}$ and can live to a maximum age $J = 80$ (i.e., $\psi_{J+1,i} = 0$). Individuals begin to work at $j = 1$ and retire at age $J_R = 45$. The initial total number of households at time $t = 0$ is normalized to one. The model population grows at a constant rate, n.

Family structure. At birth, each household is assigned one of three family types: (i) married couple with children ($\lambda = 0$), (ii) single childless man ($\lambda = 1$), and (iii) single mother ($\lambda = 2$). Married households comprise a husband and wife of identical age j and education θ. Marital status depends solely on survival probabilities (mortality shocks), meaning a married household will only become single if one spouse dies. Single households remain single until death. The model abstracts from divorce, marriage, and re-marriage after the initial assignment. The transition probabilities for family structure ($\pi_{\lambda_{j+1}|\lambda_j}$) is given by

$\pi_{\lambda_{j+1}\|\lambda_j}$	$\lambda_{j+1} = 0$	$\lambda_{j+1} = 1$	$\lambda_{j+1} = 2$
$\lambda_j = 0$	$\psi_{j+1,m}\psi_{j+1,f}$	$\psi_{j+1,m}(1-\psi_{j+1,f})$	$(1-\psi_{j+1,m})\psi_{j+1,f}$
$\lambda_j = 1$	0	$\psi_{j+1,m}$	0
$\lambda_j = 2$	0	0	$\psi_{j+1,f}$

Table 1: **Transition probabilities of family structure**

Children. Motherhood is a definite stage of life for every woman in the model. Children are deterministic and exogenous as we abstract from fertility choice. They do not contribute to the utility of their parents nor to the broader economy once they reach adulthood. Households have full information regarding the timing of children's arrival, non-pecuniary and pecuniary child care costs, the FTB benefits per child, the CCS rates per hour worked, and the human capital gains (or losses) if the mother works (or stays at home). For simplicity, childcare quality and costs for a child aged j_c are exogenous and uniform across all households. There is no informal care. All households have the same number of children, $\bar{nc} = 2$, and child spacing is identical, although the timing of births varies by education. The firstborn arrives earlier for low-education (θ_L) and later for high-education (θ_H) households. Thus, the k^{th} child is born to every household at age $j = b_{k,\theta}$ and is dependent until age 18 (from $j = b_{k,\theta}$ to $j = b_{k,\theta} + 17$). Afterwards, they leave home permanently, ending the parent-child link. With these simplifications, the number of children a household of age j and education θ has is $nc_{j,\theta} = \sum_{k=1}^{\bar{nc}} \mathbf{1}_{\{b_{k,\theta} \,\leq\, j \,\leq\, b_{k,\theta}+17\}}$.[13]

[13]We assume children and population growth are detached. Resources allocated to a child's upbringing do not contribute to

4.2 Preferences

Household preference is represented by a time-separable expected utility function

$$\sum_{j=1}^{J} \beta^{j-1} \left(\prod_{s=1}^{j-1} \pi_{\lambda_{s+1}|\lambda_s} \right) u(c_j, l_j^m, l_j^f, \theta, \lambda_j)$$

where β is the time discount factor, c is joint consumption, l^m is male leisure time, l^f is female leisure time, θ is the education level, and λ is the family type. Suppressing the age subscript j to ease notation, the periodic household utility function for each family type λ can be written as follows

$$\begin{aligned} u(c, l^m, l^f, \theta, \lambda = 0) &= \frac{\left[\left(\frac{c}{\iota_{0,\theta}} \right)^{\nu} (l^m)^{1-\nu} \right]^{1-\frac{1}{\gamma}} + \left[\left(\frac{c}{\iota_{0,\theta}} \right)^{\nu} (l^f)^{1-\nu} \right]^{1-\frac{1}{\gamma}}}{1 - \frac{1}{\gamma}}, \\ u(c, l^m, \theta, \lambda = 1) &= \frac{\left[(c)^{\nu} (l^m)^{1-\nu} \right]^{1-\frac{1}{\gamma}}}{1 - \frac{1}{\gamma}}, \\ u(c, l^f, \theta, \lambda = 2) &= \frac{\left[\left(\frac{c}{\iota_{2,\theta}} \right)^{\nu} (l^f)^{1-\nu} \right]^{1-\frac{1}{\gamma}}}{1 - \frac{1}{\gamma}}, \end{aligned}$$

where ν is the taste for consumption, γ is the elasticity of intertemporal substitution (EIS), and $\iota_{\lambda,\theta} = \sqrt{\mathbf{1}_{\{\lambda \neq 1\}} + \mathbf{1}_{\{\lambda \neq 2\}} + nc_\theta}$ is the consumption equivalence scale. While the model does not explicitly include children in the household utility functions, parents' concern for their children's welfare is partially reflected in their efforts to maximize per capita consumption.

Consumption equivalence scale. Children increase household size, thereby reducing per capita consumption. We capture this effect using the square root consumption equivalence scale $\iota_{\lambda,\theta}$, formally expressed as $\iota_{\lambda,\theta} = \sqrt{\mathbf{1}_{\{\lambda \neq 1\}} + \mathbf{1}_{\{\lambda \neq 2\}} + nc_\theta}$, where $\mathbf{1}_{\{x\}}$ is an indicator function with a logical argument x, and $\mathbf{1}_{\{\lambda \neq 1\}} + \mathbf{1}_{\{\lambda \neq 2\}} + nc_\theta$ calculates the household size (number of adults and children). $\iota_{\lambda,\theta}$ reflects the economies of scale within households, as shared consumption (e.g., utilities and durable goods) means the cost of living does not increase linearly with each additional member. It also adjusts for household composition. For instance, a family of four (two parents and two children) requires more resources than a childless couple but not necessarily two times more.[14]

4.3 Endowments

Married and single men. Men always work full-time until retirement and earn labor income $y_{j,\lambda}^m = w n_{j,\lambda}^m e_{j,\lambda}^m$ where w is market wages, and $n_{j,\lambda}^m$ and $e_{j,\lambda}^m$ are exogenous labor supply and earning ability, respectively. Their intensive margin of labor supply $n_{j,\lambda}^m = 1 - l_{j,\lambda}^m$ is set at normalized average work hours over the working age. The earning ability $e_{j,\lambda}^m$ is decomposed into a deterministic component $\bar{e}_j$ and a stochastic shock ϵ_j^m: $e_{j,\lambda}^m = \bar{e}_j \left(\theta, h_{j,\lambda}^m \right) \times \epsilon_j^m$, where $\bar{e}_j \left(\theta, h_{j,\lambda}^m \right) = e^{\theta} h_{j,\lambda}^m$ is a non-linear function of education θ and male human

future labor force productivity. Single men are childless. Children and child care are exogenous and deterministic life events only for couples and single women. Furthermore, because fertility is exogenous, making children affect household utility, aside from the indirect effect through time cost on leisure, is not a necessary feature.

[14] The consumption equivalence scale can be translated into the required income that equalizes per capita consumption levels between parent and non-parent households. For instance, using the square root scale $\iota_{\lambda,\theta}$ to compare between childless couples and parents who have nc_θ children, a dollar to the former is equivalent to x dollars to the latter if $\frac{1}{\sqrt{2}} = \frac{x}{\sqrt{2 + nc_\theta}}$. This results in \$1.22 for couples with one child and \$1.41 for those with two children. While the square root scale is adopted in this model for ease of computation, these implied equivalent incomes are closely aligned with the average estimates for Australia in the Department of Social Services (DSS) report and for New Zealand by Chatterjee and Michelini (1998).

capital $h^m_{j,\lambda}$. The stochastic shock ϵ^m_j follows a first-order auto-regressive process

$$\overbrace{\ln\left(\epsilon^m_j\right)}^{=\eta^m_j} = \rho \times \overbrace{\ln\left(\epsilon^m_{j-1}\right)}^{=\eta^m_{j-1}} + \upsilon^m_j \tag{3}$$

with persistence parameter ρ and white-noise disturbance $\upsilon^m_j \sim N\left(0, \sigma^2_\upsilon\right)$.

Married and single women. In addition to the joint consumption and savings decisions, households make labor participation decisions for their female members, choosing among three discrete choices: staying at home ($\ell = 0$), working part-time ($\ell = 1$), or working full-time ($\ell = 2$). If a woman participates in the labor force, she will commit to an exogenous work hour plan $n^f_{j,\lambda,\ell}$ that varies by her age, family, and employment types. These decisions are shaped by the need to balance various work-related trade-offs to maximize household utility. The trade-offs, as detailed below, affect female labor supply behavior, their susceptibility to the insurance and incentive effects of the transfer schemes, and ultimately, how they respond to reforms in the counterfactual economies.

Benefits of working. If a woman works, she (i) *earns an income calculated as* $y^f_{j,\lambda} = wn^f_{j,\lambda,\ell}e^f_{j,\lambda}$, (ii) *accumulates human capital for the next period* $h^f_{j+1,\lambda}$, and (iii) *obtains a child care subsidy per child of* sr_j if she meets the CCS eligibility criteria as outlined in Section 4.5.2. Her earning ability is $e^f_{j,h} = \bar{e}_j\left(\theta, h^f_{j,\lambda,\ell}\right) \times \epsilon^f_j$, where the deterministic part $\bar{e}_j\left(\theta, h^f_{j,\lambda,\ell}\right)$ is determined by her education θ and human capital $h^f_{j,\lambda,\ell}$. As her male counterparts, the stochastic component ϵ^f_j is governed by an auto-regressive process: $\ln\left(\epsilon^f_j\right) = \rho \times \ln\left(\epsilon^f_{j-1}\right) + \upsilon^f_j$, with persistence parameter ρ and white-noise disturbance $\upsilon^f_j \sim N\left(0, \sigma^2_\upsilon\right)$. Different from the male earning ability, however, the female earning ability $e^f_{j,\lambda}$ contains an endogenously evolving human capital component over her life cycle according to the law of motion

$$log(h^f_{j,\lambda,\ell}) = log(h^f_{j-1,\lambda,\ell}) + (\xi_{1,\lambda,\ell} - \xi_{2,\lambda,\ell} \times (j-1))\, \mathbf{1}_{\{\ell_{j-1}\neq 0\}} - \delta_l(1 - \mathbf{1}_{\{\ell_{j-1}\neq 0\}}) \tag{4}$$

where human capital from working is gained at a diminishing rate over age j and is determined by the coefficient $\xi_{1,\lambda,\ell} - \xi_{2,\lambda,\ell} \times (j-1)$. δ_ℓ is the depreciation rate of human capital when not working.[15]

Costs of working. Labor force participation is costly. If a woman works, she (i) *incurs a formal child care cost per child* κ_j, (ii) *loses a portion or all of the means-tested FTB transfers*, and (iii) *sacrifices leisure on top of incurring a fixed time cost* χ_p *if she works part-time and* χ_f *if she works full-time.* More precisely, at any age j, her labor choice (ℓ) and family type (λ) affect her available leisure time $l^f_{j,\lambda,\ell}$ in the following manner

$$l^f_{j,\lambda,\ell} = \begin{cases} 1 & \text{if staying at home } (\ell = 0) \\ 0 < 1 - n^f_{j,\lambda,\ell=1} - \chi_p < 1 & \text{if working part-time } (\ell = 1) \\ 0 < 1 - n^f_{j,\lambda,\ell=2} - \chi_f < 1 & \text{if working full-time } (\ell = 2). \end{cases} \tag{5}$$

where χ_p and χ_f are fixed time costs associated with part-time and full-time work, respectively (with or without children).[16] The decision for women to engage in the labor market therefore hinges on the interplay between these costs and benefits, including child care costs, the insurance and work incentive effects of the FTB and the CCS, and other factors such as human capital potential and family insurance (via partner's earnings). These dynamics are discussed in our main quantitative analysis in Section 6.

[15] Human capital gains, such as experience and new skill acquisition, typically manifest as increased returns to labor. In this context, the law of motion employed is akin to a learning-by-doing human capital accumulation process, rather than an on-the-job training framework. Unlike learning-by-doing, on-the-job training requires an agent to invest in enhancing human capital by dividing her work time between productive activities and training. A significant challenge with this setup involves identifying returns to productive time in the data, as these are not directly observable.

[16] We assume the fixed time cost is a penalty on the wife's leisure only. Evidence from multiple sources, including an ABS report on barriers and incentives to labor force participation, suggests child care responsibilities are more heavily weighted on mothers.

4.4 Technology

A representative firm with labor-augmenting technology A_t and a Cobb-Douglas production function $Y_t = K_t^{\alpha}(A_t L_t)^{1-\alpha}$ transforms capital K_t and total labor services L_t into output Y_t. Technology A_t grows at a constant rate g. The firm pays capital income tax τ_t^k, and chooses capital and labor inputs to maximize its profit, taking as given the capital rental rate $q = r_w + \delta$ and the wage rate w_t, where r_w is the world interest rate and δ is the depreciation rate of capital. Suppressing the time subscript t, the firm's problem is

$$\max_{K,L} \quad (1-\tau^k)(Y - wAL) - qK \tag{6}$$

The firm's first-order conditions are:

$$r_w = (1-\tau^k)\alpha\frac{Y}{K} - \delta, \tag{7}$$

$$w = (1-\alpha)\frac{Y}{AL} \tag{8}$$

4.5 Fiscal policy

We model key features of the Australian fiscal system including an income tax system, the two means-tested transfer programs for families with children, and a means-tested pension program for retirees.

4.5.1 Tax system

Progressive income tax. The government levies tax on individual labor earnings via a progressive income tax schedule.[17] The progressive tax mechanism allows the model to capture the extra distortions (or lack thereof) when tax interacts with child benefits. For instance, in a tax-free or low-tax income bracket, the FTB phase-out rate's add-on work disincentive effects could be less consequential compared to its effects under a proportional scheme, and vice versa for higher-income brackets.

The taxable income for an individual $i \in \{m, f\}$ at age j is the labor income $y_{j,\lambda}^i$. We approximate the tax schedule using a parametric tax function following Feldstein (1969); Benabou (2000), and Heathcote et al. (2017). Suppressing the family type λ subscript and gender i superscript, the individual income tax payment is given by

$$tax_j = \max\left\{0, y_j - \zeta y_j^{1-\tau}\right\} \tag{9}$$

where tax_j denotes the tax payment, ζ is a scaling factor, and τ is the parameter that controls the progressivity of the tax scheme. At one extreme, if τ approaches infinity, tax_j approaches y_j, implying 100% of the taxable income is taxed. At the other extreme, if $\tau = 0$, then $tax_j = (1-\zeta)y_j$, making $(1-\zeta)$ is a flat tax rate. As τ increases (*decreases*), the marginal tax rate (MTR) and average tax rate (ATR) increase (*decrease*) for a given income level. We impose a non-negative tax restriction to exclude all government transfers in the form of negative income tax. We use ζ as the government budget balancing tool. ζ affects the overall tax size across income levels. An increase in ζ reduces the tax burden, shifting the tax schedule downward and expanding the zero-tax income bracket, while a decrease in ζ has the opposite effect.

4.5.2 Transfer system

The government runs means-tested child benefits to support eligible parents with children. There are two

[17] Australia has a separate tax filing system which treats the individual, and not the household, as the basic unit for income tax purposes. In the current model, we abstract from capital earnings tax and franking credits under Australia's dividend imputation system. We assume that the representative firm pays corporate taxes and distribute fully franked dividends to households, exempting them from capital earnings tax. See the Parliamentary Budget Office (PBO) 2024 report on dividend imputation and franking credits for further detail.

main programs: Family Tax Benefit (Part A and Part B) and Child Care Subsidy. Below are simplified versions of the actual programs. For further details, we refer the interested readers to Appendix Section B.

Family Tax Benefit Part A (FTB-A). The FTB-A is paid per dependent child. The claimable amount depends on household combined taxable income, age, and number of dependent children. Key policy parameters that determine the levels, kinks, and slopes of the FTB-A schedule are: (i) maximum and base payments per child, tr_j^{A1} and tr_j^{A2}; (ii) joint income test thresholds for the maximum and base payments, $\bar{y}_{max}^{tr}$ and $\bar{y}_{base}^{tr}$; and (iii) phase-out rates for the maximum and base payments, ω_{A1} and ω_{A2}. That is, the FTB-A benefit per child tr_j^A received by a household is given by

$$tr_j^A = \begin{cases} tr_j^{\mathrm{A1}} & \text{if } y_{j,\lambda} \le \bar{y}_{max}^{tr} \\ \max\left\{tr_j^{\mathrm{A2}},\ tr_j^{\mathrm{A1}} - \omega_{A1}\left(y_{j,\lambda} - \bar{y}_{max}^{tr}\right)\right\} & \text{if } \bar{y}_{max}^{tr} < y_{j,\lambda} \le \bar{y}_{base}^{tr} \\ \max\left\{0,\ tr_j^{\mathrm{A2}} - \omega_{A2}\left(y_{j,\lambda} - \bar{y}_{base}^{tr}\right)\right\} & \text{if } y_{j,\lambda} > \bar{y}_{base}^{tr}, \end{cases} \tag{10}$$

where $y_{j,\lambda} = \mathbf{1}_{\{\lambda\neq 2\}} y_{j,\lambda}^m + \mathbf{1}_{\{\lambda\neq 1,\ell\neq 0\}} y_{j,\lambda}^f + ra_j$ denotes the household combined income.

Family Tax Benefit Part B (FTB-B). The FTB-B is paid per household as additional support to single parents and single-earner partnered parents with limited means. Similar to the FTB-A, the FTB-B is a function of age and number of dependent children. However, the eligibility and amount claimable are determined by marital status and separate income tests on primary and secondary earners' taxable income. Key policy parameters that determine the levels, kinks, and slopes of the FTB-B schedule are: (i) two maximum payments for families with children below age 5 or between age 5 and 18, tr_j^{B1} and tr_j^{B2}; (ii) income test thresholds for primary and secondary earners, $\bar{y}_{pe}^{tr}$ and $\bar{y}_{se}^{tr}$; and (iii) a phase-out rate based on the secondary earner's taxable income, ω_B. Let $y_{pe} = \max(y_{j,\lambda}^m,\, y_{j,\lambda}^f)$ and $y_{se} = \min(y_{j,\lambda}^m,\, y_{j,\lambda}^f)$ denote the primary and secondary earner's taxable incomes, respectively. The amount of FTB-B received by a household tr_j^B is

$$tr_j^B = \begin{cases} \Upsilon_1 \times tr_j^{\mathrm{B1}} + \Upsilon_2 \times tr_j^{\mathrm{B2}} & \text{if } y_{pe} \le \bar{y}_{pe}^{tr} \text{and } y_{se} \le \bar{y}_{se}^{tr} \\ \\ \Upsilon_1 \times \max\left\{0,\ tr_j^{\mathrm{B1}} - \omega_B(y_{se} - \bar{y}_{se}^{tr})\right\} & \text{if } y_{pe} \le \bar{y}_{pe}^{tr} \text{and } y_{se} > \bar{y}_{se}^{tr} \\ +\Upsilon_2 \times \max\left\{0,\ tr_j^{\mathrm{B2}} - \omega_B(y_{se} - \bar{y}_{se}^{tr})\right\} & \end{cases} \tag{11}$$

where $\Upsilon_1 = \mathbf{1}_{\{nc_{[0,4],j}\ge 1\}}$ and $\Upsilon_2 = \mathbf{1}_{\{nc_{[0,4],j}=0\, and\, nc_{[5,18],j}\ge 1\}}$ are indicator variables, $nc_{[a,b],j}$ is the number of dependent children in the age range $[a,b]$ for a household aged j.

Child care subsidy (CCS). The CCS supports the cost of formal child care for children aged 13 or younger. Similar to the FTB, the CCS assesses family income and is dependent on the age and number of children. However, unlike the FTB, it is also conditional on work.[18] Key parameters determining eligibility and subsidy rate per child include (i) joint income test thresholds, $\{\bar{y}_1^{sr}, \bar{y}_2^{sr}, \bar{y}_3^{sr}, \bar{y}_4^{sr}, \bar{y}_5^{sr}\}$; (ii) fortnightly work hour test thresholds, $\{0, 8, 16, 48\}$; and (iii) phase-out rates, $\{\omega_c^1, \omega_c^3\}$. The base CCS rate per child sr at age j is given by

$$sr_j = \Psi(y_{j,\lambda}, n_{j,\lambda}^m, n_{j,\lambda,\ell}^f) \times \begin{cases} sr_1 & \text{if } y_{j,\lambda} \le \bar{y}_1^{sr} \\ max\{sr_2,\ sr_1 - \omega_c^1\} & \text{if } \bar{y}_1^{sr} < y_{j,\lambda} < \bar{y}_2^{sr} \\ sr_2 & \text{if } \bar{y}_2^{sr} \le y_{j,\lambda} < \bar{y}_3^{sr} \\ max\{sr_3,\ sr_2 - \omega_c^3\} & \text{if } \bar{y}_3^{sr} \le y_{j,\lambda} < \bar{y}_4^{sr} \\ sr_3 & \text{if } \bar{y}_4^{sr} \le y_{j,\lambda} < \bar{y}_5^{sr} \\ sr_4 & \text{if } y_{j,\lambda} \ge \bar{y}_5^{sr}, \end{cases} \tag{12}$$

where $y_{j,\lambda} = \mathbf{1}_{\{\lambda\neq 2\}} y_{j,\lambda}^m + \mathbf{1}_{\{\lambda\neq 1,\ell\neq 0\}} y_{j,\lambda}^f + ra_j$ is the joint income and ω_c^i is the phase-out rate. $\Psi(y_{j,\lambda}, n_{j,\lambda}^m, n_{j,\lambda,\ell}^f)$

[18] Work is a more restrictive term used for our purpose. In practice, the CCS assesses hours of recognized activities which comprise, among others, paid work (including self-employed), unpaid work in a family business, paid or unpaid leave, volunteering, and job seeking activities.

is the adjustment factor to the base subsidy rate through a test on individual work hours if single or on the lower of the two spouses' hours if married. Let $n_j^{min} = min\{n_{j,\lambda}^m, n_{j,\lambda,\ell}^f\}$ be the household's minimum work hour. The adjustment factor is given by

$$\Psi(y_{j,\lambda}, n_{j,\lambda}^m, n_{j,\lambda,\ell}^f) = 0.24_{\{y_{j,\lambda} \leq AU\$70{,}015 \, and \; n_j^{min} \leq 8\}} + 0.36_{\{8 < n_j^{min} \leq 16\}} + 0.72_{\{16 < n_j^{min} \leq 48\}} + 1_{\{n_j^{min} > 48\}}$$

Otherwise, $\Psi(y_{j,\lambda}, n_{j,\lambda}^m, n_{j,\lambda,\ell}^f) = 0$.

