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Understanding the rising trend in female labour force participation

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Abstract

Female labour force participation has increased tremendously since World War II in developed countries. Prior research provides piecemeal evidence identifying some drivers of change but largely fails to present a consistent story. Using a rare combination of data and modelling capacity available in Australia, we develop a new decomposition approach to explain rising female labour force participation since the mid-1990s. The approach allows us to identify the role of tax and transfer policy reforms as well as three other factors that have been shown to matter by earlier studies: (i) changes in real wages; (ii) population composition changes; and (iii) changes in labour supply preference parameters. For the first time, all these factors are identified through a single consistent decomposition framework. A key result is that – despite the ongoing emphasis of public policy on improved work incentives for women in Australia and elsewhere – changes in financial incentives due to tax and transfer policy reforms have contributed relatively little to achieve these large increases in participation. Instead, the other three factors drive the increased female labour force participation.

KEYWORDS

behavioural microsimulation, decomposition, employment rate, female labour force participation, tax–transfer policy

JEL CLASSIFICATION

H31, J22, J31

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1 | INTRODUCTION

Female labour force participation has increased tremendously over the long run in developed countries.¹ This trend is still ongoing in most of these countries² and has been the subject of extensive research. This research is important to bolster our understanding of changing labour markets, and also for effective policy design. However, understanding the drivers of these large structural changes remains a challenge, partly because most studies focus on one factor, providing piecemeal and sometimes inconsistent evidence while often leaving a large portion of the observed changes unexplained.

The key contribution of this paper is to provide separate and internally consistent estimates of the role of tax and transfer policy reforms, wage growth and population changes as well as suggestive evidence on changes in labour supply preferences. Although previous studies have pointed to the potential importance of these factors separately, the contribution of tax–transfer reforms remains largely undocumented. Using Australia’s rare combination of consistent historic data collecting the same household and individual information over several decades and specialised tax-benefit behavioural microsimulation modelling capacity, we develop a new approach that directly uses micro data on households and individuals in a unified analytical framework to estimate the respective roles of the previously mentioned four factors: tax and transfer policy reforms; changes in real wages; population composition changes; and changes in labour supply preference parameters. Other papers have estimated similar impacts but they have used heterogeneous agent models including a limited number of typical households rather than allowing for the full heterogeneity of households in representative population samples, and/or simplifying the actual tax and transfer system information that is incorporated in the modelling.³

The key result is that despite employment effects of tax and transfer reforms looming large in the political discourse in Australia and beyond,⁴ this paper shows that these reforms have done little to drive the rise in female participation rates in Australia. Two other important results emerge from this study. First, real wage growth plays an important role, confirming results from earlier studies. Second, changes in the structure of the population, and in particular changes in educational attainments, play a more important role than suggested by some earlier studies.

There have been numerous studies on female labour force participation. The extensive US literature has emphasised the role of rising wages and reductions in the gender wage gap as key drivers for the increase in labour force participation.⁵ Although the literature has generally found little evidence for changes in observable demographic characteristics explaining much of the labour force participation increase, one notable exception is Eckstein and Lifshitz (2011), who identify a large role for rising education levels above and beyond the effects on wages. Numerous other explanations have been considered in the literature, including technological improvements in the household,⁶ cohort (or time) effects,⁷ possibly related to shifts in preferences; fertility;⁸ culture and social norms,⁹ which again may relate to shifts in preferences; improvements in medical technology and the advent of oral

¹ Costa, 2000.

² Thévenon, 2013.

³ See, for example, Kaygusuz (2010) and Bick et al. (2019).

⁴ This focus of the policy discourse extends beyond Australia. A prominent example is the 2017 US tax reform that linked employment and tax cuts in its title (“Tax Cuts and Jobs Act of 2017”).

⁵ See Eckstein, Keane and Lifshitz (2019), Jones, Manuelli and McGrattan (2015), Cardia and Gomme (2013), Eckstein and Lifshitz (2011), Attanasio, Low and Sánchez-Marcos (2008), Olivetti (2006), Pencavel (1998), Juhn and Murphy (1997) and Gustafsson and Jacobsson (1985).

⁶ Eckstein and Lifshitz, 2011; Jones et al., 2015.

⁷ Goldin, 1990.

⁸ Erosa, Fuster and Restuccia, 2005.

⁹ Costa, 2000; Fernández, Fogli and Olivetti, 2004; Fernández, 2013.

contraception;¹⁰ reductions in the cost of children;¹¹ and labour demand shifts towards occupations favoured by women.^{12,13}

Nevertheless, a large portion of the observed changes typically remains unexplained¹⁴ and most studies have focused on one or sometimes two factors, thereby limiting the capacity to gauge the relative importance of different factors. In addition, the role of tax–transfer policy reforms, which have often been presented by governments as improving work incentives, has been understudied, leading Blundell, Bozio and Laroque (2013) to call for ‘a detailed analysis of effective incentives in the tax and benefit system, how they have changed over time, and how individuals and families have responded’. Two recent studies that have examined this issue are Eckstein et al. (2019) and Bick et al. (2019). The former is broader in that it also considers education, partnering and fertility but it does not explicitly consider the role of tax and transfer changes on employment over time. The latter compares outcomes for seven countries. However, both studies have had to substantially simplify the representation of the tax and benefit system.¹⁵ Other studies have focused on the role of a few specific policy changes.¹⁶

We consider actual labour supply changes over more than two decades and assess the contributions of four specific drivers: changes in financial incentives arising from all tax and transfer policy reforms implemented during this period; real wage growth; population composition changes; and changes in labour supply preference parameters. Our starting point is to quantify the effect of tax–transfer policy reforms by extending the decomposition approach introduced by Bargain (2012b) from its original focus on income to the distribution of hours worked. We then augment this decomposition with an approach inspired by Oaxaca–Blinder wage decompositions to identify the effect of changes in wages and in population composition. All other drivers of change are captured in a fourth component represented by changes in labour supply preference parameters. We focus on changes in labour supply decisions separate from decisions related to education or retirement (which are outside the scope of this paper) by restricting our analysis to prime working-age individuals aged between 25 and 55. The analyses are descriptive and addressing the potential endogeneity of wages or population changes is outside the scope of this paper. As our modelling framework is static, it does not allow us to consider the endogeneity of partnering or fertility decisions. In addition, impacts from the demand side of the labour market or, more generally, general equilibrium effects are not identified.

The new approach developed in this paper to decompose changes in the distribution of hours worked is data-demanding. This constraint explains our choice of Australia as a case study, because consistent individual (and household) data on labour supply and income have been collected in Australia for several decades. However, Australia is also of broader interest as similar trends are observed across most OECD countries.¹⁷ The decomposition is based on Australian survey data spanning 23 years from 1994 to 2016, combined with a behavioural microsimulation model that embeds the details of

¹⁰ Goldin and Katz, 2002; Albanesi and Olivetti, 2016; Eckstein et al., 2019.

¹¹ Attanasio et al., 2008; Eckstein and Lifshitz, 2011.

¹² Blau and Kahn, 2017, p. 809; Goldin, 1990.

¹³ Also, Bick, Fuchs-Schündeln and Lagakos (2018) provide cross-country evidence on the wage–hours relationship. They note that ‘in the majority of countries hours are decreasing with the individual wage, while only in the richest countries [such as the US] is this relationship reversed’ (Bick et al., 2018, p. 191). They find that the positive relationship between wages and hours in high-income countries is strongest for women.

¹⁴ Blau, 1998, p. 161; Bick et al., 2019.

¹⁵ Eckstein et al. (2019) develop a life-cycle model for the US that considers federal income taxes, the earned income tax credit, unemployment benefits and social benefits, with a range of simplifications including the use of fitted values and limited details for couples to keep model estimation feasible. The multi-country study by Bick et al. (2019) focuses on labour income taxes (which are approximated through calculating net incomes at 201 earnings points for women and 101 earnings points for men, excluding many income support payments) for couple families with an employed male partner, and their outcome of interest is hours worked per worker rather than employment. Both studies assume fixed preferences over the decades of analysis. Evidence on a more inclusive range of tax and transfer policy reforms and women’s employment is still lacking.

¹⁶ See, for example, Burniaux, Duval and Jaumotte (2004) and OECD (2004).

