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Who cares? Household service migrants and the labour market outcomes of Australian women.

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 This paper uses unit record data from Household, Income and Labour Dynamics in Australia Survey (HILDA) conducted by the Australian Government Department of Social Services (DSS). The findings and views reported in this paper, however, are those of the author and should not be attributed to the Australian Government, DSS, or any of DSS' contractors or partners.

Abstract

Exploiting geographic variation in the distribution of migrants across Australia, I estimate the causal effect of female household service migrants on the labour market outcomes of Australian women. In line with a simple time-use model, I find a statistically significant positive effect on the hours worked by women in the top wage quartile. I also find that the increase in hours worked is lower for mothers of children under the age of 17 who experience a larger income effect than comparable non-mothers when household service prices decrease. Using novel data on the historical male-to-female sex-ratio across Australia, I find new evidence on the role of ingrained gender norms on the uptake of household services. Women in areas with a historically high ratio of men and thus more conservative attitudes today reduce their hours worked less than women in areas with lower historical sex-ratios, consistent with a higher valuation of leisure. Further, I distinguish between the effect of inflows from formal household service workers (e.g. childcare and aged care) and informal household service workers (e.g. cleaners and laundry workers). I find that while both have a statistically significant positive effect on the hours native women work, the effect from an inflow of informal workers is substantially larger in magnitude.

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1 Introduction

Despite substantial progress towards gender equality in Australia, women continue to shoulder a disproportionate share of household production tasks including cleaning, laundry, and child and aged care. On average, Australian women dedicate 64.4 percent of their working time to unpaid care work, compared to just 36.1 percent for men (Workplace Gender Equality Agency, 2016). Encouragingly, this trend shows signs of improvement, with women spending 17 percent less time on housework between 2011 and 2019 (Table A2). However, men's contribution to housework has remained stagnant over the same period, prompting questions about how the gap in household production is being addressed.

In this paper I propose that this gap is being filled, at least in part, by female migrants in the household service sector. This is based on the time-use model established by Cortés and Tessada (2011) which suggests that an inflow of migrants reduces the price of household services, allowing women to substitute from household production to market work. The model predicts how women will respond in terms of both hours worked (intensive margin) and labour force participation decision (extensive margin). Based on the model, an inflow of migrants who act as substitutes for household production should increase the hours worked by native women at the top of the wage distribution. This has been widely supported by a number of recent papers including from the US (Cortés, 2008; Cortés and Tessada, 2011; Cortés and Pan, 2019), Italy (Barone and Mocetti, 2011), Spain (Farré et al., 2011) and the United Kingdom (UK) (Romiti, 2018). The effect on the extensive margin and across different sub-groups remains less clear, with mixed findings on the effect of migrants on labour force participation decisions and on mothers.

I contribute to this literature by examining the effect of household service migrants in an Australian context. Specifically, I estimate the causal effect of an increased share of female household service migrants on the labour market outcomes of Australian women. An OLS specification of this relationship would be biased due to the endogeneity of migrant location choice. Female household service migrants may select which geographical area to live in based on female labour market outcomes, generating reverse causality. There may also be other factors, such as housing affordability, that simultaneously influence female labour market outcomes and migrant location choice. To address these concerns, I construct a shift-share instrument based on the distribution of migrants across Australia in 1981. This instrument, popular in the migration literature, is based on the assumption that immigrants are more likely to settle in areas with historically higher numbers of existing migrants from the same region. The validity of this approach rests on the exogeneity of these historical migrant shares, which I strengthen by including time and area fixed effects and area-specific controls.

Examining the effect of migrants in Australia is important for several reasons. For one, Australia's migration system is markedly different to those previously studied in this set of literature, with the system characterised by a selective points-based process and highly educated migrants (OECD, 2023a). As an island, Australia also has one of the lowest estimated per capita incidence of illegal migration (World Population Review, 2024). This is vastly different to countries previously studies who exhibit an abundance of low-skilled and often illegal workers. Implications drawn from the Australian context would therefore be more applicable to countries

with similarly structured immigration systems, such as Canada, New-Zealand and post-Brexit UK (Sumption, 2019; UK Visas and Immigration, 2019). Secondly, Australia has a large and growing share of international migrants, with 30.7 percent of the population born overseas in 2023, an increase of 25 percent since just 2006 (Australian Bureau of Statistics, 2024). Australian household service migrants are also substantially more educated than their native counterparts (Eastman et al., 2018). Thus, unlike the existing literature which largely focuses on low-skilled migrants as substitutes for household production, this paper will instead use a more granular independent variable, examining the share of female migrants employed in the household service sector. This distinction in the independent variable is important for two reasons. First, by looking at the share of female household service migrants rather than all low-skilled migrants I am able to more plausibly isolate the effect of substitutes for household production on native women and ignore other channels or complementarities through which broader low-skilled migrants may influence female labour market outcomes. Second, due to the high level of education of Australian household service migrants, looking at low-skilled migrants would not be appropriate. Instead, the high-skilled nature of Australia's household service migrants may alter the incentives to utilise household services. For example, mothers may be more inclined to send their child to childcare knowing that their carer is highly qualified (Gordon et al., 2021). Finally, Australia presents a unique opportunity to investigate how gender norms alter the effect of household service migrant. I build on the work of Grosjean and Khattar (2019) who exploit Australia's colonial past to investigate the effect of historical male-to-female population sex-ratios on modern day attitudes towards women. Specifically, they use the convict sex-ratio as an instrument for the population sex-ratio. This novel approach is unique to Australia where British convicts were allocated across the country without choice, reducing the risk of selection bias in location decisions. The authors find that areas with a higher historical ratio of males today exhibit more conservative beliefs about the role of women, with women in these areas working less and enjoying more leisure time. Using this data and findings, I make a novel contribution to the existing literature by estimating how the effect of household service migrants differs based on historical sex-ratios, which I argue acts as a proxy for ingrained gender norms.

Overall, in line with existing literature and the theoretical time-use model I find that an increase in the share of female household service migrants increases the hours worked of native women in the top wage quartile. I find a negative effect on labour force participation for women in the second wage quartile, which I argue is driven by a shift towards women relying on their husbands income to allow them to exit the labour market and hire household services. I also find that mothers experience a smaller increase in hours worked than non-mothers, which I propose is due to a larger income effect from the reduced price of household services. Using the novel data on historical sex-ratio's I further uncover that women in areas with historically high sex-ratios and more traditional beliefs about gender roles respond less to the changes in the share of female household service migrants. This is consistent with a higher valuation of leisure for women in these areas and is robust to the inclusion of an instrument for the convict sex-ratio.

Finally, I examine how the magnitude of the effect differs based on inflows of migrant women in the informal household services (e.g. cleaners, housekeepers) and the formal householder services (e.g. child and aged care). I find that the hours worked by high-income native women

is over four times as responsive to changes in the share of informal household service workers than it is to changes in the share of formal household service workers. This is consistent with the idea that informal household service workers provide more flexible services, allowing women to advance in occupations that disproportionately award high hours worked (Goldin, 2014).

Together, these findings suggest that Australia's restrictive migration process may be hindering women's time at work by limiting their ability to outsource household production to migrants. Expanding visa options for household service migrants presents a viable pathway to improve the labour market outcomes of high-income Australian women, but should be addressed with caution given the results on the extensive margin for low-income women and the ethical concerns that arise from the risk of migrant exploitation.

The thesis is organized as follows: Section 2 provides background on the household service sector, outlines the theoretical framework and summarises the existing literature. Section 3 details the data sources and provides descriptive statistics. Section 4 presents the empirical strategy. Section 5 outlines the main results and Section 6 examines heterogeneity across different sub-groups based on motherhood status, historical sex-ratio and type of household service migrant. Section 7 presents several robustness checks and Section 8 concludes with a summary of the key insights, policy implications, and suggestions for future research.

2 Background

2.1 The Australian household service sector

For the purposes of this paper, household production and household work are used interchangeably. I refer to household production purchased on the market as household services (or HS). I further divide this into two sub-sectors for further analysis: the formal and informal household service sector.

2.1.1 Formal household services

The formal household service sector includes childcare workers, nannies and aged and disability carers who work within the home and in government or privately run facilities. Australia's formal household service sector is highly reliant on women (85 percent of the workforce) and migrants (39 percent of the workforce). Acknowledging the seminal role of unpaid work in gender inequality, Australian governments have sought to implement numerous policies to reduce the care burden on women, with government expenditure on early childhood services growing by 140 percent between 2008 and 2018 (Hurley et al., 2020). This trend has continued with Australia's two largest states announcing plans in 2022 to heavily expand access to childcare in the year before school (Department of Education, 2022). These policies have however been constrained by significant workforce shortages, which have been filled by a rapidly growing share of migrants, with migrant participation in the formal household service sector growing by over 15 percent between 2011 and 2016 (Beavan, 2023; Eastman et al., 2018). With Australia's point based system limiting formal household service migrants from entering through traditional visa pathways, workers rely on 'backdoor' channels including working holiday and student visas, with 38 percent of overseas born formal household service workers first entering Australia on an

international student visa (Eastman et al., 2018). Public calls for an expanded formal household service workforce saw the announcement of a new migration program in 2023, extending visa concessions to nurse support workers, personal care assistants and aged and disability carers (Kaul, 2023).

Another marked change in the formal household service sector is the composition of the overseas-born workforce. Of those recently arrived, 42.3 percent were from Southern Asia, an increase of 350 percent from those who arrived in between 1991 and 2000 (Figure A2). Women from African countries are also vastly over-represented in today's formal care workforce, with 36 percent of Liberian and 30 percent of Sierra Leone migrants employed in the sector. This is compared to just 3.8 percent for Australian women (Table A1).

2.1.2 Informal household service workers

While the value of Australia's formal household service sector is well documented, much less is known about the informal household service sector including housekeepers, laundry workers and domestic cleaners. There remains almost no literature or publications on this sector in an Australian context, aside from on the determinants of using domestic services (Baxter et al., 2009) and treatment of au pairs (Berg and Meagher, 2018). However, neither of these papers relate to migration or broader labour market outcomes.

Based on official census statistics, the domestic services workforce is 90 percent smaller than the formal care workforce. However, a large portion of this work occurs in the informal cash economy, and is not recorded in official statistics (Baxter et al., 2009). Nonetheless, census data does indicate that women and overseas-born people are heavily over-represented in the domestic care sector, with 70 percent of the workforce being female and 40 percent born overseas.

While informal household service workforce only represent 0.1 percent of the total female workforce in Australia, survey data suggests that Australian women do regularly pay for household help. Baxter et al. (2009) find that 19 percent of Australian married or co-cohabiting couples paid for household help on a regular basis. Using the Household Income and Labour Dynamics in Australia (HILDA) Survey, I find a slightly lower number, with almost 12 percent of Australian-born people regularly paying for household help in 2019 (Table A3). The number of Australian women who regularly pay someone to help with housework has been increasing since 2011.

2.2 Simple theoretical framework

To support the economic rationale behind my analysis, I borrow the simple time-use model described in Cortés and Tessada (2011) and Cortés (2023). The model provides two vital pieces of information to support the interpretation of my results. The first, is which subset of women are most likely to change their time-use decisions due to a reduction in the price of household services, and the second, is whether women with a larger burden of household work, such as children, are expected to respond differently.

In the model, the agents income is a combination of her own hourly income (w) and her unearned income (M) (i.e. partners income). The agent allocates time between household production (h), leisure (l) and market work (n) and spends their income among household

services provided by the market (x) and all other market good (y). Each household is required to provide a fixed number of household production units (R), which are either provided by them or purchased through the market at price p. The agents utility is thus a combination of their utility from market goods and leisure, both of which are concave:

$$u(y) + v(l) \tag{1}$$

The agent's decision is how to allocate time between work and unpaid household production, aiming to maximize utility subject to their time, budget and household production unit requirement. This leads to the establishment of four distinct cases:

1. *Low-income earner:* an agent who's market wage and unearned wage are both low. To maximise her utility she decides to work ($n^* > 0$) but not purchase household services on the market ($x^* = 0$).

2. *Full-time homemaker:* an agent who's own wage is low, but who's unearned income (i.e. partners income) is medium such that she does not have to work ($n^* = 0$) but can also not afford to purchase household services on the market ($x^* = 0$).

3. *High-income partner:* the agent's unearned income (i.e. partners income) is high enough that she does not need to work ($n^* = 0$), but can still pay for household services ($x^* > 0$).

4. *High-income earner:* The agent has a high wage, and therefore a high enough opportunity cost of time that she opts to pay for household services until the point that the marginal utility of household services on the market is equal to her marginal wage ($f(h') = \frac{w}{p}$).

Through this framework, we are able to predict which agents are theoretically most influenced by a change in the price of household services. The first, is that we expect to see changes in the extensive margin of labour supply only where the decrease in p is sufficiently large that it induces agents to purchase household service where they otherwise would not have (i.e. moves them into case three or four). In this case, agents with low-income will substitute to greater leisure time, while agents with high-income will join the labour force. The second result is at the intensive margin on hours worked. Agents who previously outsourced some of their household production will dedicate less time to household production (decrease in h) given the lower cost of outsourcing this work. How this effects hours worked depends on whether leisure is a normal or inferior good. If leisure is an inferior good, the income and substitution effect will move in the same direction and labour supply will increase unambiguously. If leisure is a normal good, labour supply will increase only if the price of leisure is not sensitive to changes in income. Regardless, the important consideration is that on the intensive margin, we only expect the labour supply of high-income women to be effected by a reduction in the price of household services. Of this group, women with lower wages are expected to see a larger effect as these women operate on the margins and have the lowest marginal productivity of household production.

Finally, we consider how the simple time-use model is altered in the presence of children. Cortés and Tessada (2011) present children as an exogenous increase in the required level of household production in a household (R). As R increases, the marginal productivity of household production increases. On this basis, a mother is unambiguously more likely than an otherwise

identical women to purchase household services. While the level of household services purchased by mothers is clear, the relative change on hours worked in less obvious. Again, it depends on whether leisure is considered an inferior or normal good. If leisure is a normal good, the income effect will be larger for mothers. In other words, given that they expend more on household services than a comparable non-mother, the savings from a reduction in p will be larger for mothers. With this larger income effect, mothers will reduce working hours to consume more leisure than non-mothers. On the contrary, if leisure is an inferior good, we expect to see an increase in the labour supply of mothers more than non-mothers.

The robustness of this model has been tested in other countries (Cortés and Tessada, 2011; Cortés and Pan, 2013, 2019), but never robustly in the Australian context. This presents an interesting extension to the existing model for two key reasons. Firstly, the presence of fixed award rates in formal household services (notably child and aged care) means that p may be less responsive to changes in the supply of workers, and therefore remain rigid and higher than other countries examined under the model. Secondly, the highly educated nature of Australian migrants may lead to a higher utility from acquiring household services. For example, given migrant workers are more likely to hold a masters degree (Table 2), the perceived benefit from outsourcing household production such as childcare may be higher relative to countries with lower educated migrants. As a result, examining the model in an Australian context provides valuable insights into the unique interactions between labor supply, price rigidity, and migrant education levels.

2.3 Related literature

2.3.1 The effect of migrants on the outcomes of native women

In the last decade, a robust set of literature has sought to understand how low-skilled migrants, particularly those who act as substitutes for household production, effect the labour market outcomes of native women.[1] The underlying theory supporting this stream of literature is that migrants (typically of a low-skilled background) increase the supply of workers who are substitutes in household production, reducing the price of of tasks like cleaning and childcare. In line with the simple time-use model outlined in Section 2.2, the reduced price in household services allows native workers to substitute from household production to greater time in the workforce.

A key catalyst for this stream of literature was a paper from Cortés (2008) that exploited variation in immigrant enclaves across cities in the US to estimate the effect of low-skilled migrants on the price of household services. This analysis yielded two important implications: first, that a higher share of low-skilled workers reduced the price of immigrant-intensive services including housekeeping; and secondly, that the wage effects were much larger for immigrants than natives suggesting that the two are imperfect substitutes.

