Winning the Bread and Baking it Too: Women's Excess Home Production Time and Household Inefficiency

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Abstract

We document that female breadwinners do more home production than their male partners, even when restricting to "housework" like cooking and cleaning instead of childcare. By comparing to gay male and female couples, we highlight that specialization within heterosexual households does not appear to be "gender neutral" even after accounting for average earnings differences. This could be explained by either a large *comparative* advantage (in "housework," not childcare) by women or some gendered inefficiency in the division of home production within the household. Using a model, we show that if either of these two elements are present, unions involving women who out-earn their male partner will produce lower surplus: A gendered friction in the reallocation of home production means that relative earning status affects real economic returns to marriage. This provides a micro-founded reason for substantial literature showing that lower relative earning by men decreases marriage rates. We test our mechanism—that allocation of housework plays a role, rather than only norms about earning—by exploiting variation in home production by men based on country of origin. We show that being in an environment where women are more likely to out-earn their partners is particularly likely to explain ethnic out-marriage when one's country of origin has a strong gender-bias in household production.

1   Introduction

While women have entered the labor force at increasing rates, and exceed men in schooling investments, stubborn gender gaps remain, especially in high-paying, time intensive jobs. Some of this gap is often attributed to women's preferences to work fewer hours, choose jobs with more flexibility, and spend more time out of the labor force or working part-time. It seems apparent, therefore, that women's time use outside of labor supply connects to these remaining gaps. While much research has focused on how the birth of children affects women's wages (Kleven et al., 2019), this paper focuses on another persistent, and puzzling, gender gap: women's greater time spent on household chores. This paper explores the way in which households allocate home production time both empirically and theoretically. We show empirically that the allocation of even non-childcare tasks like housework appears gendered, irrespective of relative earning status. We then demonstrate theoretically that if men have either a productivity disadvantage or social unwillingness to do housework, it will mean that the marital surplus for couples with "traditional" earnings pattern will be higher than that for couples where the wife out-earns the husband, which we test empirically.

Our paper first documents a puzzling stylized fact using data from the American Time Use Survey (ATUS): women who are breadwinners in heterosexual relationships spend more time on household chores than their male partners. In every other couple type – heterosexual couples with male breadwinners, lesbian couples, and gay couples – the breadwinner spends less time on chores than the non-breadwinner. More startlingly, we show this is driven not by childcare, but rather chores like food preparation and cleaning.

We also use predicted wages, rather than realized earnings, to show that this lack of reallocation by relative earning status is particular to heterosexual marriages. In same sex male relationships, men respond just as much to their predicted percent of household wages as do women in heterosexual relationships. It appears that within heterosexual relationships, the allocation of household tasks is not gender neutral.

Since these could be explained by some fixed unobserved characteristics of men and women in a relationship, we then turn to variation over time within a given relationship. Using data from the Panel Study of Income Dynamics, in the US, and the Household, Labor, and Income Dynamics in Australia (HILDA) survey, we document

that changes in relative earnings within a household have very little impact on the time devoted to household tasks by men. We also show that upon household dissolution, men increase their time devoted to tasks while women decrease it substantially (while the opposite occurs when a household forms), suggesting that men are capable of altering their time-use investments and do care about household production.

To explain these patterns, we construct a framework that models how single and married households determine how much time is devoted to home production and which members of the household perform these tasks. Our model assumes efficient household decisions and allows heterogeneity in the wages and household production productivity of each partner. The model allows individuals to distribute their time between labor, leisure, and household production.

To explain the fact that women who earn more (and thus have an absolute advantage in wage-earning) still do more cooking and cleaning with a standard efficient household model requires that bread-winning women have an even larger advantage in the efficiency of home production. This efficiency could be either based on skills or socially constructed, such as from a utility cost of performing in gender non-concordant domains.

The model also highlights that forming a household opens up partners to trade in home production, something that they are not able to do when single, and also introduces returns to scale in the form of some portion of home production being a public good. This allows them to reallocate time spent in home production to the household member that has the comparative advantage. Depending on the relative forces of comparative advantage and returns to scale, women's home production time could go up upon marriage, and down upon divorce, as her greater productivity is utilized in the "open economy" of marriage. This greater contribution to the household surplus should be compensated through consumption, rather than through leisure time, as a partner who performs better in both domains has time that is too valuable to spend on leisure, aligning with our stylized facts.

However, we also document a few facts that appear to point to a gendered inefficiency in the allocation of household labor, rather than just an efficient model with comparative advantage. Both total time and the implied time cost of home production goes down upon divorce. The latter, in particular, cannot happen in an efficient model, where the gendered reallocation only happens if the woman's time is *cheaper*. Furthermore, we show that as women's wage rate goes from below one half

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her partner's to over two times his, men's home production time fails to increase. This is not possible in a comparative advantage model, where the degree of comparative advantage would be relative to the wage ratio.

This unresponsiveness of men's household time to relative wages is not driven by part-time possibilities, as we show it even occurs in households where both partners are in high part-time occupations, and thus truly could reallocate men's time into home production, and women's time into market work.

Dividing households into 20 quantiles by relative wage, we show this pattern is visible across the full distribution of relative wages. While women appear to "optimize" by shifting their work hours and home production hours in an arc as their earning power shifts, men change their time allocation very little from the 10th to the 90th percentile of relative earnings. Even when men become non-working, with a very low opportunity cost of time, they exhibit a small increase in home production that is dwarfed by their increase in leisure time.

We then turn to the implications of these findings. The model, with differential productivity by gender or with inefficiency, produces a stark implication: marriages where wives out-earn husbands will generate less surplus than those where husbands out-earn wives. This provides micro-foundations for the result in Bertrand et al. (2015) that there appear to be "missing marriages" where wives out-earn husbands. It also provides a new insight in a broader literature showing that the relationship between male and female earnings impacts marriage and divorce (Killewald, 2016; Autor et al., 2019; Wilson, 1987; Bertrand et al., 2020; Feyrer et al., 2008; Gimenez-Nadal et al., 2012),for the first time emphasizing the role of men's performance of home production, rather than stigma against high-earning women, as a possible channel decreasing real, not perceived, surplus from these marriages.

To test that our channel plays a role, we seek a setting where willingness to perform housework may vary, since our model predicts that the disadvantage from female-high-earning households is proportional to men's housework disadvantage, unlike in other explanations like men simply being threatened by women's earning power. Using variation in ethnic groups and data on the ratio of women's to men unpaid home production time in country of origin, we show that expected female over male earnings and expected female over male housework interact to predict higher ethnic out-marriage. That is, individuals from an ethnic group where women do substantially more housework than men in marriage markets where men earn less are more

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likely to marry someone from outside their ethnic group.

Our paper relates to several literatures. The fact that heterosexual women perform more housework than their partner has been documented with regularity, and remains true even in developed economies across multiple countries, time periods, policy landscapes, and levels of gender progressivity (Kommission (2004); Bittman et al. (2003); Rizavi and Sofer (2010)). A common explanation for this, most notably argued by Becker (1998), is that small biological differences and/or gendered socialization of boys and girls can lead to a gender gap in productivity at household tasks that endows women with comparative advantage with household tasks. In addition to Becker's initial unitary framework, the more modern collective approach to modeling household decision making, which assumes households are efficient, also posits a dominant role of comparative advantage as members allocate time to domestic and market production according to their marginal productivities in the relevant areas (Browning et al., 2014).

Increasingly, empirical evidence casts doubt on the ability of comparative advantage alone to explain observed patterns in the distribution of housework. Firstly, women's labor market participation and earnings relative to men have greatly increased, while their human capital investment has exceed that of men (Blau and Kahn, 2007, 2017), and technological change has greatly eased the skill investments required for home production (Greenwood et al., 2005).

Additionally, there is consistent evidence that within couples, looking at both the cross section and in panel data, that women's home production decreases as a function of their relative income in the household, but typically stops falling as women begin to make more than their partner (panel data (Bertrand et al. 2015; Bittman et al. 2003), cross section (Rizavi and Sofer 2010; Sevilla-Sanz et al. 2010)) In fact, both Bertrand et al. (2015) and Bittman et al. (2003) present empirical results showing women's housework increases as they earn more than their spouses, although our results provide much more mixed evidence of this claim. Lastly, in a direct test of a simple, Cobb-Douglas Beckerian model of household time allocations, Siminski and Yetsenga (2022) find that a woman "would need to be 109 times more productive in market work than her husband before reaching expected parity in domestic work," which seems implausibly high. Our work thus seeks to take these empirical regularities and bring them to a model of marriage formation which would highlight the possible interaction between gender differences in household chores and marital surplus.

Our work has important implications for closing the gender gap (Goldin, 2014), documenting sources of heterogeneity in estimated own-wage elasticity of labor demand (Lichter et al., 2015), improving models of household decision making, and investigating the role of social norms on economic behavior (Akerlof and Kranton, 2000).

The rest of the paper is organized as follows. The next section documents stylized facts about household tasks allocation by gender and relationship status. Section 3 then proposes a model of the household to try to explain these facts and derive conclusions about marital surplus. The next section tests the empirical implications of this model. Finally, the last section concludes.

2   Stylized Facts

2.1   Home Production by Breadwinning Status

It is well known that women perform more household tasks than their spouses. The OECD documents that women spend on average twice as many minutes per week on unpaid care than their male counterparts around the world. Often, it has been argued that this reflects a natural advantage or something similar that would make women more able to perform these tasks. However, what we wish to document in this section is how orthogonal these purported advantages appear to be to how much women can earn in the labor market.

We start by documenting a puzzling stylized fact using the American Time Use Survey (ATUS). In most couple types, the breadwinner does less home production than the non-breadwinner. This is true for straight couples with a male breadwinner, for gay male couples, and for lesbian couples. It is not, however, true for straight couples with a female breadwinner. Figure 1 shows that in these couples, the female partner, who is also the breadwinner, does more home production than the non-breadwinning male partner.
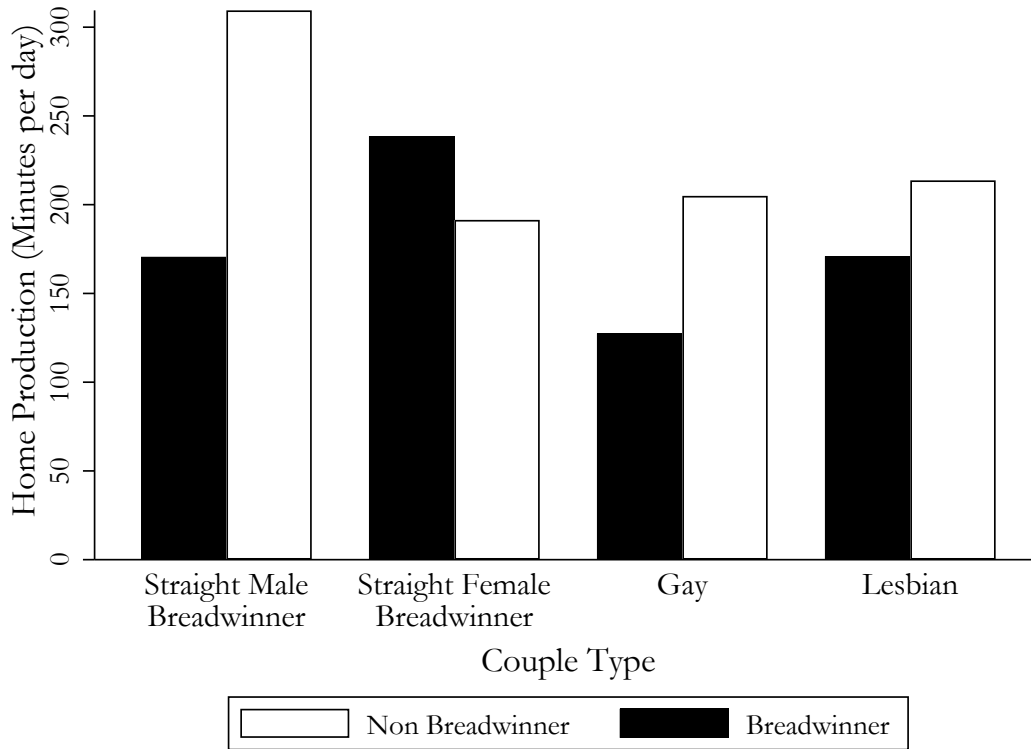
Figure 1: ATUS Home Production

Notes: This figure shows mean levels of home production (including time spent on chores, childcare, and home management) for both married and cohabiting couples. Breadwinners are determined by comparing the reported usual weekly earnings of couple members. Both couple members are aged between 20 and 55 years old. Data are from the 2003 to 2019 waves of the American Time Use Survey.

Figure 2 shows this fact holds when we exclude childcare, and focus on "housework" only, specifically cooking, cleaning, and interior maintenance and decoration. While there may be biological asymmetries that result in women doing more childcare, such as the need to recover from childbirth and breastfeeding, and then further dynamic complementarities that arise from this initial distribution, there seem to be fewer arguments as to why there should be a fundamental gender difference in the performance of housework tasks such as laundry and meal preparation.
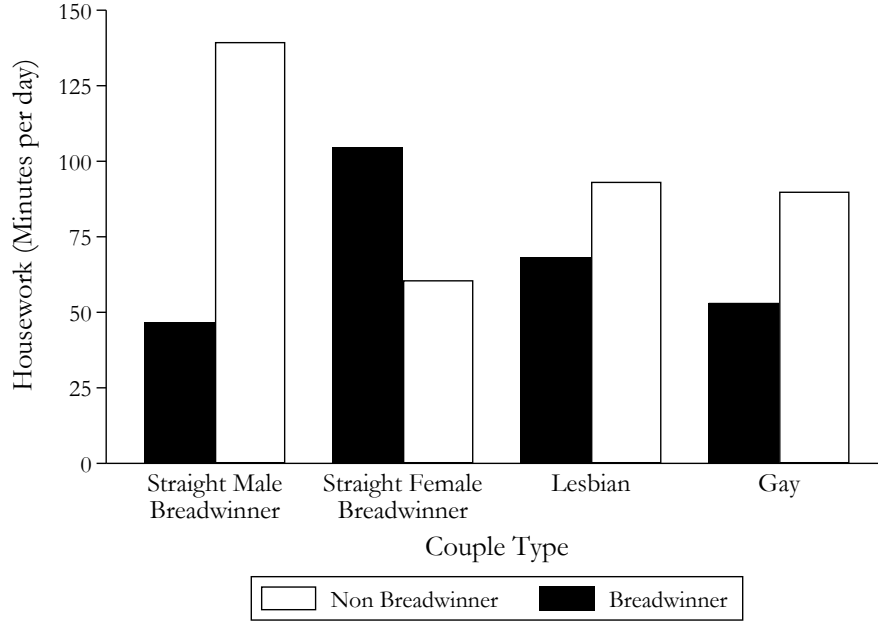
Figure 2: ATUS Housework

Notes: This figure shows mean levels of housework (defined as as the sum of the following ATUS time-use categories: Housework; Food & Drink Preparation, Presentation, & Clean-up; Interior Maintenance, Repair & Decoration) for both married and cohabiting couples. Breadwinners are determined by comparing the reported usual weekly earnings of couple members. Both couple members are aged between 20 and 55 years old. Data are from the 2003 to 2019 waves of the American Time Use Survey.