¹⁷ Furthermore, wage elasticity estimates for Australia presented in Section 4.1.2 are well within the range of prior estimates for other developed countries, further supporting the claim of broader relevance.

all tax and transfer policy reforms implemented during this period. In answering the call by Blundell et al. (2013), we are thus able to account for the complexity and non-linearities in the tax and transfer system, a feature that has been shown to be important in explaining labour supply behaviour.¹⁸ This allows us to go beyond the more limited amount of detail in modelling tax–transfer reforms of recent studies.¹⁹

The paper is structured as follows. In Section 2, we describe the data used in the analyses and discuss the sample selection. In Section 3, we provide some background with regard to the Australian context. We outline the methodology for the different components of our analysis (microsimulation, labour supply modelling and decomposition) in Section 4. Then, we present and discuss the results in Section 5, after which we conclude in Section 6.

2 | DATA

2.1 | The Survey of Income and Housing (Costs)

The analysis is based on several years of the Australian Survey of Income and Housing (SIH), which was previously known as the Survey of Income and Housing Costs. This nationally representative survey is designed by the Australian Bureau of Statistics to collect detailed information on the income sources, labour market status, hours worked and socio-economic characteristics of households and household members. In particular, the SIH provides rich information on the various components of labour and capital income that we use to generate measures of market income. Market income is determined by the wage rate (w), hours worked and non-labour market income; that is, it includes income from employment, investment and from one's own business.

We use the SIH to compute the values of taxes and benefits by using the Melbourne Institute Tax and Transfer Simulator (MITTS) to determine entitlements to benefits and income tax to be paid, as described briefly in Section 4, rather than the actual receipts or payments reported in the SIH. MITTS generates all major social security transfers, family payments, rebates and income taxes to compute disposable income at any hours worked. Labour supply responses to a change in the tax–transfer regime are estimated using the behavioural component of MITTS, which is based on a structural model of labour supply (briefly described in Section 4.1).

2.2 | Sample selection

To ensure that we have some (net) wage variation in our data and sufficient observations for each of our demographic groups to estimate the structural labour supply models, we pool four cross-sectional surveys from the mid to late 1990s (1994–95, 1995–96, 1996–97 and 1997–98) at the beginning of our observation period and three cross-sectional surveys from 2011 to 2016 (2011–12, 2013–14 and 2015–16) at the end of our observation period. Pooling data provides some additional variation in net income due to (small) policy and wage changes. This additional variation facilitates estimation of structural parameters. We exclude from this sample full-time students, self-employed workers, people receiving a disability support payment, people who report being permanently unable to look for work and anyone aged over 65.

For the simulated decomposition, we only use the first and last years of data for our observation period. The decomposition attributes the labour supply changes between the first year (1994–95) and the last year (2015–16) of our datasets to a range of factors. To allow a focus on labour supply decisions

¹⁸ Bick and Fuchs-Schündeln, 2018.

¹⁹ Bick et al., 2019; Eckstein et al., 2019.

separate from any decisions related to education or retirement, we restrict the sample on which we run our simulations to individuals who are aged between 25 and 55. Tables A.1 and A.2 in the online Appendix present summary statistics for the non-labour market characteristics, with labour market outcomes presented and discussed in Section 3.1.

Comparing the average age of individuals in our 1994–95 sample with that of the 2015–16 sample, we observe that the prime working-age population has slightly aged on average, and that there are slightly fewer children. However, the most striking difference between the two samples is the large increase in the proportion of people who complete post-school qualifications. This increase is particularly large for partnered women and single parents (who are mostly women). Similar patterns are observed for the pooled mid to late 1990s data versus the pooled data from the 2010s used in the labour supply estimations.

3 | THE AUSTRALIAN CONTEXT

3.1 | Labour market outcomes in 1994–95 and 2015–16

Similar to many other countries around the world, female labour force participation has increased substantially over the past few decades in Australia. Overall, combining information from Tables 1 and 2, the SIH shows that the employment rate of all women aged 25–55 increased by over 16 percentage points from 58 per cent in 1994–95 to 74.2 per cent in 2015–16.²⁰ The data also show (not reported in the tables) that the proportion of these working-age women in full-time work increased from 39.7 per cent in 1994–95 to 51 per cent in 2015–16. Summary statistics provided in Tables 1 and 2 by household type reveal the extent of various labour market changes by different demographic groups.

TABLE 1 Labour market summary statistics for partnered women

Variable	1994–95		2015–16	
	Mean	Std dev.	Mean	Std dev.
Hours of work	19.022	17.879	24.899	17.410
Partner's hours of work	37.746	14.978	39.305	13.147
Labour force status: not in LF	0.346	0.476	0.217	0.413
unemployed	0.040	0.196	0.030	0.170
employed	0.614	0.487	0.753	0.431
Partner's labour force status: not in LF	0.050	0.217	0.046	0.209
unemployed	0.062	0.241	0.030	0.172
employed	0.888	0.315	0.924	0.265
Nominal wage in AU\$ ^a	14.277	7.268	29.829	13.270
Partner's nominal wage in AU\$ ^b	18.882	9.215	37.531	16.623
Weighted no. of obs./no. of obs.	2,228,009	2,264	2,719,300	4,473

Note: Population-weighted estimates based on partnered women aged 25–55 and excluding full-time students, and people who are retired, self-employed or receive a disability support payment. ^a The 1994–95 female wage is AU\$23.10 in 2016 dollars. ^b The 1994–95 male wage is AU\$30.46 in 2016 dollars.

Source: Authors' calculations based on the SIH.

²⁰ This is excluding full-time students, and people who are retired, self-employed or receive a disability support payment. Additional employment statistics are provided in Tables A.3 and A.4 in the online Appendix by educational attainment, and in online Appendix F where we check the goodness of fit of our labour supply model.

TABLE 2 Labour market summary statistics for single women

Variable	1994–95		2015–16	
	Mean	Std dev.	Mean	Std dev.
No dependent children				
Hours worked	30.908	16.658	32.830	15.725
Labour force status: not in LF	0.100	0.301	0.096	0.295
unemployed	0.093	0.290	0.047	0.212
employed	0.807	0.395	0.856	0.351
Nominal wage in AU\$ ^a	15.818	5.923	30.489	11.943
Weighted no. of obs./no. of obs.	531,464	534	797,290	1,261
With dependent children				
Hours worked	15.862	18.262	23.231	18.767
Labour force status: not in LF	0.387	0.487	0.243	0.429
unemployed	0.100	0.300	0.070	0.256
employed	0.513	0.500	0.687	0.464
Nominal wage in AU\$ ^b	12.148	4.648	29.780	12.640
Weighted no. of obs./no. of obs.	316,635	368	418,440	893

Note: Population-weighted estimates based on single women aged 25–55 and excluding full-time students, and people who are retired, self-employed or receive a disability support payment. ^a The 1994–95 wage for single women is AU\$25.55 in 2016 dollars. ^b The 1994–95 wage for single parents is AU\$19.62 in 2016 dollars.

Source: As for Table 1.

The tables clearly show that the employment rate increased for all groups. A large increase in labour force participation, employment and hours worked can be observed, especially for single parents (who are largely women) and partnered women. Single parents increased their employment rate by 17.4 percentage points, and average working hours by over seven hours per week. Partnered women's employment rate increased by more than 12 percentage points on average, and hours worked by over five hours per week. The increase for single women is much more modest and is mostly driven by a decrease in unemployment (with labour force participation not changing).

These statistics indicate that partnered women and single parents may be the most interesting groups for a decomposition.

3.2 | The tax and transfer system in 1994–95 and 2015–16

Australia has been traditionally described as a liberal welfare regime where strong emphasis is placed on the provision of welfare through market mechanisms. Underpinned by the principle of self-reliance by which every citizen with capacity to work should do so, the Australian welfare system is aimed to help only those who are most in need, limiting the tax burden and the overall spending to ensure work disincentives are minimised. While the welfare system essentially operates at the family level (and is thus based on joint income), the tax system operates at the individual level. Australia is one of the OECD countries with the lowest levels of tax and social expenditures, as well as the country with the most targeted system.²¹

Over the last three decades, similar to other developed countries, Australia's social security system has seen major reforms, with the clearly stated aim to reduce welfare dependency and promote

²¹ Whiteford, 2014.