This US-based research was extended in Cortés and Tessada (2011), who find that low-skilled workers increase the hours worked by native women (intensive margin) but do not effect their labour market participation decisions (extensive margin). In line with the simple time-use

[1] This literature was summarised by Cortés (2023) .

model established in the paper and borrowed for my analysis, the effect is found to be particularly large for women in the top-quartile of the wage distribution. However, contrary to the models suggestions there was no evidence of heterogeneous effects for mothers of small children. Looking at the Spanish case, Farré et al. (2011) similarly find an increase in the intensive margin decision of native woman, but in contrast, also find a significant effect on the extensive margin, and a extensive margin higher effect for skilled women with children and elderly dependents. In Italy, Barone and Mocetti (2011) find a positive effect on the extensive margin and minimal effect on the intensive margin. They also expand their analysis to consider how the effect differs based on local welfare policies, and find a lower effect in areas with strong welfare policies indicating a possible substitution between social institutions and household service migrants. Forlani et al. (2015) extend the understanding of the role of policies and institutions, aggregating estimates across high- and low-support countries.[2] For high-skilled natives they find a positive effect on hours worked in both high- and low-support countries, but for low-skilled natives they only identify an effect in low-support countries. They argue that these results are consistent with the idea that migrants act as a substitute for family-support policies, particularly among low-educated natives.

The broader effects of migrants on female labour market outcomes beyond participation and hours worked, has also been a recent area of study. Cortés and Pan (2019) use a triple-difference strategy combined with a shift-share IV to estimate changes to the gender pay gap in occupations that reward long work hours in the US. They find evidence that low-skilled immigrants reduce the gender pay gap in occupations that disproportionately reward excess work hours. Interestingly, they also find that this does not explain the remaining lack of women at the very top, with no change in the share of women in the top earnings decile. This presents an important implication, relevant to this analysis: that supply-side policies that improve the price and availability of household services may contribute to closing the gender pay gap, however, there are likely other barriers driving the gap at the very top. Romiti (2018) examined the effect of immigrants in the UK on both labour market outcomes and fertility, on the basis that the two have historically grown in tandem. She finds that immigration reduces the cost and increases the size of the UK childcare market and lead to a positive effect on hours worked, but no changes to fertility.

Across the existing literature, one things remains unanimous - migrants who act as substitutes in household production have a positive effect on the hours worked by native women. However, the effect on a vast number of other outcomes remains contested: Is there an effect on the labour force participation decisions? Are there any effects in countries with strong support for family-based policies? And are there heterogeneous effects for mothers? I contribute to the

[2]In their analysis Forlani et al. (2015) categories and aggregate countries based on the level of support for family policies such as childcare and parental leave. Australia, along with the UK form the high-support group while Switzerland, the US and Germany form the low-support group. All estimates provided are from a pooled sample with multiple countries, meaning that no estimates specific to Australia are provided. They use the same panel data as this paper (HILDA), but the classification of household service migrants is much broader and includes less relevant occupations including healthcare, veterinary services and prison based services. I would argue that this is a poor occupational choice as these occupations may influence women's labour market outcomes through channels beyond household services. This analysis is also the first to use an independent variable specifically measuring the share of service sector migrants, whereas previous papers relied on the share of low-skilled immigrants. Barone and Mocetti (2011) also provided a more specialised independent variable, but did so by limiting analysis to only to the 10 countries with the highest portions of household service workers.

literature by answering these questions in an Australian context.

2.3.2 The effect of migrants on native labour supply

This paper also contributes to a broader set of literature on the effect of migration on native labour supply. This presents a highly complex and context specific question, that economists have sought to answer for many decades. Early work in the 80's and 90's relied on the assumption that migrants increase the homogeneous aggregate supply of labor, with studies findings the effect on native wages to be trending towards zero (Peri, 2016; Borjas, 2003). Card (2001) was the first to acknowledge heterogeneity amongst migrants, using historical migrant share across the US to examine how migrants and natives compete within occupational sub-groups, finding minimal effect on the wages of low-skilled natives. On the contrary, using US-level data, Borjas (2003) find that migrants reduce the wages of low-skilled native workers, arguing that low-skilled migrants and natives act as direct competitors. Peri and Sparber (2009) finds a positive effect on natives, suggesting that migrants specialise in manually intensive work and provide a channel for natives to move to higher-paying communication-oriented roles.

The literature on the effect of migrants in an Australian context is more limited, but broadly suggests that migrants have no effect or a positive effect on native labour market outcomes. Breunig et al. (2017) examine the relationship between immigration and labour market outcomes since 2001, assuming distinct labour markets based on constructed educational-experience cells. They find no indication that migrants have had a negative effect on the labour market outcomes of natives. Crown et al. (2020) examine the effect of temporary work visas in high skilled occupations, instrumenting for the portion of skilled visa holders by multiplying the 1966 share of migrants from four country groups by the national growth rates in migration (a variation on a shift-share instrument). They find complementarities between skilled migrants and native workers, with natives moving into roles which rely more heavily on communication skills and provide higher wages. Similarly, OECD (2023a) use a shift-share IV approach using the 1981 share of migrants and find a positive effect on the employment of natives and no effect on wages. This result holds across multiple sub-groups, including low-skilled workers and females and is driven by an inflow of natives into a region as the number of migrants increase. It is likely the Australian literature more prominently finds positive effects from migrants due to the fact that Australian migrants are highly educated (OECD, 2023b).

2.3.3 Determinants of female household production and labour market outcomes

The disproportionate share of household work carried out by women and it's resulting effect on persistent gender inequality in the labour market, is by no means a recent economic phenomenon. In the 80s, Gary Becker developed two models which contributed to the explanation of reduced female labour market participation and hours worked. The first, was the application of a simple model of comparative advantage to the household setting, finding that it is more efficient for one member of the household (i.e. the women) to specialise in household production (Becker, 1973). The second was a model of individual effort allocation, where he argued that due to a high level of effort exerted on household production, women have less remaining effort to allocate to market work, reducing their hours worked and incentive to invest in human capital (Becker,

1985). More recent work has run contrary to these findings, with Bertrand et al. (2015) finding that the gap in time spent on household production is larger in households where the wife earns more than her husband. They find that as the woman's earning surpasses the man, she works more hours in the home to ensure her husband feels less 'threatened' by the earnings gap. This effect is argued to be driven not by economic rationale, but by entrenched gender norms.

Baxter et al. (2009) examine the determinants of domestic labour in Australia, with a particular focus on whether cultural views on the use of paid domestic help affect uptake. Using a linear probability model and controlling for individual characteristics such as age and education level, they find that demand for household services is largely driven by the hours worked by the woman in the household. Further, they find that attitudes towards outsourcing household production substantially effect the probability of paying for household services. However, somewhat surprisingly they find that attitudes towards gender roles have no effect. These findings contribute to the notion that the decision to pay for household services is not a purely rational or economic one, but is instead influenced by attitudes and beliefs. Nonetheless, given that the results reflect correlation rather than causation, they should be interpreted with caution.

Another relevant Australian study from Grosjean and Khattar (2019) examines the effect of the male-to-female ratio (sex-ratio) of Australia's first census on modern day attitudes and the labour market outcomes of women. In areas with more men, women were historically more likely to get married and less likely to participate in the labour market. These effects are shown to persist through to modern day Australia with women in areas with historically high-sex ratios less likely to work in high ranking occupations and more likely to enjoy leisure and have conservative attitudes. These findings are strengthened by the use of an instrumental variable for the *convict* sex-ratio, as convicts specifically had no influence over their location choice, and are thus more likely to be plausibly exogenous than the broader population. The paper also contributes to understanding of determinants of time spent on household production, however the results on this appear mixed. While the OLS estimate suggests that women in high-sex ratio areas spend less time on household tasks,[3] the statistical significance of this effect is removed entirely after instrumenting for the convict sex-ratio. I utilise the findings and the data from this paper in my analysis to add a novel contribution to the existing literature on the role of gender norms on the effect of migrants on female labour market outcomes.

3 Data and Descriptive Statistics

3.1 Female labour market data

The data on female labour market outcomes are drawn from the Household Income and Labour Dynamics in Australia (HILDA) Survey, a nationally representative survey conducted annually since 2001. In line with best practice longitudinal survey design, participants are selected into the sample at the household level across census collection districts in Australia, with a general top up sample of 2,153 households added in 2011 to ensure the sample remains representative of the Australian population (Summerfield et al., 2023). The sample is subject to attrition bias,

[3] A one standard deviation increase in the historical sex-ratio is associated with a -1.23 hour reduction in women's time spent with children.

with re-interview rates lower amongst people aged 15 to 24, born in a non-English speaking country, unemployed and working in low-skilled occupations. In particular, migrants arriving to Australia after 2011 are underrepresented in the sample (Wilkins et al., 2024). This however is not a concern for the main analysis as the main sample is restricted to working women aged between 25 and 64 who are born in Australia. I choose specifically to look at women aged over 25 to capture women who are more likely to be responsible or jointly responsible for household production. According to HILDA data, the average age for an Australian woman to move out of home in 2017 was 24.2 (Vera-Toscano and Wilkins, 2019).

I define two samples for my analysis. The first is the intensive margin sample comprised of native women who are currently working. Based on the average weekly wage for all jobs, I allocate women into a wage quartile, calculated at the geographic area level. The second sample is the extensive margin sample. This includes women who are not currently in the labour force, but have previously reported an occupation. Where the women is not currently employed, I follow Cortés and Tessada (2011) and use the average male wage of her last reported occupation. This allows me to also categorise women in the extensive margin sample by wage quartile to better analyse results in the context of the simple time-use model.

Table 1 presents descriptive statistics of the HILDA sample in Australian census years (2011, 2016 and 2021) across Australian born women (main sample), Australian born men and household service workers. Women consistently report spending over twice as much time as men looking after children and the elderly. Women's time spent on housework also appears to have declined by over 17 percent between 2011 and 2021, with men's time spent on housework only increasing by 1 percent over the same period. This provides initial suggestive evidence that there may be a greater dependence on household services facilitating the decline in female household work. This is supported by Table A3 which suggests that from 2011 to 2019,[4] 10 percent more native born Australians regularly paid for household help. For working women, 12 percent more paid for household help, with the increase largely driven by women in the first and fourth quartile of the wage distribution (Table A2). Unsurprisingly, trends in the use of household services appear to move in line with time spent on work. Women in the first quartile see an increase in hours worked between 2011 and 2019 of 2 percent, and over the same period, 66 percent more women use household help regularly. On the contrary, hours worked decreases for women in the third quartile by 4 percent, with the percentage of women using household help also decreasing by 19 percent.

Analysis is conducted at the geographical area level, which divides Australia into 15 different geographic regions.[5] The geographical area boundaries were designed to represent the functional area of Australia's states and territories and to maximise stability over time to allow for more robust time series analysis (Australian Bureau of Statistics, 2021). Australia provides an ideal location for geographic analysis given the diversity of and large distance between the geographical areas. This ensures that people are likely to both live and work within the same geographical

[4]The HILDA survey question on the use of household help is asked as part of a module every three years and thus cannot be easily aligned with the census periods.

[5]Under the ABS classifications, this is referred to as the Greater Capital City Statistical Area (GCCSA). In total there are 16 geographical areas, 'Other Territories' is excluded due to small sample and high levels of dispersion.

area, compared to countries with greater labour mobility across regions,[6].

Table 1: Summary Statistics by Year and Group

Statistic	2006	2011	2016
Australian Born Women			
Age	43.12	43.42	43.04
Weekly wage	476.38	510.18	505.02
Hours worked (per week)	22.48	22.58	22.49
Time spent on housework (per week)	19.68	16.54	16.70
Time caring for children/elderly (per week)	9.29	8.89	10.83
Have a child under 4 (percent)	16.46	17.19	19.57
Have a child under 17 (percent)	45.67	44.36	44.08
Have an elderly dependent (percent)	13.51	13.73	11.98
Are Aboriginal (percent)	2.98	3.69	3.98
Number of Observations	3626.00	4829.00	5023.00
Australian Born Men			
Age	42.98	43.24	42.87
Weekly wage	856.80	911.33	840.56
Hours worked (per week)	37.78	36.70	34.44
Time spent on housework (per week)	7.66	6.53	7.59
Time caring for children/elderly (per week)	3.45	2.94	4.00
Have a child under 4 (percent)	17.10	18.53	19.66
Have a child under 17 (percent)	45.90	44.78	43.40
Have an elderly dependent (percent)	7.98	8.37	7.80
Are Aboriginal (percent)	2.03	2.68	3.27
Number of Observations	3258.00	4328.00	4559.00
Household service workers			
Age	43.74	44.62	44.13
Weekly wage	438.50	469.22	459.20
Hours worked (per week)	27.64	27.59	26.83
Time spent on housework (per week)	16.17	13.86	16.05
Time caring for children/elderly (per week)	6.45	4.05	8.27
Have a child under 4 (percent)	10.78	9.28	13.22
Have a child under 17 (percent)	51.23	45.45	45.70
Have an elderly dependent (percent)	16.17	14.10	14.89
Are Aboriginal (percent)	4.62	4.99	5.08
Migrants (percent)	20.34	25.60	24.84
Women (percent)	80.88	82.75	82.17
Number of Observations	408.00	539.00	628.00

Note: Figures are constructed usingHousehold Income and Labour Dynamics in Australia (HILDA) Survey. All population groups are restricted to 25 to 64 year olds. The Australian born women and Australian born men sample include all respondents, including those not in the labour market. Household service workers are defined on the 2-digit level and includes both 'Cleaners and Laundry Services' and 'Carers and Aids'. The 2011 sample size increases dramatically due to a top-up sample added to the dataset in that survey year.

[6]For example, for analysis conducted in European countries like Italy and Spain (Barone and Mocetti, 2011; Farré et al., 2011) it is more likely that people work beyond their recorded geographical area.

3.2 1981 census data

I use novel 1981 Australian census data, specifically constructed by the ABS and confidentially kindly provided by Christopher Parsons for the purpose of this research. This includes data on the Australian labour force in 1981 by regions of birth (of which there are 59 excluding Australia), industry and education level. The industries are divided into primary industries which typically describes raw material industries such as mining, secondary industries typically involving manufacturing and tertiary industries typically related to the service sector. Historical census data is provided at the Statistical Area 4 (SA4) level.[7].

3.3 Modern census data

Modern census data is collected from the 2006, 2011 and 2016 Australian census.[8] I exclude 2021 data to avoid identification issues related to data anomalies during the COVID-19 pandemic, particularly given the effect of border closures on migrant inflows.

Similar to the historical census data, 2006 data is not provided on the geographical area level and is matched based on the best-fit in terms of land-size. Across all three years I collect data on female migrants in household services to form the dependent variable. I also collect data on geographical area level characteristics including unemployment rates and portion of women aged 25 to 64 with a bachelors degree or above.

Using census data, I further construct a variable for the share of female migrants in the household service sector. A household service migrants is defined to the 2-digit level of the Australian occupation index (ANZSCO) to align with the occupation data provided in the HILDA data set. Women working as 'Carers and Aids' including childcare and aged care workers are henceforth referred to as formal household service workers, while women working in 'Cleaners and Laundry Services' including domestic cleaners and housekeepers are categorised as informal household service workers.

Additionally, I use modern data census day to provide information on immigrant shifts. This involves collecting data on the number of immigrants by year of arrival and region of birth and summing the total migrants across each 5-year census period. For example, 2011 migrant inflows involves summing up inflows for each region of birth from 2006 until the 2011 census night. This is deemed to be the most appropriate shift-data as it allows disaggregation by gender. For completeness, I re-produce my estimates using alternative migrant inflow data in Section 7.