One challenge to this might be that this reversed pattern in housework specialization appears only because women are temporarily breadwinners, and after experiencing child penalties, they will then be the lower earner, and thus specialization follows this anticipated pattern. As a counter to this, Figure 3 shows the same reversal in housework time for straight couples with female breadwinners when they are childless, after having a child who is under 5, and when having children over 5, by which point we may consider the breadwinning status to be more permanent.
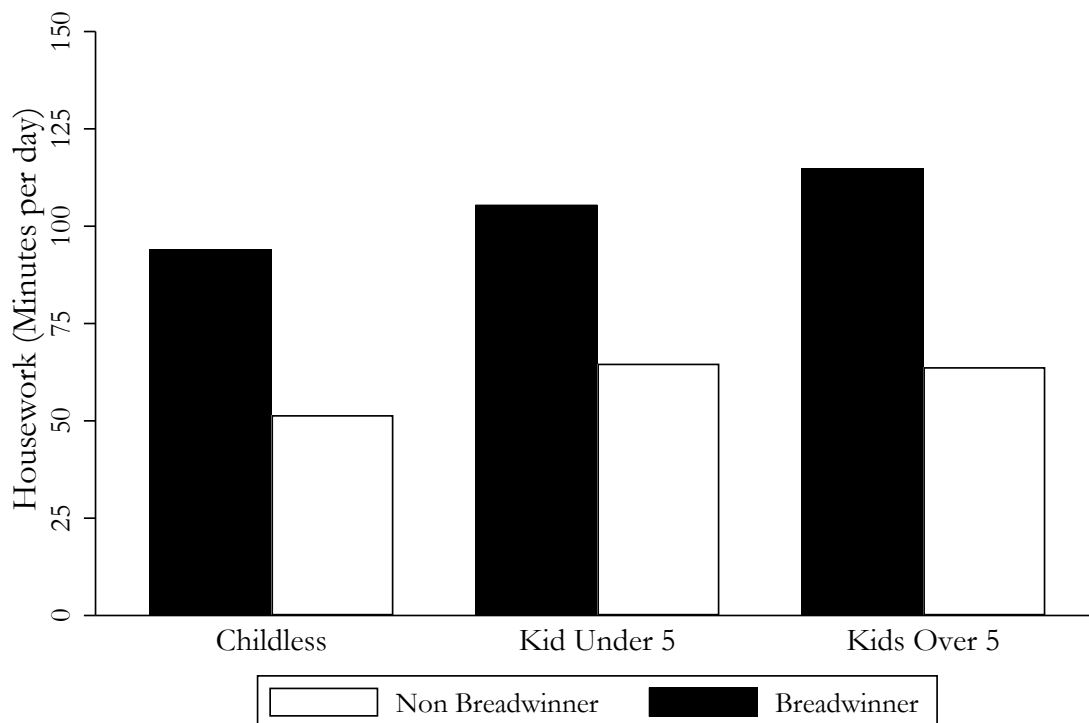
Figure 3: ATUS Housework By Age of Youngest Child

Notes: This figure shows mean levels of housework (defined as home production less childcare time) for heterosexual married and cohabiting couples without children, with children younger than 5, and with children older than five. Breadwinners are determined by comparing the reported usual weekly earnings of couple members. Both couple members are aged between 20 and 55 years old. Data are from the 2003 to 2019 waves of the American Time Use Survey.

Perhaps because of this lack of relief from housework duties, breadwinning moms have less leisure time than non-breadwinning moms, as shown in Figure 4. Their slightly lower time on childcare and housework does not make up for their additional work hours, resulting in 48.7 fewer minutes of leisure each day. Note that leisure time includes sleep minutes, which is why it represents such a substantial portion of the day.
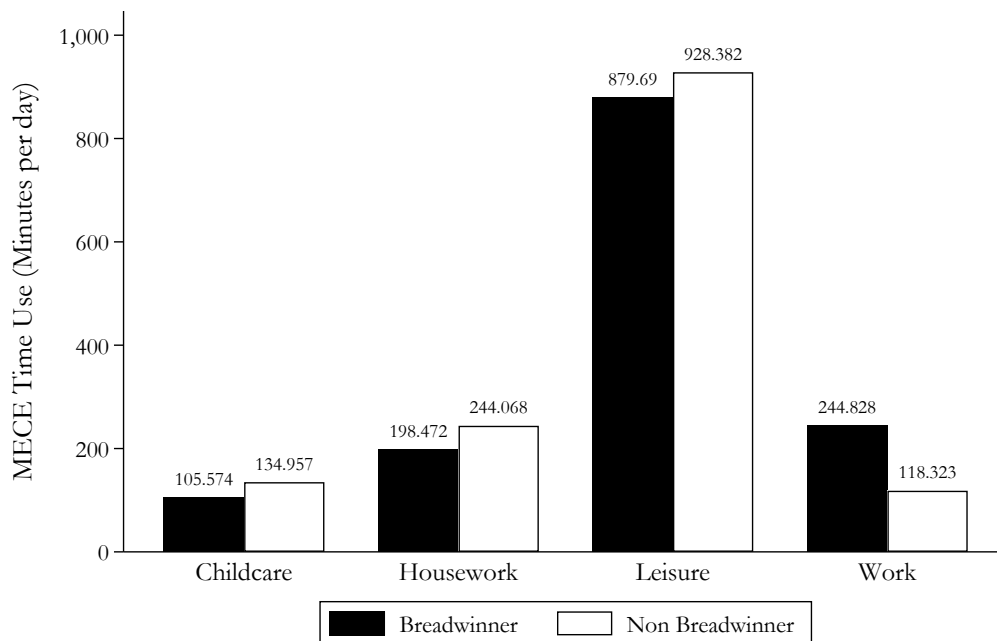
Figure 4: Mothers' Time Use by Breadwinner Status

Notes: This figure shows mean levels of time use for married and cohabiting heterosexual women with household or non household children by breadwinner status. Time use categories are classified using a mutually-exclusive, collectively exhaustive (MECE) framework, allocating every minute of the day into the four categories pictured. Breadwinners are determined by comparing the reported usual weekly earnings of couple members. All observations are drawn from couples where both members are aged between 20 and 55 years old. Data are from the 2003 to 2019 waves of the American Time Use Survey.

This seems hard to justify with a model where female breadwinner's greater earning capacity should "buy them" greater bargaining power within the household.

Looking at the opposite angle, Appendix Figure A.3 shows that the labor supply of men also appears to be unresponsive to whether they or their (female) partner is the higher earner. The distribution on the difference between male and female hours worked looks strikingly similar between couples where the female partner earns the higher wage, and those where it is the male partner who does.

Together, these facts suggest that specialization without the household does not appear to be gender neutral.

2.2 Response to Predicted Wages

Because earnings are clearly endogenous to time investments, we are also interested in comparing how men's and women's home production time responds to predicted earning power. We first predict wages exploiting information regarding education, gender, state of residence and year of the survey only. We then, for married individuals, regress time in home production and housework on their expected percent of the household wage, controlling for household average wage (since households where women earn more also tend to be poorer), in both same and opposite sex couples. We find something stark: While men are much less responsive in either total home production or housework time than women in heterosexual relationships, men in same sex relationships are *more* responsive to this metric than women in same sex relationships. In other words, the fact that there are two opposite sex people in a relationship appears to play a role: the allocation of household tasks is not gender neutral.

Table 1: Home Production by Predicted Wages, by Couple Type and Gender

| | All Home Production | | | | "Housework": Cooking and Cleaning | | | |
| | Straight | | Same Sex | | Straight | | Same Sex | |
	Male	Female	Male	Female	Male	Female	Male	Female
Pred. % HH Wage	−47.74***	−136.06***	−169.17**	−8.69	−1.87***	−17.21***	−15.78*	−6.84
	(10.04)	(10.51)	(85.88)	(89.22)	(0.64)	(1.09)	(8.05)	(7.22)
Avg. HH Wage	0.09	−1.19***	0.13	0.81	0.06***	−0.21***	−0.12	−0.02
	(0.11)	(0.11)	(1.32)	(1.05)	(0.01)	(0.01)	(0.13)	(0.08)

*$p < 0.1$, **$p < 0.05$, ***$p < 0.1$. Sample of same-sex and opposite-sex couples from ATUS and HILDA. Individuals are between the ages of 20 and 55. All errors clustered at the household level. All regressions include fixed effects for country, and year and controls for age, quadratic age, and children in the household.

2.3 Panel data evidence

All the results presented above are derived from cross-sectional comparisons. One could worry that there are unobservable characteristics of men and women who work more or perform more household tasks that drive their behavior and that is correlated with wage changes. To reduce these concerns, we turn to panel data that allows us to compare the behavior of an individual or couple over time. We use panel datasets: Household, Income and Labour Dynamics in Australia (HILDA) and the US Panel

Survey of Income Dynamics (PSID).

We first show that the patterns visible in these data are similar to the ones visible in the ATUS. In addition, compared to the ATUS, the longitudinal data contain the hours worked and the household production allocation of both partners at the same time.

We next show that as a couple experiences a change in their relative earnings, the response is again very well muted. In Figure 5, we present event study evidence on the effect of promotions on both members of a household's time use using the PSID. Promotions are classified in a given year when a respondent is still employed at their same job from the year prior, but reports changing positions within the employer after the survey was last administered, and the respondent's yearly labor income strictly increased since the last year.

Figure 5 restricts the population to the households of men and women in heterosexual partnerships whose income increased by at least $15,000 in the year after the promotion. To be included in the event studies shown in Figure 5, an individual and their spouse must have been observed with non-missing personal housework for at least one year in the pre-period, and one year in the post-period. Controls include year and state fixed effects as well as dummies of number of children present in the household, and a quadratic in the both household members' ages.

Panels (a) and (b) plot the event study estimates of men and women's average weekly housework after a man or woman's promotion, respecitvely. Women appear to adjust their housework, albeit temporarily, in the expected directions after a large change earnings, increasing by around 2.5 hours when their husbands are promoted, and decreasing by 4 when they are promoted themselves. For men, however, both promotions appear to be a non-event. These results are qualitatively similar when restricting to promotions that increase the promoted individual's wage by 25% *relative* to their spouse's wage, shown in Figure A.8.

Figure 5: PSID Promotion Events: Housework
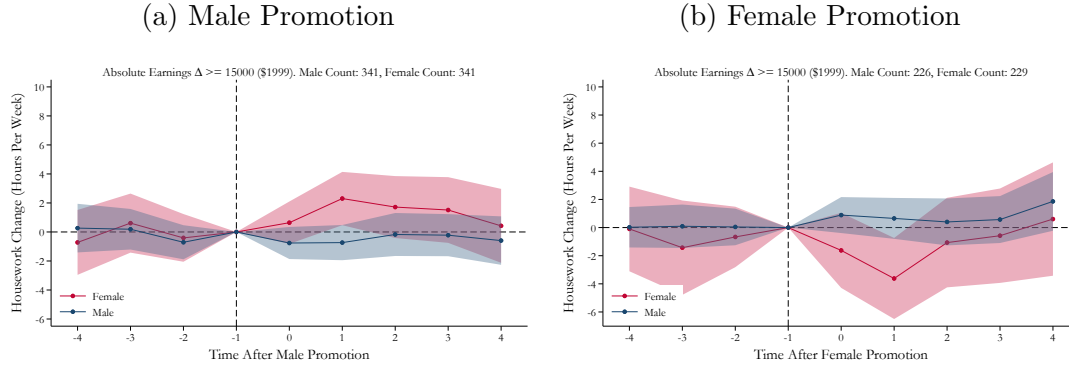
(a) Male Promotion   (b) Female Promotion


Notes: Plot of event study estimates of the effect of male (Panel (a)) and female (Panel (b)) promotions, defined as entering a new position at unchanged employer since the last year with an increase in income of at least $15,000 (in 1999 dollars), on reported weekly hours of housework performed by men and women relative to the period before the event (t=-1). Regressions include year and state fixed effects, dummies for number of children present, and quadratics in both members' ages. All results clustered at the couple level. All individuals were heterosexual and aged between 20 and 55 years old. All individuals must be observed with non-missing housework data least once before and once after the relevant events. Data are from all years between 1985-1997 and the odd years between 1999-2019 of the Panel Study of Income Dynamics

A possible explanation for this pattern would be that men do not value home production or that they are unable to perform these tasks. To study this, we look at how time spent in home production changes before and after the formation of relationships or their dissolution.

We first show using the American Time Use Survey that divorced mothers spend less time on housework, while divorced fathers spend slightly more. Similarly, divorced mothers work more, while divorced fathers work less. This would suggest that men can provide more household tasks when they cannot rely on a partner to perform them.

Figure 6: MECE Time Use Divorced Parents

(a) Mothers   (b) Fathers
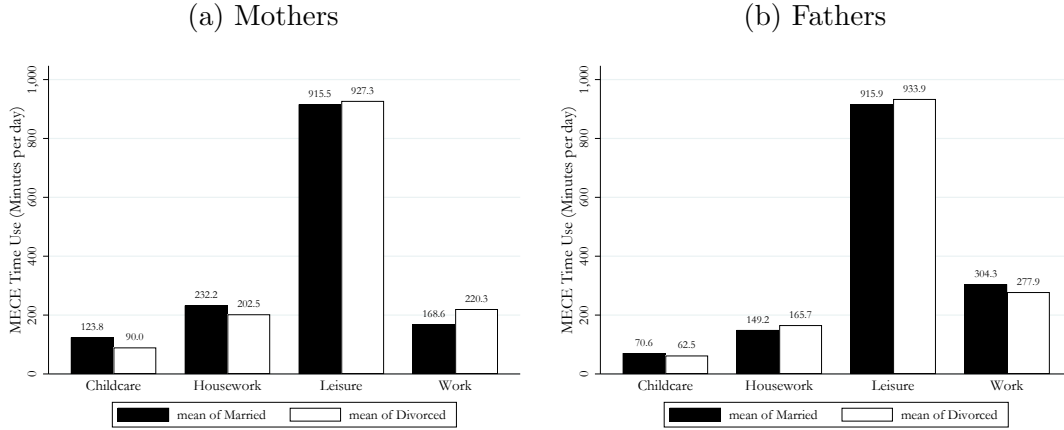
Notes: This figure compares mean levels of MECE time use across marital status for women with household or non household children in panel (a) and men with household or non household children in panel (b). Married individuals are in opposite-sex registered marriages, and divorced individuals are currently living alone or solely with household children. All observations are drawn from couples or single households where all adult members are aged between 20 and 55 years old. Data are from the 2003 to 2019 waves of the American Time Use Survey.

