Coordinated Work Schedules and the Gender Wage Gap

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Abstract

Using U.S. time diary data we construct occupation-level measures of coordinated work schedules based on the concentration of hours worked during peak hours of the day. A higher degree of coordination is associated with higher wages but also a larger gender wage gap. In the data women with children allocate more time to household care and are penalized by missing work during peak hours. An equilibrium model with these key elements generates a gender wage gap of 6.6 percent or approximately 30 percent of the wage gap observed among married men and women with children. If the need for coordination is equalized across occupations and set to a relatively low value (i.e. Health care support), the gender gap would fall by more than half to 2.7 percent.

Key words: Labor Supply, Occupations, Coordination, Work Schedules, Time Use, Gender Wage Gap.
JEL Classifications: J2, J3, E2.

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1 Introduction

Balancing work and family is a challenge in modern societies. Household production not only limits the total number of hours that can be devoted to market work, it may also conflict with *when* hours can be supplied. For example, as long as parents cannot perfectly substitute child care responsibilities across different hours of the day, there will be temporal restrictions on when parents can supply labor.

From the perspective of the employer, *when* work happens may be important if there is joint production and firms need to coordinate workers. The need for coordination may be task and occupation-specific. The nature of production in some occupations may require workers to be at work at the same time to perform a joint task. In other occupations, workers may be assigned tasks which can largely be performed on their own and precisely when that work is completed is less important. The need for coordination raises productivity of hours supplied when others are present. To the extent that women have more household care responsibilities than men, and therefore have greater difficulty committing to be present at any particular hour, this mechanism generates a gender wage gap. In this paper we study the timing of labor supply and its interaction with household care needs during the day. Compared to the extensive literature on labor supply along the quantity dimension, this is an under-explored area. We fill this gap by making empirical, theoretical, and quantitative contributions.

Using the American Time Use Survey (ATUS), we document novel facts regarding the timing of work for men and women. We find that parents perform household care (child care plus adult care) throughout the day– even during peak hours– suggesting that parents are indeed unable to postpone household pro-

duction to non-work times. Comparing men and women, even among full-time workers, women provide more household care and work less throughout the day relative to their male counterparts. The gap in hours is small but our point is that even small gaps can generate productivity losses depending on the timing.

We also employ the ATUS to measure coordinated work schedules at the occupation level. For each occupation, we record at what time of the day individuals report being at work. We associate more bunching (work schedules concentrated at particular times) with stronger coordination needs, because bunching implies that individuals are at work at the same time. We find that the degree of bunching of work hours varies across occupations and, consistent with the notion of coordination, our measure is positively correlated with other occupational characteristics such as "face to face discussions," "developing and building teams," and "establishing and maintaining interpersonal relationships" reported in the O*NET database.

We then use individual level data from the Current Population Survey (CPS) to study the relationship between wages and our occupational level measure of coordination. We find that our measure of coordination commands a wage premium: a one standard deviation higher ratio leads to approximately 12 percent higher wages. In addition, it generates a gender wage gap: women who work in coordinated occupations are paid a higher wage but relatively less than men (by about 6 percent). Interestingly, we find that married men with full-time working spouses (who presumably have greater household care responsibilities) also experience an earnings penalty in high coordination occupations relative to men with non-working spouses.

Motivated by these facts, we develop a theory of occupational choice and time

allocation during the day to household care and market work. In the model a gender wage gap is generated by the interaction of three key elements. First, women assign a higher value to household care– an assumption which we justify as a reflection of current social norms. Since household care activities performed at different times are less than perfect substitutes, women end up allocating more time to household care when everyone else is working, which is costly. This penalty rises with the occupational coordination needs so women are less likely to select into occupations with higher coordination needs.

We parameterize the model with the data used in the empirical analysis. We restrict the sample to married men and women with children who are full-time workers. The model generates a gender wage gap of 6.6 percent (approximately 30 percent of the observed gender gap). To understand the extent to which occupational differences in coordination are responsible for the observed gender gap we conduct a counterfactual exercise where coordination needs are equal across all occupations and set to the level of "Healthcare Support"– an occupation with a relatively low level of coordination. In this case, the overall gender wage gap in the model falls by more than a half to 2.7%. The gender wage gap within occupations decreases by 65% to 2.2%. In another counterfactual, we equate the value that men and women place on household care. We can think of this experiment as a way to evaluate changes in social norms that drive a reduction in the gender gap in household care responsibilities. As a result, the gender wage gap within occupations decreases by 50% to 3.1%. Finally, we focus our study on the effects of the ability to substitute household care during the day. Our baseline calibration points to an economy in which household care activities are fairly substitutable but imperfectly so. They may reflect parenting styles or just constraints on the time

of the day in which some activities take place (for example meetings with school teachers). We thus analyze a counterfactual economy in which women can now more easily distribute the household care to off-peak times so they do not incur a productivity loss. As a result, the gender wage gap within occupations decreases by 27% to 4.5%.