There are three further things worth noting in regards to the construction of the region of birth variables for modern day data. The first, is that the 59 regions do not include all overseas born people, but do represent 163 countries and 92 percent of Australia's migrants in 2016. The second is that Nepal and Bhutan, two of the largest countries of birth of Australian household service migrants, are not included in the regional groupings of the 1981 data. For this reason, the region is re-categorised to become 'India, Nepal and Bhutan' given the cultural

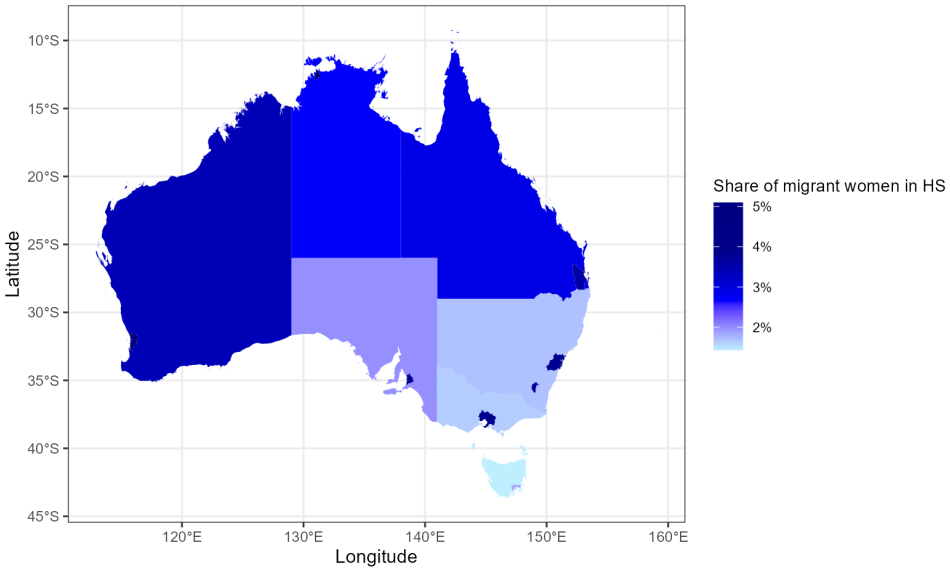
[7]I convert it to the geographical area level based on which geographical area the SA4 is most encompassed by in terms of land size. For example, if an SA4 was split 40 percent into 'Greater Melbourne' and 60 percent into 'Rest of Victoria', I have allocated the SA4 to 'Rest of Victoria'. Note that I would have preferred to base it one portion of population, but land size was the only available metric. This conversion (and the 2006 conversion) is done using correspondence files provided by the ABS

[8]All census data prior to 2006 is not digitized and is therefore not easily accessible.

and geographic similarities of the three countries (Jones, uary). The robustness of results to the exclusion of Nepal and Bhutan is tested in Section 7.3. Finally, regions of birth are are aggregated from individual countries within the ABS TableBuilder environment to reduce the risk of measurement error arising from data randomisation in the face of small sample size.[9]

Modern data census data also provides valuable insights into the distribution and composition of migrants across Australia, and trends in household service migrants. Specifically, the share of female household service migrants is vastly different across different geographical areas in Australia (Figure 1). For example, in 'Greater Perth' and 'Greater Darwin', migrant women employed in household services represent over 5 percent of all adult women, while in 'Rest of Tasmania', they represent only 1.5 percent. The share of household service migrants also varies across census years, with increases in the share across geographical areas between 2006 and 2016 (Table A4). These distinct geographical differences provide an ideal source of identifying variation for my analysis.

Figure 1: Share of female household service migrants relative to adult female population



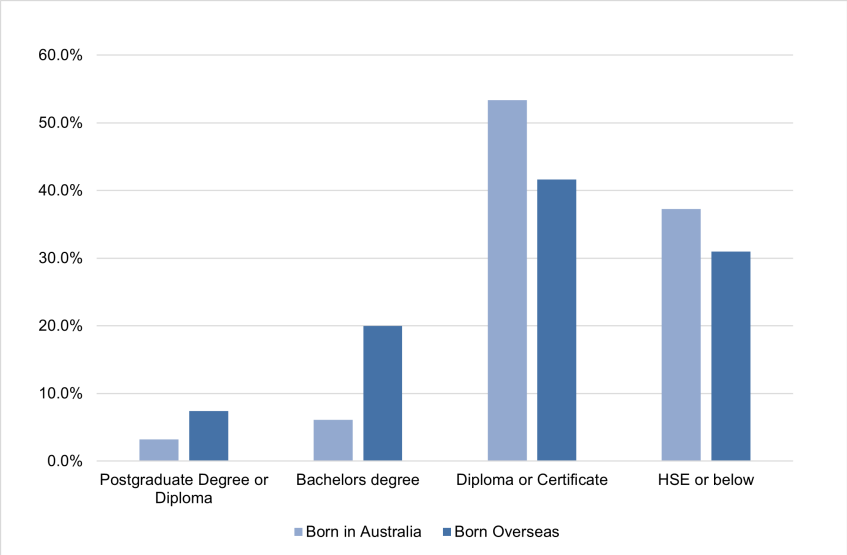
Note: This map shows the share of migrant women in household services across geographical areas in Australia in 2016 (the final year of the sample). The share of migrant women in household services is calculated as the number of female household service migrants born overseas in each geographical area, divided by the total female population aged between 25 and 64 in the geographical area.

In the last decade, the composition of Australian migrants has also changed dramatically, with Chinese and Indian migrant numbers surpassing those of the UK and New Zealand for the first time in Australia's history (Phillips and Simon-Davies, 2017). This trend is also seen in the composition of household service migrants. Of recently arrived household service migrants, 39.7 percent were from Southern Asia, an increase of 900 percent from those who arrived in between 1981 to 1990 (Figure A1).

Migrant household service workers are also highly educated relative to their Australian born counterparts (Figure 2). In fact, almost 7.4 percent of migrants have some form of postgraduate qualification, twice the rate of Australian workers.

[9]The TableBuilder platform randomises numbers below 10 for confidentiality purposes.

Figure 2: Highest education level of female HS workers



Note: The vertical axis is the share of female household service workers with each highest level of qualification. The share is the number of HS migrants with that level of education divided by the total number of HS migrants who recorded a highest level of education in the 2016 Australian census.

4 Empirical Strategy

4.1 OLS Specification

I begin by introducing the baseline empirical specification, which exploits geographic variation in the concentration of female household service migrants across Australia to estimate the effect of migrants on female labor market outcomes:

$$LS_{i,g,t} = \beta_0 + \beta_1 \frac{MigrantWHS_{g,t}}{FemalePop_{g,t}} + \beta_3 X_{i,g,t} + \beta_4 GA_{g,t} + \alpha_g + \mu_t + \epsilon_{g,t} \tag{2}$$

$LS_{i,g,t}$ represents the measures of female labour supply i in geographical area g in census-year t. This is either the log of weekly hours of paid work or a dummy variable equal to 1 if individual participates in the labour market. $\frac{MigrantWHS_{g,t}}{FemalePop_{g,t}}$ is the proportion of female household service migrants relative to the female working age population (25 to 64 years old for the purposes of this analysis). It is defined in this way to provide a proxy for the availability of household services relative to the total female population who are most likely to rely on household services. $X_{i,g,t}$ is a vector of individual control variables including age, age squared, married, dummy for having a child 4 or younger and a dummy for having a child 17. These factors are likely to affect the number of household service migrants and labour market decisions. $GA_{g,t}$ is a vector of geographical area level controls including the unemployment rate, female education rate and 1981 secondary industry participation rate times year dummies. I include a geographical area fixed-effect α_g to control for underlying differences between geographical area that may affect female labour market outcomes and female immigration, and also include census year fixed effects μ_t to account for national level trends, ensuring estimates capture only geographical area level variation. Standard errors are clustered at the geographical area and year level to account

for correlation in the error term.

4.2 Identification and IV estimation

The OLS estimation of equation 2 is subject to bias given the endogeneity of migrant location choice. First, female migrants in the household service sector may chose where to live based on female labor market outcomes, creating a reverse causality problem. Second, there are likely to be omitted variables such as housing affordability that influence migrant location choice as well as female labour market outcomes. To overcome this endogeneity I utilise a shift-share instrumental variable approach, introduced by Bartik (1991) and popularised as a formal econometric tool by Card (2001).

The shift-share IV approach takes advantage of the fact that new migrants are more likely to settle in geographical areas with large shares of existing migrants from their region. It combines the percentage of existing migrants in each geographical area from each region (the 'share') with the aggregate level inflow of migrants to Australia (the 'shift'). By multiplying the inflow of migrants by lagged shares, the instrument aims to isolate the exogenous components of migrant inflows, capturing migrants who move based on familial connections rather than economic conditions. For example, if 10 percent of Philippine migrants lived in Greater Melbourne in 1981, the instrument will allocate 10 percent of Philippine migrants to Greater Melbourne each year.

My shift-share instrument is constructed using 1981 census data on the share of migrants from the 59 regions of origin across Australian geographical areas. This is combined with data on the inflow of *female* migrants from each region as follows:

$$\widehat{MigrantW}_{g,t} = \sum_{c} \frac{Immig_{c,g,t}}{Immig_{c,g,1981}} \times ArrivedMigrantW_{c,t} \tag{3}$$

$\frac{Immig_{c,g,t}}{Immig_{c,g,1981}}$ is the share of immigrants from the labour force of region c living in geographical area g in 1981. $ArrivedMigrantW_{c,t}$ is the aggregate number of female migrants who arrived to Australia from region c in census period t. This shift variable is defined specifically as women as 80 percent of household service workers in Australia are women, and it is expected that female migrants are more likely to substitute for female natives in household production (e.g. more work in cleaning rather than gardening). I choose to consider a shift in all female migrants rather than only household service migrants for two reasons. The first, is that a broader shift measure reduces the likelihood of measurement error in response to small sample size. Secondly, I aim to strengthen the exogeneity of the instrument as the inflow of all female migrants is less likely to be driven by geographical area specific economic conditions correlated to female household service migrant share.

Given the variation in the size of populations across Australian geographical areas, I divide the instrument by the historical migrant population to construct a relative measure for female immigrant inflows. In line with existing literature, the historical migrant population is used to scale the instrument rather than current population size as it is less likely to be correlated with current economic shocks (Forlani et al., 2015):

$$Instrument_{r,t} = \frac{\widehat{MigrantW}_{r,t}}{Pop_{c,1981}} \tag{4}$$

The results for the first stage specification are reported in Table 2. The coefficients reduce when including geographical area and year fixed effects, but remain strongly statistically significant. The coefficient also drops further when weighted by population size, indicating that the instrument may be strongest in geographical areas with relatively smaller populations. This however is not considered a major concern as the first stage result remains statistically significant at the 1 percent level and has an F-statistic of 97, providing convincing evidence of a strong first stage. Overall, the results suggest that a 1 percentage point increase in the predicted share of migrant women relative to the 1981 total labour force is associated with a 0.139 percentage point increase in the share of migrant women in household services. This is slightly lower than the first stage estimates of other comparable papers given that the dependent variable is a broader category of migrants than the instrumental variable (the share of all female migrants and the predicted share of female *household service* migrants respectively).[10]

The key assumption of this instrument is that the 1981 distribution of immigrants across geographical areas by region of birth is not correlated with *changes* in economic or demographic characteristics at the geographical area level after 2001, except for through the direct impact on immigration. This strategy presents two commonly identified problems. The first, is that past economic shocks that attracted migrants to the geographical area persisted over time. I overcome this by using a heavily lagged share variable, 30 years prior to the period of analysis. This is substantially more lagged than other papers in this set of literature which often rely on a 5 or 10 year lagged share (Mayda et al., 2022; Cortés and Tessada, 2011). A second concern, is that unobserved time-invariant factors that determined migrant location choice in 1981 may be correlated with current female labour market conditions. For example, proximity to the beach or abundance of natural resources may lead to higher wealth in an area and drive improved labour market outcomes. I account for this by controlling for geographical area fixed effects as well as employment characteristics, including the portion of females with a bachelors degree or higher, the unemployment rate, and an interaction term between secondary industry share in 1981 by year dummy.

Another potential threat to instrument validity is labour mobility between geographical areas in response to migration. If existing residents respond to a migrant inflow by moving to other geographical areas, this spreads the effect of immigration across labour markets rather than isolating them to the geographical areas in which they are analysed. In this case, the coefficients creating a lower bound estimate for the effect of migrants (Card, 2001).

[10] Cortés and Tessada (2011) and Barone and Mocetti (2011) find first stage coefficients of 0.2 and 0.35 respectively.

Table 2: First stage regression results

	Dependent variable: Share of Migrant Women in Household Services			
	(1)	(2)	(3)	(4)
Predicted share of migrant women	0.418***	0.243***	0.222***	0.139***
	(0.051)	(0.038)	(0.045)	(0.042)
Unemployment rate			0.032	0.102**
			(0.030)	(0.037)
Share of women with bachelors degree or higher			0.013	0.005
			(0.017)	(0.013)
Secondary industry * 2011 Dummy			0.011	0.006
			(0.014)	(0.013)
Secondary industry * 2016 Dummy			−0.006	0.021
			(0.015)	(0.015)
Constant	0.011***			
	(0.002)			
Geographical area and Year FE	No	Yes	Yes	Yes
Controls	No	No	Yes	Yes
Weighted by geographical area population	No	No	No	Yes
Observations		45	45	45
R^2		0.938	0.946	0.913
Adjusted R^2		0.899	0.896	0.834
F Statistic		136.633*** (df = 3; 27)	57.373*** (df = 7; 23)	97.401*** (df = 7; 23)

Note: Standard errors are reported in parenthesis. * p < 0.1, ** p < 0.05, *** p < 0.01.
Geographical area controls include the unemployment rate, rate of females with a bachelor's degree or higher, and the 1981 secondary industry share interacted with a census year dummy. Errors are clustered at the geographical area × census year level. Weighting by geographical area is done within each census year.

5 Main Results

5.1 Hours worked in the labour market

I begin by examining how an increase in the proportion of household service migrants effects the hours worked by Australian women. The first panel of Table 1 presents the results from equation 2 across the sample of working women. The simple time-use model predicts that only high-income women who currently pay for household services will alter their hours in the labour market in response to a change in the price of household services. The IV coefficient of β_1 is negative but not statistically significant, indicating no effect on hours worked by natives.[11]

I next examine how this effect differs by wage quartile. I find that only women in the top wage quartile see a statistically significant effect from the inflow of household service migrants. This result is consistent with the time-use model described above and with previous findings (Cortés and Tessada, 2011; Farré et al., 2011; Barone and Mocetti, 2011). Specifically, a 1 percentage point increase in the share of household service migrants (as a portion of women aged 25-64) is associated with a 12.38 percentage point increase in the hours worked by native women in the top wage quartile. Note that this coefficient need be interpreted with caution. Given that my dependent variable is the share of migrant women in household services relative to the female population (which had a mean value of 2.8 percent across the sample), a 1 percentage point increase is by no means on the margins and represents over a 35 percent increase on the current share (Appendix Table A4). A more realistic interpretation would therefore be that a 0.1 percentage point increase is associated with a 1.23 percent increase in average hours worked for women in the top wage quartile.[12] This is equivalent to an extra 31 minutes of market work per week.[13] This finding is not only statistically significant, but also highly economically significant. To provide a point of comparison, the Grattan Institute, a leading Australian think-tank, estimated that $5 billion dollar increase in the childcare subsidy would increase women's hours worked by 13 percent and boost GDP by $11 billion annually (Wood et al., 2020). Following the same assumptions and isolating the benefit to the top-quarter of earners, a 0.1 percent point increase in household service migrants is loosely equivalent to a $118 million investment in childcare and would create a $260 million boost to Australian GDP by unlocking female hours worked.[14]

I further investigate this finding by subdividing the top quartile of earners (Appendix Table A7). The results suggest that the statistical significance for top income earners is driven by women in the second quartile of the top quartile of wage earners (i.e. women from the 82.25 to 87.5th percentile of total wage distribution). This result is in line with the predictions of the simple time-use model which suggests that women at the lower end of the high income earners will respond most to changes in the price of household services given that they have the lowest marginal productivity of household production and are thus most responsive to marginal

[11] Based on the simple time-use model, a negative coefficient would suggest that the income effect is greater than the substitution effect as the price of household services increases. However, given the result is statistically insignificant we can draw no inference from the negative coefficient

[12] I will use this smaller approximation throughout as the results are intended to reflect small changes to the relative supply and price and are unlikely to hold true with changes of large magnitude.