Age pension. Age pension is means-tested, using income and assets tests, and is independent of contribution history. The pension is available to households upon reaching the retirement age, $j = J_R$. Let $\mathcal{P}^a(a_j)$ be the claimable pension benefit based on the assets test

$$\mathcal{P}^a(a_j) = \begin{cases} p^{\max} & \text{if } a_j \leq \bar{a}_1^P \\ \max\{0, \; p^{\max} - \omega_a(a_j - \bar{a}_1)\} & \text{if } a_j > \bar{a}_1^P \end{cases} \tag{13}$$

where p^{max} is the maximum pension payment, $\bar{a}_1^P$ is the assets-test threshold, and ω_a is its corresponding phase-out rate. Let $\mathcal{P}^y(y_{j,\lambda})$ be the claimable amount according to the income test

$$\mathcal{P}^y(y_{j,\lambda}) = \begin{cases} p^{\max} & \text{if } y_{j,\lambda} \leq \bar{y}_1^p \\ \max\{0, \; p^{\max} - \omega_y(y_{j,\lambda} - \bar{y}_1^p)\} & \text{if } y_{j,\lambda} > \bar{y}_1^p \end{cases} \tag{14}$$

where $\bar{y}_1^p$ is the income test threshold and ω_y is the income-test phase-out rate. The pension benefit pen_j received by a household is determined by

$$pen_j = \begin{cases} \min\{\mathcal{P}^a(a_j), \mathcal{P}^y(y_{j,\lambda})\} & \text{if } j \geq J_P \text{ and } \lambda = 0 \\ \frac{2}{3}\min\{\mathcal{P}^a(a_j), \mathcal{P}^y(y_{j,\lambda})\} & \text{if } j \geq J_P \text{ and } \lambda = 1, 2 \\ 0 & \text{otherwise} \end{cases} \tag{15}$$

Government budget. The government at time t collects taxes on consumption, company profit, and household income (T_t^C, T_t^K, T_t^I), and issues bonds $(B_{t+1} - B_t)$ to meet its debt obligation $(r_t B_t)$ and its commitment to three spending programs: (i) general government purchase, G_t; (ii) child-related transfer programs (FTB and CCS), Tr_t; and Age Pension, $\mathcal{P}_t$. The inter-temporal government budget is given by

$$T_t^C + T_t^K + T_t^I + (B_{t+1} - B_t) = G_t + Tr_t + \mathcal{P}_t + r_t B_t \tag{16}$$

4.6 Market structure

Markets are incomplete. Households cannot insure against idiosyncratic earnings and longevity risks by trading state-contingent assets. They can hold one-period risk-free assets to insure against these risks, but are not allowed to borrow against future income, implying asset holdings are always non-negative.

The model economy is a small open economy where the rate of return to capital, and thus labor, are unchanged across steady states. The free flow of foreign capital ensures that the domestic interest rate is maintained at the world interest rate r^w (no arbitrage condition). The link between the rental price of capital and the world interest rate is given by $q = r^w + \delta$, where δ is the domestic capital depreciation rate.

We also abstract from labor market frictions. There are no search for employment, and no adjustment costs when switching between part-time and full-time work.

4.7 The household problem

Households are heterogeneous in terms of age $j \in \{1, 2, \ldots, J\}$, family type $\lambda \in \Lambda$ where $\Lambda = \{0, 1, 2\}$, permanent education realized at birth $\theta \in \Theta$ where $\Theta = \{\theta_L, \theta_H\}$, female human capital $h^f_{j,\lambda,\ell} \in H$ where $H = [h_{min}, h_{max}] \subset \mathcal{R}^+$, asset holdings $a_j \in A$ where $A = [a_{min}, a_{max}] \subset \mathcal{R}^+$, and transitory shocks to male and female labor income, ϵ^m_j and $\epsilon^f_j \in S$ where $S \subset \mathcal{R}$.

Working-age married parent ($\lambda = 0$) **and single mother** ($\lambda = 2$) **households.** Define $Z = \Lambda \times A \times H \times \Theta \times S \times S$ as the state space for households aged $j < J_R$. Let $z_j = \left\{\lambda_j, a_j, h^f_{j,\lambda,\ell}, \theta, \eta^m_j, \eta^f_j\right\} \in Z$ be the state vector of a household aged j. For a given z_j, the household decides on joint consumption (c), female labor force participation (ℓ), and next period joint assets (a_+) from a choice set $\mathcal{C} \equiv \{(c, \ell, a_+) \in \mathcal{R}^{++} \times \{0, 1, 2\} \times \mathcal{R}^+\}$ to maximize its expected lifetime utility according to:

$$V(z) = \max_{c,\,\ell,\,a_+} \left\{ u(c, l^m, l^f, \theta, \lambda) + \beta \sum_{\Lambda} \int_{S^2} V(z_+)\, d\Pi(\lambda_+, \eta^m_+, \eta^f_+ | \lambda, \eta^m, \eta^f) \right\} \tag{17}$$

s.t.

$$\begin{aligned}
(1+\tau^c)c + (a_+ - a) + \mathbf{1}_{\{\ell\neq 0\}} n^f_{\lambda,\ell} \times CE_\theta &= y_\lambda + FTB_\theta - T_\lambda + beq \\
l^f &= 1 - n^f_{\lambda,\ell} - \left(\mathbf{1}_{\{\ell=1\}}\chi_P + \mathbf{1}_{\{\ell=2\}}\chi_f\right) \\
l^m &= 1 - n^m_\lambda \;\text{ if }\; \lambda = 0 \\
c &> 0 \\
a_+ &\geq 0
\end{aligned}$$

We suppress the subscript j to ease the notation. $y_\lambda = \mathbf{1}_{\{\lambda\neq 2\}} y^m_\lambda + \mathbf{1}_{\{\ell\neq 0\}} y^f_\lambda + ra$ is the household market income; $CE_\theta = w(1-sr)\sum_{i=1}^{nc_\theta} \kappa_i$ is the net formal child care expense per hour; sr and κ_i are the CCS rate and the hourly child care cost for the i^{th} child as a fraction of hourly wages; $FTB_\theta = nc_\theta \times tr^A + tr^B$ is the total FTB transfer comprising tr^A from (10) and tr^B from (11); τ^c is the consumption tax; and $T_\lambda = \mathbf{1}_{\{\lambda\neq 2\}} tax^m + tax^f$ is the total income tax payment where tax^i for $i \in \{m, f\}$ is calculated using the tax function (9). Bequest motives are not operative. Households are born with no wealth ($a_1 = 0$), and each living working-age household at age j receives a uniform lump-sum accidental bequest beq from deceased households of the same period based on (E.2).

Working-age single childless male households ($\lambda = 1$)**.** Single male households follow an exogenous labor supply profile over their life cycle. They do not make labor decisions. At every age j, they choose an optimal pair (c, a_+) from a choice set $\mathcal{C} \equiv \{(c, a_+) \in \mathcal{R}^{++} \times \mathcal{R}^+\}$ to maximize their expected lifetime utility subject to the budget constraint (19). Specifically, a single male household problem reduces to a consumption-savings problem:

$$V(z) = \max_{c,\,a_+} \left\{ u(c, l^m, \theta) + \beta \sum_{\Lambda} \int_{S^2} V(z_+)\, d\Pi(\lambda_+, \eta^m_+ \mid \lambda, \eta^m) \right\} \tag{18}$$

s.t.

$$\begin{aligned}
(1+\tau^c)c + (a_+ - a) &= y_{\lambda=1} - T_{\lambda=1} + beq \\
l^m &= 1 - n^m_{\lambda=1} \\
c &> 0 \\
a_+ &\geq 0
\end{aligned} \tag{19}$$

where $y_{\lambda=1} = wn^m_{\lambda=1} h^m_{\lambda=1} e^{\theta+\epsilon^m} + ra$ is the single male household's market income, and $T_{\lambda=1} = tax^m$ is calculated using the tax function (9).

Retirees. Retirement at age J_R is mandatory. The education and transitory shock states become absorptive states. In addition, since retirees no longer have dependent children, they are not eligible for the child benefits. Pension payouts are not conditional on earning history but are conditional on family type λ. An eligible single household receives two-thirds of the maximum pension payment that a couple would receive. The state vector of a retired household at age $J_R \leq j \leq J$ is simplified to $z^R = \{\lambda, a\} \in \{0,1,2\} \times \mathcal{R}^+$, and their choice set is $\mathcal{C}^R \equiv \{(c, a_+) \in \mathcal{R}^{++} \times \mathcal{R}^+\}$. Suppressing the j subscript, the retired household optimization problem reduces to:

$$V(z^R) \quad = \quad \max_{c,\, a_+} \left\{ u(c,\lambda) + \beta \sum_{\Lambda} V(z^R_+)\, d\Pi(\lambda_+|\lambda) \right\} \tag{20}$$

s.t.

$$\begin{aligned}
(1+\tau^c)c + (a_+ - a) \quad &= \quad ra + pen \\
c \quad &> \quad 0 \\
a_+ \geq 0 \quad &\text{and} \quad a_{J+1} = 0
\end{aligned}$$

where *pen* is the Age Pension described in Equation (15).

The *stationary distribution of households* (E.1.1), *aggregation* (E.1.2), the *definition of competitive equilibrium* (E.1.3), and the *numerical solution* (E.2) are detailed in Appendix Section E.

5 Calibration

Our steady-state economy is on a balanced growth path where consumption, investment, and capital grow at the constant rate of labor-augmenting technology growth g, whereas the time endowment for labor and leisure is fixed. The classes of parametric functions for preference and technology are chosen to ensure comparability with the previous studies on related issues.

The model is calibrated to match key statistics of the Australian economy from 2012 to 2018, a period of relative stability in macroeconomic indicators such as household consumption and asset growth. This timeframe allows us to use the policy parameters for the child benefit programs from 2018 after major changes had been introduced. Externally calibrated parameters, summarized in Table 2, are obtained from our estimates using the HILDA survey, widely adopted estimates in similar studies on Australia, and publicly available data from sources such as the Australian Bureau of Statistics (ABS) and the Department of Social Services (DSS), as well as international organizations like the World Bank. The remaining micro and macro parameters are internally calibrated to match key model moments with corresponding data moments, as detailed in Table 3.

We also test the model's performance by comparing a set of non-targeted data moments with their model counterparts. Results shown in Table 4 demonstrate that our benchmark model does reasonably well in matching the selected empirical facts of the Australian economy.

5.1 Demographics

A model period is one year. Newborn households enter the model economy at age 21 ($j = 1$) as workers, retire at age 65 ($j = J_R$ =45), and can live up to the maximum age of 100 ($j = J = 80$). Time-invariant average conditional survival probabilities for males and females ($\psi_{j,m}$ and $\psi_{j,f}$) are calculated from the 2001-2019 ABS Life Tables. The growth rate of newborn households is kept constant at $n = 1.6\%$, which is the average annual population growth rate in Australia between 2012-2018 (AIHW 2023).

The share of newborn households by family type $\pi(\lambda)$ is estimated from the HILDA survey. Married households comprise 70% of the newborns ($\pi(\lambda_0) = 0.70$). The remaining 30% are single households, 53% of

Parameter	Value	Target
Demographics		
Maximum lifespan	$J = 80$	Age 21-100
Mandatory retirement age	$J_R = 45$	Age Pension age 65
Population growth rate	$n = 1.6\%$	ABS 2012-2018
Survival probabilities	ψ_m, ψ_f	Australian Life Tables (ABS 2010-2019)
Measure of newborns by λ type	$\{\pi(\lambda_0),\, \pi(\lambda_1),\, \pi(\lambda_2)\} = \{0.70,\, 0.14,\, 0.16\}$	HILDA 2012-2018
Technology		
Labor aug. tech. growth	g =1.3%	Average per work hour growth rate (World Bank 2012-2018)
Output share of capital	$\alpha = 0.4$	Treasury 2019
Real interest rate	$r = 4\%$	World Bank 2012-2019
Households		
Relative risk aversion	$\sigma = 1/\gamma = 3$	Standard values 2.5-3.5
Male and female labor supply	$n^m_\lambda,\, n^f_\lambda$	Age-profiles of average labor hours for employees (HILDA)
Male human capital profile	h^m_λ	Age-profile of wages for men (HILDA)*
Education		
Education level	$\{\theta_L, \theta_H\} = \{0.745, 1.342\}$	College-HS wage ratio of 1.8**
Measure of households by θ	$\{\pi(\theta_L),\, \pi(\theta_H)\} = \{0.7,\, 0.3\}$	College-HS ratio (ABS 2018)
Fiscal policy		
Income tax progressivity	$\tau = 0.2$	Tran and Zakariyya 2021***
Consumption tax	$\tau^c = 8\%$	$\tau_c \times \frac{C_0}{Y_0} = 4.5\%$
Company profit tax	$\tau^k = 10.625\%$	$\tau^k \left(\frac{Y - WL}{Y}\right) = 4.5\%$
Government debt to GDP	$\frac{B}{Y} = 20\%$	Average (CEIC 2012-2018)
Government general purchase	$\frac{G}{Y} = 14\%$	Net of FTB, CCS and Age Pension (WDI and AIHW)
FTB, CCS and Pension parameters		HILDA tax-benefit model

Table 2: Externally calibrated parameters

Notes: (*) The age-profiles of median hourly wages for married and single men are obtained by regressing log(wage) on quadratic age terms and four dummies (gender, marital status, employment type, and time). We then normalize all hourly wage estimates by the average hourly wage of male aged 21. (**) Our estimates based on HILDA suggests a wage premium for married men in the range of 1.7-1.8 over the 18 years period 2001-2018. (***) Given progressivity $\tau = 0.2$, we use the scale parameter ζ which controls the size of the tax system as an endogenous tax variable to to balance post-reform budgets.

Parameter	Value	Target
Households		
Discount factor	$\beta = 0.99$	Saving ratio 5%-8% (ABS 2013-2018)
Taste for consumption	$\nu = 0.375$	LFP rate 68-72% of working-age mothers (HILDA 2012-2018)
Fixed time cost of work	$\{\chi_f, \chi_p\} = \{0.1125, 0.0525\}$	Age profile of full-time employment share for mothers
Female human capital		
Depreciation rate	$\delta_h = 0.074$	Male-female wage gap at age 50*
Accumulation rate for:		
Married mother working full-time	$(\xi_{1,\lambda=0,\ell=1}, \xi_{2,\lambda=0,\ell=1}) = (0.0450, 0.00175)$	Married father's age-profile of full-time wages
Married mother working part-time	$(\xi_{1,\lambda=0,\ell=2}, \xi_{2,\lambda=0,\ell=2}) = (0.0350, 0.00135)$	Married father's age-profile of part-time wages
Single mother working full-time	$(\xi_{1,\lambda=2,\ell=1}, \xi_{2,\lambda=2,\ell=1}) = (0.0206, 0.00088)$	Single father's age-profile of full-time wages
Single mother working part-time	$(\xi_{1,\lambda=2,\ell=2}, \xi_{2,\lambda=2,\ell=2}) = (0.0179, 0.00060)$	Single father's age-profile of part-time wages**
Technology		
Capital depreciation rate	$\delta = 0.07172$	$\frac{K}{Y} = 3.2$ (ABS 2012-2018)
Transitory shocks		
Persistence parameter	$\rho = 0.98$	Literature
Variance of shocks	$\sigma_v^2 = 0.0145$	Gini coefficient of male earnings at age 21, $GINI_{j=1,m} = 0.35$
Fiscal policy		
Maximum pension payment	$pen^{max} = 30\% \times Y$	Pension share of GDP, $\frac{\mathcal{P}_t}{Y_t} = 3.2\%$ (ABS 2012-2018)

Table 3: Internally calibrated parameters

Notes: (*) We chose age 50 to allow sufficient time for δ_h to take effect on female labor supply decisions. (**) We calibrate the female human capital accumulation and depreciation rates for a type $\{\lambda, \ell\}$ woman such that her age-profile of wages matches that of her male counterpart if she chooses to work without time off.

whom are female, resulting in $\pi(\lambda_1) = 0.14$ and $\pi(\lambda_2) = 0.16$. Figure 9 reports the shares of survivors by family type over the life cycle.

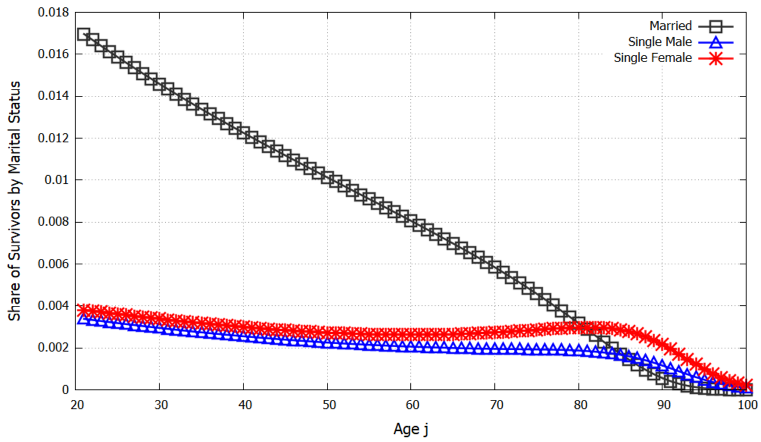

Figure 9: **Time-invariant shares of survivors by age and family type.**

5.2 Preferences

We calibrate the subjective discount factor $\beta = 0.99$ so that the household savings ratio stays between 5-8%, as reported by the ABS (2012-2018), and set the elasticity of intertemporal substitution (an inverse of relative risk aversion σ) to $\gamma = 1/3$, within the standard range commonly used in the literature.[19] The taste for consumption relative to leisure, ν, is calibrated to 0.375 for the female labor force participation to stay within the range of 68-72%. The fixed time cost parameters of work, χ_f and χ_p, are calibrated to 0.1125 and 0.0525, respectively, so that the model-generated life cycle profile of full-time employment share of mothers matches that in the data (Figure 12).

5.3 Endowments

Labor productivity. Every adult household member is subject to idiosyncratic transitory earnings shocks η^i for $i \in \{m, f\}$. These shocks follow an identical AR1 process with an auto-correlation coefficient ρ and variance of the innovation σ_υ^2. We set $\rho = 0.98$ within the bound of common values in the literature and calibrate σ_υ to achieve a Gini index of 0.35 for the efficiency wage distribution of 21-year-old men. This configuration results in a Gini coefficient of 0.3766 (non-target) for the working age male population.[20] The Rouwenhorst method is employed to discretize the shock values η^i into 5 grid points {0.29813, 0.54601 1, 1.83146, 3.35424} with the following Markov transition probabilities[21]

$$\begin{bmatrix} 0.9606 & 0.0388 & 0.0006 & 0 & 0 \\ 0.0097 & 0.9609 & 0.0291 & 0.0003 & 0 \\ 0.0001 & 0.0194 & 0.9610 & 0.0194 & 0.0001 \\ 0 & 0.0003 & 0.0291 & 0.9609 & 0.0097 \\ 0 & 0 & 0.0006 & 0.0388 & 0.9606 \end{bmatrix}$$

[19] $\beta = 0.99$ results in the growth-adjusted time discount factor $\tilde{\beta} = \beta(1+g)^{\nu\left(1-\frac{1}{\gamma}\right)} = 0.9807$ for the balanced-growth path steady state economy.

[20] σ_υ is used to match the Gini index of the model's male efficiency wage distribution with that of the data's male earnings distribution, which include variations in work hours (instead of just wages). The reason is that our exogenous male work hour profiles are normalized average values. Since the model lacks an endogenous source of hour variation, we utilize the transitory fluctuation process—that drives the model's male efficiency wages—to also capture the exogenous variation in hours, resulting in a more realistic model's male earnings distribution.

[21] The Rouwenhorst method of discretization differs from the Tauchen methods in that it does not require the normality assumption of the shock distribution.

We assume two education types—low (θ_L) and high (θ_H)—realized at birth, representing those with at most a high school degree and those with a bachelor's degree or higher qualifications, respectively. The earning ability profile of an individual is scaled by θ. We set $\theta_L = 0.745$ and $\theta_H = 1.342$ to achieve a college wage premium of 1.8 in the benchmark economy. The measures of low and high education households are $\pi(\theta_L) = 0.7$ and $\pi(\theta_H) = 0.3$ based on the college-high school ratio in the ABS (2018).

We abstract from men's labor supply decisions and women's intensive margin of labor supply decisions. Men always work full-time and follow pre-determined labor supply paths, while women can choose their labor supply along the extensive margin. Their age-profiles of normalized average work hours by gender, family type, and employment type (n^m_λ and $n^f_{\lambda,\ell}$) are estimates from the HILDA survey data (2001-2018), as shown in Figure 10. Productivity is set to zero from age J_R onward, making retirement mandatory. [22]

The age-profiles of hourly wages for single and married males, estimated from the HILDA survey, are used as proxies for the male human capital age profiles h^m_λ. On the other hand, the human capital of women, $h^f_{\lambda,\ell}$, is governed by their labor market decisions and therefore evolves endogenously over the life cycle. The human capital gain parameters, $\{\xi_{1,\lambda,\ell}, \xi_{2,\lambda,\ell}\}$, are calibrated by household type (λ) and employment type (ℓ) such that the life cycle paths of human capital of single and married women mimic those of their respective male counterparts (under the assumption of assortative mating) should they choose to work continuously without time off. This is achieved by adapting the first half of the law of motion of human capital 4 (ignoring depreciation from staying at home) into a regression equation of average estimated male wage growth on age variable. The targeted age profiles of male wages are HILDA estimates for each pair $\{\lambda, \ell\}$. Some additional adjustments (e.g., by discarding wage data near retirement age) are made to better fit the estimated male profiles since the data for some groups, such as single fathers, is noisy. The estimates $\{\hat{\xi}_{1,\lambda,\ell}, \hat{\xi}_{2,\lambda,\ell}\}$ thus are obtained from: $log(\hat{w}^m_{j,\lambda,\ell}) - log(\hat{w}^m_{j-1,\lambda,\ell}) = \hat{\xi}_{1,\lambda,\ell} + \hat{\xi}_{2,\lambda,\ell} \times (j-1)$.[23]

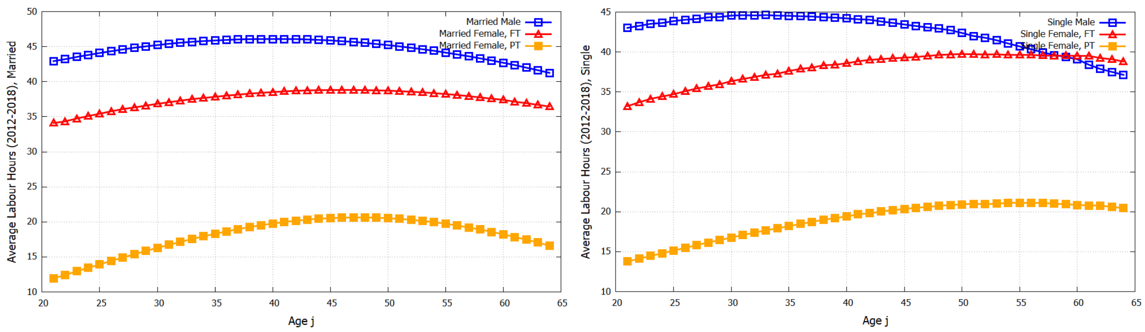

Figure 10: **Exogenous labor supply over the life cycle. Left:** Age profiles of average work hours for married parents if employed. **Right:** Age profiles of average labor hours for single men and single mothers if employed.
Notes: The two y-axes are different. The former ranges from 10 to 50 hours and the latter ranges from 10 to 45 hours.

Children. Children are deterministic and exogenous. Provided that a plurality of parents (42%) in our sample have two children, our model households are assumed to have only two children over their lifetime to reduce computational burden.[24] Heterogeneity in children is linked to the education type θ through the timing of their arrival. The longitudinal study of Australian children (LSAC) annual statistics report in 2017 shows that the largest share of first-time mothers aged 15-19 concentrates within the low education group (67.7%), and only around 10% of first-time mothers aged 25-37 have low education. Conversely, nearly half of the first-time mothers in the latter age group have a bachelor's degree or higher. We reflect this fact in the model

[22] Empirical evidence suggests that male labor supply is inelastic. Doiron and Kalb (2004) find that the effects of child care cost increases on male labor supply are negligible in Australia. Our own estimates from the HILDA survey also show that male labor supply profiles remain virtually unchanged across various demographics, such as parental and marital status.