In the cross-section, divorced parents have more leisure than married parents time, while divorced mothers perform less housework relative to married mothers, with the opposite holding for divorced versus married fathers

We next turn to studying this question in a panel data. Our event study methodology is as follows. Divorce event years in the PSID are determined by the listed year of separation and/or divorce for a PSID respondent given by their entry in the marriage file. In cases where a couple separation is indicated, and future response records do not indicate a subsequent reconciliation of couple, this year is used instead of the year of divorce. When individuals' entries for separation or divorce year in the marriage file contradict each other, we observe response records to determine the first year in which the respondents were not listed in the same household.

Information on housework is collected from a the cohabiting romantic partner of a sample respondent after they are categorized as the "spouse" of the original respondent, namely after this partner has been living in the family unit for at least one year. Cohabitation events are specified as the year in which an individual who was previously living without a designated "spouse" is coded as living with one, which also includes legal marriages. Up to three of each individual's cohabitation or divorce/separation events are used in estimation of the event studies.
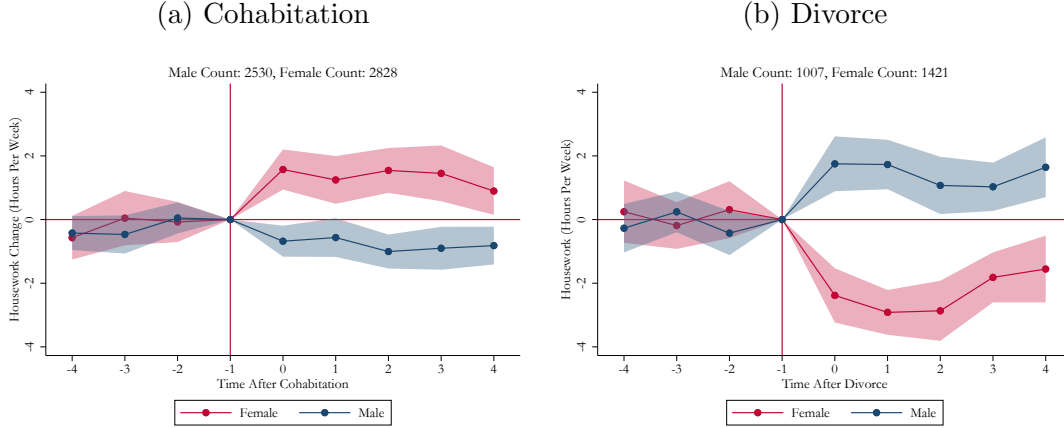
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As with the prior promotion event studies, individuals included in the event studies shown in Figure 7 must have been observed with non-missing personal housework for at least one year in the pre-period, and one year in the post-period. Controls include year and state fixed effects for all event studies. Event studies at the individual level control for dummies of number of children present in the household, and a quadratic in the individual's age.

Because we cannot observe both halves of a couple before they enter a relationship, since spouses enter the data-set through the relationship with the sampled individual, to look at the effects at the couple level, we simply add up the effects for men and women separately to get an implied total of housework if the sampled individuals were married to each other.

Figure 7 shows that women's housework time goes up substantially upon marriage and men's housework time goes down. Similarly, women's housework time goes down upon divorce, and men's goes up. This would not be expected if housework as generated higher return upon marriage, due to benefiting both partners, for example, in which case both parties' time would increase. This would also not be expected if there were returns to scale in chores, in which case both members' housework would be lower in marriage.

We show these same series in the HILDA in Appendix Figure A.9. They show that in the case of Australia, at the moment of cohabitation, only women's time increase without a change in men's time. For divorce, we see a pattern more similar to that of the PSID where women's time decrease and men's time increase slightly.

Figure 7: PSID Cohabitation and Divorce Events: Housework

(a) Cohabitation

Male Count: 2530, Female Count: 2828

(b) Divorce

Male Count: 1007, Female Count: 1421

Notes: Plot of event study estimates of the effect of partnership formation (Panel (a)), defined as a new spouse entering an individual's household, and divorce or separation (Panel (b)) on reported weekly hours of housework performed by men and women relative to the period before the event (t=-1). The implied change in total housework in each period is calculated as the sum of women and men's estimates. Regressions include year and state fixed effects, dummies for number of children present, and quadratics in the individual's age. All results clustered at the couple level. All individuals were heterosexual and aged between 20 and 55 years old. All individuals must be observed with non-missing housework data least once before and once after the relevant events. Data are from all years between 1985-1999 and the odd years between 2001-2019 of the Panel Study of Income Dynamics

3   Model

Having demonstrated that men's time devoted to household tasks is very unresponsive to relative earnings and that this is visible in cross-sectional and panel data despite them apparently valuing those services and being able to perform them when alone, we next turn to a model that highlight which factors would be determining the allocation of time of men and women, both when single/divorced or when paired.

3.1   Collective Model with Differential Productivity

It has been hypothesized, in response to these documented patterns, that men and women may experience differential costs of home production. It is difficult to think that for tasks like washing dishes or doing the laundry, these differential productivities could be anything other than products of gendered socialization, but we nonetheless aim to test whether differential productivity alone could explain the patterns we see. We thus examine the predictions of an efficient, collective decision-making model with

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differential costs of home production by gender to see if it can match the stylized facts presented above.

In autarky, each spouse maximizes their utility in the following way:

$$U^g(c^g, x^g, l^g), \qquad g = w, m$$

where c is consumption, x are the household produced goods and l is leisure time of the woman (w) and man (m) respectively.

The restrictions are $c^g = w^g h^g$, where w^g represents the wage and h^g the working hours of person g and $x^w = f(T - l^w - h^w)$ for the woman and $x^m = \beta f(T - l^m - h^m)$ for the man where $\beta < 1$ to represent the fact that he is less productive than her in household production. Let us assume that $f(0) = 0$ y $f'(0) = \infty$ such that both men and women always invest some time in household production.

Assuming an interior solution, the first order conditions imply that

$$\frac{\partial U^w}{\partial x} f'(T - l^w - h^w) = \frac{\partial U^w}{\partial l} = \frac{\partial U^w}{\partial c} * w^w$$

and

$$\frac{\partial U^m}{\partial x} \beta f'(T - l^m - h^m) = \frac{\partial U^w}{\partial l} = \frac{\partial U^m}{\partial c} * w^m$$

Single men and women could thus devote different amount of time to household tasks because of their different productivity, their difference in wages but also their different preferences for household production. Men could devote less time to household production because their productivity is lower, because they have higher wages or because they care less about services and goods produced in the household.

Let us now think of these two individuals forming a couple and taking decisions that are Pareto efficient. This would be equivalent to them maximizing a joint utility function given by

$$\mu U^w(c^w, x, l^w) + (1 - \mu)U^m(c^m, x, l^m)$$

where μ represents the Pareto weight that could depend on wages and other factors. Notice that household production is now treated as a public good and is common to both. The budget constraint for individual consumption remains the same although there can be transfers between spouses so it is the joint condition: $c^m + c^w = w^w h^w + w^m h^m$ but the time constraint for household production becomes

$x = \delta(f(T - l^w - h^w) + \beta f(T - l^m - h^m))$ where $1/2 \leq \delta \leq 1$ indicates the degree of returns to scale to household production. When $\delta = 0.5$, there are not returns to scale in household production while when $\delta = 1$, the production of each household member is perfectly shared to others.

The first order conditions then become:

$$\mu = \frac{\frac{\partial U^m}{\partial c}}{\frac{\partial U^m}{\partial c} + \frac{\partial U^w}{\partial c}}$$

$$\frac{\partial U^w}{\partial l^w} = \delta f'(T - l^w - h^w) \left(\frac{\partial U^w}{\partial x} + \frac{1 - \mu}{\mu} \frac{\partial U^m}{\partial x} \right) = \frac{\partial U^w}{\partial c^w} w^w$$

$$\frac{\partial U^m}{\partial l^m} = \delta \beta f'(T - l^m - h^m) \left(\frac{\mu}{1 - \mu} \frac{\partial U^w}{\partial x} + \frac{\partial U^m}{\partial x} \right) = \frac{\partial U^m}{\partial c^m} w^m$$

Combining the last two FOCs and replacing the bargaining weight for the first FOC, we obtain

$$\frac{f'(T - l^w - h^w)}{f'(T - l^m - h^m)} = \frac{\beta w^w}{w^m}$$

Prediction 1: The ratio of time devoted by spouses to household production should only be determined by differences in productivity or differences in wages

From the above condition, we observe that the ratio of time devoted to household work only depends on $\beta w^w / w^m$. This implies that preferences for household production or bargaining power should here be irrelevant in determining the share of household tasks performed by each partner. This argument is akin to that of Udry (1996) for agricultural production. Efficient households should devote the time of the most productive partner to obtain the household production at the least cost. They should then compensate that household member through transfers in terms of consumption.

Prediction 2: The comparative advantage of women in household work should be decreasing in the wage ratio.

Women would use a higher fraction of their time in household production than men because they are more productive unless they have a higher wage than their partner. Overall, we should observe that the fraction of time devoted to household task should respond to the relative wages if the household functions in an efficient

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way. The productivity gap would also need to be very large to justify that women who earn twice as much as their husbands still perform more household tasks ($\beta < 1/2$).

Prediction 3: The ratio of leisure by each spouse will depend on relative bargaining power and the ratio of wages. Time spent in the workforce should depend on the ratio of wages as well.

By combining the FOCs, we obtain that

$$\frac{\frac{\partial U^m}{\partial l^m}}{\frac{\partial U^w}{\partial l^w}} = \frac{\mu}{1-\mu}\frac{w^m}{w^w}$$

Thus, the partner that has more bargaining power should be able to enjoy more leisure and leisure should also be dependent on the ratio of wages. We should thus observe that individuals spend more time in the workforce when they are the partner who has the higher wage.

Prediction 4: Married women may spend more time in household production than when single or divorced if they have a productivity advantage in those tasks or a wage disadvantage.

When single, each partner must produce their own desired home production. When together, they can reallocate such that the most productive partner does more and keep produce the same amount of x. As long as the returns to scale of being together do not decrease the overall demand for time of partners, the partner that has the comparative advantage of household production could do more of it in marriage than in singlehood or divorced state.

The marginal cost of devoting more time to household tasks is the same in marriage as in singlehood. The marginal return differs because of δ and to the fact that partners can enjoy the x produced by their spouse, which lowers the marginal utility of x. Thus, if women are selected to perform more household tasks when married, the model would also predict that they should be compensated through higher leisure, though by how much would also depend on her bargaining weight.

Prediction 5: Married households will never "pay" more for household production than single/divorced pairs of individuals, that is, $w^w(T - l^w - h^w) + w^m(T - l^m - h^m)$ will never be larger in marriage than in singlehood or divorce.

That is because the solution to the single's problem can also be found from a maximization of a weighted sum of their utility but subject to the fact that each

partner cannot share x nor make transfers of consumption or leisure time. Let us denote as $x*^m$ and $x*^w$ as the preferred elections when single. Given the condition of efficient allocation of tasks to each spouse when forming a household, we know that the cost of producing this combination of x will fall or at least stay the same, in an even higher proportion if there are returns to scale in the household. This will be akin to an increase in income from the single to the married state for the household. If c and l are both normal goods, this increase in income should be used to increase the consumption of all three goods and it would thus be impossible that the increase in x lead to an increase in the cost of producing it since this would imply that either consumption or leisure would fall. Thus, if the household acts efficiently, it would not lead to the household using more time in household production than when single, although it would lead to reallocation of household time from the spouse whose cost is higher or efficiency lower to the one who has a lower wage or more efficient. This spouse would be compensated through a transfer in consumption or leisure.

Prediction 6: Surplus from marriage will be higher for couples where the wife earns less than the husband when β is low.

By the envelope theorem, the effect of an increase in the woman's wage fixing the sum of their wages is given by

$$\frac{\partial U^g}{\partial c^g}(h^w - h^m)$$

It will thus be positive if the wife works more than her husband and less if the opposite. Specialization has benefits here and so making the partner who works more hours earn a even larger wage is good as it allows specialization within the household. However, if β is lower than 1, the woman could have a higher wage than her husband and still work less hours outside the home than him. In that case, increasing her wage will decrease the welfare of the household.

This will be more the case in marriage than in singlehood as in singlehood, the expression was

$$\frac{\partial U^w}{\partial c^w}h^w - \frac{\partial U^m}{\partial c^m}h^m$$

This would be less negative than above when β is smaller because the man would have to work more to generate his household produced goods on his own, reducing his labor supply. This is not the case when married, thus implying that the impact of the wife earning a higher wage is more negative when married than when both living separately.

In order to obtain a tractable version of the model, we specify a type of utility functions (additive logs) and a form of the production function (square-root of time) and show these results in Appendix B. In that version of the model, women work more household hours when married than when single and vice-versa for men, as long as $\beta w^w < w^m$. Men would work more than their spouse when $\beta w^w < w^m$ unless their bargaining power is such that they can enjoy large amount of leisure.

3.2 Inefficient Theoretical Framework

Replicating the empirical facts regarding households' lack of responsiveness to relative wages requires a model with some inefficiency. In particular, it requires that gender roles are more active in marriage than in either singlehood or divorce. Those could take many different forms. To avoid adopting a particular version, we will simply assume that there will be additional benefits for women to devote time to household tasks and that men will want to under-invest in those same tasks when in a relationship. Alternatives would include differential likelihood of divorce based on gender-based specialization when couples are married, differential utility from doing gender concordant tasks but only when married, or to have bargaining power increase when one follows gender norms in their time allocation.