[13] Based on an average hours worked per week of 42.13 (Table 1) multiplied by 60 minutes and 1.23 percent.

[14] Using linear extrapolation of Wood et al. (2022) estimates. Equivalent childcare investment is calculated as $\frac{1.23\%}{13\%} \times \$5b \times \frac{1}{4} = \$118m$. Equivalent GDP boost is calculated as $\frac{1.23\%}{13\%} \times \$11b \times \frac{1}{4} = \$260m$.

changes in price.[15]

Table 3: Female household service migrants and log hours worked by Australian women: Working women by wage quartile

	OLS	First-stage	Reduced-form	IV
	(1)	(2)	(3)	(4)
Full sample				
Predicted share of migrant women		0.166***	-0.323	
		(0.037)	(1.108)	
Share of migrant women in HS	0.981			-1.946
	(3.847)			(6.785)
Num.Obs.	9391	9391	9391	9391
0–25th percentile				
Predicted share of migrant women		0.172***	0.108	
		(0.038)	(2.193)	
Share of migrant women in HS	16.012*			0.630
	(9.319)			(12.721)
Num.Obs.	2353	2353	2353	2353
25–50th percentile				
Predicted share of migrant women		0.157***	0.245	
		(0.035)	(1.330)	
Share of migrant women in HS	-1.014			1.562
	(6.429)			(8.499)
Num.Obs.	2350	2350	2350	2350
50–75th percentile				
Predicted share of migrant women		0.173***	-0.074	
		(0.039)	(0.848)	
Share of migrant women in HS	-3.529			-0.427
	(2.774)			(4.899)
Num.Obs.	2345	2345	2345	2345
75–100th percentile				
Predicted share of migrant women		0.161***	1.999**	
		(0.037)	(0.800)	
Share of migrant women in HS	5.139			12.387**
	(3.643)			(5.351)
Num.Obs.	2343	2343	2343	2343

[15] A 0.1 percentage point increase in the share of female migrant household service workers is associated with a 7.5 percent increase in weekly hours worked for this group. This result is significant to the 1 percent level and is equivalent to over 3 hours more market work per week. However, given the small sample size when dividing into sub-groups, these more granular results should be interpreted with caution.

Note: Standard errors are in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. The dependent variable is the log of weekly hours worked for columns (1), (3), and (4), and the share of migrant women in HS for column (2). All estimates include census year and geographical area fixed effects, with geographical area controls for unemployment rate, female education rate, and 1981 secondary industry share interacted with a census year dummy and individual controls for age, age squared, marital status, and presence of young children. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is by geographical area. The sample comprises working Australian-born women aged 25-64.

5.2 Labour market participation decision

Next, I consider the effect of female household service migrants on labour force participation decisions (extensive margin). As outlined in Section 2.2, we only expect to see a change on the extensive margin when the change in price is large enough to move women from one 'case' to another. For example, the change in p may be large enough that the woman moves from case one where she works and does not buy services, to case three where unearned income is sufficiently high that she does not need to work and can afford to purchase household services. This requires large changes in p. The other alternative, is that migrant women in the household service sector act as substitutes to native women, forcing them out of the labour market.

The effect on the labour market participation across the sample of women who have a recorded job classification is reported in the first panel of Table 4. The IV coefficient of β_1 is -1.50 and is statistically significant at the 10 percent level. This suggests that on average, as the share of female migrant household service workers increases by 0.1 percentage points, the probability of a native women working in the labour market decreases by 0.15 percentage points.

Again, I further analyse the results by wage quartile. I find a statistically significant negative effect only for women in the 50 to 75th percentile of the wage distribution. To uncover whether this is driven by competition with migrants or changes in the price of household services, I recreate the regressions with interaction terms. The first, in column (4) includes an interaction term for the partners weekly wage.[16] This is intended to reflect the fact that those with high unearned income may be moved to category three as the price of household services changes. The second in column (5) includes an interaction term with a dummy variable for whether the woman is employed in household services. This is intended to reflect the fact that the result may be driven by woman who work in the same sector as the incoming migrants being forced out of the labour force due to direct competition.

I find that the coefficient for the 50 to 75th wage percentile becomes statistically insignificant when accounting for the interaction with partners wage. Interestingly the coefficient on the partners wage is statistically significant at the 10 percent level, suggesting that it may be a shift to case three driving this result. From equation (5) we can see that the interaction term with the household service dummy is statistically insignificant and that the original coefficient remains largely unchanged, suggesting that competition with household service migrants is unlikely to be driving the result. Interestingly, once accounting for the interaction with partners wage, the coefficient on the extensive margin decision at the 25 to 50th wage quartile becomes statistically significant. However, in order to construct this regression a large number of observations have been dropped,[17] so this suddenly negative result may be spurious correlation.

[16] This is divided by 100 so that the coefficients are visible to three decimal places

[17] All women without partners recorded in the data are removed.

Table 4: Female household service migrants and the labour market participation of Australian women: All women by wage quartile

	OLS	First-stage	Reduced-form	IV	IV - Partner Income	IV - HS Worker
	(1)	(2)	(3)	(4)	(5)	(6)
Full sample						
Predicted share of migrant women		0.165***	-0.250***			
		(0.037)	(0.094)			
Share of migrant women in HS	-0.146			-1.518*	-1.398	-1.504*
	(0.484)			(0.787)	(0.963)	(0.782)
Interaction with partners income					-212.174	
					(320.760)	
Interaction with household service worker dummy						0.133
						(0.142)
Num.Obs.	8701	8701	8701	8701	5517	8701
0–25th percentile						
Predicted share of migrant women		0.166***	-0.377			
		(0.037)	(0.337)			
Share of migrant women in HS	0.244			-2.269	-2.930	-2.241
	(1.670)			(2.196)	(2.492)	(2.291)
Interaction with partners income					638.604	
					(451.644)	
Interaction with household service worker dummy						0.144
						(0.487)
Num.Obs.	2179	2179	2179	2179	1411	2179
25–50th percentile						
Predicted share of migrant women		0.161***	-0.273			
		(0.037)	(0.273)			
Share of migrant women in HS	1.174**			-1.691	-3.944*	-1.705
	(0.569)			(1.851)	(2.141)	(1.844)
Interaction with partners income					332.702	
					(302.641)	

Interaction with household service worker dummy						0.221
						(0.265)
Num.Obs.	2179	2179	2179	2179	1334	2179
50–75th percentile						
Predicted share of migrant women		0.171***	-0.300**			
		(0.039)	(0.119)			
Share of migrant women in HS	-0.851			-1.758**	2.745	-1.751**
	(0.570)			(0.832)	(2.162)	(0.819)
Interaction with partners income					-1828.035*	
					(1057.894)	
Interaction with household service worker dummy						0.084
						(0.130)
Num.Obs.	2173	2173	2173	2173	1349	2173
75–100th percentile						
Predicted share of migrant women		0.162***	0.033			
		(0.037)	(0.093)			
Share of migrant women in HS	-0.180			0.205	0.856	0.214
	(0.479)			(0.574)	(1.082)	(0.572)
Interaction with partners income					-360.218	
					(433.208)	
Interaction with household service worker dummy						0.069
						(0.195)
Num.Obs.	2170	2170	2170	2170	1423	2170

Note: Standard errors * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable for columns (1) and (3)-(6) is a dummy variable equal to 1 if the woman participates in the labour market and zero otherwise. The dependent variable for column (2) is the share of migrant women in HS. Columns (5) and (6) includes an interaction effect with partners income and a dummy variable equal to 1 if the individual worked in the household service sector respectively. All estimates include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area. The sample includes Australian born women aged between 25 and 64 who are either currently working or have previously recorded an occupational category.

6 Heterogeneity Analysis

6.1 Women with children

Next, I investigate the effect of children either under 4 years old or under 17 years old. To do this, I rely on an interaction term between the respective child dummies and the share of household service migrants as follows:

$$\begin{aligned} LS_{i,g,t} = \delta_0 + \delta_1 \frac{MigrantHS_{g,t}}{FemalePop_{g,t}} + \delta_3 \frac{MigrantHS_{g,t}}{FemalePop_{g,t}} Child_{i,g,t} + \delta Child_{i,g,t} \\ + \quad \delta_4 K_{i,g,t} + \delta_5 GA_{g,t} + \alpha_g + \mu_t + \epsilon_{g,t} \end{aligned} \tag{5}$$

Here, $Child_{i,g,t}$ is a dummy variable for either having a child under 17 or a child under 4 and $K_{i,g,t}$ is a vector of individual controls including age, age squared and a married dummy. For each regression, I control only for one of the child dummies (either child under 4 or child under 17) such that if captures the effects of all mothers with a child under 4 and under 17 respectively. As discussed in Section 2.2, if leisure is a normal good we expect to see a lower effect on hours worked for mothers due to a larger income effect. If leisure is an inferior good we expect to see the opposite.

I find a statistically significant negative effect for women in the top wage quartile with at least one child under the age of 17 (Table 5). For every 0.1 percentage point increase in the share of migrant women in household services, a mother with a child under 17 years old is expected to experience a 0.26 percentage point smaller effect on hours worked than a comparable non mother in the top wage quartile. This equates to an average of 6.5 minutes less time at work per week relative to a non-mother.[18]

Based on the simple time-use model, the negative coefficient on δ_3 indicates that leisure is a normal good and that mothers use income saved through the reduced price of household services to consume more leisure time. This is contrary to the findings of Cortés and Tessada (2011) and Farré et al. (2011) who find no statistically significant differences between hours worked between mothers and non-mothers. Curiously, I also only see the effect for mothers with children under the age of 17. Children under four are likely create a larger increase in the minimum household production requirement (R), so I would have expected a larger effect for this group rather than the latter. The lack of statistical significance for the child under 4 group may be due to a smaller sample of mothers of young children, relative to mothers of children under 17 year old's, particularly in the working women sample.

[18]The average working woman in the sample with children under the age of 17 and in the top wage quartile works 41 hours per week.

Table 5: Female household service migrants and log hours worked by Australian women: Heterogeneous effects for mothers

	1st Percentile	2nd Percentile	3rd Percentile	4th Percentile
	(1)	(2)	(3)	(4)
Have a child below 4 yr old				
Share of migrant women in HS	0.225	2.190	-0.329	12.096**
	(12.775)	(8.876)	(4.709)	(5.340)
Interaction with child under the age of 4 dummy	2.311	-3.512	2.475	0.171
	(3.588)	(2.417)	(3.157)	(3.182)
Num.Obs.	2353	2350	2345	2343
Have a child below 17 yr old				
Share of migrant women in HS	2.222	5.634	0.400	12.095**
	(12.672)	(8.136)	(4.754)	(5.081)
Interaction with child under the age of 17 dummy	-2.196	-3.802	-1.753	-2.623**
	(3.654)	(2.555)	(1.439)	(1.328)
Num.Obs.	2353	2350	2345	2343

Note: Standard errors are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The dependent variable is log of weekly hours worked. All estimates include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area. For a detailed version of results for this specification including first-stage and reduced form estimates see Appendix Table A8.

6.2 Gender norms

Finally, I examine how the effect differs based on the historical sex-ratio from Australia's first census. Existing literature in Australia points to a causal relationship between a high historical male-to-female sex-ratio and more conservative attitudes towards the role of women, lower female labour market participation, stronger masculinity norms and higher male violence (Grosjean and Khattar, 2019; Baranov et al., 2023). The use of a historical-sex ratio therefore provides valuable insights into how deeply ingrained gender norms and cultural beliefs, driven by higher shares of males in early Australia, effect contemporary women's time-use decisions. This is valuable as using a measure of attitudes towards gender roles would be subject to substantial endogeneity bias given that an individual's attitudes are influenced by a myriad of social, cultural and economic factors.

Using data from Grosjean and Khattar (2019), I interact the sex-ratio with the instrumented female migrant share.[19] Given that in areas with higher sex-ratios women work less and enjoy more leisure, I expect their relative valuation of leisure to be higher than an equivalent women in a lower sex-ratio area. Thus, if leisure is a normal good, I expect the income effect to be greater in areas with a higher historical sex-ratio (i.e. for the interaction effect to be negative).

In line with my expectations, I find a statistically significant and negative effect of the interaction term at the 5 percent level for women in the top wage quartile (Table 6). This suggests that in areas with a high historical sex-ratio, women are more likely to use the decrease in price (p) to increase leisure time rather than hours worked. This result is robust to the inclusion of a 'double-instrument' approach where I instrument for the share of household migrants with my shift-share variable *and* the historical sex-ratio with the convict sex-ratio as per Grosjean and Khattar (2019). Using the single IV approach I find a positive and statistically significant effect in the third wage quartile, although this result is no longer statistically significant after utilising the convict sex-ratio instrument. This may reflect the fact that the historical ratio includes people with autonomy in where they live and is therefore subject to bias. Overall, the results of my regression using a 'double instrument' approach indicate that a 0.1 percentage point increase in the share of female household service migrants results in a 0.45 percent lower effect on hours worked for women in the top wage quartile, who live in areas with a higher sex-ratio. This may suggest that the positive effect of migrants on hours worked is attenuated by more conservative attitudes towards gender roles, given the strong existing link established between conservative cultural beliefs and historically high ratios of men.

This provides a novel contribution to the existing literature given the difficulty in plausibly estimating the role of gender and cultural norms. It provides suggestive evidence that women's time and household service allocation decisions may be influenced by ingrained attitudes and gender norms, which have been passed down through generations within a geographical area. It also suggests that women in areas with high- and low-historical sex-ratios may derive inherently different utility from outsourcing household production or spending time on market work.

[19]The detailed regression equations are provided in Appendix A. Sex-ratios are aggregated to a geographical area level based on a weighted average of the SA4 sex-ratios.

Table 6: Female household service migrants and log hours worked by Australian women: Heterogeneous effects from historical sex-ratios

	OLS	Single IV	Double IV
	(1)	(2)	(3)
0–25th percentile			
Share of migrant women in HS	6.252	-6.050	-12.989
	(16.398)	(21.464)	(22.283)
Dependent variable interaction with sex ratio	2.038	-0.775	1.367
	(4.010)	(4.714)	(4.935)
Num.Obs.	2331	2331	2331
25–50th percentile			
Share of migrant women in HS	11.726	8.030	5.280
	(8.140)	(10.905)	(10.886)
Dependent variable interaction with sex ratio	-3.215*	-0.799	0.036
	(1.741)	(1.581)	(1.570)
Num.Obs.	2328	2328	2328
50–75th percentile			
Share of migrant women in HS	-5.505	-2.257	-0.716
	(5.263)	(8.622)	(8.592)
Dependent variable interaction with sex ratio	1.422	1.157	0.663
	(1.410)	(1.374)	(1.398)
Num.Obs.	2323	2323	2323
75–100th percentile			
Share of migrant women in HS	11.525*	29.186***	28.608***
	(6.429)	(8.522)	(8.271)
Dependent variable interaction with sex ratio	-2.172	-4.712***	-4.524***
	(1.614)	(1.740)	(1.660)
Num.Obs.	2322	2322	2322

Note: Standard errors are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
The dependent variable is the log of weekly hours worked. The single IV regression instruments for the share of migrant women in household services. The double IV instruments for both the share of migrant women in household services and the historical sex-ratio. All estimates include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area. For a detailed version of results for this specification including first-stage and reduced form estimates see Appendix Table A9.