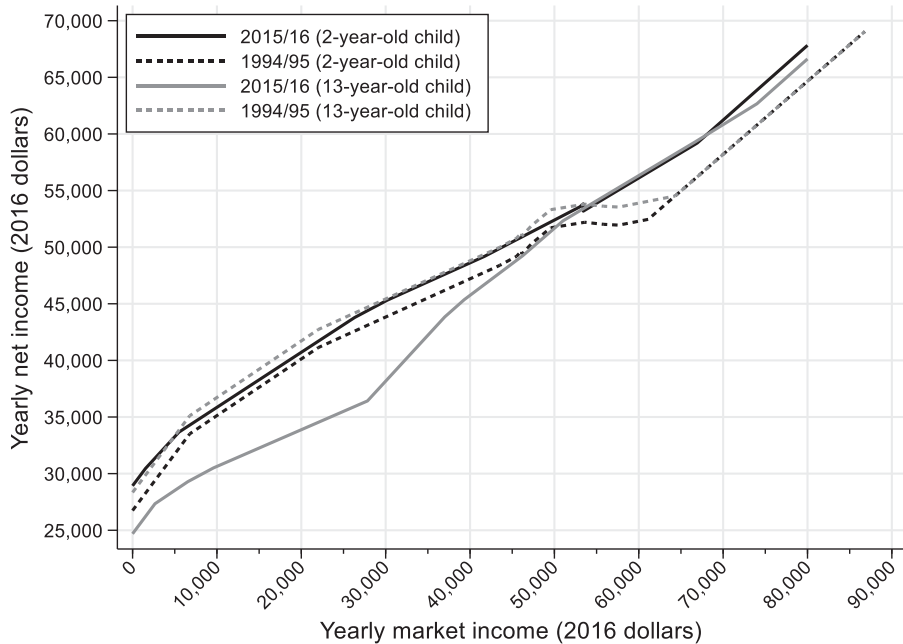


FIGURE 1 Budget constraints for a working-age single parent

Note: The single parent is aged 35.

Source: Authors' calculations using the MITTS.

self-reliance through paid work.²² Australian fiscal policy has been subject to a continuous process of reforms that can be traced back to the significant reforms of the 1980s and 1990s, which led to the broadening of the tax base. These reforms have been mostly driven by the principle of efficiency more than those of equity and simplicity.²³

As a result, the tax and transfer system in 2016 is substantially different from that in 1994. In this section, we summarise some of the most substantial changes that occurred during this period. Online Appendix B provides details of the main income tax parameters, allowances, pensions and family payments affecting working-age individuals and households. To allow for easy comparison of real values, we provide all rates and thresholds for payments in 1994–95 in both March 1995 and January 2016 dollars, using the Australian Bureau of Statistics (ABS) consumer price index (CPI) for uprating.²⁴

To illustrate the Australian tax and transfer system and its changes over time, Figures 1–3 present budget constraints that are generated for four hypothetical secondary earners and for two single parents, who tend to be women.²⁵ The partners' income, for partnered women, is set at 40 hours per week at AU\$40 per hour (leading to an annual market income of just over AU\$80,000) and is kept constant while varying the women's hours. In an alternative scenario, it is assumed that the partner is unemployed and has zero market income. The single parent is assumed to have a child aged either 2 or

²² See, for example, the Budget Speech 2006–07, delivered on 9 May 2006 on the second reading of the appropriation bill (no. 1) 2006–07 by The Honourable Peter Costello MP, Treasurer of the Commonwealth of Australia, https://australianpolitics.com/downloads/budgets/2006_budget/Budget_Speech.pdf.

²³ Tran-Nam et al., 2016.

²⁴ ABS, cat. no. 6401.0, Table 1, series ID A2325846C.

²⁵ Associated average and marginal effective tax rate schedules are provided in online Appendix C.

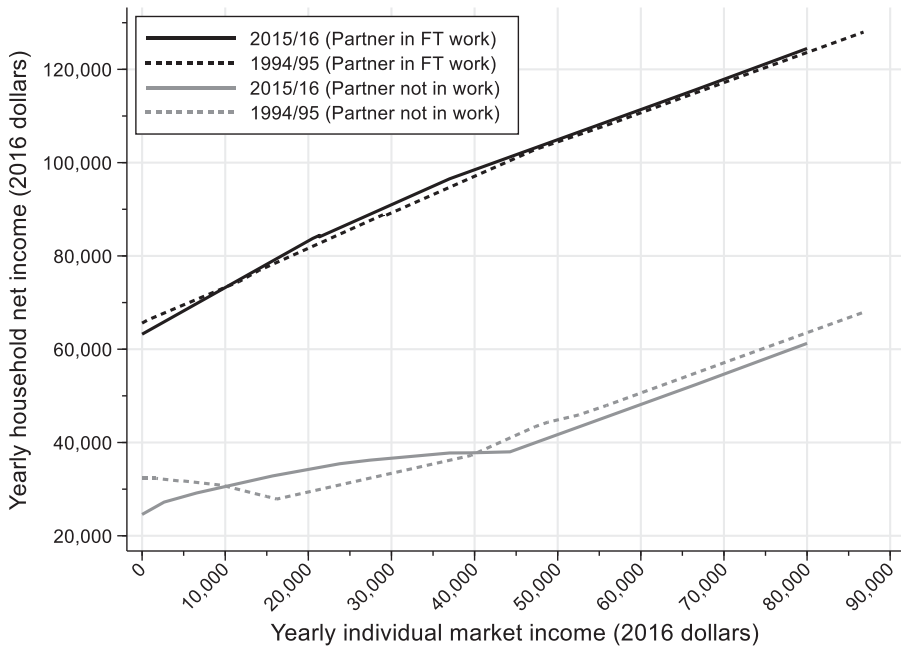


FIGURE 2 Budget constraints for a working-age partnered woman without dependent children

Note: The partner in full-time work works 40 hours per week at a wage rate of AU\$40 per hour. Both partners are aged 35.
Source: As for Figure 1.

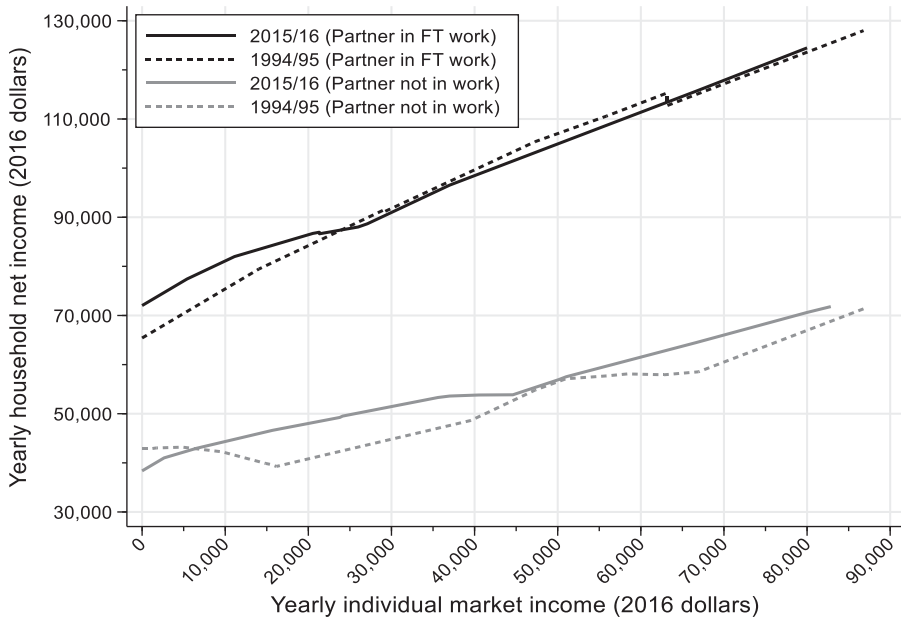


FIGURE 3 Budget constraints for a working-age partnered woman with children

Note: The partner in full-time work works 40 hours per week at a wage rate of AU\$40 per hour. Both partners are aged 35. Couple with two children: one aged 2 and the other 4.
Source: As for Figure 1.

13, while the couple family with children is assumed to have two children aged under 5 years. There is no non-labour income. These are just examples, and our modelling allows for any type of household and characteristics of its members. Figures A.1–A.3 in the online Appendix present the distribution of women in each household type by market income, to show where changes in these budget constraints are likely to affect many women.

The figures present the net household income that the women would have had in 1994–95 and 2015–16 against their annual market income. These budget constraints are constructed using the tax and transfer systems of 1994–95 and 2015–16, respectively. For comparability between years, the income tax thresholds, the benefit withdrawal thresholds, and allowances and pensions of 1994–95 are all inflated to the 2015–16 level using the wage index.²⁶ Using a wage index instead of the CPI means that tax thresholds, allowances and pensions have all kept pace with wages.