In that case, the decisions of households in the second period will change from the results above and we will now face:

$$\mu = \frac{\frac{\partial U^m}{\partial c}}{\frac{\partial U^m}{\partial c} + \frac{\partial U^w}{\partial c}}$$

$$\frac{\partial U^w}{\partial l^w} = \delta f'(T - l^w - h^w)\left(\frac{\partial U^w}{\partial x} + \frac{1 - \mu}{\mu}\frac{\partial U^m}{\partial x}\right) + \gamma = \frac{\partial U^w}{\partial c^w}w^w$$

$$\frac{\partial U^m}{\partial l^m} = \delta\beta f'(T - l^m - h^m)\left(\frac{\mu}{1 - \mu}\frac{\partial U^w}{\partial x} + \frac{\partial U^m}{\partial x}\right) - \gamma = \frac{\partial U^m}{\partial c^m}w^m$$

where $\gamma > 0$ represents an additional benefit (cost) of household production for women (men).

In words, this means that consumption shares continue to reflect the relative bargaining power of each spouse but what changes is that investing in home production now has an additional return for women while there is an additional benefit to working for men.

Total household production time (and even cost) may increase from singlehood to marriage if the incentives generated by γ outdoes the benefits of reassigning tasks to the least costly partner. Leisure, on the other hand, could now fall upon forming a household.

This leads us to conclude with two additional propositions.

Prediction 7: The ratio of time devoted by spouses to household production may not be very responsive to wage ratio changes in an inefficient model

Because of the wedge γ, decisions of either partner will now involve other elements in their time allocation decision. This could lead the ratio of the time devoted to home production to be very different than the ratio of wages for γ large enough.

Prediction 8: Surplus from marriage will be higher for couples where the wife earns less than the husband when there is gendered inefficiency.

Under our model of gendered inefficiency, women will perform more household tasks than is efficient because it gives them a utility to do so while men benefit from working more than what would be the efficient outcome. This is something that is not very costly to a household whose wage ratios already led the woman to perform more of the household tasks. However, it will be particularly detrimental to a household where the woman has a wage advantage over her partner.

3.3 Model Comparison

Compared to the previous model, we will now have that household task allocation may be dependent on bargaining weights, on discount factors and even on how different the continuation value for a couple is to remain married versus single. We should particularly see an overinvestment in households tasks by women (and by the household overall) in relationships where there is a big difference between what can be obtained in marriage and in singlehood.

On the other hand, men's labor supply may be less responsive to the wage ratio than in the original model because they have now an additional incentive compared to women in investing in work-related activities, even if their wages are not as large as that of their partner.

If this model holds true, we should observe that relationships that invest more in household tasks, particularly by women, and relationships where the man works

more hours, both conditional on wages, would be more lasting. We should also observe more distortions compared to the optimal decision in couples where the gains from the marital union are considered more relevant.

4   Empirical tests

4.1   Evidence for the model

If the fact that men's housework time goes down and women's goes up in marriage means that households are taking advantage of women's greater productivity, it means that men are essentially net "purchasers" of housework tasks within marriage, which is one force causing women's leisure to decrease as she earns more. We show suggestive evidence consistent with this.

This evidence lends some support to the idea that men, potentially due to gender socialization, experience a higher cost of home production, and, when married, "purchase" it from their partners in the marriage economy.

Figure 8 provides evidence from the ATUS on leisure (Panel (a)) and from the HILDA on bargaining power and consumption (Panel (b)) that conform to the efficient model's predictions. Consistent with Prediction 3, as the ratio of her wage over his increases, her leisure decreases, consistent with her time being too valuable to the household to allocate to leisure. At the same time, the ratio of women's clothes to men's clothes purchased goes up, as does her share of household financial control. This would also suggest that there is a transaction between spouses where the wife is being compensated for her home production through consumption. Leisure results are presented for ATUS only as it is the only survey that explicitly elicits time spent on leisure.

Appendix Figure A.10 shows that, upon divorce, men's expenditure on meals outside of the home increases significantly, whereas women's are unchanged. This suggests that men switch from "purchasing" these potentially home produced goods within the household to explicitly purchasing them on the market.

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Figure 8: Dual Earner's Leisure and Women's Consumption By Earnings Ratio

(a) Male and Female Housework

(b) Measures of Women's Consumption
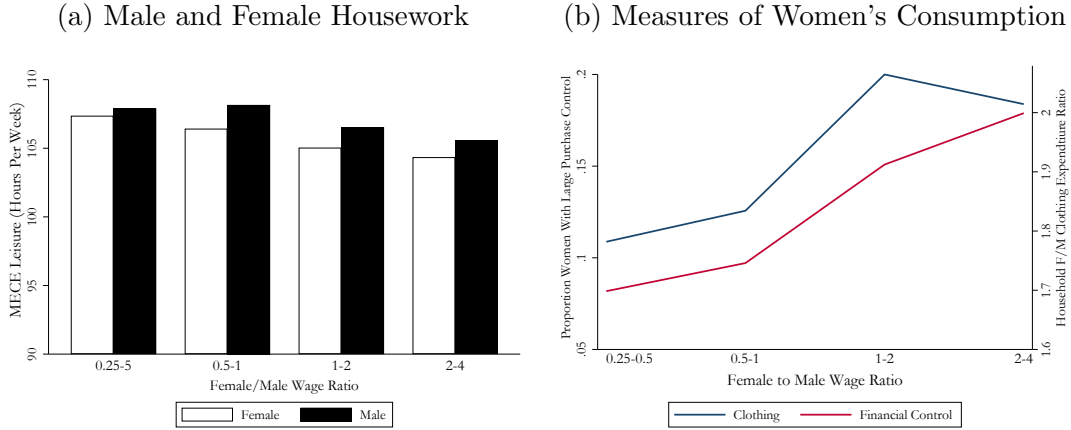
Notes: Panel (a) shows mean levels of time spent on Socializing, Relaxing, and Leisure (in minutes per day) for women and men in dual earning couples grouped by the ratio of female to male yearly earnings using the ATUS. Panel (b) plots two measures of women's consumption in these couples, this time in the HILDA, again grouped by female to male earnings ratio. "Clothing" is defined as the average ratio of household expenditures on women's to men's clothing and footwear across couples in an earnings group. "Financial Control" is defined as the proportion of couples where either women report "always" or "usually" making large household purchasing or men reporting that their spouses "always" or "usually" make the decisions. Earnings are calculated as gross financial year wages and salaries including a weighted topcode. All observations are drawn from heterosexual couples where both members are aged between 20 and 55 years old. Data are from waves 1 through 20 from the Household, Income, and Labor Dynamics in Australia survey, and from years 2003-2019 in the American Time Use Survey.

4.2 Evidence of inefficiency in time allocation

Next, we compare the housework and paid work hours of both partners depending on the relative wage ratio in the PSID. Figure 9 shows that men barely alter their time allocation depending on the wage ratio of the household. Women decrease their housework as their relative wage increases but they always spend much more time on home production than their male partner, irrespective of the wage ratio. Moreover, men's work hours stay stubbornly fixed at a higher point than women's across the wage ratios. This total inelasticity of men with respect to the wage ratio, even when their spouses earn between twice and four times more per hour than them, seemingly contradicts the second prediction of the efficient model, namely that women's comparative advantage is housework over market work should be decreasing in the wage ratio.

Figure 9: Dual Earners Housework and Market Work Hours By Wage Ratio
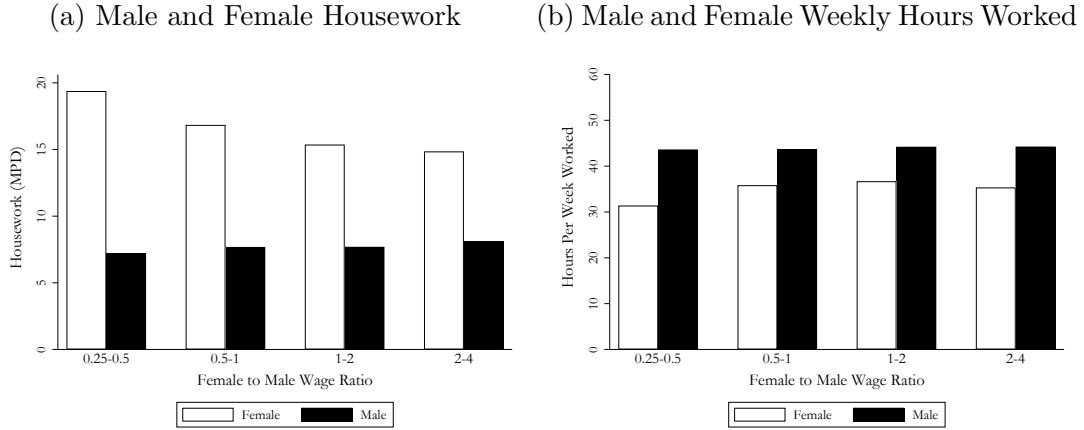
(a) Male and Female Housework

(b) Male and Female Weekly Hours Worked

Notes: Panel (a) shows mean levels of housework (hours per week) for women and men in dual earning couples grouped by the ratio of female to male wage. Panel (b) plots the average weekly hours worked per week in all jobs for men and women, again grouped by female to male wage ratio. Wages are calculated as gross financial year labor income divided by annual hours worked in all jobs. All observations are drawn from heterosexual couples where both members are employed with non-missing yearly wages and salary earnings, and are aged between 20 and 55 years old. Data are from all years between 1985-1996 and odd years between 2001-2019 from the Panel Study of Income Dynamics.

Notice that in Panel (b) of Figure 9, men's weekly hours worked in the labor market appear fixed slightly above 40 hours per week. One potential explanation is men or the occupations in which they are more frequently employed face larger frictions in setting working hours than women. To test this explanation of the results, we repeat the exercise in Figure 10, this time restricting to couples where both men and women work in services, sales and office support, or transportation occupations, which empirically exhibit the highest levels of part-time work for men. This new sub-sample exhibits exactly the same patterns as before, notably with male hours worked above that of their spouses across the wage ratio groups. Notice, in these couples, the household could increase total income substantially by reallocating men's time into home production and women's into market work—and has the job flexibility to do so. The fact that they do not suggests that this time allocation is not only driven by efficient comparative advantage, since if it were, this calculation would surely be different for couples where the wife earns less than half what the husband does to where she earns more than double.

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Figure 10: Dual Earners Housework and Market Work Hours By Wage Ratio, Flexible Occupations

(a) Male and Female Housework

(b) Male and Female Weekly Hours Worked
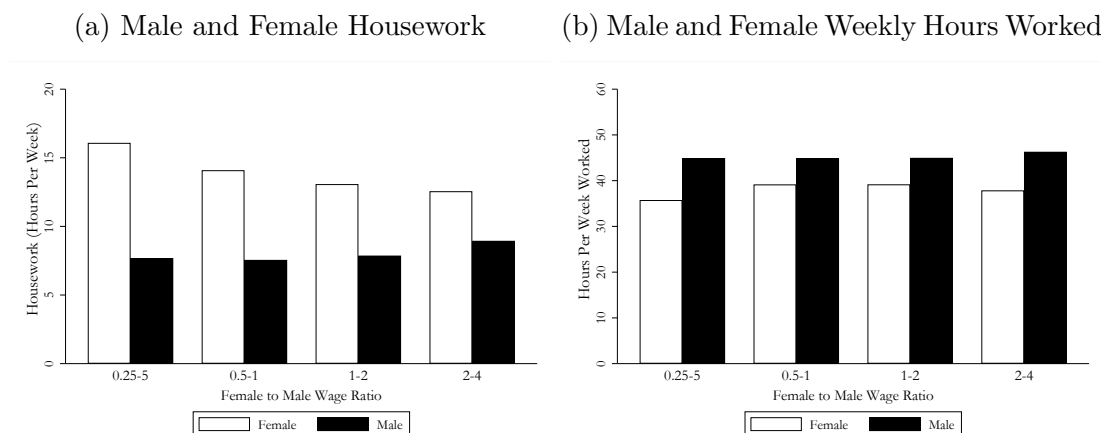
Notes: This figure replicates Figure 9, further restricting to couples where both individuals are employed in services, sales and office support, or transportation occs.

We next move on to considering the stark marriage and divorce effects we documented longitudinally. Predictions of the efficient household allocation would suggest that in general, married households should spend less time in household tasks than the sum of two separated or single individuals. But more importantly, that they should "pay" less than single individuals.

From what we have shown so far, there are already indications that the allocation may not be efficient. For example, from Figure 6, total implied housework by married parents is higher than that by divorced parents, as divorced moms' housework is less than that of married moms by more than divorced dads' compares to married dads. This would be an interesting challenge to the collective model, as the model predicts total time should be higher in divorce, when efficient specialization by cost is not available. Similarly, Figure 7 shows that in marriage, *total* housework time is higher than it is in either singlehood or divorce. One would think if there were returns to scale, households would be able to reduce the total time spent, even as they potentially increased the amount consumed, by having the lower cost provider performing the tasks. We thus next turn to whether households costs of home production are higher in marriage than divorce.

We then weight the hours spent on housework in marriage and then divorce by the wage, treating it as the shadow cost of time, to see if households total costs of housework production go up or down upon divorce. Surprisingly, we find that total

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costs are lower upon divorce, suggesting that the time allocation within marriage may have been skewed further than was justified by comparative advantage.