6.3 Formal versus informal household service migrants

Household services is a broad term which covers a wide range of tasks. Previous literature has failed to distinguish between the type of household service workers, and therefore fails to establish which sector has a greater influence on female labour market outcomes. To investigate this I separate household services into two distinct sub-categories: formal and informal services. As outlined in Section 2.1, formal household services include childcare and aged care while informal household services concerns cleaners and laundry workers. These sub-sectors have vastly different characteristics including the type of workers and the settings. For example, childcare provision (a formal household service) is largely provided by governments in Australia with workers often subject to award rates. On the other hand, household cleaners (an informal household service) work directly in the home and are less formally provided or paid. This provides an ideal opportunity to contribute to the existing literature by better understanding the *type* of household service migrant that most effects female labour market outcomes.

I repeat the specification from equation 2 using the same instrument of predicted female migrant share. Rather than *all* household service migrants, I now use use the share of either formal or informal female household service migrants as my independent variable. The results from the regression are reported in Table 7. For both specifications I find a statistically significant effect on hours worked for women in the top-wage quartile, consistent with my previous findings and in line with the existing literature. Interestingly, the effect from an inflow of informal migrants appears to be over four times as large as the effect from an inflow of formal household service migrants. This provides an important and novel contribution as previous papers have suggested that flexibility in childcare may be the driving force in why migrants increase women's hours at work. These results indicate that it may in fact be cleaners, laundry workers and housekeepers who play a more influential role in improving the labour market outcomes of native women.

It is important to note however that the initial share of migrant women in household services is different across formal and informal household services. As a much larger sector, the average share of formal household service migrants across the sample is 1.8 percent, relative to 1 percent for the informal sector. As a result, a 0.1 percentage point increase represents a 5 percent increase from the current share in the formal sector compared to a much larger 10 percent increase from the current share in the informal sector.

While this may account for some of the discrepancy between the expected effect, it is highly unlikely to fully explain a coefficient estimate over four times as large in the informal household service sector. Since these occupations often rely on government-provided services and award rates, formal services prices are expected to be higher and more rigid than informal services. This rigidity likely limits the impact of an inflow of migrant women on prices, and consequently, on women's time-use decisions, with a minimal effect on price only influencing women at the very margins. Additionally, formal household services, such as child and aged care, are likely less flexible in terms of service provision, often adhering to fixed hours and being less available on short notice compared to informal services. Flexibility of household services is an important factor in determining women's availability for work; therefore, a lack of flexibility may limit the impact of formal migrants.

Table 7: Female household service migrants and log hours worked by Australian women: Formal versus informal household service workers

	Formal HS		Informal HS	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
0–25th percentile				
Share of migrant women in informal HS			70.736***	3.340
			(25.276)	(67.456)
Share of migrant women in formal HS	12.485	0.776		
	(11.577)	(15.676)		
Num.Obs.	2353	2353	2353	2353
25–50th percentile				
Share of migrant women in informal HS			-14.233	9.709
			(18.331)	(53.596)
Share of migrant women in formal HS	0.806	1.863		
	(6.553)	(10.118)		
Num.Obs.	2350	2350	2350	2350
50–75th percentile				
Share of migrant women in informal HS			-8.799	-2.292
			(9.683)	(26.020)
Share of migrant women in formal HS	-3.931	-0.526		
	(3.316)	(6.038)		
Num.Obs.	2345	2345	2345	2345
75–100th percentile				
Share of migrant women in informal HS			28.383**	64.131**
			(11.574)	(29.159)
Share of migrant women in formal HS	2.833	15.347**		
	(4.592)	(7.333)		
Num.Obs.	2343	2343	2343	2343

Note: Standard errors are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
The dependent variable is the log of weekly hours worked. For columns (1) and (2), the independent variable is the share of formal household service (HS) workers relative to the female population. For columns (3) and (4), it is the share of informal HS workers relative to the female population. Formal HS refers to 'Carers and Aids' while Informal HS refers to 'Cleaners and Laundry Workers' under the 2-digit Australian occupation index (ANZSCO). The instrumental variable in all regressions is the predicted share of all female migrants. All estimates include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area. For a detailed version of results for this specification see Appendix Tables A12 and A10.

7 Robustness checks

7.1 Correlation between historical characteristics and share

Goldsmith-Pinkham et al. (2020) provide a series of valuable tests to assess, at least partially, the validity of the identifying assumptions of the shift-share instrument. One such test involves estimating the correlation between the region of origin share and 1981 geographical area characteristics. What is important to note here is that a strong correlation between *levels* is not in and of itself an issue. The risk to exogeneity arises where there is a correlation between initial migrant shares and the *change* in geographical area characteristics, as far as these characteristics also influence changes in female labour market outcomes. Table A13 shows the correlation between 1981 migrant shares from the five largest inflow regions and 1981 geographical area characteristics. From this, we can see that the characteristics explain a large amount of variation in the share variable, up to 87 percent in the case of the UK. We can also see that most correlations are not statistically significant, with the exception of share of the 1981 labour force in secondary industries and the share of the 1981 labour force with bachelors degrees or higher. I control for secondary industry share with a dummy variable interaction term and correlation with education level by controlling for current day female education rate. This intends to limit the risk of omitted variables correlated to changes in the secondary industry and education shares and the dependent variable, and ensure that the instrument only effects changes in female labour force participation through it's effect on migration.

7.2 Exclusion of two major cities

Over 40 percent of the adult population of Australia lived in either Greater Melbourne or Greater Sydney in 2016 (Australian Bureau of Statistics, 2016). This may lead to results being heavily skewed towards these geographical areas. As a result, I re-estimate the main table of results excluding Melbourne and Sydney in Table A11. The magnitude of the coefficients remains the same. However as the sample size has reduced by almost 50 percent, the standard errors increase and render the results statistically insignificant. Nonetheless, the similar magnitude of the effect suggests that my findings are not solely driven by Australia's two largest cities.

7.3 Alternative data for dependent variable and shift-share instrument

I next test several alternative specifications of the data for robustness. Firstly, I test a more granular definition of the household service migrants for my independent variable. Specifically, I include only domestic cleaners, childcare and aged care workers. This excludes more general occupations like personal care assistants and unclassified household service workers. The results are presented in Table A14. Again, the only statistically significant result is for women in the fourth wage quartile, with the coefficient slightly larger in magnitude and weaker in statistical significance than the main result. This confirms that the main specification using two-digit occupation code is robust and that the results are not driven by unspecified or arguably less relevant workers.

Next, I consider a different shift-variable which relies on the total inflow of migrants by country of origin per month. Gender and education disaggregated migration data is not freely

available in Australia, meaning that than other the census data used for the main analysis, the only alternative data considers net inflows across *all* migrants. This data has relatively weak predictive power in estimating female household migrants as it considers inflows of male and female migrants of all ages and reports migrant arrivals to the closest integer of ten. Table A15 presents the results for this specification. The coefficient estimate for the fourth quartile is positive but smaller in magnitude than the main specification and no longer statistically significant. This is likely as estimates converge to zero in the face of measurement error, which is likely to have occurred considering inflows are rounded to the closest integer of ten.

I next consider a shift-variable which relies on the total inflow of female *household service* migrants, rather than adult female migrants as is used in the main specification. The results are presented in Table A16. The first stage estimates are substantially larger in this specification which is expected considering the shift-share and dependent variable in this specification both specifically relate to female household service migrants. This suggests that a 1 percentage point increase in the predicted share of household service migrants is associated with on average a 1.4 percentage point increase in the actual share of female household service migrants. Considering the IV result, I again find an economically and statistically significant effect in the fourth quartile of the wage distribution. The coefficient is slightly larger (approximately 25 percent larger) than the main specification.

Finally, I test the analysis excluding migrants from Nepal and Bhutan. As discussed in Section 3.3, no data on the share of migrants from Nepal and Bhutan is included in the 1981 share data, so instead I group these two countries with India to enable them to be included in the analysis. The results of the specification excluding shifts in Nepalese and Bhutanese female household service migrants is presented in Table A17. Once again the only statistically significant coefficient is in the top-wage quartile, however, surprisingly this coefficient is larger than in the baseline specification (17.71 up from 12.387). Unsurprisingly, the first stage estimate is lower in this specification than in Table 2. Given that a large number of female household service migrants come from these two countries, excluding them reduces the correlation between the current share of female household service migrants and my instrument, increasing the magnitude of the IV estimate.

Nonetheless, the overall stability of the coefficients in the presence of different data for both the dependent and independent variable provides convincing evidence of the robustness of the results. The relationship between the hours worked of high-income women and female household service migrants is unlikely to be driven by spurious correlation given that the relationship consistently holds across different iterations of the data.

8 Conclusion

Australia's gender pay gap reached an all time low in 2024, falling to just 21.7 percent, with the change driven by more women in management positions (Workplace Gender Equality Agency, 2023). In this paper I provide evidence that female migrants in household services may have contributed to this improvement, with a higher share of female migrant household service workers associated with more hours worked by women in the top wage quartile. These findings are consistent with a simple time-use model, run in line with existing global literature and are robust to the inclusion of alternative specifications of the independent variable and shift-share instrument. I further contribute to debate around the extensive margin effect and the differing effects for mothers, finding reduced labour market participation for women in the second wage quartile, and larger effects for mothers in the top wage quartile than comparable non-mothers. I provide novel evidence that the effect of an inflow of household service migrants is weaker in areas with more traditional ideas about gender roles, estimated using historical sex-ratios. Further, I provide new evidence that the type of household service migrants likely matters, finding that informal household service workers such as cleaners and housekeepers have an effect larger in magnitude than formal household service workers such as child and aged carers.

These findings have meaningful implications for policy makers about Australia's migration system and the determinants of female labour market outcomes. Firstly, by limiting the inflow of household service workers, Australia's points based migration may be inadvertently limiting the hours worked by native women by preventing declines in the price of household services. The policy announced in 2023 to streamline visa access for formal household service workers goes some way to addressing this. However, based on my findings, expanded access to informal workers may have had a greater impact on the time in market work by native women, particularly given the greater price and time flexibility of informal household services. This is particularly critical to closing the gender pay-gap given non-linear compensation in hours worked (i.e. disproportionately high wages for longer hours worked) (Goldin, 2014). Nonetheless, the negative extensive margin effect seen for women in lower wage quartiles suggests that women with high-income partners may opt out of the labour market in response to an inflow of household service migrants, creating a potentially negative effect for native women's labour market outcomes. This risk should be considered in policy making, however I would argue is outweighed by the positive effects for hours worked by high-income women for two reasons. Firstly, the non-linearity in hours worked is the largest remaining contributor to the gender pay gap, more so than the labour force participation decision of low income women (Goldin, 2014). Secondly, by increasing the hours worked and overall wages of high income women, the average returns to female human capital will increase, encouraging greater investment in work and education for future generations of women. The findings on the effect of historical sex-ratios also importantly emphasises the ongoing role of attitudes towards gender roles on women's labour market outcomes. Women in areas with higher historical sex-ratios and more conservative attitudes may benefit less from expanded access to household services, further increasing the gap in hours worked between women in historically low- and high- sex-ratio areas. This suggests that there is a need to raise awareness about equal household and familial responsibilities to ensure interventions to increase market work for women achieve their intended effect. For example, my findings may indicate

that cheaper childcare is less effective at improving the labour market outcomes of women with more traditional beliefs about gender roles and that without addressing these underlying beliefs, the effect of policies will be hampered.

It is worth noting that this research does have it's limitations. For one, it may have been beneficial to have more granular data than the geographical area level to increase the sample size and geographic variation, for example on an SA4 level.[20] This would have been particularly beneficial for analysis on the historical sex-ratios. Nonetheless, there are also benefits to using the higher level area, namely that it represents the regions where people most likely live and work. This would not necessarily have been the case if I was to use a more granular location variable given the likelihood that people commute for work. Additionally, it would have been advantageous to have data on net inflows disaggregated by gender, rather than relying on census estimates which are unlikely to capture all temporary workers.[21]

Further research would be beneficial to support the findings of this paper and contribute to broader understanding on the role of migrants and channels to improve female labour market outcomes. First, looking at the differing effects of female-related reforms in Australia (e.g. universal childcare) based on historical sex-ratios would provide valuable insight into the effect of gender norms on the efficiency of policies aimed at improving mothers hours worked. Secondly, given the importance of migrants in modern day Australia, more analysis is required to understand how different types of migrants effect different groups of Australians. For example, how household service migrants affect Aboriginal Australians or second generation Australian immigrants. Finally, further work is required to understand the ethical concerns of increasing Australia's intake of household service migrants, with past research pointing to substantial risk of exploitation amongst this potentially vulnerable group. Low-pay and poor working conditions for female household service migrants would undermine the purpose of expanding visa access for this group in the first place - to improve the labour market outcomes of women.

[20] Only researchers based in Australia are able to gain access to HILDA data on the SA4 level.

[21] Unfortunately, this data was only available with costly consultation from the Australian Bureau of Statistics and therefore could not be used for this analysis.

References

Australian Bureau of Statistics. (2021, July 17). *Greater Capital City Statistical Areas.* https://www.abs.gov.au/statistics/standards/australian-statistical-geography-standard-asgs-edition-3/jul2021-jun2026/main-structure-and-greater-capital-city-statistical-areas/greater-capital-city-statistical-areas

Australian Bureau of Statistics. (2024, April 24). *Australia's population by country of birth.* https://www.abs.gov.au/statistics/people/population/australias-population-country-birth/latest-release

Baranov, V., De Haas, R., and Grosjean, P. (2023). Men. Male-biased sex ratios and masculinity norms: evidence from Australia's colonial past. *Journal of Economic Growth*, 28(3):339–396. https://doi.org/10.1007/s10887-023-09223-x

Barone, G. and Mocetti, S. (2011). With a little help from abroad: the effect of low-skilled immigration on the female labour supply. *Labour Economics*, 18(5):664–675. https://doi.org/10.1016/j.labeco.2011.01.010

Bartik, T. J. (1991). *Who benefits from state and local economic development policies?* WE Upjohn Institute for Employment Research. https://doi.org/10.17848/9780585223940

Baxter, J., Hewitt, B., and Western, M. (2009). Who uses paid domestic labor in Australia? Choice and constraint in hiring household help. *Feminist Economics*, 15(1):1–26. https://doi.org/10.1080/13545700802248989

Beavan, K. (2023, November 23). New report suggests a path to end childcare shortages but desperate parents want action now. *ABC News.* https://www.abc.net.au/news/2023-11-24/child-care-availability-report-suggests-solutions-shortage/103129906

Becker, G. S. (1973). A theory of marriage: Part I. *Journal of Political Economy*, 81(4):813–846. https://doi.org/10.1086/260084

Becker, G. S. (1985). Human capital, effort, and the sexual division of labor. *Journal of Labor Economics*, 3(1, Part 2):S33–S58. https://doi.org/10.1086/298075

Berg, L. and Meagher, G. (2018). *Cultural exchange or cheap housekeeper? Findings of a national survey of au pairs in Australia.* Migrant Worker Justice Initiative. https://www.mwji.org/highlights/aupair

Bertrand, M., Kamenica, E., and Pan, J. (2015). Gender identity and relative income within households. *The Quarterly Journal of Economics*, 130(2):571–614. https://doi.org/10.1093/qje/qjv001

Borjas, G. J. (2003). The labor demand curve is downward sloping: Reexamining the impact of immigration on the labor market. *The Quarterly Journal of Economics*, 118(4):1335–1374. https://doi.org/10.1162/003355303322552810

Breunig, R., Deutscher, N., and To, H. T. (2017). The relationship between immigration to Australia and the labour market outcomes of Australian workers. *Economic Record*, 93(301):255–276. https://doi.org/10.1111/1475-4932.12328

Card, D. (2001). Immigrant inflows, native outflows, and the local labor market impacts of higher immigration. *Journal of Labor Economics*, 19(1):22–64. https://doi.org/10.1086/209979

Cortés, P. (2008). The effect of low-skilled immigration on US prices: evidence from CPI data. *Journal of political Economy*, 116(3):381–422. https://doi.org/10.1086/589756