[23] Accounting for human capital profiles by both marital status and education could increase the quality of these matching exercises. However, this would require additional data moments that are challenging to compute accurately due to the limited sample size in certain demographics, such as younger married households and older single households.

[24] The share of parents with two children is derived from a sample of households aged 50 and above to reflect the number of children most households have over their life cycle. Our data indicates that by age 50, 12% of parents have one child, 42% have two, 28% have three, and the rest have four or more children. Therefore, the average number of children in our model is comparable to the actual figure.

by assigning the first child's birth to low-education (θ_L) households at age 21 (i.e., $j = 1$, the youngest in the model) and to high-education (θ_H) households at age 28. Then, for both types of households, the second child arrives exactly 3 years after the firstborn (at age 24 for θ_L and 31 for θ_H). This assumption aligns with the average child spacing in Australia (AIHW 2023). Additionally, to maintain tractability and based on the observation that women constitute the majority (87.21%) of lone parents in our sample, we assume only single women and married households have children.[25]

Child care costs. We abstract from informal child care, regional child care cost variations, and types of child care services. Formal care services are assumed to have identical quality and price. That is, they operate in a perfectly competitive market environment. With a conservative estimate of \$12.5 per hour, the cost of child care is 52% of the average hourly wages of a 21-year-old male in the model. The total cost of formal child care for a household aged j is the sum of costs for all dependent children. We assume that child care costs, κ, decline once children have reached school age (6 years old). Specifically, working mothers pay the full cost of formal child care for children aged 0-5 years, and one-third of the cost afterwards, under the assumption that public schools are free and additional expenses—such as out-of-school hours (OOSH) care and extracurricular activities—amount to one-third of the pre-school child care expenditure.[26]

5.4 Technology

The production function is $Y = K^{\alpha}(AL)^{1-\alpha}$ where the capital output share is $\alpha = 0.4$. The labor augmenting technology A is set to 1 in the benchmark economy. Since the average annual GDP per hour worked growth rate in Australia is 1.3%, we set $g = 0.013$. Given α, the company profit tax rate $\tau^k = 10.625\%$, and the target capital-to-GDP ratio $K/Y = 3.2$, we use the firm's first-order conditions (7) to derive the capital depreciation rate $\delta = 0.07172$ in the initial steady state equilibrium.

5.5 Fiscal policy

Taxes. We set the progressivity parameter $\tau = 0.2$ (see Tran and Zakariyya 2021) and use the scale parameter ζ, which controls the tax size given τ, as an endogenous budget balancing variable in all policy experiments. We set $\tau^c = 8\%$ to target the consumption tax share of GDP, $\frac{\tau^c C}{Y} = 4.5\%$, where $\frac{C}{Y} = 56.3\%$ according to the ABS data in the period 2012-2018. We calibrate the company income tax rate to match the company income tax share of GDP, $\tau^k \left(\frac{Y - WL}{Y}\right) = 4.25\%$. Provided that $\frac{WL}{Y} = 1 - \alpha = 0.6$, we calculate τ^k to be 10.625%.

Family Tax Benefit and Child Care Subsidy. We use the policy parameters set by the Australian government in 2018 for the Family Tax Benefit (Part A and Part B) and the Child Care Subsidy programs, including base and maximum payment rates, income thresholds, and phase-out rates.

Means-tested Age Pension. The Age Pension's income and assets test thresholds, and their respective phase-out rates are based on 2018 values. The maximum pension payout, p^{max}, is internally calibrated to be 30% of the average income to achieve a total pension share of GDP of 3.2% in the benchmark steady state economy.

General government expenditure and debt. We define general government expenditure G as all government expenses other than the two child benefit programs (FTB and CCS) and the Age Pension that are explicitly accounted for in the model. The general expenditure in the benchmark is calculated to be 14% (Total expenditure is 18.5% of GDP, net of the estimated combined expenditure on the FTB, the CCS, and

[25] The assumption that all households, except single male, have children aligns closely with the fertility rate in Australia which hovered around 1.8 per woman between 2012-2018. More precisely, since married and single female households comprise 86% of the population in our model, the fact that each of these households has 2 children implies that the average number of children per household is $0.86 \times 2 = 1.72$.

[26] OOSH services operate before school (6:30am-9am), after school (3pm-6pm), and during vacation period (7am-7pm). The decline in child care costs after school age also reflects the lower average time children of school age spend in child care (only 40% of children between aged 6-8 participate in any form of child care, and this rate declines to 20% by age 12). For further information on child care usage and costs, see the AIFS (2015) and DSS (2005) reports. We use recent information on hourly child care costs and assume that the cost ratio of school-age children to pre-school-age children has remained unchanged since 2005.

the Age Pension programs, which is 4.5% of GDP). Public debt B is set at 20%, which is close to the average public debt share of GDP prior to the pandemic.

5.6 The benchmark economy

We assess our model's performance by comparing model-generated moments with data moments.

Aggregate macro variables. We examine selected key target and non-target aggregate macroeconomic variables in the benchmark economy. Table 4 demonstrates that the benchmark model performs reasonably well in matching aggregate data moments.

Moments	Model	Data	Source
Targeted			
Capital, K/Y	3.2	3-3.3	ABS (2012-2018)
Savings, S/Y	4.7%	5-8%	ABS (2013-2018)
Mothers' labor participation, LFP	72.57%	68-72%	HILDA (2012-2018)*
Consumption tax, T^C/Y	4.23%	4.50%	APH Budget Review
Corporate profit tax, T^K/Y	4.25%	4.25%	APH Budget Review
Age Pension, P/Y	3.65%	3.20%	ABS (2012-2018)
Gini coefficient (male aged 21)	0.35	0.35	HILDA (2012-2018)
Non-targeted			
Consumption, C/Y	52.80%	54-58%	ABS (2012-2018)
Investment, I/Y	32.29%	24-28%	ABS (2013-2018)
Mothers' full-time share	50.32%	50%	HILDA (2012-2018)
Scale parameter, ζ	0.7417	0.7237	Tran and Zakariyya 2021
Income tax, T^I/Y	14.93%	11%	APH Budget Review
Tax revenue to output	28.36%	25%	ABS(2012-2018)
Child-related transfers (FTB + CCS)	1.7%	1.45%	ABS (2012-2018)

Table 4: **Key macroeconomic variables: Model vs. Data moments**

Notes: (*) Multiple sources agree on these ranges of participation rates for mothers. (**) We set 0.35 *as the target for the Gini coefficient of wage distribution at birth* ($j = 1$)*. This results in the Gini coefficient for the male wage distribution over the entire working age of* 0.3766.

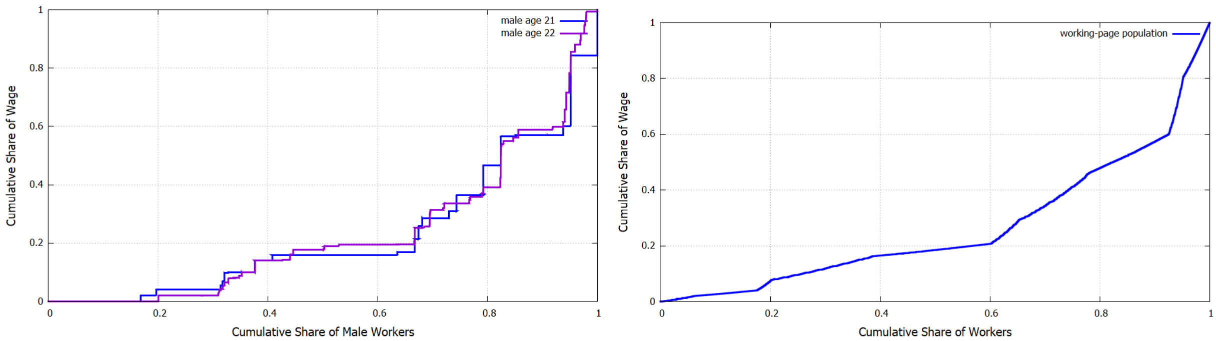

Figure 11: **Lorenz curves of wage distributions. Left:** Lorenz curves of the distributions of married male wages at age 21 and 22 (Gini = 0.35). **Right:** Lorenz curve of the wage distribution of working-age male population (Gini = 0.3766). Wages in the model incorporate human capital, education and transitory shocks over the life-cycle .

Life-cycle profiles of labor force participation and full-time share of employment. Age-based moments require the average model woman to behave in a way that closely resembles the average real woman with similar characteristics at different life stages. Thus, they serve as good additional metrics to gauge how our model economy performs against the data.

Figure 12 reports the age-profiles of labor force participation (non-target) and full-time share of employment (target) for mothers from the data and the benchmark model. Our model performs reasonably well in matching these age-based data moments until approximately age 55, after which the model and data labor force participation rates begins to diverge significantly. This divergence can be attributed to two main assumptions made for tractability: (i) exogenous work hour profiles and mandatory retirement, and (ii) exogenous children.

First, the inability to adjust work hours when young and the mandatory retirement at age 65 imposed on economic agents in the model means more mothers have to work until retirement to offset the absence of labor earnings afterwards and to insure against longevity risk. Second, the assumption of exogenous children, with births restricted to the first 10 years of working age, could overstate the average labor supply path since older mothers are excluded from consideration.

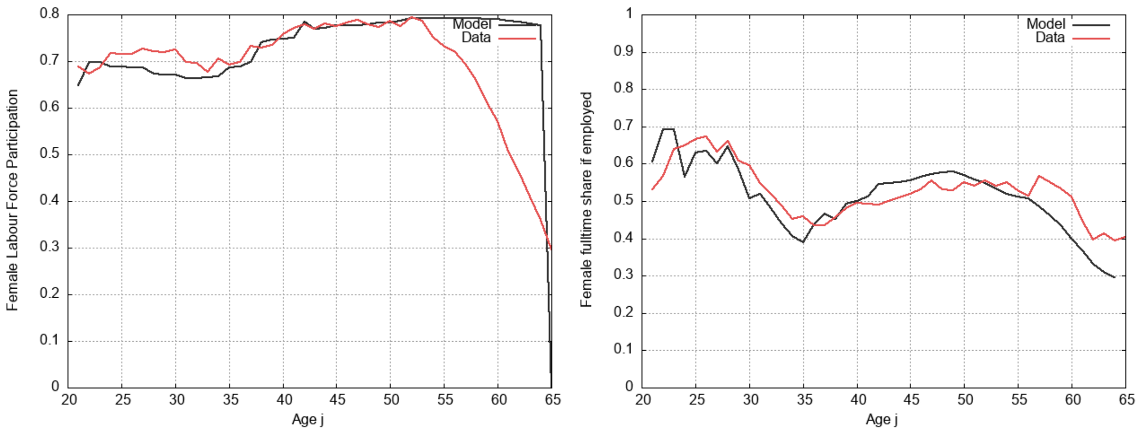

Figure 12: **Model vs Data: Life-cycle profiles of labor supply of mothers. Left:** Labor force participation. **Right:** Full-time share of employment.

6 Quantitative analysis

In this section, we use the calibrated model to assess whether child benefits should be universal, if not, whether the existing means-tested system could be improved. In evaluating each proposed reform, both aggregate and distributional effects are considered.

6.1 Baseline universal child benefit payment

We begin by quantifying the effects of replacing the status quo means-tested system with universal child benefits to families with dependent children. Specifically, we eliminate all the means-testing rules but retain the baseline payment for the FTB and subsidy rates for the CCS, as well as the demographic and other non-income criteria of the transfers (e.g., conditions related to the number and age of dependent children) as described in Section B of the Appendix. We refer to this reform as the *baseline universal child benefits*.

The new regime eliminates the effects of means testing, which involve wage distortions associated with the income tests and varied wealth effects (or the lack thereof for those ineligible for benefits under the means-tested scheme), as explained in Section 3. In the universal regime, all mothers, independent of their family income, are eligible for maximum FTB transfers. Similarly, the CCS program awards maximum subsidies for all working mothers, thus further encouraging labor supply. Moreover, this means high-income parents, who were previously ineligible, now receive the transfers as well. However, funding the expanded child benefits under the universal plan increases the tax burden across all income levels by lowering the scale parameter ζ of the tax function (9), effectively shifting the tax schedule upward. This not only results in a negative wealth effect on all workers but also lowers the threshold for the first tax-paying income bracket, creating new distortions for low-income workers. Ultimately, the net effects on overall welfare, equity, and key macroeconomic variables depend on the balance between the distortions and wealth effects brought about by means testing and those that arise due to the increased tax burden under the universal scheme.

Table 5 details the aggregate outcomes of this transition. Remarkably, making the FTB and the CCS universally accessible improves overall welfare and macroeconomic performance despite the 4.2 percentage point (*pp*) increase in the average tax rate required to fund the significantly larger FTB and CCS expenditures, which inflate by 281.4% and 129.45%, respectively. This implies that the work incentives due to the removal of means testing, along with the negative wealth effect of higher taxes, outweigh the disincentives from the positive wealth effect of the universal transfers on higher-income parents and the increased tax distortions, especially in the lower income bracket. As a result, labor force participation and work hours among mothers increase by 4.2*pp* and 2.64*pp*, respectively, culminating in modest gains of 2.09% in female human capital and 0.11% in output. Additionally, ex-ante welfare increases by 0.85%.

Aggregate implications of universal FTB and CCS programs			
CCS size, %	+129.45	Hour, %	+6.71
FTB size, %	+281.40	Human cap. (H), %	+2.09
Average tax rate, *pp*	+4.20	Consumption (C), %	+0.04
Fe. Lab. Force Part. (LFP), *pp*	+2.64	Output (Y), %	+0.11
Fe. Full time (FT), *pp*	+4.39	Welfare (EV), %	+0.85

Table 5: **Aggregate effects of universalizing child benefits.**
Notes: The tax scale ζ falls from 0.75 to 0.71. Results in the table are reported as changes relative to the levels in the benchmark economy.

On an aggregate level, the baseline universal child benefits outperform the status quo in all key metrics. However, these aggregate changes mask the heterogeneous effects on different demographics, particularly in how the reform transfers welfare from single to married (couple) households as illustrated by the distributional outcome in Table 6.

Married households emerge as clear winners, experiencing approximately a 1.3% increase in welfare. On the contrary, single households, including single mothers—the primary targets of the transfers—are disadvantaged under the universal system. Single men are the most adversely affected, as they receive no benefits and now bear a higher tax burden. For single mothers, those with high education see a welfare decline of 0.69%, while their low-education counterparts experience a 0.51% decrease. Nonetheless, given that the winners (couples) represent 70% of the model's population, the reform would likely secure majority vote and be adopted if social aversion to inequality is absent.

	Couples (H)	Couples (L)	Single M (H)	Single M (L)	Single W (H)	Single W (L)
Welfare (%)	+1.36	+1.34	−1.47	−1.20	−0.69	−0.51

Table 6: **Welfare changes by demographic due to universal child benefits** (*H*: High education, *L*: Low education, *M*: Men, *W*: Women).
Notes: Results are reported as percentage changes relative to the levels in the benchmark economy.

To better understand this inequitable redistributive outcome, we investigate labor supply and consumption responses by demographic, depicted in Figures 13 and 14.

For married mothers, Figure 13 shows that the work incentive effects from eliminating means testing dominates the disincentives.. Because wage distortions under the status quo regime were strongest during child-rearing years (which occur earlier for low-education households), universalizing child benefits results in the most pronounced increase in labor supply during the prime working ages (20 to 40), when mothers' human capital gain rates are highest, especially for those with lower education. These boosts to labor earnings and human capital enable couples to save more early in life for retirement and insuring against earnings shocks, thus enhancing their wealth and consumption over the life cycle (Figure 14) and allowing married women in their 50s to increase their leisure (Figure 13). Improved self-insurance, more efficient allocation of labor supply, and higher consumption over the life cycle ultimately contribute to the welfare gains by couples, as evident in the first two columns of Table 6.

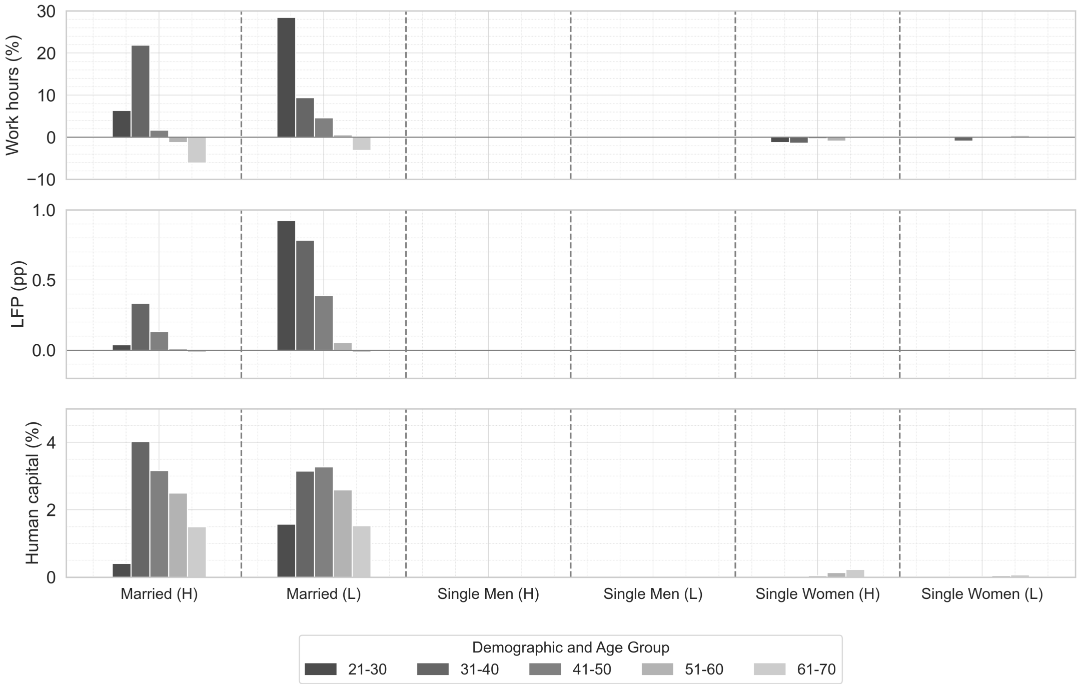

Figure 13: **Changes in female work hours (top), labor force participation (middle), and human capital (bottom) due to universal child benefits.**
Notes: This figure is based on Table F.1 in the Appendix. We report LFP as percentage point (pp) changes, and work hours and human capital as percentage changes (%) relative to their respective values in the benchmark economy.

Conversely, for single mothers, Figure 13 shows that their labor supply is highly inelastic to the reform, with only a minor fraction transitioning out of full-time employment. Several factors might account for the stark differences in responses between single and married mothers.

First, the availability and strength of family insurance via spousal earnings are important considerations. Without a partner, single mothers have lower household income on average. Since the FTB and CCS assess family income, this group is more likely to have already received maximum benefits in the pre-reform economy. In other words, they were less likely to fall within the phase-out zones of means-tested child benefits under the pre-reform economy, and therefore, are less influenced by the removal of means testing.

Second, lacking family insurance, single mothers heavily rely on their own labor supply to smooth consumption over their life cycle. The arrival of children increases their family size, penalizing per capita consumption and increasing the need to work. Additionally, parents only receive child benefits when their children are dependent, with payments phasing out as the children grow older. These factors, in conjunction with the incentive to accumulate human capital, make labor earnings necessary for single mothers, with or without government assistance.

Third, our model restricts female labor supply decisions to the extensive margin. Given that a small proportion of mothers move to part-time work in the post-reform scenario, there appears to be an incentive to maintain participation while reducing hours. Thus, the abstraction from the intensive margin of labor supply might partly explain single women's unresponsiveness to the reforms in our model.

With minimal changes to their participation, similar to their male counterparts, the welfare losses for single mothers are primarily driven by the penalties on their disposable income, resulting from the surge in the average tax rate. This further demonstrates that for single mothers, the baseline universal payments—limited to the period when their children are dependent—are insufficient to compensate for their lost labor earnings. This group is compelled to maintain their pre-reform labor supply commitment while bearing the brunt of the increased tax burden. As reported in the top panel of Figure 14, their consumption over much of their life cycle declines, leading to welfare losses.

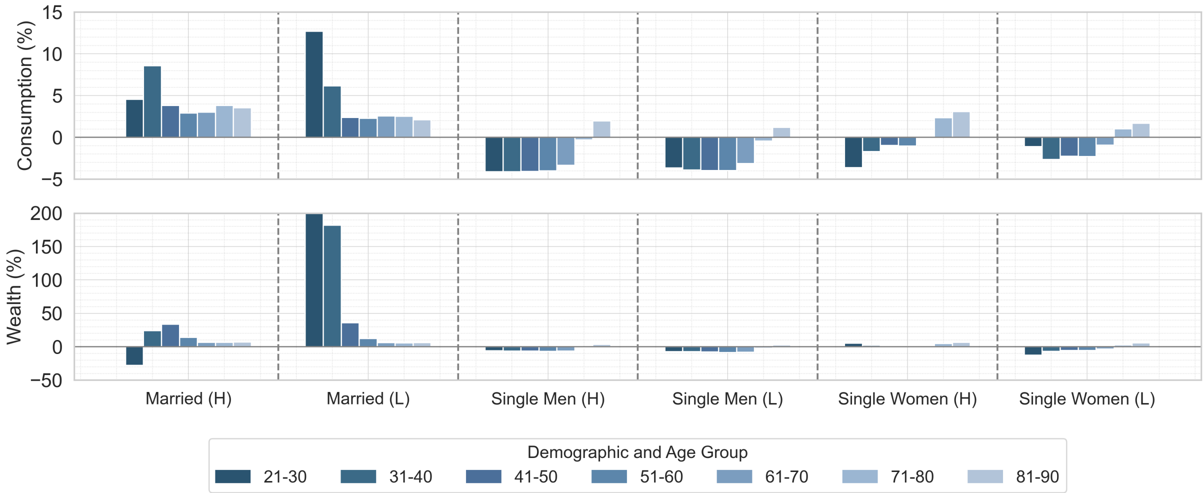

Figure 14: **Changes in consumption (top) and wealth (bottom) due to universal child benefits.**
Notes: This figure is based on Table F.2 in the Appendix. Results are reported as percentage changes relative to the levels in the benchmark economy.

In summary, the baseline universal system imposes a significant tax burden. Although the additional taxes do not fully negate the aggregate gains in labor supply, output, and welfare, they are substantial enough to reduce the welfare of single households, particularly single mothers, who are the intended beneficiaries of child-related transfer programs. Societies that prioritize the welfare of their most disadvantaged may find it difficult to accept this universal reform, even if it is favored by the majority in a utilitarian framework.

6.2 Alternative universal benefit payments

The previous analysis demonstrates how the adverse distributional effects, primarily through the tax channel, can result in the universal system harming single mothers—the very group it aims to support—due to the excessive fiscal expansion. Without means testing, a potential remedy is to control program expenditure by adjusting the benefit or payment rates. Therefore, in this section, we explore the effects of varying the generosity of the universal child benefit system by examining two contrasting scenarios: (i) a universal program with 50% smaller payment rates, and (ii) another with payment rates 50% larger than the baseline system discussed in Subsection 6.1.