Figure 11: Housework Cost after Divorce

Male Count: 1057, Female Count: 1489
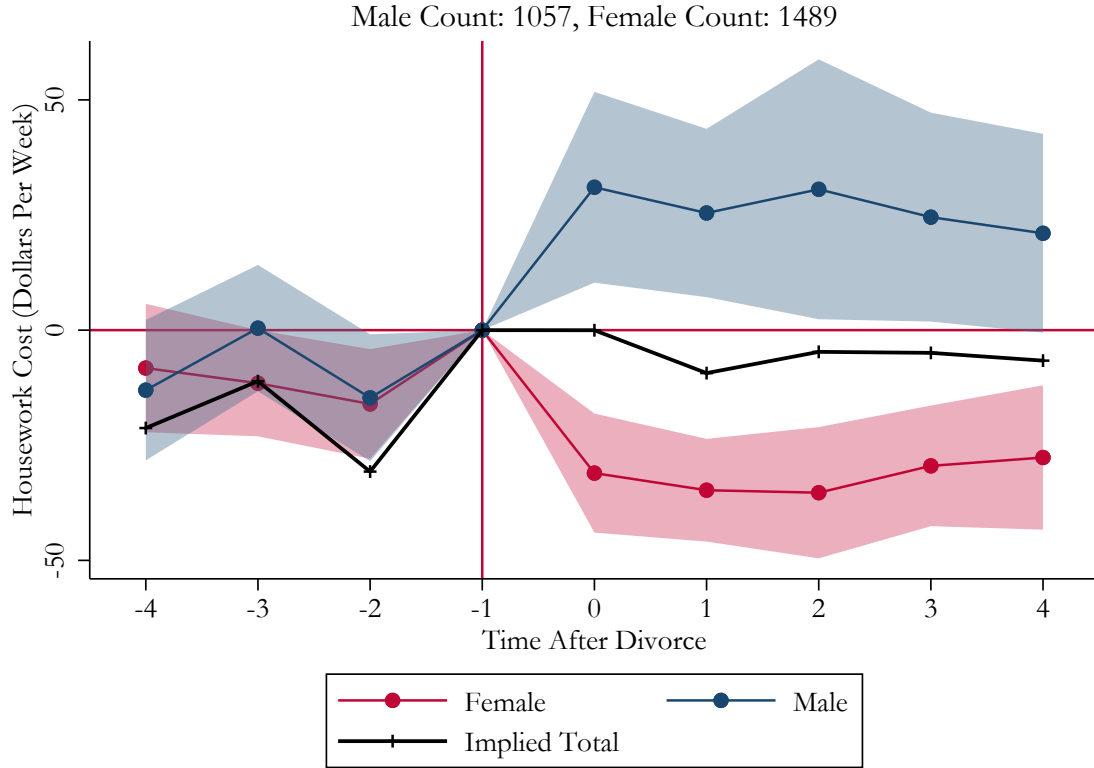
Notes: Plot of event study estimates of the effect of divorce in the PSID on the cost of weekly hours of housework performed by men and women relative to the period before the event (t=-1). The cost is calculated as weekly hours of housework multiplied by imputed wages. Wages are predicted for unemployed women and men by estimating the following empirical models by gender: regressing wages on individuals' cohabitation status, a quadratic in their age, and dummies for year, state, years of completed education, and number of children in their household. The implied change in total costs in each period is calculated as the sum of women and men's estimates. Regressions include year and state fixed effects, dummies for number of children present, and quadratics in the individual's age. All results clustered at the couple level. All individuals were heterosexual and aged between 20 and 55 years old. All individuals must be observed with non-missing housework data least once before and once after the relevant events. Data are from all years between 1985-1997 and odd years between 1999-2019 from the Panel Study of Income Dynamics

4.3 Suggestive Evidence of Identity Channel

In Figure 12 we use very fine bins of relative earnings–dividing households into 20 equal quantiles, and then grouping households where either the wife or the husband is

the sole earner, to examine in more detail men's versus women's behavior as earnings change. Whereas women's market work time arcs upwards as her relative earnings increase, men's stay relatively flat, with a very slight slope, but hardly any evidence of moving toward part-time work as earnings decrease. Similarly, while women's time in household tasks exhibit a curve toward "home-maker" as her earnings decrease, men do not increase their housework time at all until they earn zero. At this point, they slightly increase housework time, but much less so than women do (or gay men, as shown in Appendix Figure **??**). This lack of housework time is not because their job search time is so consuming: job search time is included in market work hours, which are barely above zero. Instead, we observe a substantial increase in leisure time, that dwarfs the time of men or women in any other earnings combination.

Figure 12: Time in Market Work, Home Production and Leisure by Earnings Proportion

(a) Market Work

(b) Home Production

(c) Leisure
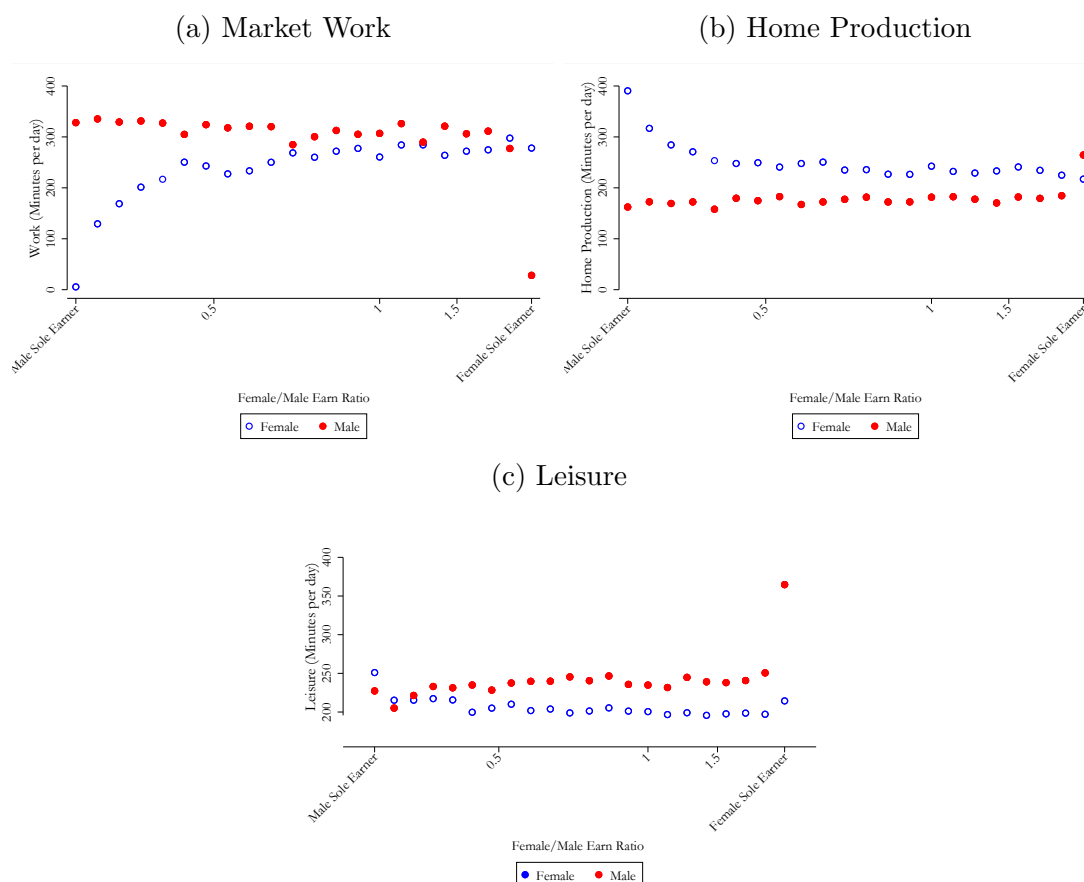
Notes: Panel (a) shows mean levels of market work (in minutes per day) for women and men in dual earning couples grouped by 20 quantiles of the ratio of female to male weekly earnings. Panel (b) plots the average levels of home production, again grouped by female to male earnings ratio. Panel (c) plots average levels of Socializing, Relaxing, and Leisure. All observations are drawn from heterosexual couples where both members are employed with non-missing yearly wages and salary earnings, and are aged between 20 and 55 years old. Data are from the American Time Use Survey, 2003-2019.

This is suggestive of two possible biases driving heterosexual men's low responsiveness in home production time to earning potential. First, the failure to adjust by lowering hours when relative earnings are lower, and second, the failure to take on sufficient tasks when earning less. In Table 2 we compare these responses to each heterosexual women and gay men, again using predicted wage. In order to show that the underlying distribution of traits is not responsible, but rather the *response* based on one's traits, we calculate counterfactals for each of employment and hours and two measures of home production (total and housework) if the distribution of traits

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in a group were the same, but their slope in response to predicted wages was that of individuals of the opposite gender, or in a same sex relationship.

We see that in general, the gender gap would disappear if straight male were to behave like straight women or vice versa. The participation gap would remain as wide if straight men were to behave like gay men but the gap in home production would significantly shrink. Both gaps would shrink if straight women were to behave like lesbians. This suggests that the problem is not that men and women differ in their observables but rather that there are differences in the way heterosexual men and women respond to their earnings potential.

Moreover, it is suggestive of an identity channel to the inefficiencies we have documented: men of all types demonstrate "over-attachment" to the labor force despite lower earning power, whereas only *straight* men fail to pick up home production tasks as earnings decline.

Table 2: Predicted employment, hours worked/week and housework

	(1)	(2)
	Straight Male	Straight Female
% Employed	88%	74%
...Pred. if were opposite gender	77%	86%
...Pred. if were in same-sex rel.	90%	84%
Usual Hours Worked per Week	37.6	26.8
...Pred. if were opposite gender	28.5	36.3
...Pred. if were in same-sex rel.	37.7	33.8
"Housework": Cooking and Cleaning	5.1	13.1
...Pred. if were opposite gender	12.6	4.9
...Pred. if were in same-sex rel.	8.3	8.1
All Home Production	92.8	143.9
...Pred. if were opposite gender	141.2	91.9
...Pred. if were in same-sex rel.	107.2	112.5
Observations	52,400	62,614

Note: Sample of men and women between the ages of 25 and 55 from ATUS. Counterfactual estimates are produced through three steps:
(1) We perform two OLS regressions, one for each sex, of wage on individual characteristics (year and dummies for age quantile and education, with fixed effects for region and metropolitan statistical area) for all single, employed people. From these regressions, we obtain predicted wages for men and women using the regression for their sex.
(2) Then, for individuals in same-sex and opposite-sex relationships, we estimate the responsiveness of predicted wage to the outcome variables listed above using OLS, separately by gender and sexual orientation.
(3) Using the OLS estimates from (2), we predict the counterfactual average outcomes of straight men and women conditional on their predicted wages, had they been (a) as responsive to predicted wages as the opposite gender and (b) as responsive to predicted wage as their gender-peers who are in same-sex relationships.

As evidence of this identity channel—that perhaps men derive some affirmation of their gender identity by remaining employed 40 hours—we exploit the fact that the HILDA measures "life satisfaction.

Table 3 investigates the relationship between individuals' full-time employment status and life satisfaction across relationship status, while testing for interaction effects by gender. The outcome variables consist of binary indicators that equal one if a respondent gave an 8 or higher out of 10 (an above average response) to questions eliciting satisfaction with "the home in which you live" in Panel A, and simply one's "life" in Panel B.

We find that across our wage specifications, full-time employment status (as opposed to part-time) is significantly correlated with a higher probability of reporting above average life satisfaction for cohabiting men, with no or slightly negative effects for single men. The asymmetry between the married and single effects of full-time work support our conjecture that gender roles being strengthened in marriage is one possibility underlying the patterns of specialization we document. The size and significance of the interaction terms for cohabiting women indicate that this positive correlation within partnership is unique to men. Women do not experience greater life satisfaction from full-time work.

Table 3: Satisfaction and Employment Status

	Cohabiting			Single		
	(1)	(2)	(3)	(4)	(5)	(6)
Full-Time	0.0632***	0.0428***	0.0555***	-0.00904	-0.0354***	-0.0116
	(0.0136)	(0.0130)	(0.0136)	(0.0126)	(0.0129)	(0.0126)
Female	0.184***	0.150***	0.171***	0.00928	-0.000240	0.00798
	(0.0293)	(0.0278)	(0.0293)	(0.0286)	(0.0285)	(0.0287)
Female × Full-Time	-0.0898***	-0.0685***	-0.0820***	0.0235	0.0326**	0.0239
	(0.0157)	(0.0148)	(0.0157)	(0.0162)	(0.0162)	(0.0162)
Linear Wage	Yes	No	No	Yes	No	No
Flexible Polynomial Earnings	No	Yes	No	No	Yes	No
Log Wage	No	No	Yes	No	No	Yes
Observations	39039	42697	39039	19821	20132	19821

Notes: This table includes OLS regression results for the relationship between life satisfaction and full-time employment. The first three columns of both panels restrict to cohabiting individuals, while the last three restrict to individuals living alone or with household children. Cohabiting columns include wage measures for both couple members, and single columns only include the respondent's own wage information. "Linear Wage" columns include controls for hourly wage. "Flexible Earnings Poly" columns include a fifth degree polynomial of the man minus the woman's yearly earnings, or simply one's own earnings in the single columns. "Log Wage" columns include controls logged hourly wage. All regressions include state, statistical area, child, own and spouse (if relevant) education fixed effects, and quadratics in ages of both couple members (if relevant). All errors clustered at couple or individual level. All observations are drawn from heterosexual couples where both members are aged between 20 and 55 years old. Data are from waves 1 through 20 from the HILDA.

5 Implications for Marriage: Ethnic Outmarriage

Our model predicts that when there is a productivity advantage for women in home production or there is gendered inefficiency in the allocation of household tasks, unions involving a woman that out-earns her spouse will be less attractive. There is already ample empirical evidence that relative earning can affect marriage rates, which our model and empirical evidence provides a new micro-foundation for. We now provide the first direct empirical test that home production plays a role in determining marriage rates when relative earnings favor women.

To test this hypothesis, we use variation across ethnic groups in how "traditional" the allocation of household tasks is in their country of origin. This would generate differences across couples in either gendered inefficiency in allocation or in culturally acquired productivity differences. However, our model does not predict that this will always be "bad" for marriage. This disparity becomes costly in terms of marital surplus when women are more likely to out-earn their spouses, because specialization along gender, rather than earnings, lines will be more costly. We thus use variation across location (by metropolitan statistical area) and ethnic groups in the relative incomes of men and women in those cells as a source of variation. Our model provides a prediction on the interaction of these two elements: women facing disfavorable earning ratios combined with disfavorable home production ratios would be more likely to forego marrying within ethnic group.

To measure this, we use data on immigrants from the American Community Survey (ACS), and data on home production ratios from the OECD's Gender, Institutions and Development Database (GID-DB)[1]. First, we have to show that the ratio of women's to men unpaid time in the home in the country of origin is predictive of this same ratio for immigrants. Figure 13 shows that the OECD home country ratio is indeed predictive of this ratio between men and women for working age individuals in the US.

To then turn to examining marriage behavior, we restrict our sample to ACS data of women at and ten years above the median age of marriage in 2021 and 2022 (25 for both years) and who immigrated between the ages of 0 and 21. The latter restriction ensures they were not married before immigration, and restricting to immigrants

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[1]These data are compiled from various National Statistical Offices by the United Nations Statistics Division. Ninety-two countries have data available between 2000 and 2022. For more information on this variable, see SDG Indicator 5.4.1. Metadata.