Cortés, P. (2023). Immigration, household production, and native women's labor market outcomes: A survey of a global phenomenon. *European Economic Review*, 158:104545. https://doi.org/10.1016/j.euroecorev.2023.104545

Cortés, P. and Pan, J. (2013). Outsourcing household production: Foreign domestic workers and native labor supply in Hong Kong. *Journal of Labor Economics*, 31(2):327–371. https://doi.org/10.1086/668675

Cortés, P. and Pan, J. (2019). When time binds: Substitutes for household production, returns to working long hours, and the skilled gender wage gap. *Journal of Labor Economics*, 37(2):351–398. https://doi.org/10.1086/700185

Cortés, P. and Tessada, J. (2011). Low-skilled immigration and the labor supply of highly skilled women. *American Economic Journal: Applied Economics*, 3(3):88–123. https://www.aeaweb.org/articles?id=10.1257/app.3.3.88

Crown, D., Faggian, A., and Corcoran, J. (2020). High skilled immigration and the occupational choices of native workers: the case of Australia. *Oxford Economic Papers*, 72(3):585–605. https://doi.org/10.1093/oep/gpaa009

Department of Education. (2022, June 16). *Commonwealth welcomes additional funding from Victoria, NSW for early childhood education* [Press Release]. https://www.education.gov.au/early-childhood/announcements/commonwealth-welcomes-additional-funding-victoria-nsw-early-childhood-education

Eastman, C., Charlesworth, S., and Hill, E. (2018). *Fact Sheet 1: Migrant Workers in Frontline Care* [Fact Sheet]. UNSW. https://www.unsw.edu.au/content/dam/pdfs/unsw-adobe-websites/arts-design-architecture/ada-faculty/sprc/2021-06-Migrant%20Workers%20in%20Frontline%20Care.pdf

Farré, L., González, L., and Ortega, F. (2011). Immigration, family responsibilities and the labor supply of skilled native women. *The BE Journal of Economic Analysis & Policy*, 11(1). https://doi.org/10.2202/1935-1682.2875

Forlani, E., Lodigiani, E., and Mendolicchio, C. (2015). Impact of low-skilled immigration on female labour supply. *The Scandinavian Journal of Economics*, 117(2):452–492. https://doi.org/10.1111/sjoe.12101

Goldin, C. (2014). A grand gender convergence: Its last chapter. *American Economic Review*, 104(4):1091–1119. https://www.aeaweb.org/articles?id=10.1257/aer.104.4.1091

Goldsmith-Pinkham, P., Sorkin, I., and Swift, H. (2020). Bartik instruments: What, when, why, and how. *American Economic Review*, 110(8):2586–2624. https://www.aeaweb.org/articles?id=10.1257/aer.20181047

Gordon, J. A., Herbst, C. M., and Tekin, E. (2021). Who's minding the kids? Experimental evidence on the demand for child care quality. *Economics of Education Review*, 80:102076. https://doi.org/10.1016/j.econedurev.2020.102076

Grosjean, P. and Khattar, R. (2019). It's raining men! Hallelujah? The long-run consequences of male-biased sex ratios. *The Review of Economic Studies*, 86(2):723–754. https://doi.org/10.1093/restud/rdy025

Hurley, P., Noble, K., and Jackson, J. (2020). *Australian investment in education: Early learning.* Victoria University, Mitchell Institute. https://vuir.vu.edu.au/40392/1/Australian-Investment-in-Education-ECEC-report.pdf

Jones, J. (2023, February). *The most similar countries to Nepal.* Objective Lists. https://objectivelists.com/which-countries-are-most-similar-to-nepal/

Kaul, N. (2023, June 6). Australian visas 2023: Fast-tracked permanent residency for aged care workers recruited from overseas. *SBS News.* https://www.sbs.com.au/language/hindi/en/podcast-episode/fast-tracked-permanent-residency-for-aged-care-workers-recruited-from-overseas/rp0oktcvj

Mayda, A. M., Peri, G., and Steingress, W. (2022). The political impact of immigration: Evidence from the United States. *American Economic Journal: Applied Economics*, 14(1):358–389. https://www.aeaweb.org/articles?id=10.1257/app.20190081

OECD (2023a). The impact of migration on regional labour markets in Australia. *OECD Regional Development Papers*, (64). https://doi.org/10.1787/d72110b5-en

OECD (2023b). Regional productivity, local labour markets, and migration in Australia. *OECD Regional Development Papers*, (39). https://doi.org/10.1787/3cc8f669-en

Peri, G. (2016). Immigrants, productivity, and labor markets. *Journal of Economic Perspectives*, 30(4):3–30. https://www.aeaweb.org/articles?id=10.1257/jep.30.4.3

Peri, G. and Sparber, C. (2009). Task specialization, immigration, and wages. *American Economic Journal: Applied Economics*, 1(3):135–169. https://www.aeaweb.org/articles?id=10.1257/jep.30.4.3

Phillips, J. and Simon-Davies, J. (2017). *Migration to Australia: a quick guide to the statistics.* Parliament of Australia. https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1617/Quick_Guides/MigrationStatistics

Romiti, A. (2018). The effects of immigration on household services, labour supply and fertility. *Oxford Bulletin of Economics and Statistics*, 80(4):843–869. https://doi.org/10.1111/obes.12225

Summerfield, M., Garrard, B., Nessa, Mossamet, Kamath, R., Macalalad, N., Watson, N., and Wooden, M. (2023). *HILDA User Manual – Release 22.* Melbourne Institute: Applied Economic and Social Research, University of Melbourne.

Sumption, M. (2019, July). *The Australian points-based system: what is it and what would its impact be in the UK?* Migration Observatory, University of Oxford. https://migrationobservatory.ox.ac.uk/wp-content/uploads/2019/07/Report-The-Australian-points-based-system-what-is-it-and-what-would-its-impact-be-in-the-UK.pdf

UK Visas and Immigration (2023, September 9). *The UK's points-based immigration system: information for EU citizens.* Government of the United Kingdom, UK Visas and Immigration. https://www.gov.uk/guidance/the-uks-points-based-immigration-system-information-for-eu-citizens

Vera-Toscano, E. and Wilkins, R. (2019, July 29). Over 50% of young Australian adults still live with their parents – and the numbers are climbing faster for women. *The Conversation.* https://theconversation.com/over-50-of-young-australian-adults-still-live-with-their-parents-and-the-numbers-are-climbing-faster-for-women-120587

Wilkins, R., Vera-Toscano, E., and Botha, F. (2024). *The Household, Income and Labour Dynamics in Australia Survey: Selected findings from Waves 1 to 21.* Melbourne Institute: Applied Economic & Social Research, the University of Melbourne. https://melbourneinstitute.unimelb.edu.au/__data/assets/pdf_file/0008/4841909/HILDA_Statistical_Report_2023.pdf

Wood, D., Griffiths, K., and Emslie, O. (2020, August). *Cheaper childcare: A practical plan to boost female workforce participation.* Grattan Institute. https://grattan.edu.au/wp-content/uploads/2020/08/Cheaper-Childcare-Grattan-Institute-Report.pdf

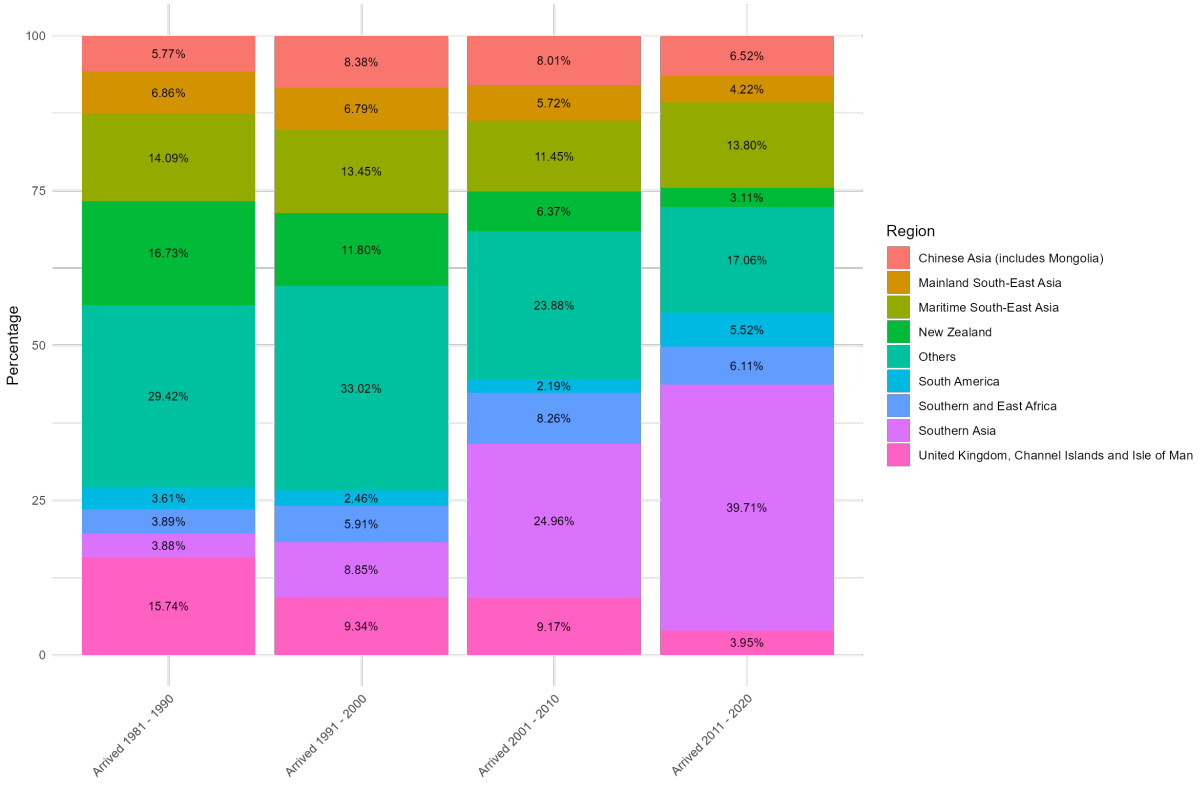
Workplace Gender Equality Agency. (2016). *Unpaid care work and the labour market.* Australian Government, Workplace Gender Equality Agency. https://www.wgea.gov.au/sites/default/files/documents/australian-unpaid-care-work-and-the-labour-market.pdf

Workplace Gender Equality Agency. (2023, November 28). *Gender pay gap falls 1.1 percentage points to new low of 21.7%* [Press Release]. https://www.wgea.gov.au/newsroom/gender-pay-gap-falls-to-new-low

World Population Review. (2024). *Percentage of illegal immigrants by country 2024.* https://worldpopulationreview.com/country-rankings/percentage-of-illegal-immigrants-by-country

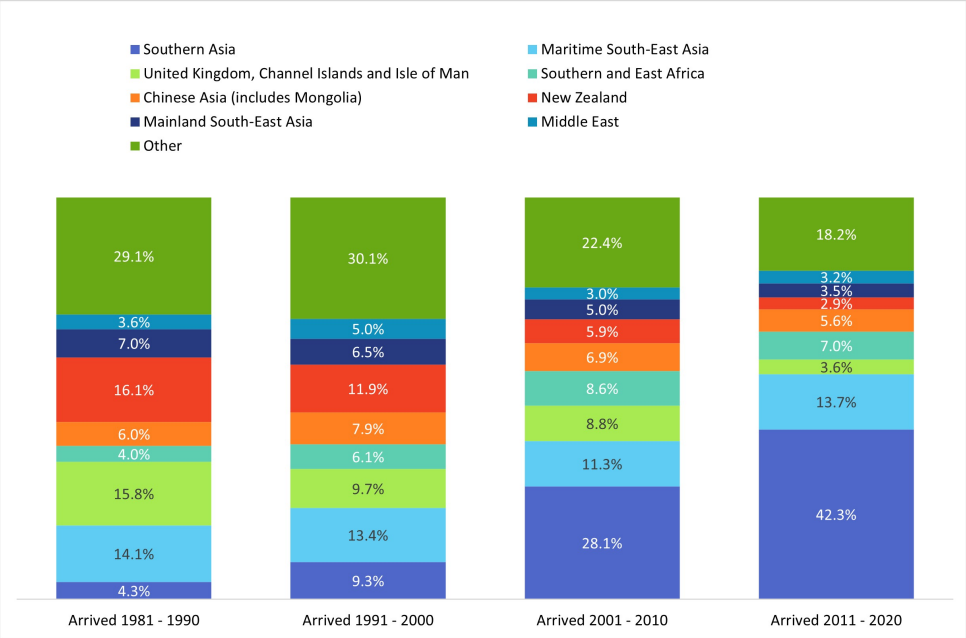
A Appendix

Figure A1: Female household service migrants (formal and informal) by region of birth and year of arrival



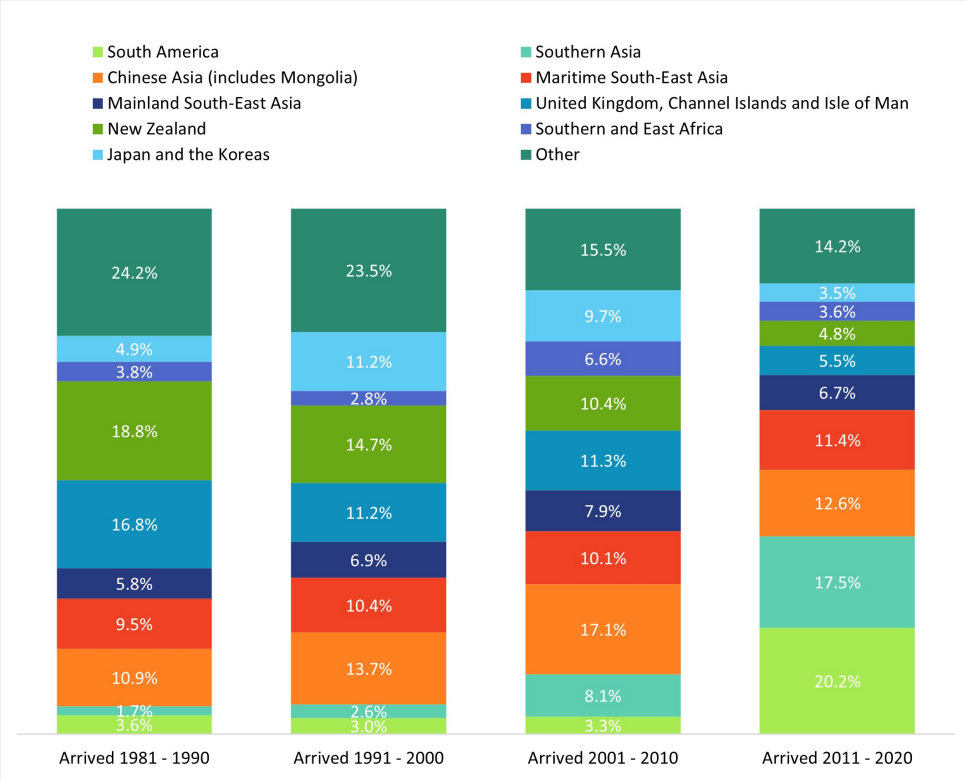
Note: Each percentage value refers to the portion of total migrant women surveyed in the 2021 Australian census and who arrived in the given period were born in each region.

Figure A2: Female formal household service migrants by region of birth and year of arrival



Note: Each percentage value refers to the portion of total migrant women surveyed in the 2021 Australian census and who arrived in the given period were born in each region. The sample is women in the formal household service sector (Carers and Aids).

Figure A3: Female informal household service migrants by region of birth and year of arrival



Note: Each percentage value refers to the portion of total migrant women surveyed in the 2021 Australian census and who arrived in the given period were born in each region. The sample is women in the informal household service sector (Cleaners and Laundry Workers).