Figures 1–3 show that the least has changed for partnered women without children with a full-time working partner, although the incentive to participate may have slightly improved for women earning up to AU\$20,000. For women earning over AU\$45,000, little seems to have changed in terms of incentives. This can also be clearly seen from Figures C.3 and C.4 in online Appendix C, which present the average and marginal effective tax rates (AETRs and METRs). Overall net income has mostly slightly increased due to a combination of slightly lower tax rates and higher income tax thresholds (see Table B.1) up to an income of AU\$180,000. Women who are partnered with an unemployed partner experienced a reduction in AETRs between AU\$10,000 and AU\$40,000, but an increase in AETRs at all other incomes. This is because of a reduction in the withdrawal (or taper) rates associated with unemployment payments, which in 1994–95 had a withdrawal-free and 50 per cent withdrawal area over a narrow range of income, before being withdrawn dollar for dollar (see Table B.2). Overall, these changes are likely to have had mixed work incentives, although at low incomes the incentives seem to have improved, with Figure C.4 clearly showing that the extremely high METRs at low incomes up to just over AU\$15,000 had decreased by 2015–16. The income distribution for this group of women in Figure A.2 shows that relatively few women are observed at the bottom end of the income range.

For women with children who are partnered with unemployed men, the tax and transfer reforms have reduced AETRs for all market incomes above AU\$5,000. This is because of the above-mentioned lower income tax rates and lower withdrawal rates for unemployment payments combined with reduced family payment withdrawal rates. The conclusion is more mixed for METRs, as indicated by the slope of the curves (and more clearly in Figure C.6). For this group of women, the METR under the 2015–16 tax–transfer system is sometimes higher and sometimes lower than under the 1994–95 system. This is because reducing withdrawal rates means that it takes longer to withdraw the unemployment and family payments. So, in medium income ranges, women are still facing high METRs as these still include the income support and family payment withdrawal rates. Higher levels of family payments (see Table B.4) have increased net income for this group over most of the market income range. Incentives to work for women earning up to AU\$15,000, and women earning between AU\$50,000 and AU\$65,000 should have improved given the much lower METRs in 2015–16 at these income levels, although the income effect could dampen the positive substitution effects. Again, a relatively modest-sized group of women earns within these income ranges (see Figure A.3). For mothers partnered with men in full-time employment on a medium-level salary, the AETR is lower in 2015–16 for incomes under AU\$20,000 and over AU\$63,000 but slightly higher at other income levels. Because of the withdrawal of the minimum rate of family payments for annual household incomes over AU\$94,316, METRs are higher below AU\$25,000 in 2015–16 than in 1994–95 (Figure C.6) but lower elsewhere (due to the lower income tax rates), again with potentially mixed effects on incentives.

For single parents with a young child, AETRs have slightly decreased at all incomes. The high METRs between AU\$50,000 and AU\$60,000 apparent in 1994–95 have disappeared (see also

²⁶ ABS, cat. no. 6302.0, table 3, series ID A2734023X.

Figure C.2). Income and substitution effects are likely to work in opposite directions. In 1994–95, single parents with a child aged 13 were treated very similarly to a parent with a child aged 2, but by 2015–16 this had changed. Figure 1 shows a large reduction in their net income for annual market income below AU\$55,000. Single parents with a child aged over 8 now receive a lower income support payment and face a less generous withdrawal rate than single parents with a child aged 8 or younger (see Tables B.2 and B.3). As a result, single parents with older children experienced large increases in AETRs at all incomes under AU\$55,000, as well as an increase in METRs between AU\$5,000 and AU\$28,000. By contrast, a reduction in AETRs is apparent above AU\$55,000 due to the lower income tax rates and more favourable family payment withdrawal rates. Thus, there was a clear shift in incentives away from participation at low income towards incentives to work more hours. Interestingly, Figure A.1 shows that relatively few single parents earn between AU\$5,000 and AU\$28,000 in 2015–16, but that the proportion of single parents earning a very low income and income over AU\$30,000 has increased in 2015–16 compared with 1994–95.

The changes observed in the budget constraints in Figures 1–3 relate to the various tax–transfer policy reforms implemented since the mid-1990s (see online Appendix B for a more detailed discussion of these reforms). Despite the claimed emphasis on reducing disincentives to work, the reforms to the tax–benefit system did not lead to an overall reduction in the METRs faced by families. Harding et al. (2009) and Dockery et al. (2008) find a substantial shift in the distribution of METRs since the 1990s with the proportion of working-age people facing METRs above 50 per cent growing from 4.8 per cent in 1996 to more than 7 per cent in 2006. However, although the proportion of working-age people facing METRs above 50 per cent may have grown, Héroult and Azpitarte (2015) show that successive reductions in benefit taper rates and income tax rates have ensured that the highest METRs decreased between 1999 and 2008 (as also observed in Figures C.2, C.4 and C.6). Figures 1–3 reflect this as well through the disappearance of flat and downward-sloping sections in the budget constraints.

The combined effect on labour supply of the tax and transfer changes occurring over the 1994–2016 period is not clear a priori, and is likely to differ by demographic group. It is an empirical question that we seek to answer in this paper. We are interested in determining to what extent these tax and transfer changes can explain the observed changes in labour supply and how they amplified or worked against the concomitant changes in preferences and in wages.

4 | METHODOLOGY

4.1 | Behavioural microsimulation

Microsimulation models were first applied in an economic context by Orcutt (1957), and are now commonly used for analysing government policy. In these models, each micro-unit (also referred to as an agent) from a population is individually represented. This facilitates analysis of heterogeneity and diversity within the simulated population. As such, microsimulation models are particularly useful for policy analyses where the effects depend upon individual-specific circumstances, or where the distributional implications are a focus of interest.

In a static microsimulation model, it is assumed that behaviour remains invariant to changes to the policy environment. In a behavioural microsimulation model such as MITTS, a structural model of labour supply is incorporated to generate behavioural responses to tax reforms (see online Appendix D for a brief description of MITTS). As the theoretical model of labour supply decisions that is implemented in MITTS is what makes the model an appropriate basis for predicting labour supply responses to policy counterfactuals, in the following subsections we provide some further detail of the model used.

4.1.1 | The labour supply model

The behavioural component in MITTS is based on the assumption that individuals and couples maximise utility, which is represented as a function of household income, and of leisure and home production time.²⁷ Individuals are assumed to balance income, and hours of leisure and home production, where more of one implies less of the other. The model allows for different preferences for income and leisure/home production time, depending on the individual's characteristics. Couple families are assumed to maximise a joint utility function, and to determine their hours of work jointly. The estimated preference parameters drive the behavioural responses to policy changes in MITTS.²⁸

We use a structural model of labour supply to estimate preference parameters and elasticities with respect to income and wages. We treat labour supply as a discrete choice problem rather than a continuous choice, which means that we consider a limited set of possible labour supply points.²⁹ The exact same specification is used for estimating the labour supply models underlying the labour responses in the periods from 1994–95 to 1997–98 and from 2011–12 to 2015–16. For all groups, except partnered men, we allow for 11 labour supply points from which the individual can choose: these include 0, 5, 10, ..., 45, 50 hours per week. Partnered men can choose from six labour supply points only, to avoid having few observations at the lower hours levels as partnered men are unlikely to work part-time hours. The points included for them are 0, 10, 20, 30, 40 and 50 hours per week.³⁰ Observed hours are rounded to the nearest discrete point in the choice set.

We use a quadratic utility specification,³¹ which is quite flexible, without imposing too many restrictions a priori, as individual leisure and consumption can be either substitutes or complements.³² Furthermore, unlike other utility functions, the quadratic utility function can take working hours rather than leisure as its arguments and therefore it does not require us to choose an arbitrary value for the total endowment of time. It also allows us to check post-estimation whether utility is quasi-concave at the observed labour supply point and thus consistent with economic theory, rather than requiring us to impose this a priori.^{33,34}

We assume that each household/individual i can choose between j alternatives from a limited set of m combinations ($= 66$ for couples) of income and working hours (y_{ij}^* , h_{1ij} , h_{2ij}); $j = 1, 2, \dots, m$, where y_{ij}^* is the household's net income associated with male working hours h_{1ij} and female working hours h_{2ij} . Parameters FC_1 and FC_2 (to be estimated) are subtracted from net income for all positive working hours to capture the fixed costs of working; that is, $y_{ij} = y_{ij}^* - FC_1 * I(h_{1ij} > 0) - FC_2 * I(h_{2ij} > 0)$, with $I(h_{1ij} > 0)$ and $I(h_{2ij} > 0)$ indicators for non-zero working hours. The fixed costs parameters may cover actual costs such as, for instance, transport and childcare costs, but they also reflect the (non-monetary) difficulty of finding part-time employment, for example. We specify the

²⁷ The total time available is assumed to be divided between leisure and home production time on the one hand, and hours in employment on the other hand. Leisure and home production time are usually combined given the data that are available.