Figure 13: Home Production Ratios among Immigrants Compared to Home Country: ATUS and OECD GID-DB
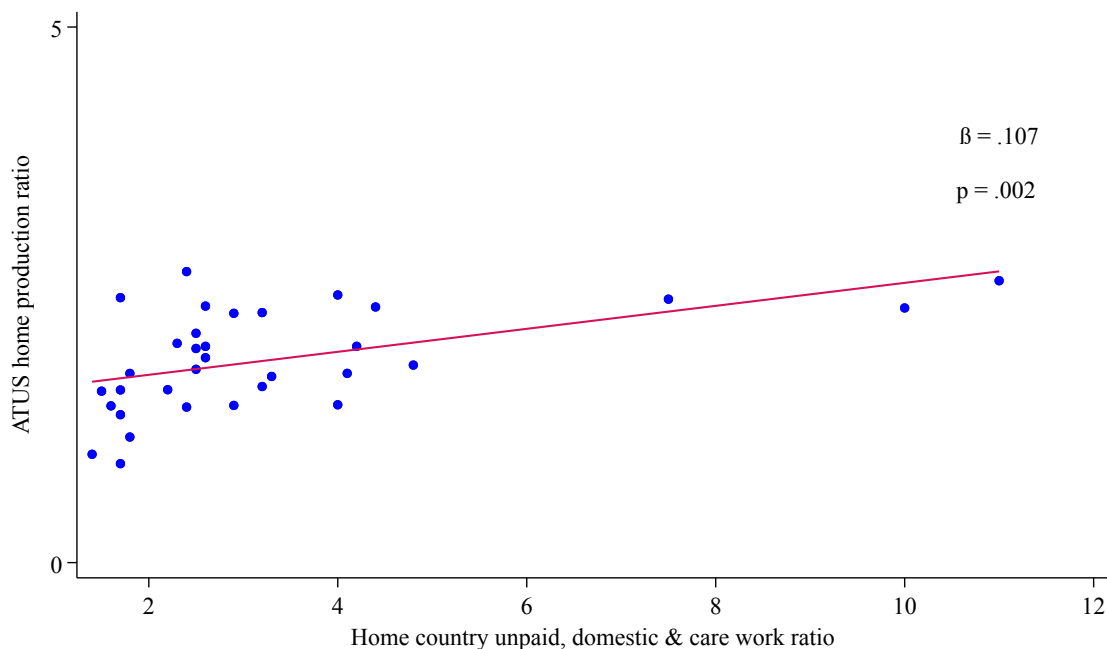
Notes: This scatterplot shows the relationship between: (a) the average female-to-male ratio of time in home production among a sample of immigrants by origin country; and (b) the origin countries' ratio of female-to-male average time spent on unpaid, domestic, and care work. Individuals included in the computations for (a) are between the ages of 20 and 55 and immigrated to the US when they were 21 or younger. Data for (a) come from the American Time Use Survey from 2003-2022 (excluding 2020), and data for (b) come from the Organisation for Economic Cooperation and Development's Gender, Institutions and Development Database (the exact sample may differ by country, but should be representative of working age adults). The β coefficient and associated p-value are from the regression of the ATUS immigrants female-to-male ratio on the OECD GID-DB origin country female-to-male ratio. Countries are included in analysis more than 10 immigrants list them as their country of origin in ATUS over the sample period.

more generally ensures there is some perceived benefit to marrying within group. To estimate the female-to-male average income ratio at the time when the women of the primary sample (2021 – 2022) would have been forming beliefs about the marriage markets they would face, we use ACS data from one decade prior (2011 and 2012, when the women of the primary sample were between the ages of 15 and 25) for men and women between the 25th and 75th percentiles of marriage age in those years. Again, we restrict to individuals who immigrated between the ages of 0 and 21. The marriage market itself is a local ethnic marriage market defined by ancestry[2] and

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[2]In Figure 13, ethnicity was defined by reported birthplace, as ATUS does not contain ancestry data. The birthplace measure is reported more crudely than the ACS ancestry variable and for many respondents indicates larger geographic areas (e.g., "Central America" or "Other USSR/Russia");

metropolitan statistical area.

Immigrant women between the ages of 25 and 35 in 2021 and 2022 would, in 2011 or 2012, observe the income ratio within the marriage market that they would eventually enter. This decade lag allows for a sufficient period of information acquisition and expectation formation prior to making marital decisions. When they enter their marriage market, having established beliefs about the characteristics of unions available to them, they face three choices: marry within their ethnic group; marry outside of their ethnic group; or remain single. We consider that marrying within one's ethnic group is preferred and thus observing that women are less likely to do so would be a demonstration that the surplus from marriage is lower.

The literature postulates that men prefer to marry women that earn less than them; the effect of this preference, which could be greater in countries with worse home production time ratios, is potentially correlated with the decision of women to not marry men who both earn less and spend less time in home production. Therefore, we include a measure of attitudes towards women's income to control for undesirability of women out-earning men from the opposite side of the marriage market. This measure comes from the same OECD data from which the international home production time measures are taken, and captures the proportion of the population aged 18 or older agreeing that: "If a woman earns more money than her husband, it's almost certain to cause problems."

These results are compatible with our model where marital surplus is smaller when a woman both outearns her spouse and will be anticipated to perform more household tasks no matter her relative income.

therefore, when analyzing ACS data, we transition to using the ancestry variable as the ethnicity marker.

Table 4: Ethnic Outmarriage and Singlehood by Home Production Time Ratios in Country of Origin

	Never/Out-married			Out-married		
	(1)	(2)	(3)	(4)	(5)	(6)
Income ratio × HP ratio	0.171***		0.160***	0.208***		0.203***
	(0.0445)		(0.0453)	(0.0744)		(0.0760)
Income ratio × Gender attitudes		0.0427	0.0477		0.0342	0.00147
		(0.0329)	(0.0293)		(0.0444)	(0.0487)
Income ratio	0.0138*	0.00629	0.0282**	0.0299**	0.0150	0.0290
	(0.00736)	(0.0148)	(0.0117)	(0.0149)	(0.0215)	(0.0203)
Constant	3.860***	3.971***	3.783***	-0.235	-0.163	-0.360
	(0.538)	(0.502)	(0.555)	(0.652)	(0.622)	(0.663)
R^2	0.171	0.179	0.174	0.170	0.172	0.169
Observations	7753	8629	7472	4743	5110	4586

Notes: This table includes OLS regression results for the relationship between ethnic out-marriage or singlehood outside the respondent's reported country of ancestry; the female-to-male income ratio; and time spent in unpaid, domestic, and care work in immigrants' countries of ancestry. The ancestry variable is defined among immigrants listing a primary ancestry; individuals listing multiple ancestries are excluded from the sample to more cleanly identify the influence of ethnicity on the outcome of intermarriage. Sample of ACS data 2021 - 2022 of immigrant women at and ten years above the median age of marriage who immigrated under the age of 21. In ACS 2021, the median marriage age for women is 25; in 2022, it is 25. Income ratios are computed among men and women aged between the 25th percentile and 75th percentile of marriage age one decade prior to the primary sample. In ACS 2011, the 25th percentile is 20 and the 75th percentile is 28; in 2012, they are 20 and 28, respectively. Columns 1 and 4 include the HP ratio interaction alone; columns 2 and 5 include the attitude interaction alone; columns 3 and 6 include both the HP ratio interaction and attitude interaction. The HP ratio and attitude variables are taken from the Gender, Institutions and Development Database (GID-DB) 2023 from the OECD Development Centre. HP ratio is the female-to-male ratio of time spent on unpaid, domestic, and care work in a 24 hour period. Controls include age; age^2; age at immigration; total income; and dummies for education, country of origin, sample year, and MSA. Standard errors are clustered at the marriage market (year × ancestry × MSA) level. Marriage markets are excluded from analysis if they contain less than ten men or less than ten women between the 25th and 75th percentiles of marriage age for the income ratio computation, or if they contain less than ten women between the ages of 25 and 35 in 2021 or 2022.

6   Conclusion

In this paper, we document some surprising stylized facts about women's home production time: women who are the household breadwinners do more housework

than their partners in heterosexual couples, despite other couple types specializing in housework according to breadwinner status. We also show that breadwinning women have less leisure time, and that women do less housework upon divorce while men do more.

Some have tried to explain these facts arguing that socialization may create differential productivity in home production between men and women. We build a collective decision-making model with differential costs of home production, and show that it can indeed match breadwinning women doing more home production than their partners, due to their comparative advantage, and predicts that women's time doing home production will go up upon marriage and down upon divorce. This efficient model also predicts that the total cost of doing home production should fall during marriage, due to the efficient time reallocation, and that home production and labor supply should be responsive to wage ratios, even with differential productivity.

This model can predict that men decrease, and women increase, their home production time upon entering into a cohabiting relationship, and that upon divorce, men increase and women decrease their time, similar to a trade model.

We present two pieces of evidence that show that there must be some additional gender-based inefficiencies to justify the way couples allocate time. First, we show that his work hours and housework hours are not responsive to the household wage ratio, or the shadow cost of time. Men's housework time increases barely any, and his hours worked change only insignificantly, as households go from men out-earning their partners by more than double to women out-earning instead. Women's housework hours do decline a bit with her relative wage (likely due to outsourcing), but her work hours do not increase concordantly.

We also find that even if you multiply housework time by its shadow cost, the wage, the total cost to the household is higher in marriage than it is in divorce, which is impossible in the efficient collective model, since couples should be able to take advantage of trade to lower their costs.

This suggests a model where something more than skill—however deeply gendered— is at play, perhaps additional gender or social norms that create inefficiency, and we provide suggestive evidence of one possible channel, that of gender identity.

Together, our model and empirical evidence suggests that marriages where women out-earn men will not just be stigmatized, they will actually be less efficient, since the gendered nature of housework makes specialization less valuable when she earns

more money, since it will be more costly to have her specialize in home production.

We provide the first empirical test of this particular channel by examining ethnic out-marriage when relative wages interact with the home production ratio in one's home country. We show that when women out-earn men in a local ethnic marriage market, their rates of in-marriage are no lower. But, when they out-earn men with a disfavorable home production ratio in their country of origin, this reduces in-marriage substantially.

Our paper provides evidence that men's inability or unwillingness to do home production may play a substantial role in both what is holding women back in the labor market and in why relative earnings matter so much for marriage. This has substantial policy implications if we believe marriage has ancillary benefits, and relative earnings are not equally distributed—consider that at any percentile in the earnings distribution where earnings are positive, white men out-earn white women, but one must go to the 87th percentile of the Black earnings distribution for Black men to out-earn Black women. The next frontier of gender equality may be for men to "lean in" at home.

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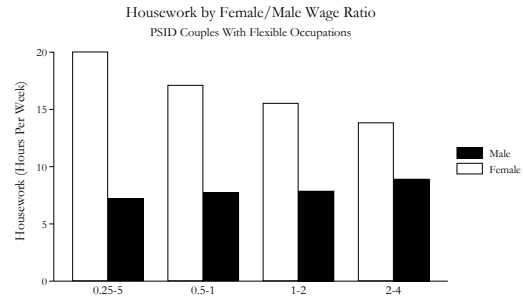
A Appendix Figures

Figure A.1: Dual Earners Housework and Market Work Hours in Flexible Jobs By Wage Ratio

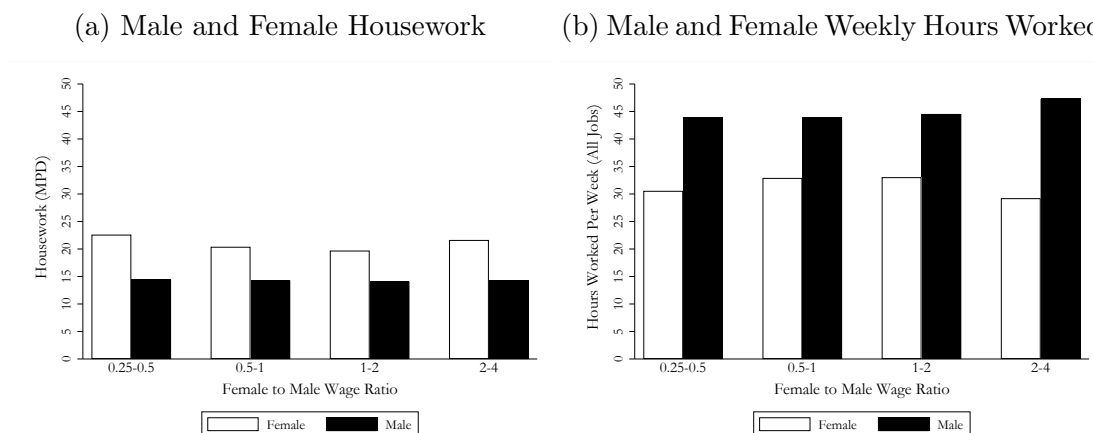(a) Male and Female Weekly Hours Worked
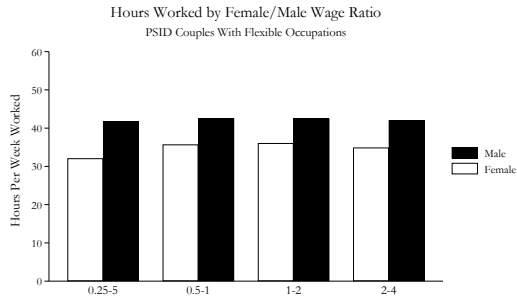
(b) Male and Female Housework

Notes: Panel (a) shows mean levels of housework (hours per week) for women and men in dual earning couples grouped by the ratio of female to male wage. Panel (b) plots the average weekly hours worked per week in all jobs for men and women, again grouped by female to male wage ratio. Wages are calculated as gross financial year labor income divided by annual hours worked in all jobs. All observations are drawn from heterosexual couples where both members are: employed in services, sales, and office support or transportation occupations with non-missing yearly wages and salary earnings, and are aged between 20 and 55 years old. Data are from 2003-2019 from the Panel Study of Income Dynamics.

Figure A.2: Dual Earners Housework and Market Work Hours By Wage Ratio, HILDA

(a) Male and Female Housework

(b) Male and Female Weekly Hours Worked

Notes: Panel (a) shows mean levels of housework (hours per week) for women and men in dual earning couples grouped by the ratio of female to male wage. Panel (b) plots the average weekly hours worked per week in all jobs for men and women, again grouped by female to male wage ratio. Wages are calculated as imputed weekly gross earnings in the respondent's main job divided by hours per week usually worked in the main job. All observations are drawn from heterosexual couples where both members are employed with non-missing yearly wages and salary earnings, and are aged between 20 and 55 years old. Data are from waves 1 through 20 from the Household, Income, and Labor Dynamics in Australia survey.