	Universal child benefits varied by payment rates		
	0.5×Baseline rates	Baseline rates	1.5×Baseline rates
CCS size, %	−15.45	+129.45	+207.27
FTB size, %	+132.56	+281.40	+430.23
Average tax rate, *pp*	+0.15	+4.20	+6.13
Fe. Lab. For. Part. (LFP), *pp*	+1.06	+2.64	+3.91
Fe. Full time (FT), *pp*	+0.23	+4.39	+6.29
Human cap. (H), %	+0.40	+2.09	+3.09
Consumption (C), %	−0.03	+0.04	+0.08
Output (Y), %	+0.16	+0.11	+0.11
Welfare (EV), %	+0.27	+0.85	+1.50

Table 7: **Aggregate efficiency and welfare effects of universal child benefits varied by size.**
Notes: Results are reported as percentage changes relative to the levels in the baseline economy. For ease of comparison, the middle column shows the aggregate changes associated with the baseline universal scheme from Subsection 6.1 again.

A key takeaway from Figure 6.2 is that adjusting the size of universal child benefits does not resolve the inequity issue. Expanding the system, despite raising labor supply and overall welfare (Table 7), worsens the welfare loss for single mothers. Conversely, shrinking the system shifts the loss from single mothers to low-education couples. As for single male households, they lose in both scenarios due to the higher tax rates relative to the benchmark economy.

Increasing the baseline universal FTB and CCS rates by 50% (Column 3 of Table 7) adds significant stress to the tax system. The average tax rate jumps by 6.13*pp*, about 2*pp* more than the increase under the baseline universal system. This elevated tax burden magnifies the negative effects on the life cycle consumption of single households (bottom panel of Figure 17). Single mothers, therefore, do not perceive this increased generosity as a gift. Due to their lack of family insurance and the short duration of child benefits, as discussed in the prior subsection, Figure 6.2 shows that single mothers make minimal changes to their labor supply decisions in this new universal regime. The larger tax burden only serves to lower their earned income and consumption during their working age, causing a welfare decline of 1.3% for high-education single mothers and 0.9% for those with low education.

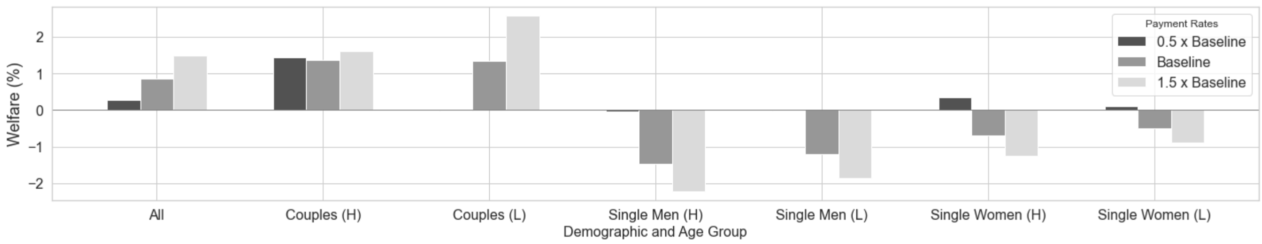

Figure 15: **Changes in welfare by demographic across different universal payment rates.**
Notes: Welfare declines slightly by 0.02% *for low-education couples when the payment rates are* 0.5× *baseline rates. The figure is based on Table F.4 in the Appendix. Results are reported as percentage changes relative to the benchmark economy.*

In contrast, married households benefit more under the expanded universal scheme. As demonstrated in the bottom panels of Figures 6.2 and 17, compared to the baseline universal regime, while the greater negative wealth effect from the higher tax burden (on both their own and their partner's earnings) lead married women to further increase labor supply during their working years, this reallocation of labor results in higher consumption over the life cycle and increased leisure prior to retirement. Ultimately, relative to the baseline system, welfare gains increase by 0.2*pp* for high-education couples (from +1.4% to +1.6%) and double for low-education couples (from +1.3% to +2.6%).

These findings suggest that more generous universal systems can exacerbate inequity, yet they may still receive majority support as they make larger welfare transfers from single households (a minority) to married households (a majority).

Conversely, halving the universal scheme's generosity (Column 1 of Table 7) delivers smaller aggregate gains but eliminates the detrimental welfare impacts on single mothers observed under the baseline and expanded schemes. Despite the less generous payment rates, the net welfare outcome for single mothers is positive, largely due to the accompanying smaller tax increase of 0.15*pp* that does not overshadow the benefits. The increased after-tax income improves life cycle consumption trajectories for both low- and high-education single mothers, as shown in the top panel of Figure 17, leading to welfare gains of 0.1% for the former and 0.4% for the latter group. However, the redistribution remains inequitable. Single men still lose from the higher tax burden, and now the welfare of low-education married households slightly declines by 0.02% (Figure 6.2). Given that low-education couples and single men together constitute the majority, this reform is unlikely to pass.

A caveat is that the welfare effect on low-education couples is almost negligible and may change depending on the model's configuration. Nonetheless, it is worth asking the question: Why do low-education couples lose? Despite the smaller benefit payouts, the positive wealth effect driven by the lower average tax rate prompts married mothers to reduce their labor supply compared to the baseline universal case, as shown by the smaller

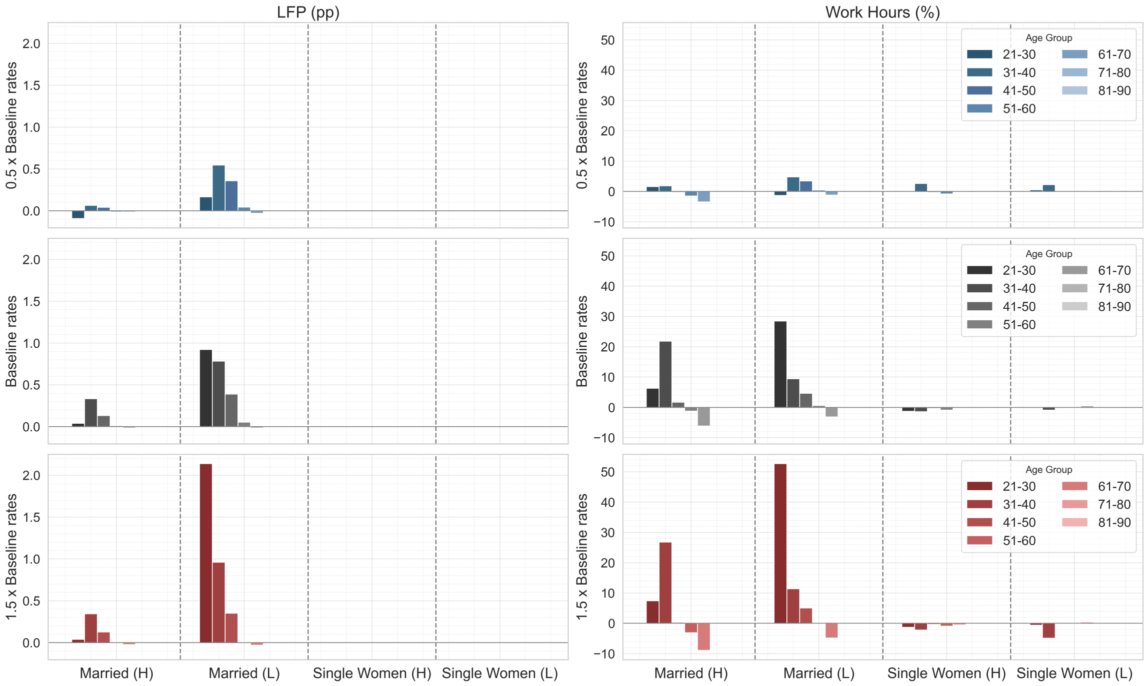

Figure 16: **Changes in female labor force participation (left) and work hours (right) across different universal payment rates: Top**: 0.5×Baseline, **Middle**: Baseline, **Bottom**: 1.5×baseline.
Notes: Figures are based on Table F.3 in the Appendix. LFP and work hours are reported as percentage point (pp) and percentage (%) changes relative to their respective values in the benchmark economy.

participation and work hours over the life cycle in the top panel of Figure 6.2. This re-optimized labor supply profile and the reduced benefits relative to the baseline do cause their consumption to fall modestly by 0.7% between age 21 and 30, but they experience steady 3-4% rises in consumption for the rest of their lives (top panel of Figure 17). Thus, the fact that their welfare still falls by 0.02% under the new regime implies that these long-term gains, stretching over 70 years of life, are not sufficient to offset their initial consumption loss.

The profiles of consumption changes in Figure 17 help explain this puzzle. Comparing the contracted (top panel), baseline (middle panel), and expanded (bottom panel) universal benefit regimes reveals that, relative to the first regime, the second and third bring about smaller consumption gains (not to mention longer work hours) for low-education couples after age 40. Yet, these more expansive systems still produce moderate welfare gains for the group, thereby implying that: (i) the observed welfare changes for low-education couples are driven mainly by early-life consumption; (ii) their marginal utility of consumption is high when they are young (due to the concavity of iso-elastic utility); and (iii) the lost benefits from reduced universal payments cannot be fully compensated by increased labor earnings.

Three assumptions contribute to this outcome. First, the assumptions of assortative mating and differential returns to labor for individuals of different education backgrounds result in small combined labor earnings for young low-education couples. Second, early parenthood among low-education households reduces per capita consumption when individual human capital and therefore earnings capacity are still limited. Additionally, having children introduces child care costs, further diminishing labor returns and hindering young low-education married mothers' ability to work and develop their human capital. Third, the credit constraint assumption restricts young households' ability to self-insure through borrowing, making it extremely difficult to smooth consumption.

In short, young low-education couples face significant barriers to work and borrowing at a time when the arrival of children adversely impacts their per capita consumption. These challenges converge to depress their earnings and consumption early in their life cycle. With insufficient government insurance to relieve these constraints, as in the case of a downsized universal child benefit system, the resultant loss of lifetime utility

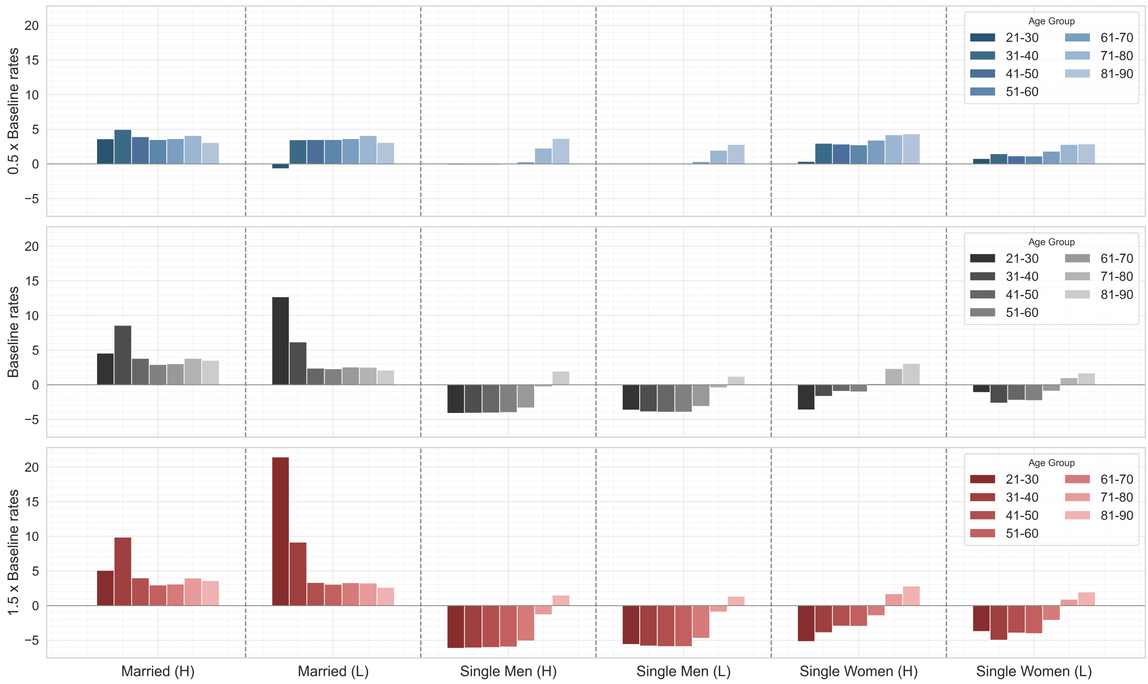

Figure 17: **Changes in consumption across different universal payment rates. Top**: 0.5×Baseline, **Middle**: Baseline, **Bottom**: 1.5×baseline.
Notes: The figure is based on Table F.4 in the Appendix. Results are reported as percentage changes relative to the benchmark economy.

driven by the decline in early-life consumption cannot be compensated by mid- and late-life consumption gains from the lower tax burden.

Discussion.

A key lesson emerges from these findings. Within the confines of our model, universal child benefits that deviate from the baseline payment rates neither address the inequitable redistribution problem associated with the baseline system nor achieve the policy goal of benefiting all low-income parents. On one hand, a smaller program alleviates the tax burden but provides insufficient government support for low-education married households. On the other hand, a larger universal program exacerbates the financial strain on single mothers due to the high tax burden it entails. Of significance to policy making, these results suggest that even with the intent of improving the welfare of the targeted vulnerable demographics at all costs, a universal child benefit system is still not desirable in the long-run, especially from a life cycle perspective. Means testing plays a crucial role in limiting fiscal pressure, balancing short-term public benefits with economy-wide tax burden (therefore, lifetime earnings impacts), and ensuring a net positive welfare outcome for vulnerable parent groups.

6.3 Incremental reforms to the means-tested system

On equity grounds, the model indicates that universal child benefits may be undesirable. In light of these findings, we turn to the question of whether incremental reforms to the status quo means-tested child benefit system could offer a solution. Technically, we explore alternative means-tested system designs by adjusting maximum payment rates and phase-out rates of the current FTB or CCS scheme to see whether they could improve both the aggregate and distributional outcomes. In our model with intricate means-testing rules, the payment rates, income-test thresholds, and phase-out rates can be combined to create a large set of possible policy mixes. However, we narrow our scope to several feasible reforms to derive key insights. Table 8 displays the overall welfare and macroeconomic outcomes from our selected reforms, with two notable observations.

Aggregate implications of incremental child benefit reforms								
	FTB payment rates		CCS subsidy rates		FTB phase-out rates		CCS phase-out rates	
	$0.5 \times tr$	$1.5 \times tr$	$0.5 \times sr$	$1.5 \times sr$	$0.5 \times \omega^F$	$1.5 \times \omega^F$	$0.5 \times \omega^C$	$1.5 \times \omega^C$
Tax rate, *pp*	-0.36	+0.19	-1.37	+0.69	+2.08	+3.34	-0.97	+1.28
Fe. LFP, *pp*	-5.65	+1.00	+1.13	-2.87	+1.69	-2.94	+0.17	-2.66
Fe. Hour, %	-10.89	+3.67	+3.28	-5.05	+1.13	-5.47	+1.00	-5.32
Fe. H. Cap, %	-4.95	+0.93	+0.92	-2.22	+0.76	-2.21	+0.22	-2.49
Cons. (C), %	-2.41	+1.03	-0.17	-1.09	+1.36	-1.55	+0.46	-2.06
Output (Y), %	-1.52	+2.20	+0.88	-1.08	+0.81	-1.67	**+0.89**	-1.42
Welfare (EV), %	-0.41	-0.02	-0.82	+0.28	-0.44	-1.41	**+0.37**	-0.61

Table 8: **Aggregate effects of incremental reforms to selected means-testing parameters.**
Notes: Results are reported in terms of percentage changes relative to the levels in the benchmark economy. Let tr denote the FTB payment rates, sr denote the CCS subsidy rates, ω^F *denote the FTB phase-out rates, and* ω^C *denote the CCS phase-out rate (a reciprocal of the taper unit which is the amount of income increment by which the subsidy rate falls by* 1pp*).* ϕ_p *is a scaling factor for a particular policy parameter. For example,* $\phi_p \times tr^{FTB}$ *when* $\phi_p = 1.5$ *means that the FTB payment rates are increased* 1.5 *times.*

First, aggregate results reveal that most counterfactual regimes involve trade-offs between output and welfare. Second, the reform that stands out is the relaxation of the CCS phase-out rates, reported in the second-to-last column of Table 8. This policy generates a modest overall welfare gain of 0.37% compared to the 0.85% gain realized under the universal system discussed in Subsection 6.1. However, unlike the universal system, which transfers welfare to married households at the expense of singles, this reform spreads the welfare gains more evenly across different household types, as demonstrated in Table 9.

	Couples (H)	Couples (L)	Single M (H)	Single M (L)	Single W (H)	Single W (L)
Welfare (%)	+0.42	+0.40	+0.34	+0.24	+0.26	+0.18

Table 9: **Welfare changes due to relaxing (halving) the CCS phase-out rates.** (*H*: High education, *L*: Low education, *M*: Men, *W*: Women).
Notes: Results are reported as percentage changes relative to the levels in the benchmark economy.

In addition to its lesser fiscal impact, which decreases the average tax rate by 0.97*pp* relative to the benchmark economy, easing the means-tested CCS phase-out rates extends the cutout point of the CCS schedule, enlarging its coverage and enabling larger subsidies to counteract the wage distortions caused by the tax system and the FTB's phase-out rates in higher income brackets.[27]

Single households experience welfare gains under this reform. Figure 6.3 suggests that while their workforce participation remains unchanged, young single mothers increase their work hours by transitioning to full-time employment. For single men, the reform leads to higher after-tax earnings. Ultimately, these factors contribute to favorable changes in the life cycle consumption profiles of all single households, as shown in Figure 6.3, resulting in higher welfare.

Furthermore, unlike the case of downsizing universal child benefits, the government insurance provided by the lump sum transfers (FTB), which has proven to be important for young low-education couples, remains intact under this regime. Combined with the decreased overall tax burden, they allow low-education married women to better re-allocate their labor supply over different phases of life (Figure 6.3). That is, the reform improves self-insurance via labor supply during periods when households face borrowing constraints and marginal utilities of consumption are high. Those who choose to work tend to do so for longer hours, especially between ages 20 and 30 when the marginal utilities of consumption for these households are likely at their peak. Married women in high-education households increase participation and hours throughout their prime working years, although some low-education married women aged 31-40 and 51+ opt out of the labor force. These changes lead to increased consumption over the life cycle for married households (Figure 6.3). Improved

[27] The resulting increased labor supply expands the tax base and reduces FTB claims, leading to a lower average tax rate.

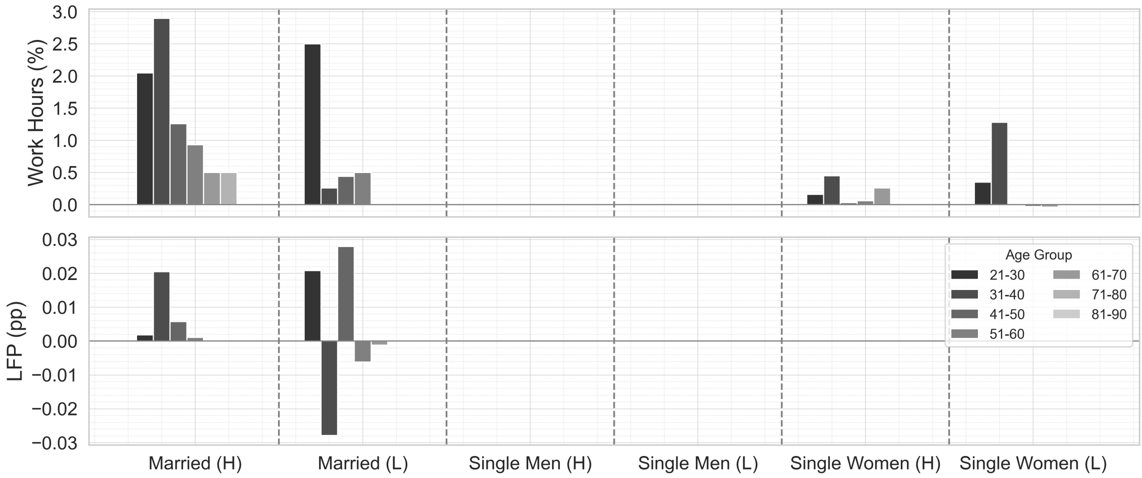

Figure 18: **Changes in work hours (top) and labor force participation (bottom) due to relaxing the CCS phase-out rates.**
Notes: LFP and Work hours are reported as percentage point (pp) and percentage (%) changes relative to their respective values in the benchmark economy.

lifetime consumption and leisure allocations, in turn, result in welfare gains for all couples, as depicted in Table 9.

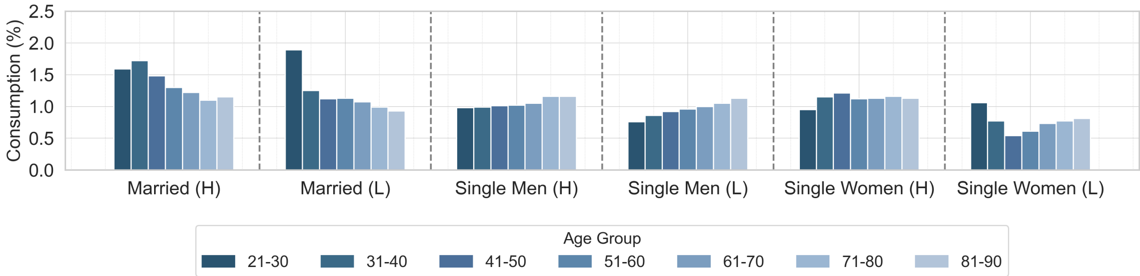

Figure 19: **Changes in consumption in response to the relaxation of CCS taper rates.**
Notes: The figure is based on Table F.5 in the Appendix. Results are reported as percentage changes relative to the benchmark economy.

While this reform meets all our criteria by improving both aggregate and distributional outcomes, the model suggests that its implementation might encounter roadblocks. Universalizing child benefits may still be preferred. To see this, recall that high-education and low-education couples (who constitute the majority) experience welfare gains of 1.36% and 1.34%, respectively, under the universal regime, albeit at the expense of the single households (Figure 6.2). The incremental approach ensures a more balanced distribution of gains but only increases welfare for the average married households by approximately 0.4%. When put to a majority vote, the universal system would still likely secure the most support.

In summary, our findings underscore that larger aggregate welfare gains do not necessarily translate to increased equity, nor does a complete overhaul of the existing means-tested framework guarantee it. Specifically for Australia, universalizing child benefits is not a Pareto improving policy reform. In our model, a less radical move, such as reducing the CCS phase-out rates, yields moderate aggregate gains and is more equitable. However, whether it can garner majority support remains uncertain. Finally, the exercises hint that a global search over combinations of multiple means-testing policy parameters might uncover more preferable alternatives.

7 Extensions

In this section, we extend the analysis to address the question whether the existing child benefit programs are socially desirable. We do so by considering three radical counterfactual policy reforms: (i) abolishing the FTB, (ii) abolishing the CCS, and (iii) abolishing both the FTB and the CCS.