²⁸ Creedy et al. (2002) outline the initial set-up of MITTS. Creedy and Kalb (2006) discuss the methodology of behavioural microsimulation modelling more generally, including a number of examples using MITTS, whereas Buddelmeyer, Creedy and Kalb (2007) report on a range of microsimulation applications in tax-transfer policy design.

²⁹ See, for example, van Soest (1995).

³⁰ Kalb et al. (2018) experiment with different choice sets for the labour supply points of male and female medical doctors. They find that distinguishing 5, 10 and 13 points makes little difference, except perhaps the 5 points for female medical doctors, which may be too few to reflect the part-time hours sufficiently. The results based on 10 and 13 points are very similar, indicating that the additional precision in hours worked does not change the results.

³¹ See, for example, Keane and Moffitt (1998).

³² Van Soest, Das and Gong (2002) show that utility functions including fifth-order polynomials yield almost identical wage elasticities compared with models using second-order polynomials. In addition, Löffler, Peichl and Siegloch (2018) compare a broad set of alternative specifications and find that the choice of utility function does not affect results much.

³³ Van Soest, 1995, p. 68; Varian, 1992, pp. 313–14.

³⁴ All four demographic groups pass the quasi-concavity test in all or the vast majority of cases. Couples pass the test in 100 per cent of the cases in 1994–98 and in 2011–16; the same is found for single women and single parents in 1994–98. Single women and single parents in 2011–16 pass this test in 96 per cent and 99 per cent of all cases, respectively. Full details are included in the labour supply tables in online Appendix E.

utility function as

$$U_{ij} = V_{ij} + \varepsilon_{ij}, \quad (1)$$

$$\text{with } V_{ij} = \beta_1 y_{ij} + \beta_2 y_{ij}^2 + \beta_3 h_{1ij} + \beta_4 h_{1ij}^2 + \beta_5 h_{1ij} y_{ij} + \left[\beta_6 h_{2ij} + \beta_7 h_{2ij}^2 + \beta_8 h_{2ij} y_{ij} + \beta_9 h_{1ij} h_{2ij} \right].$$

We assume that the random error ε_{ij} , designed to capture unobserved heterogeneity, follows a type I Extreme Value distribution, and we estimate the parameters as a multinomial logit model by maximum likelihood. Furthermore, we allow the vector of linear preference parameters β_1 , β_3 and β_6 , and the fixed costs parameters FC_1 and FC_2 to differ by some individual characteristics; for example, the number of children, the age of the youngest child, and the individual's age and education.³⁵

For single adult households, equation 1 is estimated without the terms in between square brackets. In this case, h_{1ij} denotes hours worked by the single adult (male or female) and $y_{ij} = y_{ij*} - FC_1 * I(h_{1ij} > 0)$, and there are $m = 11$ hours points to choose from.

Given the assumption of an Extreme Value type I error distribution, and assuming that individuals choose the alternative that leads to the highest utility, the probability that individual i chooses alternative j (from the m alternatives) is

$$\Pr(U_{ij} > U_{ik}, k \neq j) = \frac{\exp(V_{ij})}{\sum_{k=1}^m \exp(V_{ik})}. \quad (2)$$

To estimate these probabilities, we need to determine the utility level and thus the household net income associated with each choice j . To generate household net income, we first compute gross hourly wages, either directly from observed information on wage income and hours worked or, for non-workers, by using predicted wages based on wage regressions with a Heckman correction to account for selection bias.³⁶ To ensure identification, the following variables are included in the selection equation but not in the wage equation: the number and age of children, the tenure type for the individual, non-labour income and some partner characteristics. Children's characteristics are only included for partnered men and women and for single parents, while partner characteristics are only included for partnered men and women. None of these variables is expected to affect the market wage that an employer will pay, but all of these variables are likely to affect whether someone participates in the labour force, and thus whether they are likely to be employed. Many of the exclusion variables are significant, except for partner and children characteristics for partnered men. Furthermore, most of the estimated selection equation and wage equation coefficients are significant and show the expected sign (see Tables E.1–E.4 in online Appendix E for the full set of estimated wage coefficients).

Using gross hourly wages, we calculate the gross labour income associated with each choice of working hours. We then add non-labour income and the partner's gross income to generate gross

³⁵ We have also estimated models including unobserved heterogeneity in the preference parameters that depend on observed characteristics. Normally distributed error terms with mean zero are assumed, and the three error terms are allowed to be correlated for single parents and single women. As a result of computational issues, the error terms are assumed to be independent for couple households. None of the estimated variances and covariances was significant and the size of all estimates was very small, with the likelihood function only slightly improving when these additional parameters were included in the models. The model for couple households when using the 1995–98 data did not converge. Given these results, we use the models without additional unobserved heterogeneity terms in our simulations. Model results with the additional terms are available from the authors upon request.

³⁶ Löffler et al. (2018) show that, conditional on imputing wages for non-workers only, accounting for wage prediction errors has a limited effect on results. They also show that imputing wages for everyone leads to higher wage elasticities. We choose to impute for non-workers only, as it seems reasonable to assume that workers make decisions based on their actual wage rather than on an unobserved wage distribution. Although it might be desirable to estimate a joint wage–labour supply model, allowing for correlation between the wage equation error term and unobserved heterogeneity in the preference parameters, this is very computationally intensive to apply in a microsimulation context. In addition, we have found that adding unobserved heterogeneity makes no difference for our models, suggesting that adding further complexity in relation to the error terms is unlikely to change our findings.

TABLE 3 Participation and hours worked elasticities in 1994–95 and 2015–16 by demographic group

	Partnered men		Partnered women		Single women	Single parents
	All	With children	All	With children		
Participation rate						
1994–1995	0.145	0.140	0.375	0.476	0.208	0.843
2015–2016	0.071	0.069	0.152	0.199	0.089	0.198
Hours worked						
1994–1995	0.160	0.161	0.448	0.569	0.171	1.084
2015–2016	0.110	0.110	0.226	0.295	0.096	0.233

Note: Elasticities obtained from simulating the effect of a 10 per cent increase in gross wage rates for the prime working-age population (aged 25–55). The estimation sample excludes full-time students, self-employed workers and people receiving a disability support payment.

Source: Authors' calculations based on the weighted SIH.

household income. Finally, we apply the Australian tax and transfer system that was current in the year the survey was held, and which is (slightly) different in each year, to compute the amount of net household income associated with each level of working hours. These computations are all carried out in MITTS, our microsimulation model, which accounts for all individual income tax payments and income tax rebates, as well as income support and family payments. However, as the data do not contain all relevant information (e.g., on childcare costs), the following components are excluded: childcare rebate and benefit, private health insurance offset, superannuation concessions, capital gains discount and tax deductions. See Table D.1 and online Appendix B for detailed information.

4.1.2 | The estimated labour supply parameters

The estimated coefficients are reported in online Appendix E: Table E.5 for couple families, Table E.6 for single women and Table E.7 for single parents. The tables clearly and unsurprisingly show the larger impact of having children (and especially pre-school children) on women's preferences for labour supply compared with men's preferences, although there is some weak indication in Table E.5 (close to the 10 per cent significance level) that this may be changing – with negative coefficients estimated for male preferences for hours worked in 2011–2016 when young children are present in the household. Most single parents are women and we find strong effects from having young children for this group, with single fathers being more likely to have stronger preferences for higher hours worked (as well as more income in the 2011–2016 period). The attained education level also appears more important for women than for men, with men having less variation in participation and hours worked by education level than women. That is, most men appear to prefer to work full-time regardless of education or the presence of children. Amongst all groups (men and women), the preference for hours worked first increases with age, before declining after a certain age (which occurs in most cases in the late 30s or early 40s).