Figure A.3: Within Couple Difference in Hours Worked Distribution (Dual Earners)—ATUS

(a) Female Higher Wage
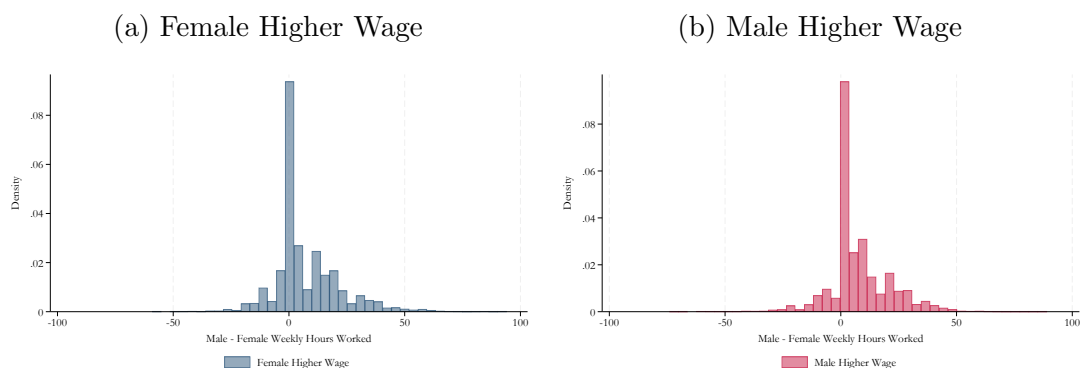
(b) Male Higher Wage

Notes: The distribution of within-couple male less female weekly hours worked for couples where both members are employed. Panel (a) shows data from couples where women have the higher wage. Panel (b) shows data from couples where men have higher wages. Wages are calculated as reported weekly earnings divided by reported average weekly hours worked in all jobs. All observations are drawn from heterosexual couples where both members are employed with non-missing earnings and hours, and are aged between 20 and 55 years old. Data are from all years between 2003-2019 and odd years between 2001-2019 from the American Time Use Survey.

Figure A.4: Within Couple Difference in Hours Worked Distribution (Dual Earners)—HILDA

(a) Female Higher Wage
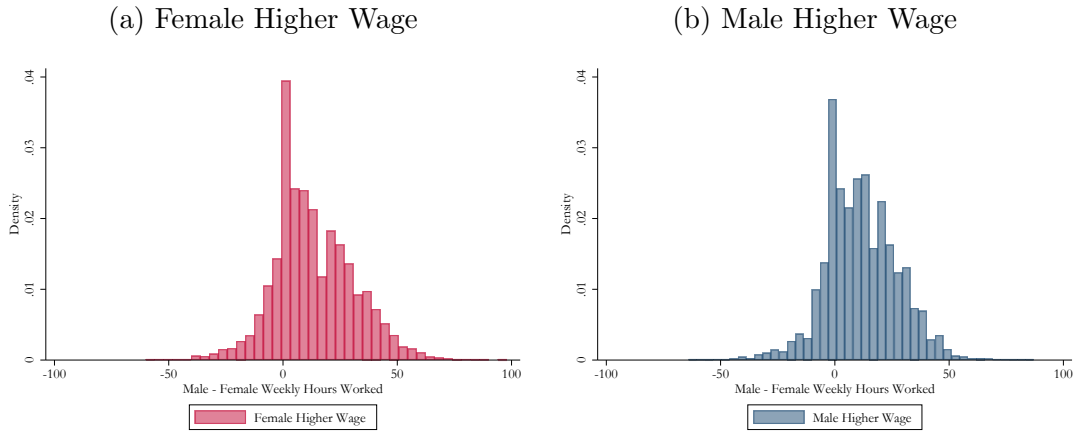
(b) Male Higher Wage

Notes: The distribution of within-couple male less female weekly hours worked in main job for couples where both members are employed. Panel (a) shows data from couples where women have the higher wage. Panel (b) shows data from couples where men have higher wages. Wages are calculated as imputed weekly gross earnings in the respondent's main job divided by hours per week usually worked in the main job. All observations are drawn from heterosexual couples where both members are aged between 20 and 55 years old. Data are from waves 1 through 20 from the Household, Income, and Labor Dynamics in Australia survey.

Figure A.5: Under-response in Employment to the Earnings Ratio by All Men
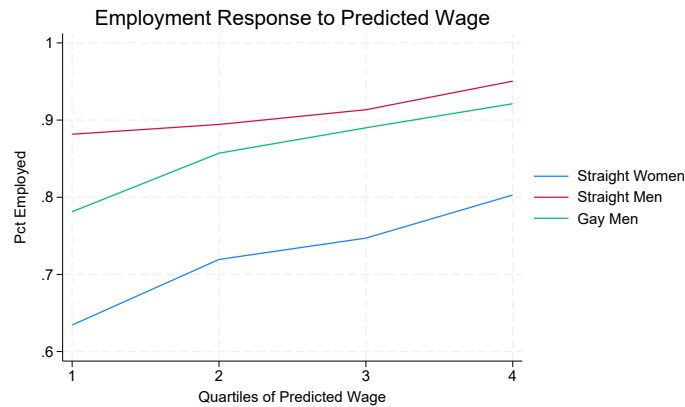

Notes: This figure shows the proportion of straight men and women as well as gay men that are employed across four quartiles of predicted wages. The sample is all heterosexual couples and same-sex male couples from ATUS and HILDA, where both individuals in a couple are between the ages of 20 and 55. For HILDA, the first observation for each unique couple is taken for the sample. Wages are predicted using dummies for education, survey year, age group, and region with fixed effects for country and for metropolitan statistical area for observations in ATUS. Quartiles of predicted wage are computed across the joint sample of predicted wage from both countries.

Figure A.6: Under-response in Home Production Time by Employment

Comparing Gay and Straight Men & Women's Housework & Food Prep Time
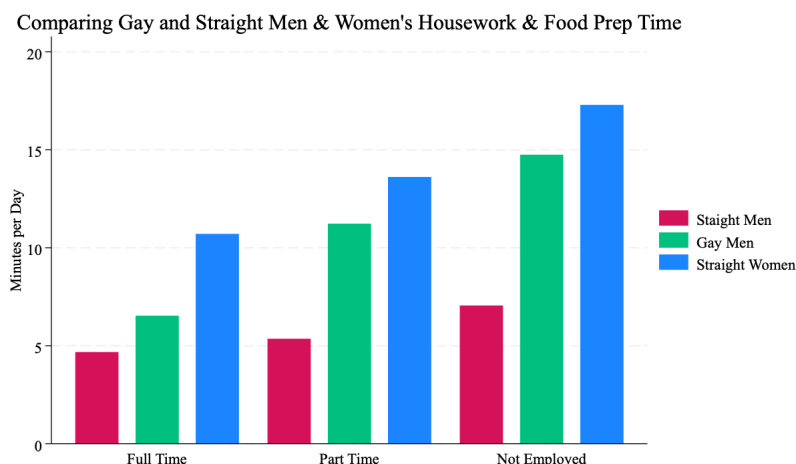
Notes: This figure shows the average level of cooking and cleaning performed straight men and women as well as gay men as a function of employment status. The sample is all heterosexual couples and same-sex male couples from ATUS and HILDA, where both individuals in a couple are between the ages of 20 and 55. For HILDA, the first observation for each unique couple is taken for the sample.

Figure A.7: Time in Market Work and Home Production by the Predicted Wage Ratio

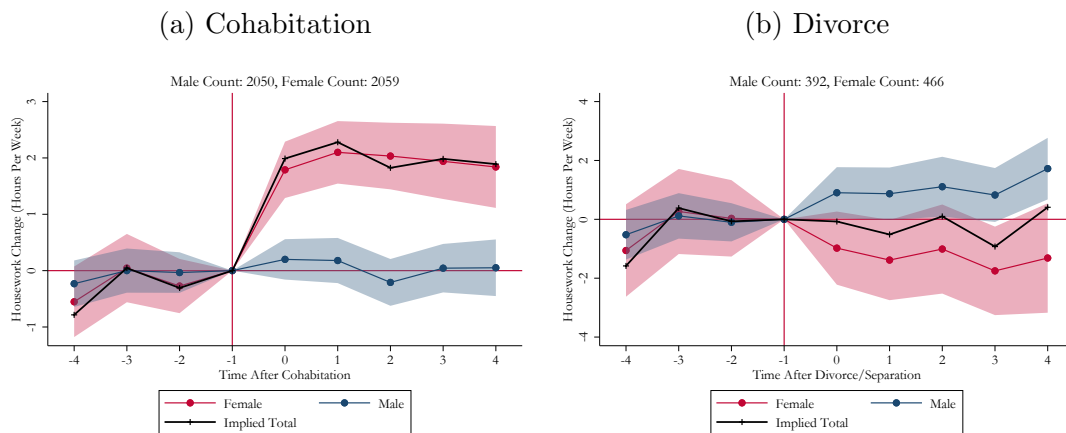(a) Market Work   (b) Home Production
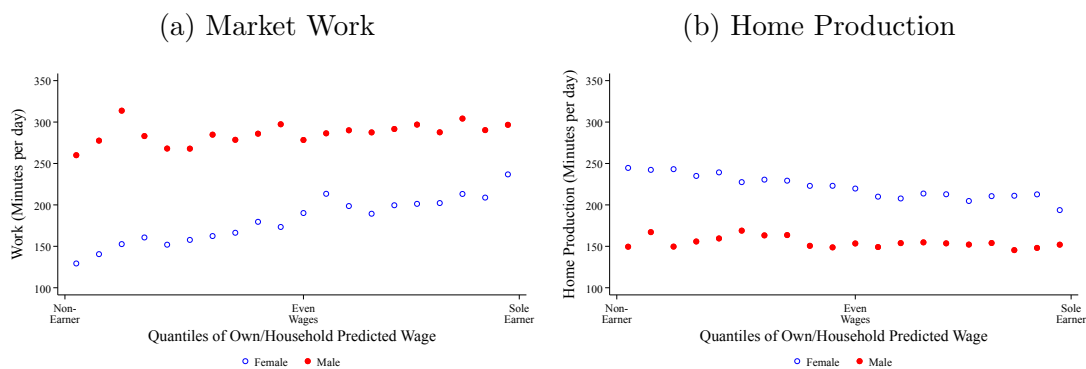
Notes: Data from ATUS, 2003-2020. Heterosexual couples aged 20-55. X-axis shows 20 quantiles of the earnings proportion, $\frac{\text{own earnings}}{\text{own + spouse earnings}}$. Non-earners are unemployed individuals with an employed spouse, such that the earnings proportion is 0. Sole earners are employed individuals with an unemployed spouse, such that the earnings proportion is 1. There are no data points at each extreme exactly due to sparsity at the extremes.

Figure A.8: PSID Promotion Events: Relative Wage Change
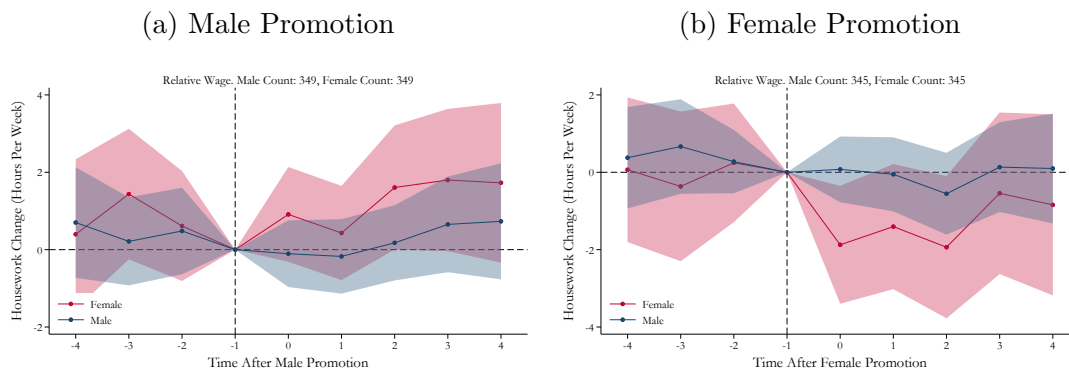
(a) Male Promotion

(b) Female Promotion

Notes: Plot of event study estimates of the effect of male (Panel (a)) and female (Panel (b)) promotions, defined as entering a new position at unchanged employer since the last year, on reported weekly hours of housework performed by men and women relative to the period before the event (t=-1). Additionally, the ratio of the individual's wage to their spouse's must increase by at least 25% after the promotion. Regressions include year and state fixed effects, dummies for number of children present, and quadratics in both members' ages. All results clustered at the couple level. All individuals were heterosexual and aged between 20 and 55 years old. All individuals must be observed with non-missing housework data least once before and once after the relevant events. Data are from all years between 1985-1997 and the odd years between 1999-2019 of the Panel Study of Income Dynamics

Figure A.9: HILDA Cohabitation and Divorce Events: Housework

(a) Cohabitation

(b) Divorce

Notes: Plot of event study estimates of the effect of partnership formation (Panel (a)), defined as a new spouse entering an individual's household, and divorce or separation (Panel (b)) on reported weekly hours of housework performed by men and women relative to the period before the event (t=-1). The implied change in total housework in each period is calculated as the sum of women and men's estimates. Regressions include year and state fixed effects, dummies for number of children present, and quadratics in the individual's age. All results clustered at the couple level. All individuals were heterosexual and aged between 20 and 55 years old. All individuals must be observed with non-missing housework data least once before and once after the relevant events. Data are from waves 1-20 of the Household, Income, and Labor Dynamics in Australia survey

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Figure A.10: Per-Person Meal Expenditure after Divorce, HILDA
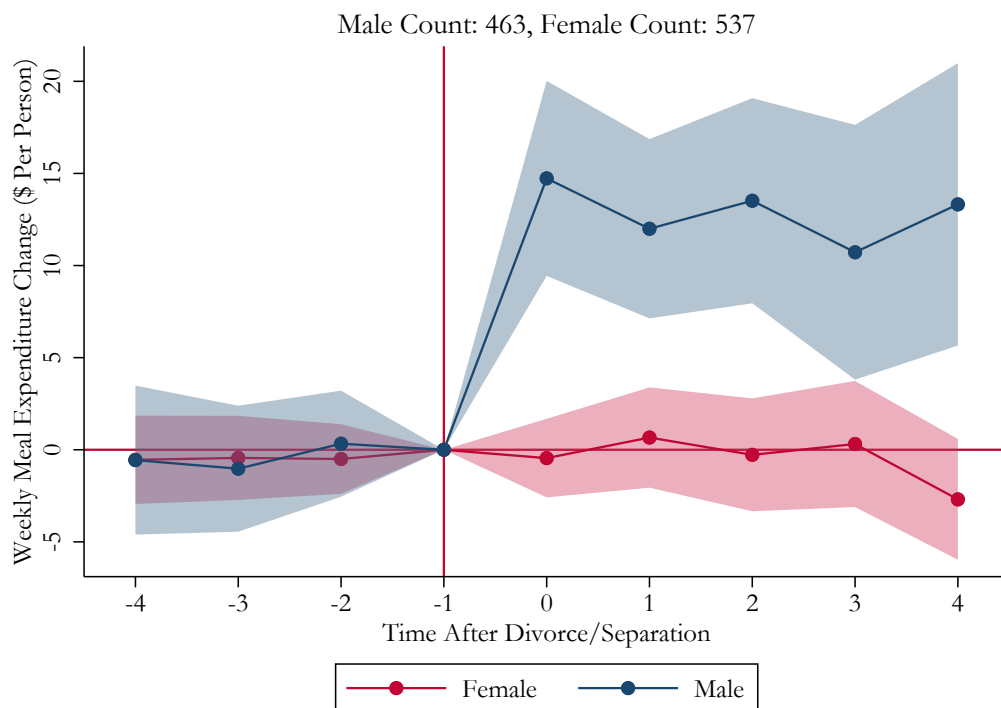
Notes: Plot of event study estimates of the effect of partnership dissolution (divorce or separation) on imputed weekly household outside meal expenditure for the two subsequent households after a partnership dissolves relative to the period before the event (t=-1). Regressions include year and region fixed effects, dummies for number of children in household, and a quadratic in own age. All results clustered at the couple level. All couples were heterosexual with both members aged between 20 and 55 years old. All individuals have non missing meal expenditure data and are observed at least once before and once after partnership dissolution. Data are from waves 1 through 20 from the Household, Income, and Labor Dynamics in Australia survey.