7.1 Abolishing either the FTB or the CCS program

Column [1] and [2] of Table 10 present the aggregate outcomes—including overall welfare and key macroeconomic indicators, such as female labor supply and human capital, consumption, and output—of abolishing the FTB (while retaining the CCS) and the CCS (while retaining the FTB), respectively.

	Abolishing one or both child benefit programs		
	[1] No FTB	[2] No CCS	[3] No FTB&CCS
CCS size, %	+49.80	–	–
FTB size, %	–	+10.89	–
Average tax rate, *pp*	+2.50	-0.70	+0.99
Fe. Lab. For. Part. (LFP), *pp*	+5.76	-10.00	+10.49
Fe. Full time (FT), *pp*	+9.21	-4.55	+20.38
Human cap. (H), %	+3.88	-4.83	+8.57
Consumption (C), %	+1.10	-3.26	+4.27
Output (Y), %	+1.38	-3.48	+3.86
Welfare (EV), %	-3.70	-1.00	-0.66

Table 10: **Aggregate effects of eliminating child benefit program(s).**
Notes: Results are reported as changes relative to the levels in the benchmark economy.

Eliminating the FTB removes the work disincentives—in particular, the wage distortions due to means testing and the positive wealth effect—associated with the program, leading to a 5.76 percentage point (*pp*) increase in female workforce participation, with an even stronger 9.21*pp* increase in full-time rate. This suggests a post-reform switch from part-time to full-time work for a sizeable portion of mothers. Overall, discontinuing the FTB program raises consumption by 1.1% and output by 1.38%, making it an attractive option from employment, consumption, and output perspectives. However, this new regime also brings about an ex-ante welfare loss of 3.7% relative to the status quo, driven by the loss of leisure, an increased tax burden, and insufficient government insurance for those in need, particularly single mothers. A society concerned with the long-term welfare of its newborns would likely oppose this reform.[28]

The removal of the CCS is likely to be met with resistance from the same society. Without the subsidy to reduce formal child care costs and mitigate the FTB's work disincentives, female labor force participation falls by 10*pp*, with a 4.55*pp* drop in full-time rate. The decreased labor supply can be attributed to (i) the status quo CCS program's work activity test, which encourages full-time employment by granting larger subsidies for longer work hours, and (ii) the FTB's work disincentives, which are fully felt without the CCS.[29] Overall, output and welfare decrease by 3.48% and 1%, respectively, making the removal of the CCS a lose-lose reform.

Notably, the general equilibrium effects via the tax channel indicate that eliminating either program produces little to no budget savings and may even increase the tax burden. For instance, removing the FTB causes a surge in the number of working mothers, resulting in a nearly 50% expansion of the CCS program. While the tax base grows, it cannot cover the increased cost of the CCS, leading to a 2.5*pp* rise in the average tax rate. This can be partially explained by the fact that much of the increase in labor supply comes from low-skilled mothers whose earnings place them in the lower income tax brackets.

[28] The adverse distributional effects (or inequities) are qualitatively comparable across the three reforms, and thus, only the third scenario associated with the removal of all child benefits (Column [3] of Table 10) is discussed. Additionally, because behavioral responses in consumption and labor supply to different child benefit reforms are driven by similar mechanisms, detailed discussions of these responses are not repeated. They can be found in prior Subsections 6.1, 6.2, and 6.3.

[29] Considering the short coverage of the subsidy (limited to children aged 13 or younger), the impact of reforming the CCS is most significant on younger mothers, especially single mothers whose family insurance is absent.

Hence, from these experiments, two lessons of relevance to policy making emerges: (i) the interplay between the child-related transfer programs could negate the budget-saving effect of a single program reform; (ii) while the two reforms lead to welfare reductions and are thus undesirable, removing the means-tested lump sum transfer (FTB) yields aggregate gains in the form of higher female labor supply, human capital, consumption, and output, whereas removing the means-tested subsidy (CCS) offers no such benefits.

7.2 Abolishing both the FTB and the CCS programs

Column [3] of Table 10 reports the aggregate effects of the third experiment that eliminates all child benefits, thereby removing both the positive and negative artificial incentive effects on mothers' labor supply. The absence of these forces results in a significant increase in female workforce participation by 10.49*pp* and a 20.38*pp* rise in full-time employment, leading to an 8.57% increase in female human capital and a 3.86% increase in output.[30]

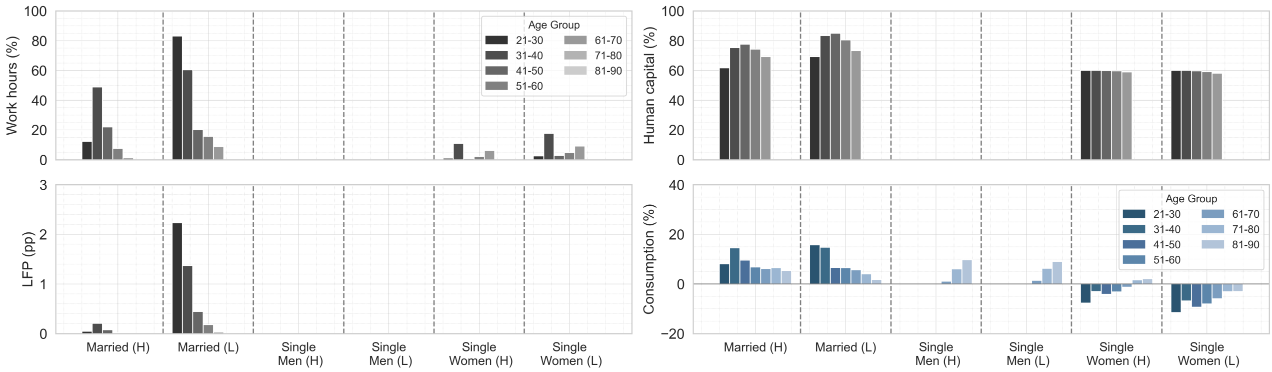

Figure 20: **Labor supply and consumption changes by demographic due to removing all child benefits. Top-left:** Work hours, **Bottom-left:** Labor force participation, **Top-right:** Human capital, **Bottom-right:** Consumption.
Notes: Results for 'Married households' capture the responses by the female spouses. Figures are based on Tables F.6 and F.7 in the Appendix. LFP and Work hours are reported as percentage point (pp) and percentage (%) changes relative to their respective values in the benchmark economy.

What contribute to the significant increase in female labor supply and human capital? Figure 20 shows substantial growth in female participation and work hours over the life cycle, with more pronounced effects among younger mothers. Given the higher human capital gain rates at early ages, this helps explain the considerable rise in human capital for women.

Responses vary by demographic. Married women, particularly those in low-education households, account for the largest share of the upward swing in labor supply. The presence of a partner's earnings makes this group more likely to fall within the phase-out zone of child benefits, significantly raising their effective marginal tax rate (EMTR) in the benchmark economy. In other words, married women's labor supply decisions are most affected by means-tested child benefit programs. Conversely, for single mothers, since their family earnings consist solely of their own, they are less likely to be in the phase-out zone of benefits and thus less affected by means testing. This, along with other factors discussed in Subsection 6.1, helps explain their weaker labor supply responses. While they work longer hours, suggesting a shift towards full-time employment, their participation decisions remain relatively unchanged.

Interestingly, the gains across key macroeconomic indicators more than double those observed in the first experiment (Column [1]), where we remove the FTB and maintain the baseline CCS. Combined with the results from the second experiment (Column [2]), these findings demonstrate that the means-tested CCS improves labor supply, consumption, output, and overall welfare only when paired with the FTB. This highlights the

[30] Despite the reduced need to fund child benefits, the large increase in labor supply and output places more female workers in the upper tax brackets, causing a slight 0.99% uptick in the average tax rate.

counteracting effect the CCS subsidies on the wage distortions created by the means-tested FTB benefits, as illustrated in the partial equilibrium analysis in Section 3.

Moreover, these aggregate results across the three radical reforms in Table 10 suggest that removing both child benefits is superior to removing only one. That is, if the FTB is abolished, the first and third experiments suggest better aggregate outcomes can be achieved by also eliminating the CCS. There are two plausible and complementary explanations: first, the CCS itself is means-tested; second, as shown in Column [1], operating the CCS alone without the FTB leads to a higher average tax rate due to the program's expansion. These factors might result in smaller labor supply, output, and welfare than could be achieved by removing both child benefit programs entirely. Once again, this emphasizes the importance of considering policy interactions.

Notwithstanding, even under the most favorable scenario of the third reform, we still observe a 0.66% overall welfare loss for newborn households relative to the pre-reform economy. This loss can partly be attributed to decreased leisure time, greater fluctuations of consumption growth over the life cycle (Figure 21), and adverse distributional effects, primarily due to the significant losses befalling single mothers (Table 11).

	Couples (H)	Couples (L)	Single M (H)	Single M (L)	Single W (H)	Single W (L)
Welfare (%)	+1.35	−0.22	+0.02	+0.06	−4.03	−6.53

Table 11: **Welfare effects due to the elimination of all child benefits.** (*H*: High education, *L*: Low education, *M*: Men, *W*: Women).
Notes: Results are reported as percentage changes relative to the levels in the benchmark economy.

The welfare losses for single mothers are reflected in the significant decline of their lifetime consumption, as depicted in the bottom-right panel of Figure 20. This demonstrates that the increased labor earnings in the reformed regime fail to adequately replace their lost government assistance. Single mothers' dependence on child benefits arises primarily from the family structure and child-related costs modeled in this study. In a setup without family type heterogeneity, households with identical education and human capital levels would have similar family- and self-insurance capacities to insure against earnings shocks and longevity risk. Differently, in our framework, single mothers—unlike married mothers—does not have access to family insurance. Single mothers, like all mothers, also face difficulties self-insuring via work due to pecuniary and non-pecuniary child penalties. The credit constraint assumption further restricts their ability to borrow. Without family insurance, with limited self-insurance ability, and facing credit constraints, the elimination of child benefits exacerbates their vulnerabilities by taking away their last form of insurance: government assistance. Figure 20 shows the greatest adverse impact on young, low-education single mothers' consumption, as this group is severely constraint in their earnings capacity early in life.

Table 11 also indicates that low-education couples experience a small welfare loss, despite the family insurance provided by the male partner's earnings. The increased married mothers' labor earnings and household consumption fail to offset the loss of child benefits, suggesting that their reallocation of labor supply in the new regime is welfare deteriorating. Plausible reasons for their vulnerability are discussed in detail in Subsection 6.2.

In summary, beyond the overall welfare loss in the absence of child benefits, the sharp welfare reductions for single mothers should be emphasized. As seen in Table 11, welfare plummets by 4.03% for high-education single mothers and 6.53% for those with low education. Despite the significantly improved macroeconomic outcomes, removing child benefits generates an overall welfare loss for newborn households, primarily driven by the severe losses experienced by single mothers. Hence, these results imply that child benefits remain a socially desirable policy in our model.

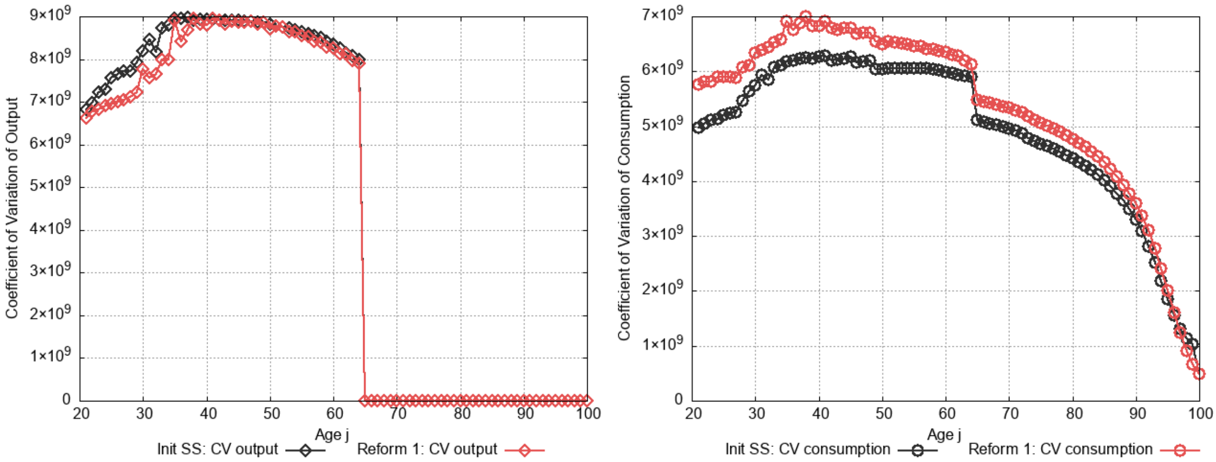

Figure 21: **Life cycle profiles of coefficients of variation: Benchmark (black) vs FTB and CCS elimination reform (red). Left:** Coefficient of variation of log output. **Right:** Coefficient of variation of log consumption.

8 Conclusion

This paper studies the aggregate and distributional effects of means-tested child benefits and potential reforms based on the unique Australian design of means-tested child benefit programs: the Family Tax Benefit (FTB) and Child Care Subsidy (CCS). Our results reveal that means testing is an effective instrument to control the size of public funds dedicated to child benefit programs, thereby lowering tax burdens and allowing targeted demographics—such as single mother and low-education married households—to achieve welfare improvements. However, these advantages come at a cost: the high effective marginal tax rates (EMTR) generated by means testing create significant work disincentives, leading to reductions in aggregate labor supply, output, and overall welfare.

Our counterfactual analyses suggest that a structural reform that replaces the current means-tested child benefits with a universal system could improve aggregate labor supply, output, and overall welfare, as well as being favored by the majority in our model. However, this reform leads to unintended welfare losses for the intended beneficiaries, single mothers. Adjusting the universal payment rates can mitigate, but not fully resolve, this inequitable redistribution problem. For example, a less generous universal scheme simply shifts the loss from single mothers to low-education couples. We find that incremental reforms to the existing means-tested system, such as reducing the CCS phase-out rates, could potentially offer a more equitable distribution of welfare gains, although such reforms might not secure majority support when compared to universal reform proposals.

Our results carry important implications for public policy design and evaluation. First, the interaction between government transfer programs and general equilibrium effects via the tax channel is crucial. Because more radical reforms drastically change the funding requirements for child benefits, balancing means-testing distortions with tax distortions arising from these reforms is key. Second, we emphasize the significance of modeling family structure to better capture the overall and distributional effects of policies. Third, our study advocates for a complete life cycle view to fully understand the trade-offs between short-term public benefits and changes in lifetime earnings capacity for intended beneficiaries. Lastly, for Australia, we demonstrate that simple incremental reforms to the existing means-tested system can lead to more balanced aggregate and distributional outcomes compared to universal benefits.

There are some caveats. This study does not address the long-run aggregate efficiency or the optimal design of child benefits. Additionally, there are several key modeling assumptions, policy issues, and objectives that may be important for designing a more effective child benefit system, but are unexplored here. These include, *inter alia*, the impact of child benefits on fertility, child quality, and marriage decisions, as well as the joint effects of progressive income taxes and means-tested child benefits. We leave these issues for future research.

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Technical Appendix for "Child-Related Transfers, Means Testing and Welfare"

Darapheak Tin and Chung Tran

A Welfare programs in Australia

The Australian tax and transfer system features progressive income taxes and highly targeted transfers. Key components of the income tax system include a progressive tax schedule, alongside various deductions, concessions, offsets, and surcharges. This progressive schedule applies to individual taxable income, which encompasses both labor and capital earnings. Government welfare transfers are typically subject to complex means-testing rules, including varying benefit levels, multi-tier income and asset test thresholds, phase-out rates, and demographic criteria.

Financial year	Welfare ($b)	Welfare-GDP (%)	Welfare-Revenue (%)
2010-11	140.19	8.43	34.04
2011-12	149.66	8.70	34.20
2012-13	153.24	8.89	33.62
2013-14	155.68	8.88	33.47
2014-15	165.13	9.41	35.15
2015-16	167.68	9.47	34.59
2016-17	165.76	8.95	33.02
2017-18	171.62	8.99	32
2018-19	174.24	8.80	31.18
2019-20	195.71	9.86	36.05

Table 12: **Welfare expenditure in Australia**.

Notes: $ value is expressed in 2019−20 prices.
Source: Welfare expenditure report by the Australian Institute of Health and Welfare.

Financial year	Families & Children	Old people	Disabled	Unemployed	Others
2009-10	2.51	3.33	1.87	0.48	0.40
2010-11	2.39	3.33	1.94	0.44	0.34
2011-12	2.33	3.43	1.98	0.44	0.52
2012-13	2.31	3.57	2.00	0.49	0.52
2013-14	2.26	3.47	2.02	0.55	0.57
2014-15	2.33	3.79	2.09	0.59	0.61
2015-16	2.32	3.86	2.08	0.60	0.62
2016-17	2.02	3.72	2.01	0.57	0.63
2017-18	1.94	3.67	2.18	0.56	0.65
2018-19	1.81	3.63	2.22	0.49	0.64
2019-20	1.92	3.85	2.53	0.93	0.62

Table 13: **Welfare expenditure to GDP (%) by target groups**.

Source: Welfare expenditure report by the Australian Institute of Health and Welfare.

		2001-05	2006-10	2011-15	2016-20*	Total
Income support	Pensions	51.74%	51.35%	57.67%	60.80%	55.79%
	Parenting payments	9.52%	6.58%	5.61%	4.63%	6.39%
	Allowances	14.80%	9.94%	10.62%	11.54%	11.59%
	Total	76.06%	67.87%	73.90%	76.98%	73.77%
Non-income support	Family payments	23.09%	24.96%	22.18%	18.02%	21.87%
	Bonus payments	0.00%	5.55%	1.31%	1.38%	2.07%
	Other non-income supports	0.59%	1.40%	2.51%	3.45%	2.10%
	Total	23.68%	31.91%	26.00%	22.85%	26.05%
Other public benefits		0.26%	0.22%	0.10%	0.18%	0.18%

Table 14: **Components of Australian public transfers over time.**
*Notes: *Welfare transfers account for roughly* 30% *of government revenue in the 2016-20 period.*

B The design of Australia's child-related transfer system

There are two main child-related transfer programs that provide substantial benefits for families with dependent children: Family Tax Benefit (FTB) and Child Care Subsidy (CCS). The FTB and CCS programs are detailed below.

B.1 Family Tax Benefit part A (FTB-A)

The FTB-A program is a non-taxable transfer paid per child and the amount claimable depends on family's circumstances. In short, it is a function of combined household adjusted taxable income, annual private rent, and age and number of dependent children. Important parameters that determine the levels, kinks and slopes of the FTB-A benefit schedule are:

1. Statutory base and maximum payment rates per qualifying dependent child (i.e., FTB child),
2. Income test thresholds for the base and maximum payments,
3. Withdrawal or taper rates for the base and maximum payments, and
4. Supplements such as the Large Family Supplement (LFS), the Newborn Supplement (NBS), the Multiple Birth Allowance (MBA), the Rent Assistance (RA), and the Clean Energy Supplement (CES) that are added to the statutory base and maximum payment rates per child to derive the total base and maximum payments.

These parameters constitute the main structure of the FTB-A program. Their values may vary from year to year. For our purpose, we adopt the 2018 FTB-A parameters in the initial steady state equilibrium of the model economy.

We first calculate the per child total base payment, b_A, and the per child total maximum payment, m_A, of the FTB-A benefit.

$$\begin{aligned} b_{A,j} = {} & LFS_j + NBS_j + MBA_j + CES_{A,base,j} \\ & + ndep_{[0,17],j} \times FTBA_{base_1} \\ & + ndep_{[18,24],j} \times FTBA_{base_2} \\ & + \mathbf{1}_{\{school=1\}} ndep_{[18,19],j} \times FTBA_{base_3} \\ & + \mathbf{1}_{\{school=0\}} ndep_{[18,21],j} \times FTBA_{base_4} \end{aligned} \tag{B.1}$$

$$
\begin{aligned}
m_{A,j} = LFS_j + NBS_j + MBA_j + RA_j + CES_{A,max,j} \\
+ ndep_{[0,12],j} \times FTBA_{max_1} \\
+ ndep_{[13,15],j} \times FTBA_{max_2} \\
+ ndep_{[16,17],j} \times FTBA_{max_3} \\
+ ndep_{[18,24],j} \times FTBA_{max_4} \\
+ \mathbf{1}_{\{school=1\}} ndep_{[16,19],j} \times FTBA_{max_5} \\
+ \mathbf{1}_{\{school=0\}} ndep_{[16,17],j} \times FTBA_{max_6} \\
+ ndep_{[18,21],j} \times FTBA_{max_7}
\end{aligned}
\tag{B.2}
$$

where *school* is a binary variable for school attendance and $ndep_{[a,b],j}$ denotes the number of children in the age range $[a, b]$ of parents aged j. $FTBA_{base}$ and $FTBA_{max}$ are parameters corresponding to the statutory base and maximum per dependent child payment rates which vary over age of a child. In 2018, $FTBA_{base} = \{2,266.65; 0; 2,266.65; 0\}$ and $FTBA_{max} = \{5504.20; 6938.65; 0; 0; 6938.65; 0; 0\}$ stated in 2018 AUD.

The income test thresholds for base and maximum payments, $TH_{base}$and TH_{max}, are

$$
\begin{cases}
TH_{max} & = FTBA_{T_1} \\
TH_{base} & = FTBA_{T_2} + (ndep_{[0,24],j} - 1) \times FTBA_{T_2A}
\end{cases}
\tag{B.3}
$$

The maximum threshold is fixed while the base threshold expands at the rate of $FTBA_{T_2A}$ for every addition of a dependent child.

In 2018, the starting income test thresholds $FTBA_T = \{52,706; 94,316\}$, and the base payment income test threshold adjustment factor per additional qualifying child $FTBA_{T_2A} = 0$, stated in 2018 AUD.

We can then calculate the FTB-A benefit.

$$
FTBA_j^0(y_h) =
\begin{cases}
m_{A,j} & \text{if } y_h \leq TH_{max} \\
MAX\{b_{A,j},\, m_{A,j} - FTBA_{w_1}(y_h - TH_{max})\} & \text{if } TH_{max} < y_h \leq TH_{base} \\
MAX\{0, & \text{if } y_h > TH_{base} \\
\qquad m_{A,j} - FTBA_{w_1}(y_h - TH_{max}), & \\
\qquad b_{A,j} - FTBA_{w_2}(y_h - TH_{base})\} &
\end{cases}
\tag{B.4}
$$

where the total household taxable income $y_h = y_m + y_f + ra$ and $FTBA_w$ is the withdrawal rate. In 2018, $FTBA_w = \{0.20,\ 0.30\}$.

The statutory rates include extra supplement for low income households. In our calculation, this supplement is later deducted from the total benefit payment if a household does not meet the supplement's income test cutoff. The income test is conducted separately once the full benefit has been computed

$$
FTBA_j(y_h) =
\begin{cases}
MAX\{0,\ FTBA_j^0(y_h) - FTBA_{AS} \times (ndep_{[0,12],j} & \text{if } y_h > FTBA_{FT1} \\
\qquad\qquad + ndep_{[13,15],j} + \mathbf{1}_{\{school=1\}} ndep_{[1619],j})\} & \\
FTBA_j^0(y_h) & otherwise
\end{cases}
\tag{B.5}
$$

where in 2018, the annual FTB-A supplement adjustment $FTBA_{AS} = 737.30$ and the supplement's income test threshold $FTBA_{FT1} = 80,000$ stated in 2018 AUD.