Because of the non-linearity of the models, the coefficients are difficult to interpret and compare across groups and years, so we also report average wage elasticities in each year and for each demographic group, restricting our sample to those aged 25–55 (see Table 3). Elasticities with respect to gross wages are representative of labour supply responsiveness, although they are also affected by the tax and transfer system (which determines the translation from gross to net wage). However, the wage elasticities do not change much when computed for the same population but with the 1994–95 tax and transfer system instead of the 2015–16 system (or vice versa). Crucially, wage elasticities are relative measures that also depend on the individual's current labour supply. An individual already working 50 hours per week would typically have a lower elasticity than the same individual working 10 hours per week. Partnered women with children aged under 15 (who typically have lower labour

supply) have larger wage elasticities than partnered women without children aged under 15, whereas for men the presence of children aged under 15 does not make much difference.

Table 3 shows that elasticities for both participation and hours worked changed the most for women (and women with children in particular) from 1994–95 to 2015–16; in all cases, the elasticities substantially decreased, which is consistent with increased labour supply. These large decreases are similar to what Heim (2007) and Blau and Kahn (2007) find for married women in the US between 1980 and 2000. They suggest that this may be due to changed preferences, as they find that changed demographics do not explain much. Furthermore, these estimated wage elasticities for Australia are well within the range of prior estimates for other developed countries,³⁷ suggesting that our results are likely to be relevant more broadly.³⁸

Goodness-of-fit measures generally show a good fit, except for the 40 hours point, which is underpredicted (see online Appendix F).³⁹ Partnered women and single parents suffer less from this underprediction of 40 hours than the other demographic groups. These findings further justify the focus of the decomposition on those groups where large changes have occurred, and where we have accurate predicted changes: partnered women and single parents.

4.2 | Decomposition approach

In this subsection, we describe the approach used to decompose changes in labour force participation into four components. Let M denote the index of interest. The aim is to decompose changes in the index between two periods, $\Delta = M_1 - M_0$. M can be any relative inequality or redistributive measure.⁴⁰

In this paper, we extend previous decompositions by acknowledging that M can also be any indicator pertaining to the distribution of hours worked, which includes all information on employment status at both the extensive and intensive margins. For instance, M can be the proportion of full-time or part-time workers in the whole population or for any specific demographic subgroup.

Let P_t denote the set of socio-economic and demographic characteristics of the population in period t , including non-labour market income. Let β_t denote the preference parameters obtained by estimating a structural labour supply model. These parameters, combined with the tax–transfer structure τ (a vector with all relevant information on taxes and benefits) and population characteristics P , determine the distribution of hours worked and we can write the value of any index M at time t as

$$M_t = M(P_t, w_t, \beta_t, \tau_t).$$

The observed changes in M between periods 0 and 1 can then be decomposed as

$$\begin{aligned} \Delta &= M_1 - M_0 \\ &= M(P_1, w_1, \beta_1, \tau_1) - M(P_0, w_0, \beta_0, \tau_0) \end{aligned}$$

³⁷ Blundell and Shephard, 2012; Bargain, Orsini and Peichl, 2014.

³⁸ Our elasticities are also comparable to results from studies using a dynamic life-cycle model approach, such as Blundell et al. (2016), who also find that single parents and partnered women with children have higher labour supply elasticities, at both the intensive and extensive margins. Their elasticities (which are simulated under the 1999 tax and benefit environment) are closest to our 1994–98 estimates.

³⁹ This is consistent with results reported by Cai et al. (2008), who compare MITTS results for a major Australian tax and transfer reform for single parents with results for the same policy change using a quasi-experimental approach. Results from the two approaches are similar for the estimated change in average hours and for the overall probability of employment. However, MITTS slightly underestimates the change in probability of full-time employment and slightly overestimates the change in probability of part-time employment. This is likely due to the relatively low number of part-time jobs in the labour market, so job seekers have to settle for full-time (often 40 hours due to institutional restrictions on labour demand) or no work instead. When aggregating hours points between 30 and 50 hours per week, the various predicted and observed proportions align very well, indicating that the underprediction at 40 hours is generally accompanied by an overprediction at 30, 35, 45 and 50 hours.

⁴⁰ As in, for example, Bargain (2012a), Hérault and Azpitarte (2016) and Creedy and Hérault (2015).

$$= M(P_1, w_1, \beta_1, \tau_1) - M(P_1, w_1, \beta_1, \tau_0) \quad (T)$$

$$+ M(P_1, w_1, \beta_1, \tau_0) - M(P_1, w_1, \beta_0, \tau_0) \quad (PR)$$

$$+ M(P_1, w_1, \beta_0, \tau_0) - M(P_1, w_0, \beta_0, \tau_0) \quad (W)$$

$$+ M(P_1, w_0, \beta_0, \tau_0) - M(P_0, w_0, \beta_0, \tau_0). \quad (P)$$

Here, the term ‘T’ is the effect of a change in the tax–transfer structure with respect to components that have an impact on net income, thus changing the financial incentives pertaining to labour supply. $M(P_1, w_1, \beta_1, \tau_0)$ is calculated using the labour supply arising after a change from tax–transfer structure of period 1 to that of period 0. The term ‘PR’ is the variation attributed to changes in preference parameters. The computation of PR and T requires the use of a behavioural microsimulation model. This model is used to estimate labour supply responses to changes in tax–transfer policies at both the extensive and intensive margins (T), following the approach introduced by Bargain (2012b).

The parameters of the tax–transfer structure τ_0 are adjusted in nominal terms to period 1 values using an uprating factor. The removal of the uprating factor simplifies the notation. The choice of an appropriate uprating factor is important, and two candidates are typically considered, either a consumer price index (CPI) or a wage index. Following earlier Australian studies by Héroult and Azpitarte (2015, 2016) and Creedy and Héroult (2015), we use a wage index based on average earnings for full-time workers provided by the ABS (cat. no. 6302.0, table 3, series ID A2734023X). The index increased by 130.2 per cent between the first quarters of 1995 and 2016.⁴¹ Any failure of the tax thresholds or transfer parameters to maintain pace with wage growth (thus increasing the AETR) is interpreted as an explicit policy choice. Specifically, in the case of Australia, the slower growth of allowance rates for the unemployed relative to wage growth is considered to be a policy decision. In contrast, the growth of the age and disability pensions in line with wage growth is considered to be the result of maintaining the status quo. For the uprating of incomes, the default is to use the same wage index, although, as explained below, we depart from this choice in two instances in the decomposition.⁴²

One innovation of this paper is that we also assess the potential effect of changes in preferences by estimating labour supply changes that result from swapping the preference parameters of periods 0 and 1 (term PR). We interpret the unexplained changes in labour supply as a change in preferences, although we acknowledge that these changes could be partly due to non-pecuniary changes in tax and transfer policies as well. Thus, $M(P_1, w_1, \beta_0, \tau_0)$ is calculated using the labour supply arising from the preference parameters from period 0 (β_0) combined with data of period 1 (P_1) and tax–transfer structure from period 0 (τ_0). As the preference parameters of period 0 only apply to (disposable) incomes expressed in period 0 prices, period 1 disposable incomes must be deflated and expressed in period 0 dollars to compute $M(P_1, w_1, \beta_0, \tau_0)$. Here we use the CPI (ABS, cat. no. 6401.0, table 1, series ID A2325846C) to ensure that incomes are kept constant in real terms.⁴³ Thus, the term PR is net of any real income (or wage) growth effect.

Starting from the counterfactual distribution $M(P_1, w_1, \beta_0, \tau_0)$, we then change the hourly wage rates to what they would have been in period 0 for the population in period 1 to obtain $M(P_1, w_0, \beta_0, \tau_0)$. The determination of the contribution of wage growth is a key component of the decomposition as the literature has emphasised the role played by changes in wages in the long-term increase in female labour force participation. It is not desirable to simply apply a wage growth index,

⁴¹ This indicator closely tracks GDP per capita, which increased by 150.4 per cent over the same period (World Development Indicators; see <https://databank.worldbank.org/source/world-development-indicators>).

⁴² Note that any change in inequality resulting from an equal proportional change in incomes and all tax and benefit thresholds is negligible (see Creedy and Héroult, 2015, p. 161).

⁴³ The index increased by 69.6 per cent between the first quarters of 1995 and 2016.

as typically obtained from statistical agencies, even if it is gender-specific. Indeed, we are interested in changes in conditional wages and not in changes due to population compositional effects, which are all subsumed in a wage index. To determine what the wages of the population in period 1 would have been in period 0, we follow the approach recently introduced by Jessen (2019). To obtain $M(P_1, w_0, \beta_0, \tau_0)$, we estimate counterfactual wages by predicting wages using the wage coefficient estimates from period 0 on data from period 1.⁴⁴ For those who were employed, we follow Bourguignon, Ferreira and Leite (2008) and retain each individual's residual from the wage equation from period 1 and adjust this for any change in the standard deviations of the residuals between the two periods. For those not in work, we simply rely on predicted wages.