Table A1: Top 20 countries by proportion of female workers in formal household services

Country birth	Women in informal HS	Women in formal HS	Women in all occupations	% Women in informal HS	% Women in formal HS	% Women in all HS
Australia	26487	327778	8580742	0.3%	3.8%	4.1%
Liberia	10	615	1704	0.6%	36.1%	36.7%
Sierra Leone	9	557	1868	0.5%	29.8%	30.3%
Nepal	213	15145	56076	0.4%	27.0%	27.4%
Nigeria	9	1275	5462	0.2%	23.3%	23.5%
South Sudan	44	909	4193	1.0%	21.7%	22.7%
Bhutan	152	1239	6170	2.5%	20.1%	22.5%
Ghana	16	572	2869	0.6%	19.9%	20.5%
DRC	21	557	3089	0.7%	18.0%	18.7%
Ethiopia	46	1293	7421	0.6%	17.4%	18.0%
Somalia	15	711	4296	0.3%	16.6%	16.9%
Kenya	30	1955	11870	0.3%	16.5%	16.7%
Burundi	9	226	1381	0.7%	16.4%	17.0%
Sudan	58	1225	8328	0.7%	14.7%	15.4%
Uganda	8	306	2141	0.4%	14.3%	14.7%
Congo	6	156	1168	0.5%	13.4%	13.9%
Eritrea	41	316	2918	1.4%	10.8%	12.2%
Solomon Islands	10	146	1350	0.7%	10.8%	11.6%
Tanzania	4	228	2142	0.2%	10.6%	10.8%
Bangladesh	32	2440	23934	0.1%	10.2%	10.3%
Philippines	1188	18348	180856	0.7%	10.1%	10.8%

Note: Figures are based on the most recent Australian census data (2023). HS refers to household service workers. Informal HS is cleaners and laungry workers. Formal HS is carers and aids, including child and aged carers. Congo refers to the Republic of the Congo and DRC refers to the Democratic Republic of Congo.

Table A2: Working Australian women: Summary statistics by year and wage quartile

Variable	2005	2008	2011	2015	2019
0–25th percentile					
Regularly pay for household help	7.21	7.46	6.89	9.22	11.72
Weekly wage	152.44	167.01	165.59	174.02	159.64
Hours worked (per week)	20.96	20.76	20.54	20.85	21.36
Hourly wage	16.16	16.93	18.06	17.06	17.40
Work in high-ranking occupation (percent)	27.12	26.54	26.59	25.95	29.45
Time spent on housework (per week)	20.81	20.25	17.95	17.79	16.82
Time caring for children/elderly (per week)	11.11	11.73	10.22	10.15	13.08
Have a child under 4 (percent)	21.05	23.31	17.67	20.38	24.31
Have a child under 17 (percent)	56.78	59.53	56.00	52.25	53.07
Have an elderly dependent (percent)	10.05	13.87	12.98	13.90	11.79
25–50th percentile					
Regularly pay for household help	10.24	10.11	7.80	6.66	8.09
Weekly wage	529.78	534.51	532.43	535.44	535.97
Hours worked (per week)	29.64	30.56	29.72	30.47	29.92
Hourly wage	21.17	19.96	20.08	19.57	20.07
Work in high-ranking occupation (percent)	25.97	21.42	23.06	26.12	25.94
Time spent on housework (per week)	17.23	16.47	15.46	13.71	13.85
Time caring for children/elderly (per week)	8.99	7.84	8.26	7.13	9.50
Have a child under 4 (percent)	14.63	13.20	16.04	17.07	18.96
Have a child under 17 (percent)	51.79	52.82	49.75	45.93	49.22
Have an elderly dependent (percent)	11.64	12.85	10.19	10.83	9.03
50–75th percentile					
Regularly pay for household help	11.38	10.71	10.21	10.84	9.25
Weekly wage	805.36	815.98	806.66	804.41	806.40
Hours worked (per week)	38.55	38.33	37.40	37.76	36.93
Hourly wage	22.73	23.15	23.32	23.41	23.18
Work in high-ranking occupation (percent)	37.57	42.03	42.27	45.16	45.79
Time spent on housework (per week)	12.73	13.08	11.82	11.42	12.23
Time caring for children/elderly (per week)	4.83	4.54	4.56	4.85	6.38
Have a child under 4 (percent)	10.31	11.56	10.31	13.13	13.72
Have a child under 17 (percent)	37.38	39.06	36.08	35.02	38.62
Have an elderly dependent (percent)	11.37	10.18	11.99	6.79	9.16
75–100th percentile					
Regularly pay for household help	21.03	19.57	20.74	22.83	21.42
Weekly wage	1315.43	1373.24	1385.43	1385.81	1432.91
Hours worked (per week)	43.72	42.76	42.49	42.64	42.13
Hourly wage	32.90	33.60	34.25	33.86	36.08
Work in high-ranking occupation (percent)	77.17	78.40	74.76	75.89	77.04
Time spent on housework (per week)	12.62	12.18	11.67	11.13	11.75
Time caring for children/elderly (per week)	4.15	4.19	4.45	5.19	6.23
Have a child under 4 (percent)	8.33	7.69	10.19	11.58	11.58
Have a child under 17 (percent)	32.97	34.04	36.26	36.52	38.37
Have an elderly dependent (percent)	9.43	10.06	11.45	12.46	9.78

Note: Figures are constructed usingHousehold Income and Labour Dynamics in Australia (HILDA) Survey. The sample includes Australian women between the ages of 25 and 64 who are currently in the labour force. Wage quartiles are calculated within each geographical area.

Table A3: Summary statistics by year and population group

Statistic	2005	2008	2011	2015	2019
Australian born men and women					
Regularly pay for household help	9.83	10.86	10.38	10.57	11.44
Number of Observations	6820.00	6844.00	9157.00	9431.00	9650.00
Australian born women					
Regularly pay for household help	9.96	10.69	10.31	10.57	11.71
Number of Observations	3593.00	3590.00	4829.00	4957.00	5072.00
Australian born working women					
Regularly pay for household help	12.01	11.88	11.58	12.26	12.91
Number of Observations	2478.00	2562.00	3400.00	3443.00	3652.00

Note: Figures are constructed usingHousehold Income and Labour Dynamics in Australia (HILDA) Survey. All population groups are restricted to 25 to 64 year olds. The Australian born men and women and Australian born women sample include all respondents, including those not in the labour market. Australian born working women includes women who are working in the reported survey period. The 2011 sample size increases dramatically due to a top-up sample added to the dataset in that survey year.

Table A4: Share of female household service migrants relative to adult female population

	GCSSA	2006	2011	2016
1	Greater Sydney	2.52	2.95	3.79
2	Rest of NSW	1.23	1.39	1.69
3	Greater Melbourne	2.42	3.00	3.81
4	Rest of Vic.	1.17	1.28	1.63
5	Greater Brisbane	2.38	2.91	3.59
6	Rest of Qld	1.90	2.30	2.91
7	Greater Adelaide	2.56	3.12	3.70
8	Rest of SA	1.61	1.74	1.98
9	Greater Perth	3.64	4.20	5.10
10	Rest of WA	2.27	2.76	3.40
11	Greater Hobart	1.22	1.46	1.88
12	Rest of Tas.	1.07	1.14	1.43
13	Greater Darwin	3.33	3.87	5.01
14	Rest of NT	1.72	1.89	2.69
15	Australian Capital Territory	2.31	2.60	3.59

Note: Figures are constructed using Australian census data. HS refers to household service. The share is estimated as the number of overseas born household service workers divided by the number of women aged between 25 and 64 in each geographical area.

Table A5: Share of migrant women in household services (HS) by year

	Migrant Women HS	Migrant Women Informal HS	Migrant Women Formal HS	Female Population
Average				
Number of women	161607	56576	105034	5819149
Share relative to female population	2.78%	0.97%	1.80%	
Change (pp)	0.10%	0.10%	0.10%	
Percentage increase	3.60%	10.29%	5.54%	
2016				
Number of women	211286	67840	143444	6293790
Share relative to female population	3.36%	1.08%	2.28%	
Change (pp)	0.10%	0.10%	0.10%	
Number of new workers	211.286	67.84	143.444	
Percentage increase	2.98%	9.28%	4.39%	
2011				
Number of women	154802	54024	100786	5820700
Share relative to female population	2.66%	0.93%	1.73%	
Change (pp)	0.10%	0.10%	0.10%	
Percentage increase	3.76%	10.77%	5.78%	
2006				
Number of women	118734	47864	70873	5342956
Share relative to female population	2.22%	0.90%	1.33%	
Change (pp)	0.10%	0.10%	0.10%	
Percentage increase	4.50%	11.16%	7.54%	

Note: Figures are constructed using Australian census data. HS refers to household services. Each column represents a different sub-sample of women. The 'Number of women' refers to women aged between 25 and 64 years old in each of the respective sub-sample. 'Share relative to female population' is the number of women in each sub-sample divided by the number of women in the female population. 'Change' refers to the percentage point change, which for the purposes of interpretation I keep at 0.1 throughout the paper. 'Percentage increase' is the percentage increase from the initial share for each sub-sample brought about by a 0.1 percentage point increase in the initial share. The first panel labelled 'Average' represents the average across all three years in the analysis.

Table A6: Top 20 countries by proportion of female workers in household service sector

Country birth	Women in informal HS	Women in formal HS	Women in all occupations	% Women in informal HS	% Women in formal HS	% Women in all HS
Australia	26487	327778	8580742	0.3%	3.8%	4.1%
Nepal	213	15145	56076	0.4%	27.0%	27.4%
South Sudan	44	909	4193	1.0%	21.7%	22.7%
Bhutan	152	1239	6170	2.5%	20.1%	22.5%
Ghana	16	572	2869	0.6%	19.9%	20.5%
Congo	21	557	3089	0.7%	18.0%	18.7%
Ethiopia	46	1293	7421	0.6%	17.4%	18.0%
Somalia	15	711	4296	0.3%	16.6%	16.9%
Kenya	30	1955	11870	0.3%	16.5%	16.7%
Sudan	58	1225	8328	0.7%	14.7%	15.4%
Eritrea	41	316	2918	1.4%	10.8%	12.2%
Brazil	934	1832	25073	3.7%	7.3%	11.0%
Philippines	1188	18348	180856	0.7%	10.1%	10.8%
El Salvador	39	526	5340	0.7%	9.9%	10.6%
Peru	68	624	6670	1.0%	9.4%	10.4%
Bangladesh	32	2440	23934	0.1%	10.2%	10.3%
Colombia	522	1399	18740	2.8%	7.5%	10.3%
Tonga	14	550	5536	0.3%	9.9%	10.2%
Zambia	18	323	3528	0.4%	9.2%	9.6%
Ecuador	28	102	1374	2.0%	7.4%	9.5%
Zimbabwe	61	1838	20376	0.3%	9.0%	9.3%

Note: Figures are based on the most recent Australian census data (2023). HS refers to household service workers. Informal HS is cleaners and laungry workers. Formal HS is carers and aids, including child and aged carers. Congo refers to the Republic of the Congo.

Table A7: Female household service migrants and log hours worked by Australian women: Analysis of the top-wage quartile

	OLS	First stage	Reduced form	IV
	(1)	(2)	(3)	(4)
1st Quartile of Q4 earners				
Predicted share of migrant women		0.280***	6.128	
		(0.083)	(4.401)	
Share of migrant women in HS	19.304**			21.907
	(8.635)			(13.302)
Num.Obs.	586	586	586	586
2nd Quartile of Q4 earners				
Predicted share of migrant women		0.116***	9.159***	
		(0.031)	(1.428)	
Share of migrant women in HS	24.576**			78.760***
	(10.357)			(21.608)
Num.Obs.	586	586	586	586
3rd Quartile of Q4 earners				
Predicted share of migrant women		0.157***	-2.459	
		(0.036)	(1.877)	
Share of migrant women in HS	-0.228			-15.672
	(4.991)			(13.911)
Num.Obs.	586	586	586	586
4th Quartile of Q4 earners				
Predicted share of migrant women		0.152***	2.429*	
		(0.034)	(1.408)	
Share of migrant women in HS	-1.208			16.015
	(5.391)			(11.311)
Num.Obs.	585	585	585	585

Note: Standard errors are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
The dependent variable for columns (1), (3) and (4) is log of weekly hours worked. The dependent variable for columns (2) is the share of migrant women in HS. All estimations include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area.

Table A8: Female household service migrants and log hours worked by Australian women: Heterogeneous effects for mothers

	Child under 4 years				Child under 17 years			
	OLS	First stage	Reduced form	IV	OLS	First stage	Reduced form	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0-25th Percentile								
Predicted share of migrant women		0.171***	-0.085			0.172***	0.631	
		(0.038)	(2.213)			(0.038)	(2.162)	
Share of migrant women in HS	14.738			0.225	19.379**			2.222
	(9.014)			(12.775)	(8.995)			(12.672)
Interaction with child under the age of 4 dummy	1.613			2.311				
	(2.943)			(3.588)				
Interaction with child under the age of 17 dummy					-4.714			-2.196
					(3.549)			(3.654)
Num.Obs.	2353	2353	2353	2353	2353	2353	2353	2353
25-50th Percentile								
Predicted share of migrant women		0.157***	0.497			0.158***	1.266	
		(0.035)	(1.408)			(0.036)	(1.301)	
Share of migrant women in HS	-1.241			2.190	3.793			5.634
	(6.606)			(8.876)	(6.467)			(8.136)
Interaction with child under the age of 4 dummy	-1.868			-3.512				
	(1.977)			(2.417)				
Interaction with child under the age of 17 dummy					-0.906			-3.802
					(1.415)			(2.555)
Num.Obs.	2350	2350	2350	2350	2350	2350	2350	2350
50-75th Percentile								
Predicted share of migrant women		0.173***	-0.143			0.173***	0.207	
		(0.039)	(0.819)			(0.039)	(0.840)	
Share of migrant women in HS	-3.501			-0.329	-3.615			0.400
	(2.823)			(4.709)	(2.426)			(4.754)
Interaction with child under the age of 4 dummy	2.821			2.475				

	(2.520)			(3.157)				
Interaction with child under the age of 17 dummy					-1.625			-1.753
					(1.423)			(1.439)
Num.Obs.	2345	2345	2345	2345	2345	2345	2345	2345
75-100th Percentile								
Predicted share of migrant women		0.162***	1.953**			0.161***	2.206***	
		(0.037)	(0.809)			(0.038)	(0.802)	
Share of migrant women in HS	4.892			12.096**	5.147			12.095**
	(3.625)			(5.340)	(3.631)			(5.081)
Interaction with child under the age of 4 dummy	-0.028			0.171				
	(3.328)			(3.182)				
Interaction with child under the age of 17 dummy					-1.708			-2.623**
					(1.453)			(1.328)
Num.Obs.	2343	2343	2343	2343	2343	2343	2343	2343

Note: Standard errors are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The dependent variable for columns (1), (3), (4), (5), (7) and (8) is log of weekly hours worked. The dependent variable for columns (2) and (6) is the share of migrant women in HS. All estimations include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area.

Regression Equations for Section 6.2

Baseline regression including an interaction with the historical sex-ratio

$$\begin{aligned} LS_{i,g,t} = \delta_0 + \delta_1 \frac{MigrantHS_{g,t}}{FemalePop_{g,t}} + \delta_3 \frac{MigrantHS_{g,t}}{FemalePop_{g,t}} HistRatio_{i,g,t} + \delta HistRatio_{i,g,t} \\ + \quad \delta_4 X_{i,g,t} + \delta_5 GA_{g,t} + \alpha_g + \mu_t + \epsilon_{g,t} \end{aligned} \tag{6}$$

Note: The OLS results for this specification are presented in column (1) of Table A9. The single IV, instrumenting only for the share of female migrants in household services is reported in column (4) of Table A9. The double IV, instrumenting the share of female migrants *and* the historical sex-ratio is reported in column (5) of Table A9. $X_{i,g,t}$ is a vector of individual control variables including age, age squared, married, dummy for having a child 4 or younger and a dummy for having a child 17. $GA_{g,t}$ is a vector of geographical area level controls including the unemployment rate, female education rate and 1981 secondary industry participation rate times year dummies. α_g and μ_t are geographical area and time fixed effects respectively.