Below are the formulae used to calculate the LFS, NBS, MBA, CES (for part A and part B), and RA in the model.

Large Family Supplement (LFS):

$$LFS_j = min\{FTBA_{S_1} \times (ndep_{[0,24],j} - FTBA_{C_1} + 1),\ 0\} \tag{B.6}$$

where $ndep_{[a,b],j}$ denotes the number of children in the age range $[a, b]$ of parents aged j, $FTBA_{S_1}$is the LFS amount per child, and $FTBA_{C_1}$is the number of dependent children a family must have to be eligible for the LFS for the first child to satisfy the cutoff $FTBA_{C_1}$ and every additional child onward. In 2018, $FTBA_{C_1} = 1$ and $FTBA_{S_1} = 0$.

Newborn Supplement (NBS):

$$NBS_j = \begin{cases} \mathbf{1}_{\{nb_j \geq 1,\ fc_j=1\}} FTBA_{NS_1} \times nb_j + \mathbf{1}_{\{nb_j \geq 1,\ fc_j=0\}} FTBA_{NS_2} \times nb_j & \text{if } ppl = 0 \\ \mathbf{1}_{\{nb_j \geq 2,\ fc_j=1\}} FTBA_{NS_1} \times (nb_j - 1) + \mathbf{1}_{\{nb_j \geq 2,\ fc_j=0\}} FTBA_{NS_2} \times (nb_j - 1) & \text{if } ppl = 1 \end{cases} \tag{B.7}$$

where nb_j denotes the number of newborns to parents aged j, fc_j is a binary variable for first child, ppl is a binary variable for Paid Parental Leave (by default, we set $ppl = 0$), and $FTBA_{NS}$ is the amount of NBS per qualified child. In 2018, $FTBA_{NS} = \{2,158.89;\ 1,080.54\}$ stated in 2018 AUD.

Multiple Birth Allowance (MBA):

$$MBA_j = \begin{cases} \mathbf{1}_{\{sa=3,\ j_c \leq FTBA_{MAGES}\}} FTBA_{MBA_1} + \mathbf{1}_{\{sa \geq 4,\ j_c \leq FTBA_{MAGES}\}} FTBA_{MBA_2} & \text{if } school = 1 \\ \mathbf{1}_{\{sa=3,\ j_c \leq FTBA_{MAGE}\}} FTBA_{MBA_1} + \mathbf{1}_{\{sa \geq 4,\ j_c \leq FTBA_{MAGE}\}} FTBA_{MBA_2} & \text{if } school = 0 \end{cases} \tag{B.8}$$

where sa is the number of dependent children with the same age, $school$ is a binary variable for school attendance, j_c is the age of children sharing birth date, and $FTBA_{MAGE}$ and $FTBA_{MAGES}$ are a child's age cutoffs to be eligible for the MBA if they attend and do not attend school, respectively. $FTBA_{MBA}$ is the MBA payment. For simplicity, we assume there can only be one instance of multiple births for each household. In 2018, $FTBA_{MAGE} = 16$, $FTBA_{MAGES} = 18$, and $FTBA_{MBA} = \{4,044.20;\ 5,387.40\}$ stated in 2018 AUD.

Clean Energy Supplement for the FTB part A (CES_A):

The Clean Energy Supplement for the FTB part A (CES_A) is separated into base and maximum payments. We add the former to the base level and the latter to the maximum level of the FTB-A benefit.

$$\begin{aligned} CES_{A,base,j} &= ndep_{[0,17],j} \times FTBA_{CE_1} + ndep_{[18,19]_{AS},j} \times FTBA_{CE_1} \\ CES_{A,max,j} &= ndep_{[0,12],j} \times FTBA_{CE_2} + ndep_{[13,15],j} \times FTBA_{CE_3} + ndep_{[16,19]_{AS},j} \times FTBA_{CE_3} \end{aligned} \tag{B.9}$$

where $ndep_{[a,b],j}$ denotes the number of children in the age range $[a, b]$ of parents aged j, $school$ is a binary variable for school attendance, $ndep_{[a,b]_{AS},j} = \mathbf{1}_{\{school=1\}} \times ndep_{[a,b],j}$, $FTBA_{CE}$ is the per child amount of the CES_A. In 2018, $FTBA_{CE} = \{36.50;\ 91.25;\ 116.80\}$ in 2018 AUD.

Note that from 2018 onward, only households who had received the CES_A in the previous year were eligible for the supplement. In the baseline model, we assume this is true for all households.

Rent Assistance (RA):

Rent assistance adds to the per child maximum payment of the FTB-A and is available only to FTB-A recipients who rent privately which we assume to hold true for all households in the benchmark model.

$$RA_j(rent) = \begin{cases} MAX\{MIN\{0.75\,(rent - rent_{min}),\ RA_{max}\},\ 0\} & \text{if } FTBA_1 \geq FTBA_{min} \\ 0 & \text{otherwise} \end{cases} \tag{B.10}$$

where $rent$ is the annual rent, $rent_{min}$ is the minimum rent to qualify for the RA, RA_{max} is the cap on the RA benefit, $FTBA_1$ is the FTB-A benefit excluding the RA, $FTBA_{min}$ is the minimum size of the FTB-A for which a household must be qualified to be deemed eligible for the RA. In 2018, expressed in 2018 AUD

$$RA_{max} = \mathbf{1}_{\{ndep_{[0,24],j} \leq 2\}} 4,116.84 + \mathbf{1}_{\{ndep_{[0,24],j} \geq 3\}} 4,648.28\}$$

$$rent_{min} = \mathbf{1}_{\{single=1\}} 4,102.28 + \mathbf{1}_{\{couple=1\}} 6,071.52$$

Before 2013, $FTBA_{min}$ is set to the base FTB-A payment and $FTBA_{min} = 0$ thereafter.

B.2 Family Tax Benefit part B (FTB-B)

The FTB-B program is paid per family. Its objective is to give additional support to single parents and single-earner partnered parents with limited means. Similar to the FTB-A, the FTB-B is a function of age and number of dependent children, but differently, the eligibility and amount claimable are determined by separate tests on the primary and secondary earners' individual taxable income, as well as the marital status of the potential recipients. Important parameters that determine the levels, kinks and slopes of the FTB-B benefit schedule are: (i) Maximum payment rate; (ii) Separate income test thresholds on primary and secondary earners; and (iii) Withdrawal or taper rates based on secondary earner's taxable income.

Let $y_{pe} = MAX(y_m, y_f)$ and $y_{se} = MIN(y_m, y_f)$ denote the primary earner's and secondary earner's taxable income, respectively, and let $m_{B_i,j} = FTBB_{max_i} + CES_{B,j}$ be the maximum payment per family. Note that the structure of the FTB-B changed in 2017. The FTB-B formula prior to 2017 is thus different to that from 2017 onwards.

Before 2017:

$FTBB_j(y_m, y_f) =$

$$\begin{cases} cond_1 \times m_{B_1,j} + cond_2 \times m_{B_2,j} & \text{if } y_{pe} \leq FTBB_{T_1} \text{ and } y_{se} \leq FTBB_{T_2} \\ \\ cond_1 \times MAX\{0,\ m_{B_1,j} - FTBB_w(y_{se} - FTBB_{T_2})\} & \text{if } y_{pe} \leq FTBB_{T_1} \text{ and } y_{se} > FTBB_{T_2} \\ +cond_2 \times MAX\{0,\ m_{B_2,j} - FTBB_w(y_{se} - FTBB_{T_2})\} & \end{cases} \tag{B.11}$$

From 2017:

$FTBB_j(y_m, y_f) =$

$$\begin{cases} cond_1 \times m_{B_1,j} + cond_3 \times m_{B_2,j} & \text{if } y_{pe} \leq FTBB_{T_1} \text{ and } y_{se} \leq FTBB_{T_2} \\ \\ cond_1 \times MAX\{0,\ m_{B_1,j} - FTBB_w(y_{se} - FTBB_{T_2})\} & \text{if } y_{pe} \leq FTBB_{T_1} \text{ and } y_{se} > FTBB_{T_2} \\ +cond_3 \times MAX\{0,\ m_{B_2,j} - FTBB_w(y_{se} - FTBB_{T_2})\} & \end{cases} \tag{B.12}$$

where $cond_1 = 1_{\{ndep_{[0,4],j} \geq 1\}}$, $cond_2 = 1_{\{ndep_{[0,4],j}=0,\, (ndep_{[5,15],j} \geq 1 \text{ or } ndep_{[16,18]_{AS},j} \geq 1)\}}$ and $cond_3 = 1_{\{ndep_{[0,4],j}=0,\, ndep_{[5,12],j}$
$1_{\{ndep_{[0,4],j}=0,\, ndep_{[5,12],j}=0,\, (ndep_{[13,15],j} \geq 1 \text{ or } ndep_{[16,18]_{AS},j} \geq 1),\ single=1\}}$

In 2018, the statutory maximum FTB-B payment $FTBB_{max} = \{4,412.85;\ 3,190.10\}$, the income test thresholds $FTBB_T = \{100,000;\ 5,548\}$ in 2018 AUD, and the withdrawal rate $FTBB_w = 0.20$.

Clean Energy Supplement for the FTB part B (CES_B):

The Clean Energy Supplement for FTB part B (CES_B) adds to the statutory per family payment of the FTB-B benefit.

$$CES_{B,j} = \begin{cases} FTBB_{CE_1} & \text{if } ndep_{[0,4],j} \geq 1 \\ FTBB_{CE_2} & \text{if } ndep_{[0,4],j} = 0 \text{ and } (ndep_{[5,15],j} \geq 1 \text{ or } ndep_{[16,18]_{AS},j} \geq 1) \\ 0 & \text{if } ndep_{[0,4],j} = 0 \text{ and } ndep_{[5,15],j} = 0 \text{ and } ndep_{[16,18]_{AS},j} = 0) \end{cases} \tag{B.13}$$

where $ndep_{[a,b],j}$ denotes the number of children in the age range $[a, b]$ of parents aged j, *school* is a binary variable for school attendance, $ndep_{[a,b]_{AS},j} = \mathbf{1}_{\{school=1\}} \times ndep_{[a,b],j}$, $FTBB_{CE}$ is the per family amount of CES_B. In 2018, $FTBB_{CE} = \{73;\ 51.10\}$ in 2018 AUD.

Note that from 2018 onward, only households who had received the CES_B in the previous year were eligible for the supplement. In the baseline model, we assume this is true for all households.

B.3 Child Care Subsidy (CCS)

The Child Care Subsidy program aims at assisting households with the cost of caring for children aged 13 or younger who are not attending secondary school and is paid directly to approved child care service providers. Eligibility criteria include (i) a test on the combined family income (y_h), (ii) the type of child care service, (iii) age of the dependent child, and (iv) hours of recognized activities (e.g., working, volunteering and job seeking) by parents (n_j^m, n_j^f). The rate of subsidy is also determined by parameters such as income thresholds, work hours, and taper unit (the size of income increment by which the subsidy rate falls by 1 percentage point). Given that the current model is silent on the type of child care and therefore child care fees, we assume the followings:

1. Identical child care service operating within a perfectly competitive framework,
2. No annual cap on hourly fee and on subsidy per child,
3. Households exhaust all the available hours of subsidized care.

The child care subsidy function is

$$CCS(y_h, n_j^m, n_j^f) = \Psi(y_h, n_j^m, n_j^f) \times \begin{cases} CCS_{R_1} & \text{if } y_h \leq TH_1 \\ MAX\{CCS_{R_2},\ CCS_{R_1} - \omega_1\} & \text{if } TH_1 < y_h < TH_2 \\ CCS_{R_2} & \text{if } TH_2 \leq y_h < TH_3 \\ MAX\{CCS_{R_3},\ CCS_{R_2} - \omega_3\} & \text{if } TH_3 \leq y_h < TH_4 \\ CCS_{R_3} & \text{if } TH_4 \leq y_h < TH_5 \\ CCS_{R_4} & \text{if } y_h \geq TH_5 \end{cases} \tag{B.14}$$

where $y_h = y_m + y_f + ra$ and $\omega_i = \dfrac{y_h - TH_i}{taper\ unit}$.
In 2018,

- Taper unit = AU\$3,000;
- Statutory (base) subsidy rates, $CCS_R = \{0.85,\ 0.5,\ 0.2,\ 0\}$;
- Income test thresholds, $TH = \{70,015;\ 175,015;\ 254,305;\ 344,305;\ 354,305\}$ in 2018 AUD;
- Let $n_j^{min} = min\{n_j^m, n_j^f\}$. The adjustment factor is

$$\Psi(y_h, n_j^m, n_j^f) = 0.24_{\{y_h \leq AU\$70{,}015,\ n_j^{min} \leq 8\}} + 0.36_{\{8 < n_j^{min} \leq 16\}} + 0.72_{\{16 < n_j^{min} \leq 48\}} + 1_{\{n_j^{min} > 48\}}$$

  Otherwise, $\Psi(y_h, n_j^m, n_j^f) = 0$.

C Major changes in child-related transfer policies

In the past two decades, the Australian government has introduced several policy reforms to enhance the effectiveness of the Family Tax Benefit (FTB) and Child Care Subsidy (CCS) programs. This section provides an overview of the major changes to these policies.

C.1 Family Tax Benefit Part A (FTB-A)

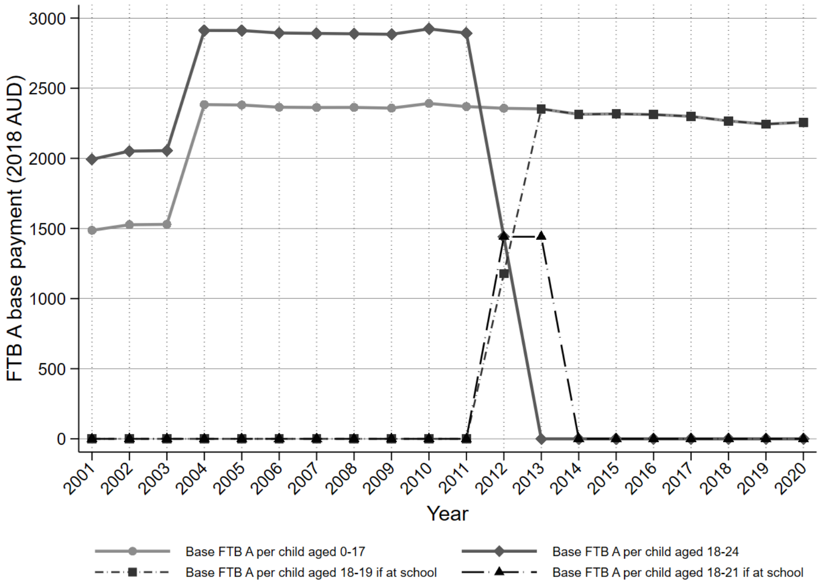

Figure C.1: FTB-A base payment rates per child.

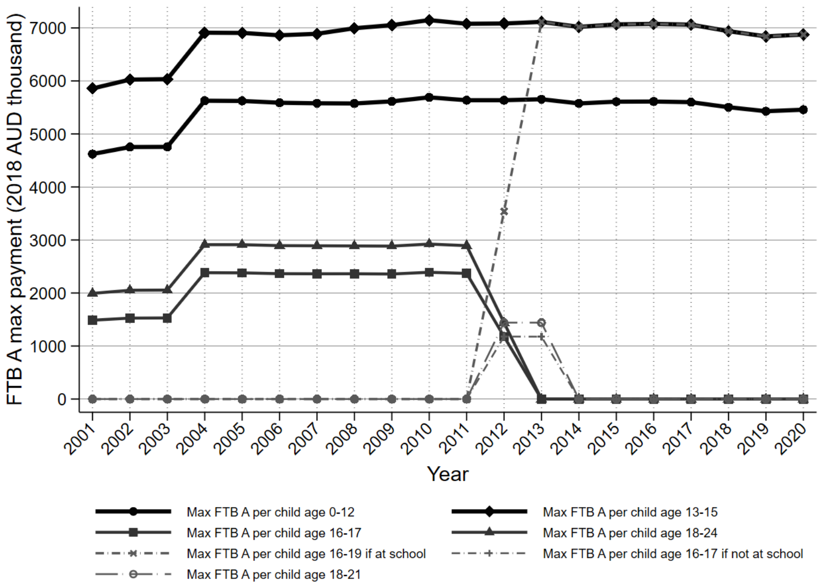

Figure C.2: FTB-A maximum payment rates per child.

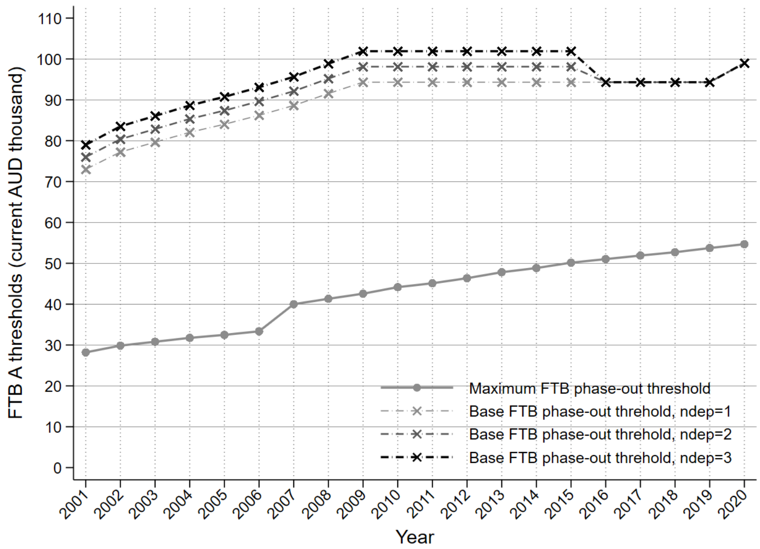

Figure C.3: FTB-A income test thresholds for maximum and base payment rates.

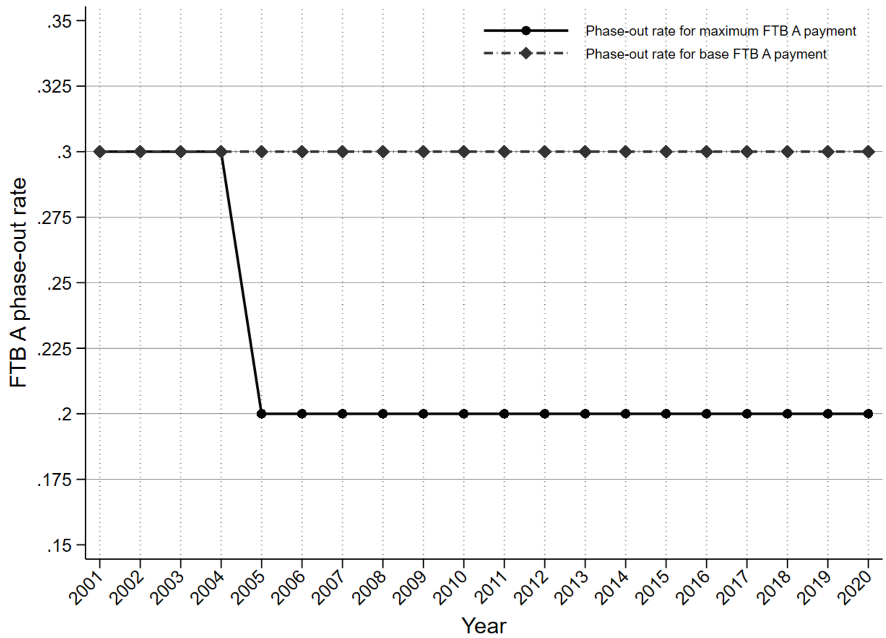

Figure C.4: FTB-A phase-out rates for maximum and base payments.

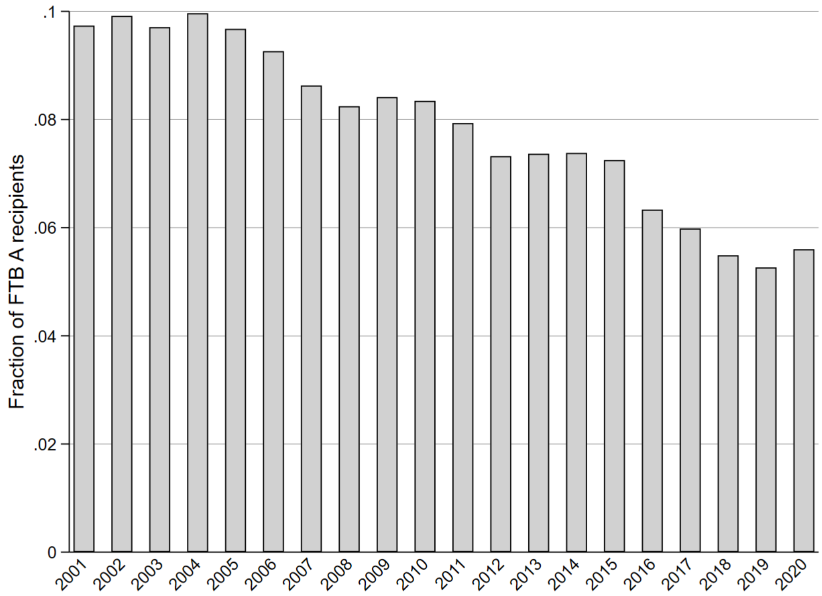

Figure C.5: Proportion of FTB-A recipients over time.

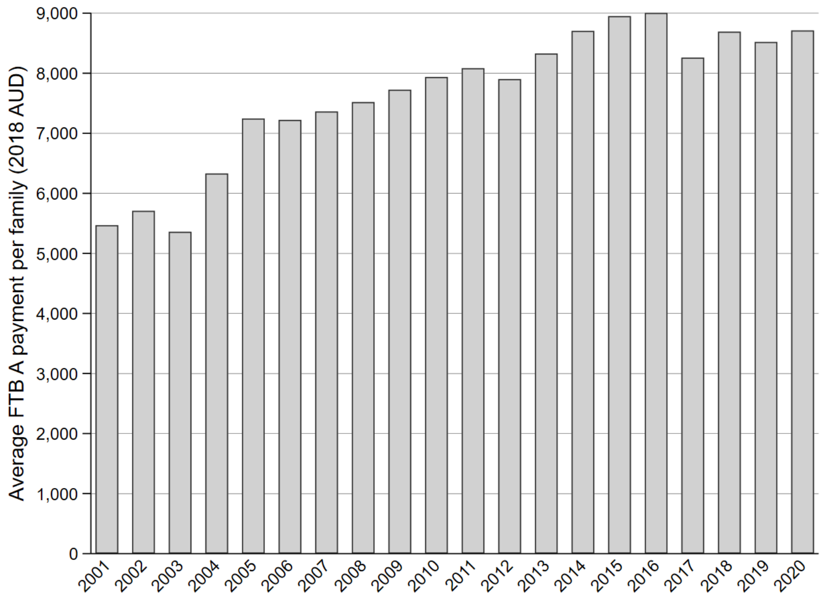

Figure C.6: Average FTB-A payment per family (2018 AUD) over time.