This approach ensures that the wage effect (term W) captures changes in the wage distribution that are due to changes in the observed returns to individual characteristics, rather than those due to changes in population composition. Non-labour (market) incomes are kept constant in real terms by deflating them to period 0 prices using the ABS price index. Hence, the term W captures the effect of changes in wages, accounting for real wage growth as well as changes in the (conditional) wage distribution. This means that the term W includes the effect of changes in relative wage rates across different population subgroups, such as between men and women.

The Workplace Gender Equality Agency publishes gender pay gap statistics on a regular basis.⁴⁵ They report little change between 1998 and 2018, with the gender pay gap actually increasing up to 2014 (18.5 per cent at its peak), after which it started declining to 14.1 per cent in 2018. Similar results are found for a range of countries with OECD (2017) showing no evidence that women's wages are closer to men's wages in 2015 than they were in 2005 (or in 1998). However, wages may have changed differently for particular female populations while leaving the overall wage gap intact.

Finally, the term P captures the effect of changes in the population's composition in terms of observable characteristics, such as, for instance, ageing or the large increase in educational attainment.

In principle, there are 24 different decomposition paths (factorial 4). These 24 decompositions account for all possible interactions between the various components of the decomposition, thus eliminating the need to introduce a separate interaction term. As there is, a priori, no reason to prefer any specific decomposition path, one could argue on the grounds of symmetry that an appropriate measure of each component is obtained by simply averaging the values from all possible decomposition paths. Following Shapley (1953) and Shorrocks (2013), we measure the effect of each component by their arithmetic mean values over all possible decomposition paths (that is, applying the same weight to each).

Tax–transfer policy changes may also affect other behaviours, such as fertility, household formation, migration and educational choice. These behaviours are not modelled explicitly; however, to the extent that these policies result in a change in population composition, their effects are captured in the population component of the decomposition (the term P above). The overall net effect of government policies – other than the modelled tax–transfer policies – affecting labour supply decisions directly or indirectly is captured in the preferences component PR, which also captures demand-side factors (other than those captured by changing coefficients in the wage equation). Such policies include, for instance, public transport policies, childcare policies (which have seen substantial changes), immigration policies or non-financial tax and transfer policies (such as additional welfare conditionality). The term PR also captures changes in social norms or any change in policy or in the society's structure that would affect the observed or perceived cost of working. To ensure that the decomposition is net of any change in modelling error, we use fitted rather than observed hours worked for M_1 and M_0 . The model's goodness of fit is thus important (see Section 4.1.2 and online Appendix F).

Although the scope of the drivers of change captured by the T, W and P components of the decomposition is relatively well defined, the term PR captures a wide range of factors. This means

⁴⁴ We make use of the wage equations embedded in the microsimulation model (see Section 4.1.1 and Tables E.1–E.4).

⁴⁵ Workplace Gender Equality Agency, 2019.

that the interpretation of the PR term is much less clear cut than the interpretation of the other decomposition components. Thus, the discussion of the results in the next section focuses on the first three components.

5 | RESULTS

We first present the decomposition results before turning to a discussion of their policy implications.

5.1 | Decomposition results by demographic group

Results from the decomposition approach described in Section 4.2 are presented in Table 4.⁴⁶ We discuss the results by outcome. The Tax, Wage and Preference components together explain a substantial portion of the changes in labour supply between 1994–95 and 2015–16 for single parents and partnered women, as do demographic changes, such as the large increase in educational attainment, which are captured in the Population component.⁴⁷

Starting with the decomposition of the large employment rate changes between 1994–95 and 2015–16, changes in the tax and transfer system explain 14.9 per cent of the change for partnered women without children, but only 3.8 per cent for partnered women with children and 0.5 per cent for single parents. The small impact from the tax and transfer system is consistent with Cai et al. (2008) who find modest impacts of around +0.5 percentage points on participation and +0.5 hours of work for single parents after the 2000 tax reform in Australia, and with findings by Kalb, Kew and Scutella (2005) who find impacts of around +0.5 hours of work and increases in participation between +1.07 and +2.38 percentage points (but at the same time more workers are expected to reduce than increase their hours).⁴⁸ The finding of small impacts is in contrast to Bick et al. (2019), who find that changes to labour income taxes are an important driver of married women's employment in the US and several European countries. However, their time frame (early 1980s to 2016) is wider and includes some major tax changes. In addition, they focus on hours worked per worker rather than employment rates, and they rely on a simplified representation of the tax and transfer system, which does not include social assistance, housing benefits, unemployment insurance or unemployment assistance. The effect of favourable tax reforms may have been offset to some extent by reforms to these (excluded) benefits.⁴⁹

Factors other than tax–transfer reforms appear much more important in Australia, especially for partnered women with children and single parents. Changes in real wage levels are a key factor for

⁴⁶ Confidence intervals could not be obtained for results presented in Table 4. However, online Appendix G presents the results for all 24 decomposition paths for the three groups of interest and shows which results are most sensitive to the decomposition path. The predicted changes due to tax–transfer policy changes are the least dependent on the decomposition path. Signs of the predicted changes are the same, independent of the chosen path, except for single parents' employment rates and average hours for partnered women with children where the average predicted change is close to zero. This is followed by the predicted changes due to population composition changes, where the sign of the predicted change only varies across decomposition paths for the proportion of single parents and partnered women with children in part-time employment. Predicted changes due to preference parameter changes are the most variable across decomposition paths.

⁴⁷ The decomposition is carried out separately for single parents and partnered women with and without children to account for their specificities and to facilitate comparisons with previous studies. In principle, changes in female employment indicators could also be driven by women moving between these three groups. However, the evidence suggests this only played a limited role. A simple shift-share analysis, holding employment constant at the 1994 level within each group but using the share of each group in the 2015–16 population, shows that this only accounts for 4.3 per cent, 7.3 per cent, 9.8 per cent and –8.5 per cent of 1994–2015 changes in the female employment rate, average weekly hours, full-time and part-time work rates, respectively.

⁴⁸ Similarly small impacts are found by Duncan and Harris (2002) who simulate the separate impacts on single parents' labour supply of two components of the Australian tax reforms introduced in 2000. They find that reducing the withdrawal rate of single parents' income support by 10 percentage points (from 50 per cent) and reducing the family payment withdrawal rate to 30 per cent across the board increases average hours by just over 0.5 hours and 0.15 hours, respectively, and the participation rate by 2.46 and 0.36 percentage points, respectively.

⁴⁹ The authors themselves note: '[t]he model captures only part of the secular increase in married women's employment rates in the 1980s and early 1990s in Europe. [...] This suggests that, perhaps not unexpectedly, other factors not considered in our model are additional important driving forces behind the pronounced increases in employment rates of married women in Continental Europe.'

TABLE 4 Decomposition results for partnered women and single parents of working age (aged 25–55): absolute (percentage points or hours per week) and relative (per cent) contributions

	Employment rate		Average weekly hours		Full-time work		Part-time work	
	(ppt)	(%)	(hrs/wk)	(%)	(ppt)	(%)	(ppt)	(%)
Single parents								
T	0.1	0.5	1.1	14.7	3.7	21.4	−3.6	−128.7
W	4.3	21.4	1.6	22.1	3.9	22.7	0.4	13.6
P	11.0	55.0	3.6	49.4	7.1	41.5	3.8	138.4
PR	4.6	23.2	1.0	13.9	2.5	14.5	2.1	76.7
Total 1994–2015 predicted change	20.0	100	7.3	100	17.2	100	2.8	100
Partnered women without children								
T	1.7	14.9	0.5	10.0	0.9	7.6	0.8	−114.7
W	1.9	16.5	0.7	14.9	1.4	11.7	0.5	−69.2
P	4.5	40.2	2.9	58.9	8.2	68.2	−3.6	535.1
PR	3.2	28.4	0.8	16.2	1.5	12.5	1.7	−251.1
Total 1994–2015 predicted change	11.3	100	5.0	100	12.0	100	−0.7	100
Partnered women with children								
T	0.5	3.8	0.0	−0.7	−0.4	−4.0	1.0	30.6
W	1.5	10.6	0.7	14.1	2.1	18.8	−0.6	−18.0
P	7.5	53.1	2.9	58.4	6.2	56.6	1.3	40.8
PR	4.6	32.6	1.4	28.2	3.1	28.6	1.5	46.6
Total 1994–2015 predicted change	14.1	100	5.0	100	11.0	100	3.2	100

Note: T refers to tax–transfer policy changes. W refers to changes in individual real wages. P refers to population composition changes. PR refers to changes in the estimated labour supply preference parameters. The estimation sample excludes full-time students, self-employed workers and people receiving a disability support payment.