Figure A.11: Housework Cost after Divorce
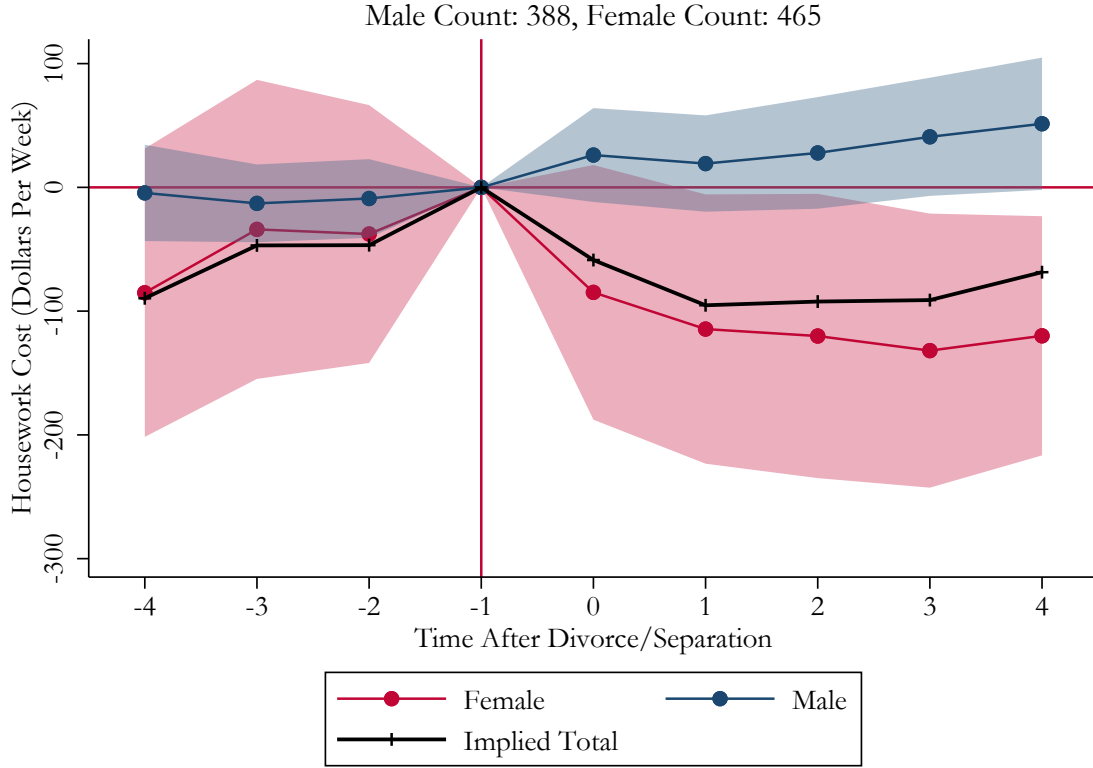
Notes: Plot of event study estimates of the effect of divorce in the HILDA on the cost of weekly hours of housework performed by men and women relative to the period before the event (t=-1). The cost is calculated as weekly hours of housework multiplied by imputed wages. Wages are predicted for unemployed women and men by estimating the following empirical models by gender: regressing wages on individuals' marital status (cohabiting, married, or single), a quadratic in their age, and dummies for year, statistical area, education (masters or doctorate, grad certificate, Bachelor's degree, diploma, Certification level III or IV, high school, or less than high school) , and number of children in their household. The implied change in total costs in each period is calculated as the sum of women and men's estimates. Event study regressions include year and state fixed effects, dummies for number of children present, and quadratics in the individual's age. All results clustered at the couple level. All individuals were heterosexual and aged between 20 and 55 years old. All individuals must be observed with non-missing housework data least once before and once after the relevant events. Data are from waves 1-20 of the Household, Income, and Labor Dynamics in Australia survey

B   An example

To obtain more tractable results, let us assume that $U^g = \ln c^g + \ln l^g + \alpha^g \ln x$ where $\alpha^m > \alpha^w$ may be larger for men than for women and $f(.) = \sqrt{..}$

The FOC when single then become:

$$\frac{\alpha^w}{2\sqrt{T-l^w-h^w}\sqrt{T-l^w-h^w}} = \frac{1}{l^w} = \frac{w^w}{c^w}$$

and

$$\frac{\alpha^m\beta}{2\sqrt{T-l^m-h^m}\beta\sqrt{T-l^m-h^m}} = \frac{1}{l^m} = \frac{w^m}{c^m}$$

This implies that $l^g = h^g$, that $c^g = w^g l^g$ and $x^w = \sqrt{T-2l^w}$ and $x^m = \beta\sqrt{T-2l^m}$. Finally, leisure time will be determined by

$$\frac{\alpha^w}{2(T-2l^w)} = \frac{1}{l^w}$$

and

$$\frac{\alpha^m}{2(T-2l^m)} = \frac{1}{l^m}$$

Leisure will be given by $l^g = \frac{2T}{4+\alpha^g}$, time devoted to household production would be $\frac{T\alpha^g}{4+\alpha^g}$ and men would devote more time to household production and less to leisure than women if they value more household production. They may consume more or less depending on their wages.

The total utility of each individual will be:

$$\ln(\frac{2Tw^g}{4+\alpha_g})+\ln(\frac{2T}{4+\alpha_g})+\alpha_g\ln(\sqrt{\frac{T\alpha_g}{4+\alpha_g}}) = \ln 4w^g+0.5\alpha_g\ln(\alpha_g)+(2+0.5\alpha_g)\ln(\frac{T}{4+\alpha_g})$$

Increasing the woman's wage, maintaining the sum of it constant will imply that aggregate utility will change by

$$\mu 1/w^w - (1-\mu)*1/w^m$$

For married individuals, we have

$$\frac{\sqrt{T-l^m-h^m}}{\sqrt{T-l^w-h^w}} = \frac{\beta w^w}{w^m}$$

$$\frac{l^m}{l^w} = \frac{w^w}{w^m}\frac{1-\mu}{\mu}$$

Using the budget constraint, we thus obtain that

$$l^w = \mu h^w + \mu \frac{w^m h^m}{w^w}$$

and thus

$$l^m = (1 - \mu)h^m + (1 - \mu)\frac{w^w h^w}{w^m}$$

and then replacing into the initial condition, we get

$$\frac{\sqrt{T - (2 - \mu)h^m - (1 - \mu)\frac{w^w h^w}{w^m}}}{\sqrt{T - (1 + \mu)h^w - \mu\frac{w^m h^m}{w^w}}} = \frac{\beta w^w}{w^m}$$

$$\frac{T - (2 - \mu)h^m - (1 - \mu)\frac{w^w h^w}{w^m}}{T - (1 + \mu)h^w - \mu\frac{w^m h^m}{w^w}} = \frac{\beta^2 w^{w2}}{w^{m2}}$$

or

$$h^m = \frac{T(1 - \beta^2 w^{w2}/w^{m2}) + h^w w^w/w^m \left((1 + \mu)\beta^2 w^w/w^m - (1 - \mu)\right)}{2 - \mu(1 + \beta^2 w^w/w^m)}$$

$$l^m = \frac{(1 - \mu)T(1 - \beta^2 w^{w2}/w^{m2}) + h^w w^w/w^m(1 - \mu)\left(1 + \beta^2 w^w/w^m\right)}{2 - \mu(1 + \beta^2 w^w/w^m)}$$

$$l^w = \frac{\mu T w^m/w^w(1 - \beta^2 w^{w2}/w^{m2}) + h^w \mu(1 + \beta^2 w^w/w^m)}{2 - \mu(1 + \beta^2 w^w/w^m)}$$

Replacing in the original FOC, this gives us

$$h^w = \frac{T\left(2(1 + \beta^2 w^w/w^m)(2 - \mu(1 + w^m/w^w)) - \bar{\alpha} w^m/w^w(1 - \beta^2 w^{w2}/w^{m2})\right)}{(1 + \beta^2 w^w/w^m)(4 + \bar{\alpha})}$$

$$l^w = \frac{2\mu T(1 + w^m/w^w)}{(4 + \bar{\alpha})}$$

The time devoted by women at home will be given by

$$T - l^w - h^w = \frac{T\bar{\alpha}\left((1 + w^m/w^w)\right)}{(1 + \beta^2 w^w/w^m)(4 + \bar{\alpha})}$$

This will be higher than what she would do as a single woman if

$$\frac{1 + w^m/w^w}{1 + \beta^2 w^w/w^m} > 1$$

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or if

$$w^m > \beta w^w$$

His time in the workplace would be given by

$$h^m = \frac{T\left(2(1 + \beta^2 w^w/w^m)(2 - (1 - \mu)(w^w/w^m + 1)) + \bar{\alpha}(1 - \beta^2 w^{w2}/w^{m2})\right)}{(1 + \beta^2 w^w/w^m)(4 + \bar{\alpha})}$$

His leisure be given by

$$l^m = \frac{2(1 - \mu)T(w^w/w^m + 1)}{(4 + \bar{\alpha})}$$

The time devoted by men at home will be given by

$$T - l^m - h^m = \frac{\bar{\alpha}T\left(\beta^2 w^w/w^m(w^w/w^m + 1)\right)}{(1 + \beta^2 w^w/w^m)(4 + \bar{\alpha})}$$

This will be less than what he was doing as a single man if

$$\beta w^w < w^m$$

Total household time devoted to household tasks will be:

$$\frac{\bar{\alpha}T\left(\beta^2 w^w/w^m(w^w/w^m + 1) + (1 + w^m/w^w)\right)}{(1 + \beta^2 w^w/w^m)(4 + \bar{\alpha})}$$

This will be more than the sum of what they devoted as a couple when

$$\beta w^w > w^m$$

But the cost of that time will be unchanged.

The household public good will be

$$\sqrt{\frac{T\bar{\alpha}(1 + w^m/w^w)}{(1 + \beta^2 w^w/w^m)(4 + \bar{\alpha})}} + \beta\sqrt{\frac{\bar{\alpha}T\left(\beta^2 w^w/w^m(w^w/w^m + 1)\right)}{(1 + \beta^2 w^w/w^m)(4 + \bar{\alpha})}}$$

$$\sqrt{\frac{T\bar{\alpha}(w^m + w^w)(1 + \beta^2 w^w/w^m)}{w^w(4 + \bar{\alpha})}}$$

Public good will always be larger in marriage than in singlehood.

Total household monetary resources will be given by

$$\frac{2T(w^w + w^m)}{4 + \bar{\alpha}}$$

a fraction μ of which will be consumed by the woman and the rest by the man.

The couple's utility will be given by

$$\mu ln(\mu \frac{2T(w^w + w^m)}{4 + \bar{\alpha}}) + \mu \ln(\frac{2\mu T(1 + w^m/w^w)}{(4 + \bar{\alpha})} + \bar{\alpha} \ln \sqrt{\frac{T\bar{\alpha}(w^m + w^w)(1 + \beta^2 w^w/w^m)}{w^w (4 + \bar{\alpha})}}$$

$$+(1 - \mu)ln((1 - \mu)\frac{2T(w^w + w^m)}{4 + \bar{\alpha}}) + (1 - \mu) \ln(\frac{2(1 - \mu)T(w^w/w^m + 1)}{(4 + \bar{\alpha})})$$

This simplifies to

$$2\mu \ln \mu + 2(1 - \mu) \ln(1 - \mu) + 0.5\bar{(\alpha)} \ln(\bar{\alpha}) + (2 + 0.5\bar{\alpha}) \ln \frac{T(w^w + w^m)}{4 + \bar{\alpha}}$$

$$-(\mu + 0.5\bar{\alpha}) \ln w^w - (1 - \mu + 0.5\bar{\alpha}) \ln w^m + 0.5\bar{\alpha} \ln(w^m + \beta^2 w^w)$$

Increasing the woman's wage, maintaining the sum of both wages constant will imply that aggregate utility will change by

$$-\mu/w^w + (1 - \mu)/w^m + 0.5\bar{\alpha} \left(-1/w^w + 1/w^m + \frac{-1 + \beta^2}{w^m + \beta^2 w^w} \right)$$

This will be different than when the two individuals live apart for the additional element on the right. When $\beta = 1$ and both genders are equally productive, having both partners being more different in wages will be better as the lower wage partner will be able to devote more time to household production. So it will be more detrimental to increase women's wages in marriage than in singlehood when $w^w < w^m$. The opposite will be true when $w^w > w^m$. In addition, when $\beta < 1$, there is a more negative impact of increasing women's, even when $w^w > w^m$. That is because the most productive party now has a higher opportunity cost of time.