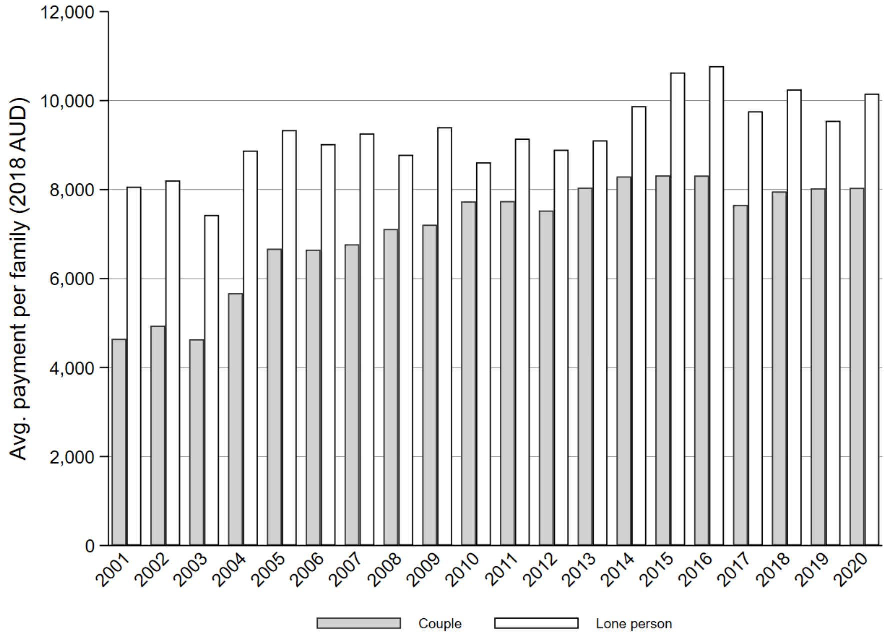

Figure C.7: Average FTB-A payment per family by marital status

The proportion of households receiving the FTB-A (out of all households observed in the survey data) has fallen from 10% in 2001 to slightly over 5% in 2020, (see Figure C.5). This can be attributed, in part, to the falling birth rate and threshold-creep due to inflation. Despite the overall decline, the benefit remains concentrated among low-income families.

At the intensive margin, the FTB-A alone represents a significant sum of inflation-indexed transfers. Figures C.1 and C.2 illustrate that there have been minimal changes to the base and maximum statutory payment rates for children under 18 since 2004. Qualified families with a child aged 13-15 could receive up to $7,000 (2018 AUD). The maximum rate per dependent child aged 12 or younger is slightly lower, but still exceeds $5,500. Given that payments are allocated per child, a two-children family could receive up to $14,000. Moreover, Figure C.6 shows that the benefits delivered to eligible families have been rising. The average FTB-A payout increased from $8,000 to $8,500 (2018 AUD) over the past decade. Moreover, because the scheme predominantly targets single-earner families, especially single parents, single parent households claimed higher benefits on average compared to couple parent households, as seen in Figure C.7.

C.2 Family Tax Benefit Part B (FTB-B)

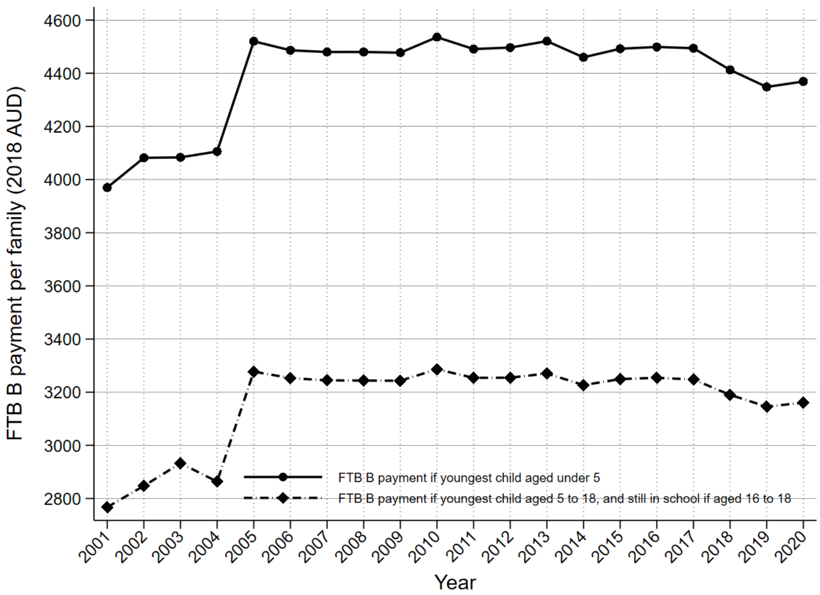

Figure C.8: FTB-B payment rates per family by age of the youngest child.

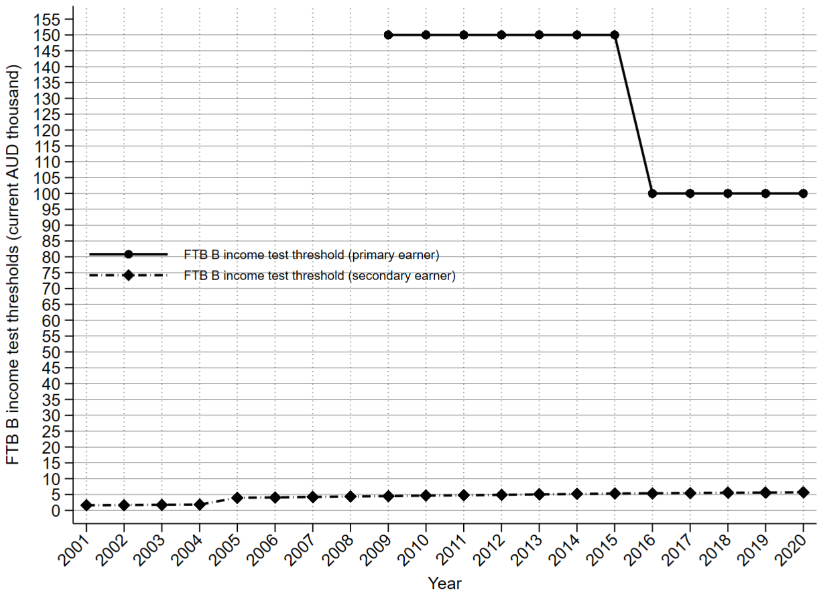

Figure C.9: FTB-B thresholds over time on primary and secondary earners over time.

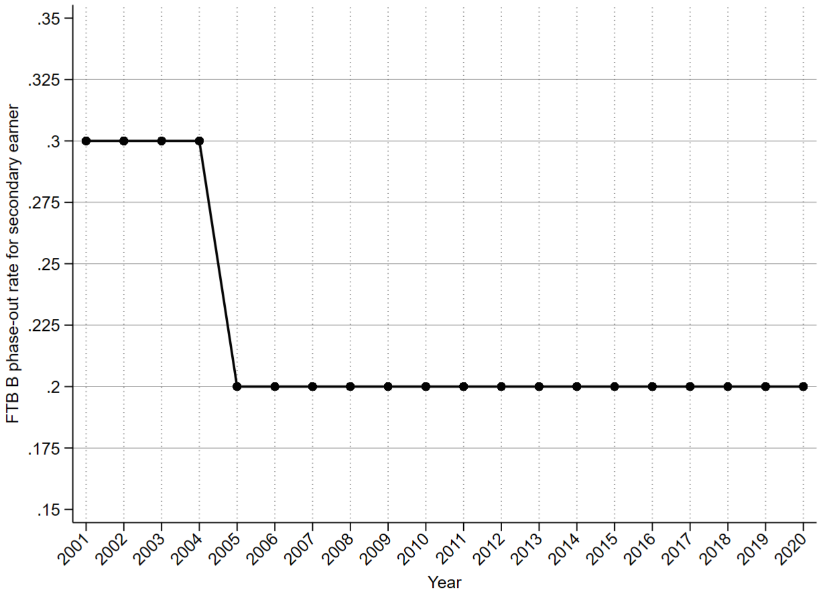

Figure C.10: FTB-B taper rates over time.

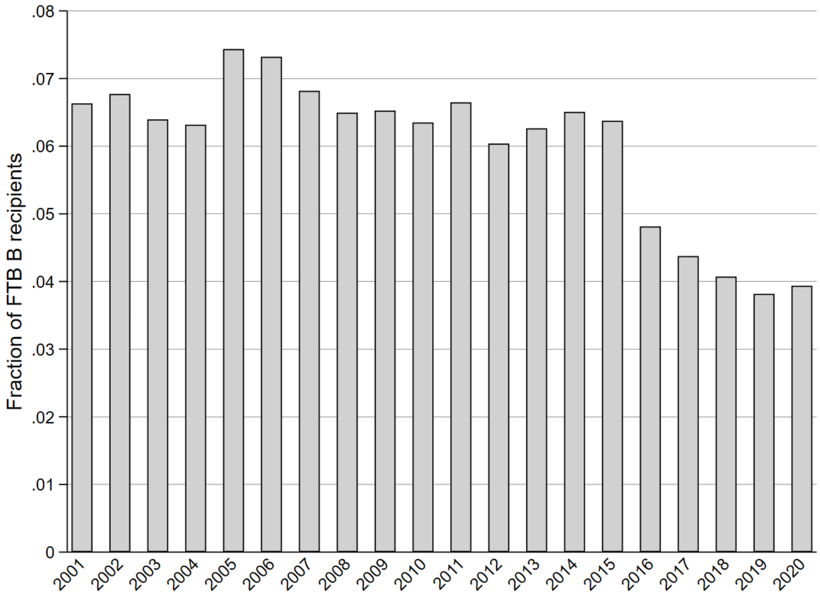

Figure C.11: Proportion of FTB-B recipients over time.

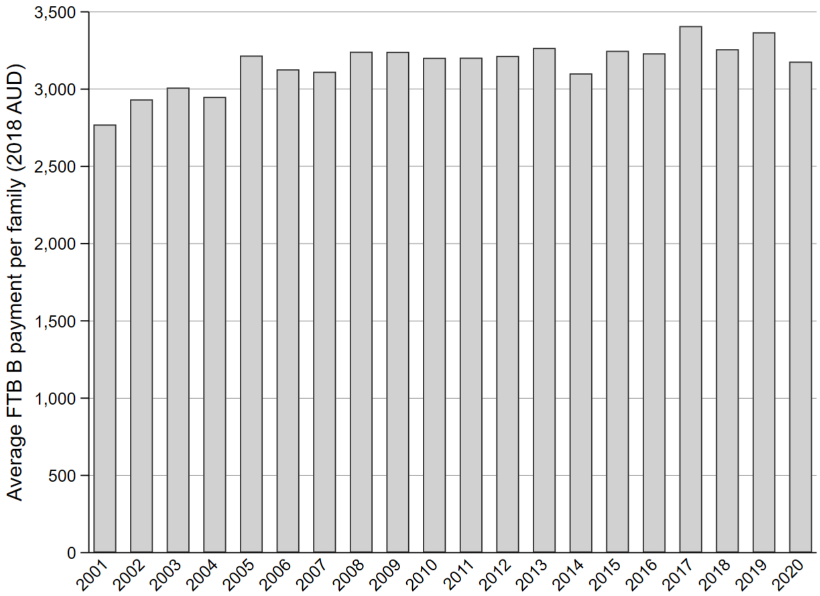

Figure C.12: Average FTB-B payment (2018 AUD) over time.

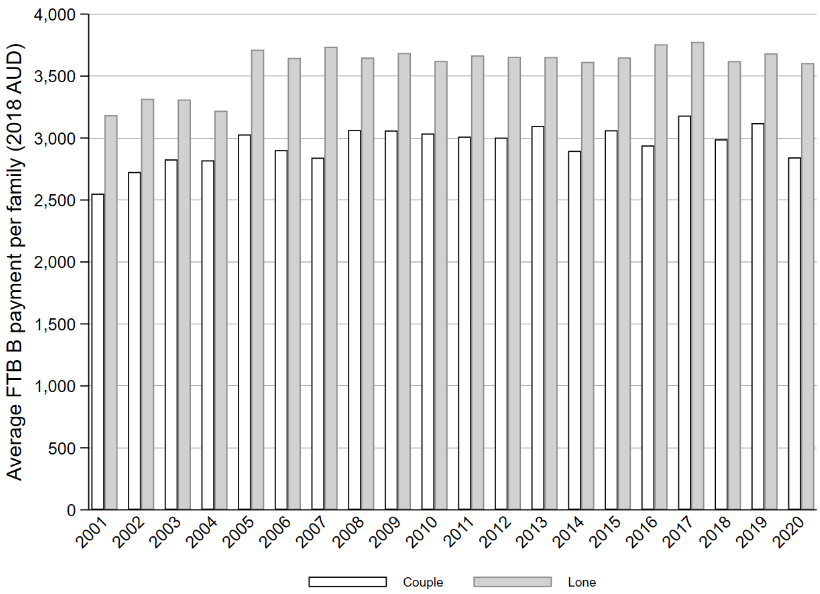

Figure C.13: Average FTB-B payment by marital status.

Because FTB-A recipient status is necessary for a household to access the FTB-B benefits, we can infer from Figures C.5 and C.11 that the majority of FTB-A households also claimed the FTB-B. Although the FTB-A is the larger of the two benefits, the FTB-B offers a non-trivial amount. As shown in Figure C.8, the FTB-B payment remained steady at approximately $4,500 (2018 AUD) for eligible families whose youngest child is under 5 years of age, and $3,200 if their youngest child is between 5 and 18 years old.

At the extensive margins, the proportion of claimants fell over time. Compared to the 2000s and the first half of 2010s, the fraction of married FTB-B households dropped by nearly 50% by 2018 (Figure C.11). This could be partially explained by factors similar to those affecting the FTB-A, such as fertility trends and threshold creep. For the FTB-B in particular, the recent drop in married recipients can also be attributed to the $150,000 (current AUD) income-test threshold for primary earners introduced in 2009, and the subsequent tightening in 2016 as the threshold decreased further to $100,000 (current AUD). These stricter measures, which complemented the existing test on secondary earners, significantly reduced the claimant pool. However, because the primary earner's income test exclusively determines eligibility (controlling the extensive margin), it had no discernible effect on the average benefit rate for recipients. The right panel of Figure C.13 demonstrates that in 2020, eligible single parents could still expect to receive over $3,500 (2018 AUD), while couple parents could expect just under $3,000 — similar to the amount they would receive in 2005.

C.3 Child Care Subsidy (CCS)

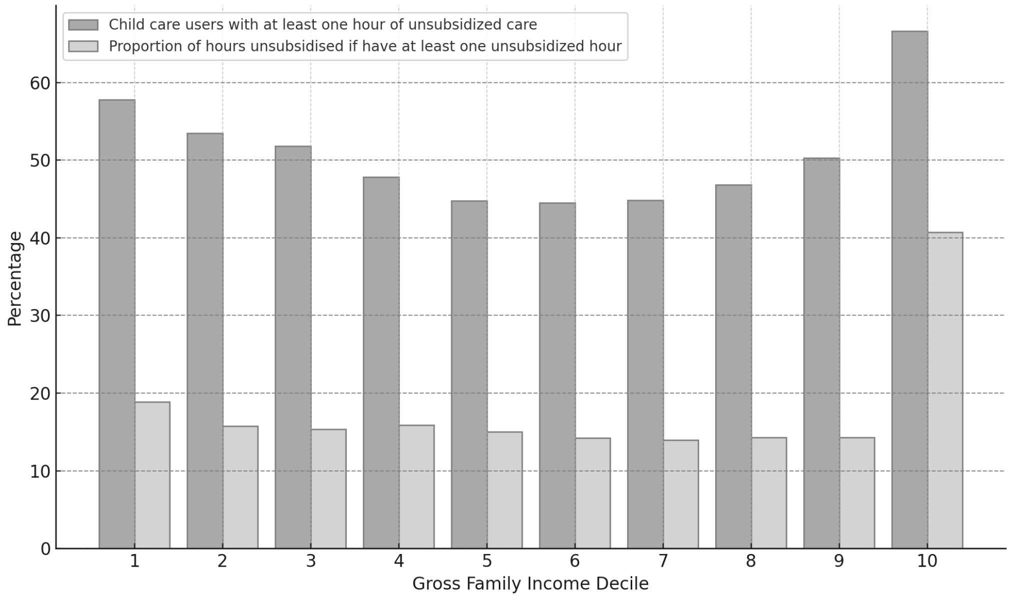

Figure C.14: Proportion of hours paid for that are unsubsidized by gross family income decile in 2018-19 financial year.
Notes: This figure uses data from Table 31 in the 2021 Child Care Package Evaluation report by the AIFS. The lowest decile earned at most $31,399. *The top decile earned* $240,818 *or more.*

Figure C.14 illustrates the proportion of unsubsidized child care hours, highlighting the program's expansive coverage. Excluding the top decile, the majority of families received fully subsidized child care. Case in point, between 50-55% of families situated around the median income received full subsidies. The prevalence of families with at least one hour of unsubsidized child care increases among the lower deciles, likely due to the work activity requirement. Yet, approximately 40% of families in the bottom decile still received full subsidies. Additionally, even among families with at least one unsubsidized child care hour, provided that they were not in the top income bracket (with annual earnings above $240,818), the average unsubsidized hours did not exceed 20% of their total child care hours.

D Life cycle profiles: additional facts

Work hour profiles

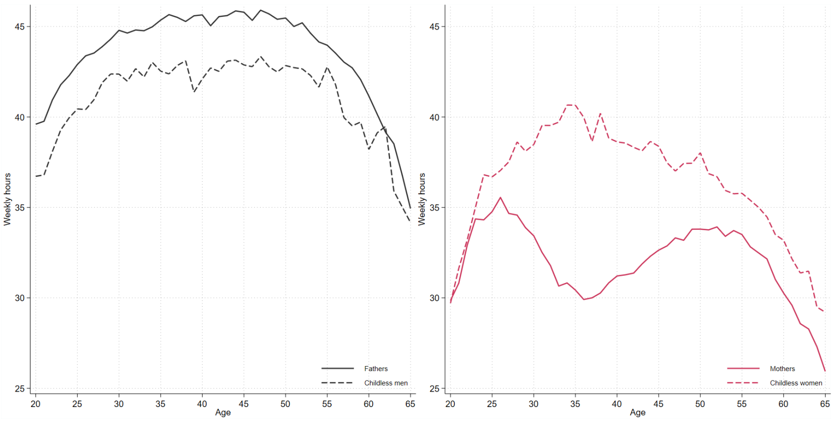

Figure D.1: Age profiles of work hours (if employed) by key demographics (gender and parenthood). Left: fathers (solid) and childless men (dashed). Right: mothers (solid) and childless women (dashed).
Notes: The age profiles stitch together 20-year snapshots of life-cycle for selected cohorts. The youngest cohort is cohort 12 aged 20-39 in the data. The oldest cohort is cohort 4 (aged 60-79) on the left panel and cohort 5 (aged 55-74) on the right panel. We omit the very old cohorts due to data limitation.

Large earnings discrepancies between mothers and non-mothers.

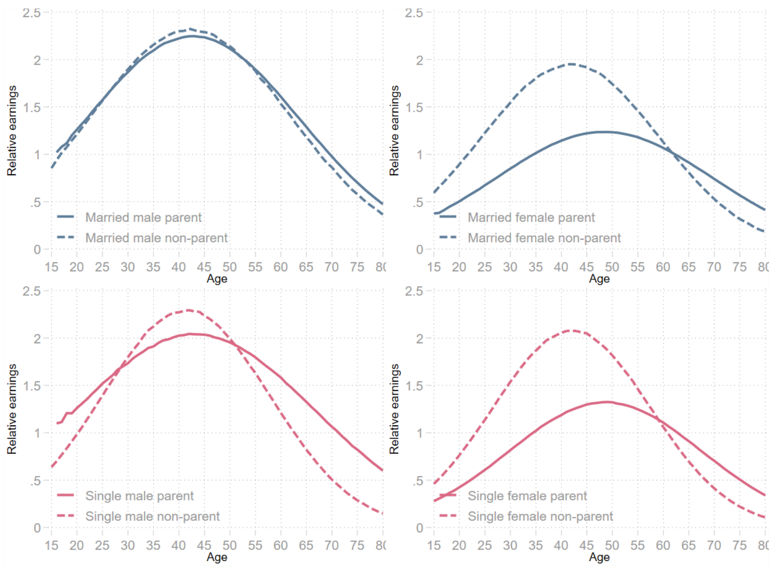

Figure D.2: **Estimated age profiles of normalized weekly earnings (against age-21 worker's average earnings) by gender, marital status, and parenthood. Top-left:** married fathers (solid) and married childless men (dashed). **Top-right:** married mothers (solid) and married childless women (dashed). **Bottom-left:** single fathers (solid) and single childless men (dashed). **Bottom-right:** single mothers (solid) and single childless women (dashed).
Notes: Due to the lack of balanced panel data covering the entire lifespan of individual observations, the wage figures are estimated values via a regression of log weekly earnings on quadratic age terms, gender, parenthood, marital status, the interactions between the selected demographics and age, and a year dummy.

Figure D.2 reports the age-profiles of estimated weekly earnings relative to the average earnings of a 21-year-old worker. Non-parent males, regardless of marital status, display more comparable trajectories over their life cycles. We also observe no large gaps between childless women and their male peers, although the former generally earn less.

The greatest difference is between mothers and non-mothers during their prime working age. Considering their labor supply behavior depicted in Figures 6 and 5, it is unsurprising that by age 45, mothers' average weekly earnings amount to only half those of non-mothers at same age. However, the estimated weekly earnings between mothers and non-mothers, independent of marital status, do converge around the same time that labor supply profiles do. This hints at the significance of labor supply differences in explaining earnings disparity.

E Equilibrium and numerical solution

E.1 Competitive equilibrium

E.1.1 The distribution of households

Let $\phi_t(z_j)$ and $\Phi_t(z_j)$ denote the population-growth-unadjusted stationary density and cumulative distribution of households aged j at time t, respectively.[31] Given that households enter the economy with identical female human capital level set at unity ($h^f_{j=1,\lambda,\ell} = 1$) and no assets ($a_{j=1} = 0$), the initial distribution of newborns ($j = 1$) in every period t is determined by:

$$\begin{aligned}\sum_{\Lambda\times\Theta}\int_{A\times H\times S^2} d\Phi_t(\lambda, a, h, \theta, \eta^m, \eta^f) &= \sum_{\Lambda\times\Theta}\int_{S^2} d\Phi_t(\lambda, 0, 1, \theta, \eta^m, \eta^f) = 1, \quad \text{and} \\ \phi_t(\lambda, 0, 1, \theta, \eta^m, \eta^f) &= \prod_{x\in\{\lambda,\theta,\eta^m,\eta^f\}} \pi(x)\end{aligned}$$

We suppress subscripts and superscripts of the state variables wherever appropriate for brevity. Here, $\pi(x)$ is the unconditional probability density of state $x \in \{\lambda, \theta, \eta^m, \eta^f\}$ for $\lambda \in \Lambda,\ \theta \in \Theta,$ and $\eta^m, \eta^f \in S$.