Source: Authors' calculations based on the weighted SIH.

single parents as they explain over one-fifth of the employment rate increase. Also, wages explain 16.5 per cent of the increase in the employment rate for partnered women without children and 10.6 per cent for partnered women with children. This is in line with Eckstein et al. (2019), who find that changes in wage structures and job offers over the past 50 years in the US increased relative wages for women, driving the socio-economic changes, including increased female employment, over this period.

For single parents and partnered women with and without children, changes in observable population characteristics such as the increased proportion of women with high education levels (see Tables A.1 and A.2) explain 55.0 per cent, 53.1 per cent and 40 per cent, respectively, of the employment rate increase. In fact, these population composition effects are likely to be largely driven by the dramatic increase in female educational attainments over the period.⁵⁰

⁵⁰ We conduct a simple shift-share analysis in Tables A.3 and A.4. Holding constant the employment rate within each education group, the increase in educational attainment can account for 33 per cent, 66 per cent and 63 per cent of the increase in the employment rates observed between 1994 and 2015 for single parents, and partnered women with and without children, respectively. A shift-share analysis is of course a purely descriptive exercise. Table A.3 shows that increased educational attainments are also potentially important drivers for other employment indicators.

This result stands in contrast to most of the US literature, which has typically found little contribution from demographic changes.⁵¹ The Australian context may differ given the high level of population growth over this period, partly driven by immigration policies aimed at attracting skilled migrants. Finally, nearly one-third of the increased employment rate for partnered women and nearly one-quarter for single parents is explained by the changes in labour supply preference parameters.

The gain in employment was mostly in full-time employment: for partnered women without children, the full-time employment rate increased by 12 percentage points, for partnered women with children by 11 percentage points, and for single parents by 17.2 percentage points. Tax–transfer reforms were instrumental in this increase for single parents (explaining 21.4 per cent), but not for partnered women without children for whom it only explains 7.6 per cent of the change, while for partnered women with children tax–transfer reforms worked in the opposite direction.

Interestingly, the results reveal that tax–transfer reforms had two offsetting effects on the employment rate of single parents and partnered women with children. The reforms encouraged full-time employment while actively discouraging part-time employment for single parents and the reverse for partnered women with children, leading to a negligible net effect on the overall employment rate for both groups.

Average hours worked increased substantially for single parents (+7.3 hours per week) and for partnered women (+5.0 hours per week). Tax–transfer policy reforms actually appear to decrease hours worked slightly for partnered women with children (−0.7 per cent contribution), while they explain part of the increase for single parents (14.7 per cent) and partnered women without children (10 per cent). The impact of tax–transfer reforms on hours worked for single parents was mostly through the impact on part-time employment. Population, preference and wage changes (in that order of importance) played key roles for partnered women, while for single parents, wage changes were more important than changes in preferences for increased hours of work.

5.2 | Discussion of policy implications

The observed increases in labour force participation and hours worked for partnered women and single parents (who are overwhelmingly women) are large. Increasing female labour force participation and hours worked has featured prominently as one of the goals of the Australian government but the policies implemented since the mid-1990s have often had counteracting effects. Although some tax–transfer policy reforms aimed to improve incentives to work, overall they have contributed relatively little to the large increases in female employment. Most of the increase has come from changes in population composition, from changed labour supply preference parameters, possibly due to changed norms and values and labour demand shifts, and from real wage growth.

Arguably, some of these changed norms and values could have been caused by government policies. For example, the eligibility for parenting payments is now restricted to parents of children aged 6 or younger (or 8 or younger for single parents), while 20 years ago, parents were not required to look for employment until their child turned 16. As a result, more parents are subject to activity testing, which sends a strong message of ‘society’ expecting primary carers of school-age children to be in the labour force. Or, in contrast, the time could have been right for the policy change due to changed norms in society. It is likely that both effects are relevant; that is, the policy change may have reinforced already changing norms and, vice versa, changing norms may have driven policy change. However, the changing preferences are likely to be part of a global and continuing trend, which may to some extent be related to shifts in labour demand towards the services sector in the economies of many developed countries.

⁵¹ Two exceptions are that Eckstein and Lifshitz (2011) find that increased educational attainment played a large role and Eckstein et al. (2019) find that the returns to education and experience have also substantially increased for women.

Our results indicate that Australian tax and transfer policies could potentially reinforce these existing trends better than they have done so far by ensuring policy reforms work in the same direction (providing financial incentives for women to participate in the labour force) rather than counteracting each other as has sometimes been the case. For example, for single parents, the tax and transfer reforms had a negative impact on part-time employment rates, which often happens to be a desirable option as it can more easily be combined with looking after children than full-time employment. Discouraging part-time employment by making this financially less attractive may lead to these women not working at all, as full-time employment may not be compatible with childcare. Instead, the focus has largely been on improving incentives to work full-time, essentially through tax cuts. Indeed, Figure 1 (and Figure C.1) show that AETRs increased for single parents with children aged over 8 at low income levels – corresponding to part-time employment – while they decreased at higher income levels. By contrast, tax–transfer reforms slightly discouraged working full-time versus part-time for partnered women with children, leading to a small change in overall employment rate (see Table 4).

The results for partnered women with and without children are quite different. The changes in taxes and transfers over the period of analysis do less to explain labour supply increases for women with children than for women without children. In fact, these policy changes had a negative effect on average hours for partnered women with children. The interpretation is that the tax–transfer policy changes related to families with children that occurred between 1994–95 and 2015–16 did not provide the right incentives, but were counteracting existing trends.

As wage elasticities for partnered and single women with children are larger than the wage elasticities for childless partnered women, one would expect tax–transfer policies that improve labour supply incentives to be particularly effective for this group. Not putting such policies in place is a missed opportunity to encourage female labour force participation. Restricting benefit eligibility is rather punitive, but there are opportunities in the tax and transfer system to use ‘carrots’ (such as more advantageous withdrawal rates, or other rewards for participation) as well as the current ‘sticks’ when aiming to achieve higher female labour force participation.

6 | CONCLUSION

Similar to many other developed countries, Australia has seen large increases in labour force participation for women since the 1990s. In Australia and beyond, the key question, as to what the main drivers of this trend are, largely remains an open question. This descriptive analysis develops and applies a novel decomposition approach to quantify the role of four key factors: (i) changes in real wages, which includes wage growth and reductions in the gender wage gap, the role of which has been identified as important by previous studies in other countries; (ii) changes in tax–transfer policies; (iii) changes in preference parameters, with both (ii) and (iii) having been suggested as likely key factors although there is little evidence on the extent of their respective effects; and (iv) population composition changes.

The increasing trend in female labour force participation is consistent with the stated goals of the Australian government, particularly in relation to counteracting the impact of population ageing on the size of the labour force. However, we find that the changed financial incentives due to tax–transfer policy reforms have done relatively little to achieve these large increases. Although tax–transfer reforms encouraged full-time employment for single parents, it actively discouraged part-time employment for them, while for partnered women with children part-time employment but not full-time employment was encouraged, leading to an overall negligible effect for both groups.

Most of the increase in labour force participation has arisen from the three other factors we have considered. The most prominent factor has been simply the changes in the composition of the population, such as the increase in education attainment. Changes in labour supply preference parameters also played a key role, and we speculate that they are largely part of a global and continuing trend across many countries rather than a consequence of government policies. However,

preferences are unobserved, and we have interpreted the unexplained changes in labour supply, which may capture a wide range of factors, as being driven by changes in preferences. This means that the interpretation of the preferences component is much less clear cut than the interpretation of the three other decomposition components. Finally, increases in real wages explain a substantial part of the increased participation, especially for single parents, a group that has experienced tremendous wage growth since the mid-1990s.

The results point to a lack of consistency in the financial incentives provided through tax–transfer policies. With more focus and consistency in tax–transfer reforms, the government could provide better support for the development of female labour force participation through policies that provide further participation incentives instead of putting hurdles in the way. This could be achieved by providing incentives through more advantageous withdrawal rates encouraging part-time employment rather than through punitive measures such as lowering single parents' payment rates (which are likely to harm future opportunities for the children of single parents). This would take into account the necessity of achieving work–family balance for this population.

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