First-stage for the shift-share instrument

$$\begin{aligned} \frac{MigrantHS_{g,t}}{FemalePop_{g,t}} = \pi_0 + \pi_1 \frac{\widehat{MigrantW}_{r,t}}{Pop_{c,1981}} + \pi_3 \frac{\widehat{MigrantW}_{r,t}}{Pop_{c,1981}} ConvictRatio_{i,g,t} + \pi ConvictRatio_{i,g,t} \\ + \quad \pi_4 X_{i,g,t} + \pi_5 GA_{g,t} + \alpha_g + \mu_t + \epsilon_{g,t} \end{aligned} \tag{7}$$

Note: The results for this specification are presented in column (2) of Table A9. $X_{i,g,t}$ is a vector of individual control variables including age, age squared, married, dummy for having a child 4 or younger and a dummy for having a child 17. $GA_{g,t}$ is a vector of geographical area level controls including the unemployment rate, female education rate and 1981 secondary industry participation rate times year dummies. α_g and μ_t are geographical area and time fixed effects respectively.

First-stage for the convict-ratio instrument

$$\begin{aligned} HistRatio_{i,g,t} = \lambda_0 + \lambda_1 \frac{\widehat{MigrantW}_{r,t}}{Pop_{c,1981}} + \lambda_3 \frac{\widehat{MigrantW}_{r,t}}{Pop_{c,1981}} ConvictRatio_{i,g,t} + \lambda ConvictRatio_{i,g,t} \\ + \quad \lambda_4 X_{i,g,t} + \lambda_5 GA_{g,t} + \alpha_g + \mu_t + \epsilon_{g,t} \end{aligned} \tag{8}$$

Note: The results for this specification are presented in column (5). $X_{i,g,t}$ is a vector of individual control variables including age, age squared, married, dummy for having a child 4 or younger and a dummy for having a child 17. $GA_{g,t}$ is a vector of geographical area level controls including the unemployment rate, female education rate and 1981 secondary industry participation rate times year dummies. α_g and μ_t are geographical area and time fixed effects respectively.

Table A9: Female household service migrants and log hours worked by Australian women: Heterogeneous effects from historical sex-ratios

	OLS	First-stage (Shift-share)	Reduced-form	Single IV	First-stage (Sex-ratio)	Double IV
	(1)	(2)	(3)	(4)	(5)	(6)
0–25th percentile						
Predicted share of migrant women		0.143***	-0.488		0.000	
		(0.046)	(3.355)		(0.000)	
Share of migrant women in HS (wpop)	6.252			-6.050		-12.989
	(16.398)			(21.464)		(22.283)
Dependent variable interaction with sex ratio	2.038			-0.775		1.367
	(4.010)			(4.714)		(4.935)
Instrument interaction with sex ratio			-0.407			
			(1.386)			
Convict sex-ratio		0.000			0.061***	
		(0.000)			(0.000)	
Num.Obs.	2331	2331	2331	2331	2331	2331
25–50th percentile						
Predicted share of migrant women		0.135***	1.152		0.000**	
		(0.043)	(1.683)		(0.000)	
Share of migrant women in HS (wpop)	11.726			8.030		5.280
	(8.140)			(10.905)		(10.886)
Dependent variable interaction with sex ratio	-3.215*			-0.799		0.036
	(1.741)			(1.581)		(1.570)
Instrument interaction with sex ratio			-0.157			
			(0.467)			
Convict sex-ratio		0.000			0.061***	
		(0.000)			(0.000)	
Num.Obs.	2328	2328	2328	2328	2328	2328
50–75th percentile						
Predicted share of migrant women		0.147***	-0.635		0.000*	
		(0.047)	(1.438)		(0.000)	

Share of migrant women in HS (wpop)	-5.505			-2.257		-0.716
	(5.263)			(8.622)		(8.592)
Dependent variable interaction with sex ratio	1.422			1.157		0.663
	(1.410)			(1.374)		(1.398)
Instrument interaction with sex ratio			0.406			
			(0.375)			
Convict sex-ratio		0.000			0.061***	
		(0.000)			(0.000)	
Num.Obs.	2323	2323	2323	2323	2323	2323
75–100th percentile						
Predicted share of migrant women		0.141***	4.971***		0.000*	
		(0.043)	(1.626)		(0.000)	
Share of migrant women in HS (wpop)	11.525*			29.186***		28.608***
	(6.429)			(8.522)		(8.271)
Dependent variable interaction with sex ratio	-2.172			-4.712***		-4.524***
	(1.614)			(1.740)		(1.660)
Instrument interaction with sex ratio			-1.344**			
			(0.602)			
Convict sex-ratio		0.000			0.061***	
		(0.000)			(0.000)	
Num.Obs.	2322	2322	2322	2322	2322	2322

Note: Standard errors are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The dependent variable for columns (1), (3), (4) and (6) is log of weekly hours worked. The dependent variable for column (4) is the share of female migrant HS workers relative to the female population. The dependent variable for column (5) is the historical sex-ratio from the first census. The single IV regression (4) instruments for the share of migrant women in household services. The double IV (6) instruments for both the share of migrant women in household services and the historical sex-ratio. All estimates include census year and geographical area fixed effects and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area $\times$ census year level. Female weekly wage distribution is constructed by geographical area.

Table A10: Female *informal* household service migrants and log hours worked by Australian women: Working women by wage quartile

	OLS	First stage	Reduced form	IV
	(1)	(2)	(3)	(4)
0–25th percentile				
Predicted share of migrant women		0.032**	0.108	
		(0.013)	(2.193)	
Share of migrant women in informal HS	70.736***			3.340
	(25.276)			(67.456)
Num.Obs.	2353	2353	2353	2353
25–50th percentile				
Predicted share of migrant women		0.025*	0.245	
		(0.013)	(1.330)	
Share of migrant women in informal HS	-14.233			9.709
	(18.331)			(53.596)
Num.Obs.	2350	2350	2350	2350
50–75th percentile				
Predicted share of migrant women		0.032**	-0.074	
		(0.014)	(0.848)	
Share of migrant women in informal HS	-8.799			-2.292
	(9.683)			(26.020)
Num.Obs.	2345	2345	2345	2345
75–100th percentile				
Predicted share of migrant women		0.031**	1.999**	
		(0.013)	(0.800)	
Share of migrant women in informal HS	28.383**			64.131**
	(11.574)			(29.159)
Num.Obs.	2343	2343	2343	2343

Note: Standard errors * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The dependent variable for columns (1), (3) and (4) is log of weekly hours worked. The dependent variable for columns (2) is the share of migrant women in HS. All estimations include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area.

Table A11: Female household service migrants and log hours worked by Australian women: Excluding Melbourne and Sydney

	OLS	First-stage	IV
	(1)	(2)	(3)
0–25th percentile			
Predicted share of migrant women		0.148***	
		(0.049)	
Share of migrant women in HS	18.405*		11.333
	(9.445)		(18.637)
Num.Obs.	1572	1572	1572
25–50th percentile			
Predicted share of migrant women		0.138**	
		(0.054)	
Share of migrant women in HS	-5.637		-24.295
	(9.768)		(16.989)
Num.Obs.	1569	1569	1569
50–75th percentile			
Predicted share of migrant women		0.162***	
		(0.060)	
Share of migrant women in HS	-9.548**		6.771
	(3.785)		(8.436)
Num.Obs.	1564	1564	1564
75–100th percentile			
Predicted share of migrant women		0.152***	
		(0.053)	
Share of migrant women in HS	1.933		10.441
	(3.697)		(8.588)
Num.Obs.	1563	1563	1563

Note: Standard errors are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
The dependent variable for columns (1) and (3) is log of weekly hours worked. The dependent variable for columns (2) is the share of migrant women in HS. All estimations include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area.

Table A12: Female *formal* household service migrants and log hours worked by Australian women: Working women by wage quartile

	OLS	First-stage	Reduced-form	IV
	(1)	(2)	(3)	(4)
0–25th percentile				
Predicted share of migrant women		0.139***	0.108	
		(0.035)	(2.193)	
Share of migrant women in formal HS	12.485			0.776
	(11.577)			(15.676)
Num.Obs.	2353	2353	2353	2353
25–50th percentile				
Predicted share of migrant women		0.131***	0.245	
		(0.035)	(1.330)	
Share of migrant women in formal HS	0.806			1.863
	(6.553)			(10.118)
Num.Obs.	2350	2350	2350	2350
50–75th percentile				
Predicted share of migrant women		0.141***	-0.074	
		(0.036)	(0.848)	
Share of migrant women in formal HS	-3.931			-0.526
	(3.316)			(6.038)
Num.Obs.	2345	2345	2345	2345
75–100th percentile				
Predicted share of migrant women		0.130***	1.999**	
		(0.035)	(0.800)	
Share of migrant women in formal HS	2.833			15.347**
	(4.592)			(7.333)
Num.Obs.	2343	2343	2343	2343

Note: Standard errors * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The dependent variable for columns (1), (3) and (4) is log of weekly hours worked. The dependent variable for columns (2) is the share of migrant women in HS. All estimations include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area.

Table A13: Relationship between Region Origin Share and 1981 GCCSA Characteristics

	India^{+}	UK	China	Philippines	NZ
	(1)	(2)	(3)	(4)	(5)
Share of 1981 LF in primary industries	0.511	-0.244	0.069	0.436	-0.800
	(0.865)	(0.483)	(2.489)	(2.412)	(1.499)
Share of 1981 LF in secondary industries	2.629***	1.266**	2.522	2.856	0.370
	(0.791)	(0.442)	(2.275)	(2.204)	(1.370)
Share of 1981 LF in tertiary industries	-0.085	-0.814	-1.813	-1.356	-1.349
	(1.127)	(0.629)	(3.243)	(3.141)	(1.952)
Share of 1981 LF with Bachelors degree or higher	1.722	1.670**	4.810	4.367	2.008
	(1.236)	(0.690)	(3.556)	(3.445)	(2.141)
Num.Obs.	15	15	15	15	15
R2	0.833	0.873	0.513	0.522	0.325

Note: Standard errors are reported in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01.

+ India includes Nepal and Bhutan.

Each column reports results of a single regression of a 1981 region share on 1981 characteristics. Results are weighted by 2006 population size.

Table A14: Female household service migrants and log hours worked by Australian women: Level-four occupational classification (Different independent variable)

	OLS	First-stage	Reduced-form	IV
	(1)	(2)	(3)	(4)
0–25th percentile				
Predicted share of migrant women		0.105***	0.595	
		(0.036)	(2.157)	
Share of migrant women in HS	20.235*			5.654
	(11.487)			(19.760)
Num.Obs.	2362	2362	2362	2362
25–50th percentile				
Predicted share of migrant women		0.093***	-0.028	
		(0.035)	(1.268)	
Share of migrant women in HS	-0.339			-0.299
	(7.241)			(13.596)
Num.Obs.	2360	2360	2360	2360
50–75th percentile				
Predicted share of migrant women		0.105***	0.160	
		(0.037)	(0.817)	
Share of migrant women in HS	-4.390			1.520
	(3.740)			(7.747)
Num.Obs.	2356	2356	2356	2356
75–100th percentile				
Predicted share of migrant women		0.097***	1.943**	
		(0.035)	(0.782)	
Share of migrant women in HS	6.056			20.012*
	(4.485)			(10.299)
Num.Obs.	2351	2351	2351	2351

Note: Standard errors are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
The dependent variable for columns (1), (3) and (4) is log of weekly hours worked. The dependent variable for columns (2) is the share of migrant women in HS. All estimations include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area.

Table A15: Female household service migrants and log hours worked by Australian women: Total inflow of migrants (Different shift variable)

	OLS	First-stage	Reduced-form	IV
	(1)	(2)	(3)	(4)
0–25th percentile				
Predicted share of migrant women		1.429***	1.705	
		(0.295)	(21.555)	
Share of migrant women in HS	7.453			1.194
	(12.857)			(15.038)
Num.Obs.	2362	2362	2362	2362
25–50th percentile				
Predicted share of migrant women		1.374***	8.995	
		(0.301)	(11.720)	
Share of migrant women in HS	-4.185			6.547
	(5.932)			(9.248)
Num.Obs.	2360	2360	2360	2360
50–75th percentile				
Predicted share of migrant women		1.446***	1.541	
		(0.315)	(7.562)	
Share of migrant women in HS	0.981			1.065
	(3.596)			(5.133)
Num.Obs.	2356	2356	2356	2356
75–100th percentile				
Predicted share of migrant women		1.412***	21.356**	
		(0.296)	(10.188)	
Share of migrant women in HS	6.667			15.123**
	(5.977)			(7.506)
Num.Obs.	2351	2351	2351	2351

Note: Standard errors are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
The dependent variable for columns (1), (3) and (4) is log of weekly hours worked. The dependent variable for columns (2) is the share of migrant women in HS. All estimates include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area.

Table A16: Female household service migrants and log hours worked by Australian women: Migrant women in household services (Different shift variable)

	OLS	First-stage	Reduced-form	IV
	(1)	(2)	(3)	(4)
0–25th percentile				
Predicted share of migrant women		0.003***	0.000	
		(0.000)	(0.039)	
Share of migrant women in HS	7.453			0.114
	(12.857)			(14.520)
Num.Obs.	2362	2362	2362	2362
25–50th percentile				
Predicted share of migrant women		0.003***	0.010	
		(0.001)	(0.019)	
Share of migrant women in HS	-4.185			3.942
	(5.932)			(7.861)
Num.Obs.	2360	2360	2360	2360
50–75th percentile				
Predicted share of migrant women		0.003***	-0.010	
		(0.001)	(0.011)	
Share of migrant women in HS	0.981			-3.676
	(3.596)			(4.333)
Num.Obs.	2356	2356	2356	2356
75–100th percentile				
Predicted share of migrant women		0.003***	0.020	
		(0.000)	(0.017)	
Share of migrant women in HS	6.667			7.614
	(5.977)			(6.554)
Num.Obs.	2351	2351	2351	2351

Note: Standard errors are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
The dependent variable for columns (1), (3) and (4) is log of weekly hours worked. The dependent variable for columns (2) is the share of migrant women in HS. All estimates include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area.

Table A17: Female household service migrants and log hours worked by Australian women: Excluding Nepal and Bhutan (Different Shift Variable)

	OLS	First-stage	Reduced-form	IV
	(1)	(2)	(3)	(4)
0–25th percentile				
Predicted share of migrant women		0.142***	-0.628	
		(0.032)	(2.117)	
Share of migrant women in HS	7.453			-4.440
	(12.857)			(15.122)
Num.Obs.	2362	2362	2362	2362
25–50th percentile				
Predicted share of migrant women		0.138***	0.308	
		(0.031)	(1.270)	
Share of migrant women in HS	-4.185			2.237
	(5.932)			(9.267)
Num.Obs.	2360	2360	2360	2360
50–75th percentile				
Predicted share of migrant women		0.146***	0.951	
		(0.033)	(0.888)	
Share of migrant women in HS	0.981			6.494
	(3.596)			(6.083)
Num.Obs.	2356	2356	2356	2356
75–100th percentile				
Predicted share of migrant women		0.143***	2.538**	
		(0.032)	(1.060)	
Share of migrant women in HS	6.667			17.717**
	(5.977)			(8.097)
Num.Obs.	2351	2351	2351	2351

Note: Standard errors are reported in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
The dependent variable for columns (1), (3) and (4) is log of weekly hours worked. The dependent variable for columns (2) is the share of migrant women in HS. All estimates include census year and geographical area fixed effect and geographical area controls for: the unemployment rate, rate of females with a bachelors degree or higher and the 1981 secondary industry share interacted with a census year dummy. Individual controls include age, age squared, married dummy, dummy for having a child 4 years old or younger and dummy for having a child 17 or younger. Errors are clustered at the geographical area × census year level. Female weekly wage distribution is constructed by geographical area.