From age $j = 2$ onward, the population density $\phi_t(z)$ evolves according to the following law of motion

$$\phi_+(z_+) = \sum_{\Lambda\times\Theta}\int_{A\times H\times S^2} \mathbf{1}_{\{a_+=a_+(z,\Omega),\, h_+=h_+(z,\Omega)\}} \times \pi(\lambda_+|\lambda) \times \pi(\eta^m_+|\eta^m) \times \pi(\eta^f_+|\eta^f)\, d\Phi(z) \tag{E.1}$$

The time subscript is omitted for brevity. Ω is a vector of behavioral, technology, and policy parameters at time t; $\pi(\eta^i_+|\eta^i)$ is the probability of η^i_+ conditional on η^i for $i \in \{m, f\}$; and $\pi(\lambda_+|\lambda)$ is the probability of λ_+ given λ from the transition probabilities in Table 1. Assets and human capital are continuous states that evolve endogenously. The share of households on each (a^+, h^+) pair is obtained through linear interpolations of a_+ and $\log(h_+)$ on the discretized domains of assets (A) and human capital (H), respectively.

E.1.2 Aggregate variables

There are J number of generations living in every period t. Let the share of each living cohort j at time t be denoted by $\mu_{j,t}$ such that $\sum_{j=1}^{J}\mu_{j,t} = 1$. Taking into account the optimal decisions $\{c(z_j, \Omega_t),\ \ell(z_j, \Omega_t),\ a(z_j, \Omega_t)\}_{j=1}^{J}$ and the unit mass of households, aggregate variables for the model economy are equivalent to per household variables. For an economy governed by a vector of parameters Ω_t in time t, the aggregate consumption C_t, wealth A_t, female labor force participation rate LFP_t, and labor supply in efficiency units for male LM_t and

[31] Because population growth rate is constant, adjustment for population growth is done when aggregating over cohorts. Mortality is age-dependent and is accounted for by the transition probabilities of family type λ as described in Table 1.

female LF_t are expressed as

$$
\begin{aligned}
C_t &= \sum_{j=1}^{J}\sum_{\Lambda\times\Theta}\int_{A\times H\times S^2} c(z_j,\Omega_t)\mu_{j,t}\,d\Phi_t(z_j)\\
A_t &= \sum_{j=1}^{J}\sum_{\Lambda\times\Theta}\int_{A\times H\times S^2} a(z_j,\Omega_t)\mu_{j,t}\,d\Phi_t(z_j)\\
LFP_t &= \sum_{j=1}^{JR-1}\sum_{\Lambda\times\Theta}\int_{A\times H\times S^2} \mathbf{1}_{\{\ell(z_j,\Omega_t)\neq 0\}}\mu_{j,t}\,d\Phi_t(z_j)\\
LM_t &= \sum_{j=1}^{JR-1}\sum_{\Lambda\times\Theta}\int_{A\times H\times S^2} h^m_{j,\lambda}e^{\theta+\eta^m_j}n^m_{j,\lambda}\mu_{j,t}\,d\Phi_t(z_j)\\
LF_t &= \sum_{j=1}^{JR-1}\sum_{\Lambda\times\Theta}\int_{A\times H\times S^2} \mathbf{1}_{\{\ell(z_j,\Omega_t)\neq 0\}}h^f_{j,\lambda,\ell}e^{\theta+\eta^f_j}n^f_{j,\lambda,\ell}\mu_{j,t}\,d\Phi_t(z_j)
\end{aligned}
$$

The aggregate government variables are

$$
\begin{aligned}
T^C_t &= \tau^c_t C_t,\\
T^K_t &= \tau^k_t(Y_t - w_t A_t L_t)\\
T^I_t &= \sum_{j=1}^{JR-1}\sum_{\Lambda\times\Theta}\int_{A\times H\times S^2} tax(z_j,\Omega_t)\mu_{j,t}\,d\Phi_t(z_j)\\
Tr_t &= \sum_{j=1}^{JR-1}\sum_{\Lambda\times\Theta}\int_{A\times H\times S^2} \left(ftb(z_j,\Omega_t)+ccs(z_j,\Omega_t)\right)\mu_{j,t}\,d\Phi_t(z_j)\\
\mathcal{P}_t &= \sum_{j=JR}^{J}\sum_{\Lambda}\int_{A} pen(z^R_j,\Omega_t)\mu_{j,t}\,d\Phi_t(z^R_j)
\end{aligned}
$$

where $tax(z_j,\Omega_t)$ is calculated using Equation (9), $ftb(z_j,\Omega_t) = tr^A(z_j,\Omega_t)\times nc_{j,\theta} + tr^B(z_j,\Omega_t)$ is the sum of FTB-A of Equation (10) and FTB-B of Equation (11), $ccs(z_j,\Omega_t)$ is the CCS with subsidy rate sr_j from Equation (12), $pen(z^R_j,\Omega_t)$ is the Age Pension from Equation (15), and L_t in the company tax (T^K) equation is the total labor supply in efficiency units, an aggregator of LM_t and LF_t.

E.1.3 Definition of competitive equilibrium

Given the household, firm and government policy parameters, the demographic structure, the world interest rate, a steady state equilibrium is such that

(a) The collection of individual household decisions $\{c_j,\ell_j,a_{j+1}\}_{j=1}^{J}$ solves the household problem (17) and (20);

(b) The firm chooses labor and capital inputs to solve its profit maximization problem (6);

(c) The government periodic budget constraint (16) is satisfied;

(d) The factor markets clear, $K^s_t = K^d_t = K_t$ and $L^s_t = L^d_t = L_t$, where

$$
\begin{aligned}
K^s_t &= A_t - B_{F,t} - B_t\\
L^s_t &= LM_t + LF_t;
\end{aligned}
$$

(e) The goods market clears:

$$
\begin{aligned}
Y_t &= C_t + I_t + G_t + NX_t\\
NX_t &= (1+n)(1+g)B_{F,t+1} - (1+r)B_{F,t}\\
B_{F,t} &= A_t - K_t - B_t
\end{aligned}
$$

where $I_t = (1+n)(1+g)K_{t+1} - (1-\delta)K_t$ is investment; $B_{F,t}$ is the required foreign capital to clear the domestic capital market; NX_t is the trade account and $NX_t > 0$ denotes a trade account surplus.[32]

(f) The lump-sum bequest is the total untapped end-of-period private wealth left by deceased agents in time t. Given the known survival probabilities, the total amount of bequest available at any time t is $BQ_t = \sum_{j=1}^{J} \sum_{\Lambda \times \Theta} \int_{A \times H \times S^2} (1 - \psi_{j,\lambda})(1+r_t) a(z_j, \Omega_t)\, d\Phi_t(z_j)$, where $\psi_{j,\lambda}$ is the conditional survival probability for each household type λ at age j. Let $m_{j,t}$ represent the mass of households. We assume bequest is uniformly distributed to each living working-age household. The amount of bequest to a household aged j at time t is[33]

$$beq_{j,t} = \frac{BQ_t}{\sum_{j=1}^{JR-1} m_{j,t}} \tag{E.2}$$

E.2 Numerical solution

The quantitative model is solved numerically in FORTRAN. We first solve the model for household optimal allocations, their distributions, and aggregate variables along the initial balanced-growth path steady state equilibrium. The model economy is calibrated to the Australian economy's key micro and macro economic moments during 2012-2018 (a relatively stable period for these moment values). With the benchmark economy in place, we then conduct policy experiments by solving for counterfactual allocations, distributions, and aggregates in the final steady state equilibria of our alternative policy regimes. The algorithm is as follows:

1. Parameterize the model and discretize the asset space $a \in [a_{min}, a_{max}]$. The choice of grid points is such that
   - Number of grid points, $N_A = 70$;
   - $a_{min} = 0$ (No-borrowing constraint);
   - The grid nodes on $[a_{min}, a_{max}]$ are fairly dense on the left tail so households are not restricted by an all-or-nothing decision (i.e., unable to save early in the life cycle due to the lack of choices on the grid nodes for small asset levels);
   - a_{max} is sufficiently large so that: (i) household wealth accumulation is not artificially bound by a_{max}, and (ii) there is enough margin for upward adjustments induced by new policy regimes;
2. In a similar manner, discretize the human capital space $h^f_{\lambda,\ell} \in [h^f_{min,\lambda,\ell}, h^f_{max,\lambda,\ell}]$ for each λ and ℓ types such that
   - Number of grid nodes, $N_H = 25$;
   - $h^f_{min,\lambda,\ell} = 1$ for all λ and ℓ;
   - $h^f_{max,\lambda=0,\ell} = h^m_{max,\lambda=0,\ell}$ and $h^f_{max,\lambda=2,\ell} = h^m_{max,\lambda=1,\ell}$ for every ℓ;
3. Guess the initial steady state values of the endogenous aggregate macro variables (K_0 and L_0) and government policy variable (ζ_0), taking $r = r^w$ where r^w is a given world interest rate;
4. Solve the representative firm problem's first-order conditions for market clearing wages w;

[32] See Appendix Subsection E.2 for detailed explanation on $B_{F,t}$ and NX_t.

[33] For married households ($\lambda = 0$), $\psi_{j,0} = 1 - (1-\psi^m_j)(1-\psi^f_j)$ is the probability that both spouses survive and the household maintains its status quo marital status. Bequest to each surviving household aged j at time t is determined by a general formula

$$beq_{j,t} = \left[\frac{b_{j,t}}{\sum_{j=1}^{J} b_{j,t}\, m_{j,t}} \right] BQ_t$$

where $b_{j,t}$ is the share of bequest for each surviving household aged j at time t. Since we assume uniformly distributed bequest, $b_{j,t} = \frac{1}{JR-1}$ if $j < JR$ and $b_{j,t} = 0$ otherwise.

5. Given the vector of the benchmark economy's macro and micro parameters (Ω_0)—such as the parameters governing the stochastic processes of lifespan (ψ) and income (η_m, η_f), factor prices (w, r), and the government policy parameters—solve the household problems for optimal decision rules on future asset holdings (a^+), joint consumption (c), female labor force participation (ℓ) and the value function of households by backward induction (from $j = J$ to $j = 1$) using *value function iteration method.* The numerical optimization and root finding algorithms are from a toolbox constructed by Hans Fehr and Fabian Kindermann;

6. Starting from a known distribution of newborns ($j = 1$), and given the households' optimal allocations, compute the measure of households across states and over the life cycle by forward induction, using

   - the computed decision rules $\{a_j^+, c_j, \ell_j\}_{j=1}^J$;
   - the time-invariant survival probabilities $\{\psi\}_{j=1}^J$;
   - the Markov transition probabilities of the transitory earnings shocks η^m and η^f;
   - the law of motion of female human capital from equation 4;

   For determining the next period measure of households on the asset (a) and female human capital (h) grids, we employ a linear interpolation method;

7. Accounting for the share of living agents, sum across all state elements to get the aggregate levels of assets (A), consumption (C), female labor force participation (LFP), labor supply (L), output (Y), tax revenue, transfers, and other relevant variables. Aggregate variables necessary for the market clearing conditions (L, K, I, C and Y) are updated via a convex updating process to ensure a stable convergence;

8. Solve for the endogenous government policy variable ζ using the government budget balance equation 16;

9. The goods market convergence criterion for a small open economy at time t is

$$\left| \frac{Y - (C + I + G + NX)}{Y} \right| \quad < \quad \varepsilon$$

   where

   - the trade balance NX is the difference between current and future government foreign debts. That is, $NX_t = (1+n)(1+g)B_{F,t+1} - (1+r)B_{F,t}$ and $B_{F,t} = A_t - K_t - B_t$ is the required foreign capital to clear the domestic capital market;
   - $NX < 0$ implies a capital account surplus or current account deficit (net inflow of foreign capital and thus an increase in the foreign indebtedness);
   - $\varepsilon = 0.001$;

10. Return to step 3 until the goods market convergence criterion is satisfied.

Our steady-state analysis is capable of capturing the ex-ante welfare effect of a regime shift (i.e., effect on the future newborns). However, grasping the full impact of a policy change requires that one also investigates the welfare effect on the current generations (non-newborns) living in the reform period. This requires that we consider the dynamics of the problem in-between steady states by solving for the transition path of the model economy. For a problem like ours with high dimensionality, this is a computationally monumental task. One might need to impose simplifying parametric forms on the social security schemes of interest, and/or shrink the state space by re-formulating certain aspects of the problem. We leave these to future endeavor. For this study, only the steady-state results are presented.

F Policy reforms: Supplementary results

F.1 Baseline universal child-related transfers (with current payment rates)

Labor supply responses by mothers to universalized child-related transfers

LFP (*pp*)	21-30	31-40	41-50	51-60	61-70	**FT** (*pp*)	21-30	31-40	41-50	51-60	61-70
M (H)	+0.0390	+0.3347	+0.1323	+0.0126	-0.0161	M (H)	+0.4783	+1.0791	-0.0287	-0.0879	-0.0814
M (L)	+0.9228	+0.7844	+0.3895	+0.0542	-0.0153	M (L)	+2.3560	+0.4973	+0.3216	+0.0178	-0.0855
S (H)	0	0	0	-0.0003	-0.0004	S (H)	-0.0305	-0.0192	-0.0036	-0.0088	0
S (L)	0	0	-0.0001	-0.0005	+0.0009	S (L)	+0.0131	-0.0276	-0.0015	-0.0042	+0.0032

Hour (%)	21-30	31-40	41-50	51-60	61-70
M (H)	+6.33	+21.87	+1.69	-1.25	-6.12
M (L)	+28.49	+9.42	+4.64	+0.60	-3.11
S (H)	-1.26	-1.40	-0.32	-0.89	-0.12
S (L)	+0.24	-0.88	-0.06	-0.20	+0.48

Table F.1: **Labor supply responses by married (M) and single (S) female households to universal child-related transfers** (H: high education, and L: low education).
Notes: Results are reported in terms of percentage changes relative to the levels in the benchmark economy.

C (%)	M (H)	M (L)	SM (H)	SM (L)	SW (H)	SW (L)
Age 21-30	+4.56	+12.70	-4.12	-3.65	-3.64	-1.12
Age 31-40	+8.59	+6.18	-4.11	-3.90	-1.69	-2.65
Age 41-50	+3.82	+2.40	-4.08	-3.97	-0.96	-2.25
Age 51-60	+2.92	+2.30	-4.03	-3.97	-1.05	-2.30
Age 61-70	+3.02	+2.56	-3.35	-3.13	+0.15	-0.93
Age 71-80	+3.81	+2.54	-0.31	-0.44	+2.34	+1.03
Age 81-90	+3.53	+2.12	+1.96	+1.21	+3.08	+1.70
Welfare (%)	+1.36	+1.34	-1.47	-1.20	-0.69	-0.51

Table F.2: **Consumption and welfare responses to universal child-related transfers** (M: Married, SM: Single men, SW: Single women (Single mothers); H: High education and L: Low education).
Notes: Results are reported in terms of percentage changes relative to the levels in the benchmark economy.

F.2 Universal child benefits with different payment rates

Labor supply responses by mothers												
	0.5×Baseline rates				Baseline rates				1.5×Baseline rates			
LFP (*pp*)	21-30	31-40	41-50	51-60	21-30	31-40	41-50	51-60	21-30	31-40	41-50	51-60
M (H)	−0.0935	+0.0634	+0.0397	−0.0149	+0.0390	+0.3347	+0.1323	+0.0126	+0.0379	+0.3452	+0.1266	+0.0019
M (L)	+0.1662	+0.5453	+0.3592	+0.0440	+0.9228	+0.7844	+0.3895	+0.0542	+2.1401	+0.9600	+0.3522	+0.0051
S (H)	0	0	0	−0.0004	0	0	0	−0.0003	0	0	0	−0.0004
S (L)	0	0	−0.0002	−0.0018	0	0	−0.0001	−0.0005	0	0	−0.0001	−0.0002
FT (*pp*)	21-30	31-40	41-50	51-60	21-30	31-40	41-50	51-60	21-30	31-40	41-50	51-60
M (H)	+0.1906	+0.0613	−0.0649	−0.0746	+0.4783	+1.0791	−0.0287	−0.0879	+0.5678	+1.3883	−0.1174	−0.1880
M (L)	−0.2479	+0.1150	+0.1595	+0.0119	+2.3560	+0.4973	+0.3216	+0.0178	+4.1052	+0.5985	+0.4306	+0.0131
S (H)	+0.0035	+0.0365	−0.0034	−0.0078	−0.0305	−0.0192	−0.0036	−0.0088	−0.0318	−0.0301	−0.0038	−0.0091
S (L)	+0.03	+0.0710	−0.0013	−0.0039	+0.0131	−0.0276	−0.0015	−0.0042	−0.0318	−0.1518	−0.0018	−0.0050
HRS (%)	21-30	31-40	41-50	51-60	21-30	31-40	41-50	51-60	21-30	31-40	41-50	51-60
M (H)	+1.60	+1.88	−0.29	−1.51	+6.33	+21.87	+1.69	-1.25	+7.47	+26.81	+0.33	−3.12
M (L)	−1.31	+4.78	+3.44	+0.48	+28.49	+9.42	+4.64	+0.60	+52.70	+11.41	+5.05	+0.14
S (H)	+0.14	+2.66	−0.30	−0.79	−1.26	−1.40	−0.32	−0.89	−1.31	−2.20	−0.34	−0.91
S (L)	+0.55	+2.27	−0.06	−0.25	+0.24	−0.88	−0.06	−0.20	−0.58	−4.86	−0.07	−0.22

Table F.3: **Labor supply responses by married (M) and single (S) female households to universal child-related transfers varied by transfer size** (H: high education, and L: low education).
Notes: Results are reported in terms of percentage changes relative to the levels in the benchmark economy.

Consumption and welfare changes by household type																		
	0.5×Baseline rates						Baseline rates						1.5×Baseline rates					
C (%)	M (H)	M (L)	SM (H)	SM (L)	SW (H)	SW (L)	M (H)	M (L)	SM (H)	SM (L)	SW (H)	SW (L)	M (H)	M (L)	SM (H)	SM (L)	SW (H)	SW (L)
21-30	+3.6	−0.7	−0.1	−0.1	+0.4	+0.8	+4.6	+12.7	−4.1	−3.7	−3.6	−1.1	+5.1	+21.4	−6.2	−5.6	−5.2	−3.8
31-40	+5.0	+3.5	−0.1	−0.1	+3.0	+1.5	+8.6	+6.2	−4.1	−3.9	−1.7	−2.7	+9.9	+9.2	−6.1	−5.9	−3.9	−5.0
41-50	+3.9	+3.5	−0.1	−0.1	+2.9	+1.2	+3.8	+2.4	−4.1	−4.0	−1.0	−2.3	+4.0	+3.3	−6.1	−5.9	−3.0	−4.0
51-60	+3.5	+3.7	−0.1	−0.1	+2.8	+1.2	+2.9	+2.3	−4.0	−4.0	−1.1	−2.3	+3.0	+3.1	−6.0	−5.9	−3.0	−4.1
61-70	+3.8	+4.1	+0.3	+0.3	+3.4	+1.8	+3.0	+2.6	−3.4	−3.1	+0.2	−0.9	+3.1	+3.3	−5.1	−4.7	−1.5	−2.1
71-80	+4.6	+3.8	+2.3	+2.0	+4.2	+2.8	+3.8	+2.5	−0.3	−0.4	+2.3	+1.0	+4.0	+3.3	−1.3	−0.9	+1.7	+0.9
81-90	+4.3	+3.1	+3.7	+2.8	+4.4	+2.9	+3.5	+2.1	+2.0	+1.2	+3.1	+1.7	+3.6	+2.7	+1.5	+1.4	+2.8	+2.0
Welfare (%)	+1.4	−0.02	−0.04	−0.02	+0.4	+0.1	+1.4	+1.3	−1.5	−1.2	−0.7	−0.5	+1.6	+2.6	−2.2	−1.9	−1.3	−0.9

Table F.4: **Household consumption and welfare responses to universal child-related transfers varied by transfer size** (M: Married, SM: Single men, SW: Single women (Single mothers); H: High education and L: Low education).
Notes: Results are reported in terms of percentage changes relative to the levels in the benchmark economy.

F.3 Relaxing the CCS phase-out rates

C (%)	M (H)	M (L)	SM (H)	SM (L)	SW (H)	SW (L)
Age 21-30	+1.59	+1.89	+0.98	+0.76	+0.95	+1.06
Age 31-40	+1.72	+1.25	+0.99	+0.86	+1.15	+0.77
Age 41-50	+1.48	+1.12	+1.01	+0.92	+1.02	+0.54
Age 51-60	+1.30	+1.13	+1.02	+0.96	+1.05	+0.60
Age 61-70	+1.22	+1.07	+1.05	+1.00	+1.17	+0.76
Age 71-80	+1.20	+0.99	+1.16	+1.03	+1.16	+0.87
Age 81-90	+1.15	+0.93	+1.19	+1.01	+1.13	+0.88
Welfare (%)	+0.42	+0.40	+0.34	+0.24	+0.26	+0.18

Table F.5: **Heterogeneous household consumption and welfare responses to halving the CCS taper rates** (M: Married, SM: Single men, SW: Single women (Single mothers); H: High education and L: Low education).
Notes: Results are reported in terms of percentage changes relative to the levels in the benchmark economy.

F.4 Removing all child-related transfers

Labor supply responses by mothers to the removal of FTB and CCS programs											
LFP (*pp*)	21-30	31-40	41-50	51-60	61-70	**FT** (*pp*)	21-30	31-40	41-50	51-60	61-70
M (H)	+0.0454	+0.2091	+0.0777	+0.0177	+0.0012	M (H)	+0.1740	+0.4243	+0.2189	+0.0687	+0.0025
M (L)	+2.2350	+1.3731	+0.4436	+0.1798	+0.0290	M (L)	+2.7824	+2.5401	+1.0656	+0.6916	+0.0955
S (H)	0	0	0	0	0	S (H)	+0.0013	+0.0075	+0.0004	+0.0012	+0.0015
S (L)	0	0	0	+0.0002	+0.0008	S (L)	+0.0159	+0.0647	+0.0091	+0.0151	+0.0112
			Hour (%)	21-30	31-40	41-50	51-60	61-70			
			M (H)	+12.36	+48.96	+22.06	+7.64	+1.25			
			M (L)	+83.20	+60.50	+20.12	+15.65	+8.80			
			S (H)	+1.08	+10.98	+0.74	+2.07	+6.13			
			S (L)	+2.57	+17.76	+2.89	+4.77	+9.28			

Table F.6: **Labor supply responses by married (M) and single (S) female households to the elimination of all child-related transfer programs** (H: high education, and L: low education)**.**
Notes: Results are reported in terms of percentage changes relative to the levels in the benchmark economy.

C (%)	Couples (H)	Couples (L)	Single Men (H)	Single Men (L)	Single Women (H)	Single Women (L)
Age 21-30	+8.12	+15.74	-0.11	-0.07	-7.74	-11.55
Age 31-40	+14.59	+14.83	-0.06	-0.06	-3.04	-6.88
Age 41-50	+9.65	+6.71	-0.03	-0.01	-4.20	-9.39
Age 51-60	+6.80	+6.59	+0.03	+0.07	-3.22	-8.03
Age 61-70	+6.24	+5.69	+1.12	+1.44	-1.32	-6.00
Age 71-80	+6.61	+4.10	+6.10	+6.36	+1.66	-3.09
Age 81-90	+5.48	+1.80	+9.83	+9.11	+2.13	-3.06
Welfare (%)	+1.35	-0.22	+0.02	+0.06	-4.03	-6.53

Table F.7: **Consumption and welfare effects by demographic due to the elimination of all means-tested child-related transfers** (H: High education and L: Low education).
Notes: Results are reported in terms of percentage changes relative to the levels in the benchmark economy.