A large literature in macroeconomics and labor economics relates family arrangements and the labor supply of its family members. Important contributions are Doepke and Tertilt (2016), Bick and Fuchs-Schündeln (2018) and Albanesi and Olivetti (2009). Our paper is also closely connected to the literature which examines the role of frictions on workers' labor supply responses. These frictions could arise from fixed wage-hours packages offered by employers which result in non-linear payment schedules. Important contributions are Prescott, Rogerson, and Wallenius (2009), Rogerson and Wallenius (2009) as well as Rosen (1976), Blundell, Brewer, and Francesconi (2008), Altonji and Paxson (1988) and Altonji and Paxson (1992). Recent papers have emphasized the role of coordination as the driving force behind non-convex budget sets. The wage-hours combinations available to workers may be sparse due to the needs for coordination. This need may arise at the firm level or even at a more aggregate, economy-wide level. For example, Guner, Kaya, and Sánchez-Marcos (2014) study how the Spanish work schedule with long lunch breaks affects parental time allocation. Other recent papers study the labor supply responses to changes in, for instance, taxes or other economic conditions. They find stark differences between responses with non-linear payment schedules and those predicted by linear payment schedules and an absence of coordination. Examples include Chetty, Friedman, Olsen, and Pistaferri (2011), Rogerson (2011), and Labanca and Pozzoli (2018). We contribute to this literature by exploring how

coordination requirements influence labor supply as well as another important margin – occupational choice. Instead of examining labor supply responses to tax changes, we examine how these hours requirements driven by coordination needs conflict with the demands of household production and consequently lead to the gender wage gap.[1]

Our work is also closely related to the literature which relates occupation-specific characteristics to the gender wage gap. Goldin (2014) argues that much of the remaining gender wage gap can be explained by the lack of flexible work arrangements. Along these lines, a number of papers have shown that the gender gap is particularly large in jobs which demand long hours (Erosa, Fuster, Kambourov, and Rogerson (2017), Gicheva (2013) Cha and Weeden (2014), Cortes and Pan (2016b), Cortes and Pan (2016a), Duchini and Effenterre (2017) and Wasserman (2019)).[2] Compared to these studies, our focus is on flexible timing, rather than the flexibility to set the number of hours. We show that while the demand for long hours and our measure of coordination are positively correlated, the correlation is far from perfect and both contribute to the gender wage gap.[3]

A recent paper, Mas and Pallais (2017), elicit workers' willingness to pay for flexible schedules using a field experiment. These authors find that while the average willingness to pay for flexibility is low, there is also a long right tail in the

[1]Our occupational choice model integrates the timing of work with the timing of household care in a unified framework where family responsibilities play a key role. This feature differentiates our work from previous work which study the timing and synchronization of works schedules. Examples of these studies are Hamermesh (1999) and Cardoso, Hamermesh, and Varejao (2012), Weiss (1996) and Eden (2017).

[2]The requirement for long hours has been also associated with less flexible work schedules. Thus our work also relates to Wiswall and Zafar (2017), Goldin and Katz (2011), and Flabbi and Moro (2012).

[3]A recent paper by Denning, Jacob, Lefgren, and vom Lehn (2019) finds that the positive relationship between hours worked and earnings is virtually absent within occupations and it is only observed across occupations. This finding suggests that the hours gap between men and women cannot account for the within-occupation gender wage gap if this hours penalty is applied. In our paper we show that differences in the within-occupation gender wage gap can be large even when the gender hours gap is small.

willing to pay distribution suggesting compensating differential for inflexibility still could be large at the margin.[4] Another recent paper, Chen, Chevalier, Rossi, and Oehlsen (2019), estimates the value of flexibility among drivers of the ride-sharing platform Uber. Drivers have almost total flexibility when to supply labor, to the point of being able to react on an hourly basis to unexpected shocks to their reservation wage. The authors estimate the surplus from that flexibility to be large, and hence their results are roughly in line with our findings.

The paper is organized as follows. Section 2 describes our data, the temporal patterns of work and household care in the ATUS, as well as our measure of hours bunching which proxies for coordination requirements. Section 3 reports our reduced form regression results using individual level CPS data. Section 4 presents the model. Section 5 illustrates the model mechanics with simple examples. Section 6 describes the calibration and our counterfactual experiments. Section 7 concludes.

2 Time Allocation by Gender, and Coordinated Work Schedules

2.1 Data

We base our analysis on the 2003-2014 American Time Use Surveys (ATUS). One respondent per household is drawn from the Current Population Survey samples and the interviews are conducted 2 to 5 months after the last CPS interview. Time

[4]They also find that workers particularly dislike working evening and weekend shifts which at first appears to be counter to our story. Occupations which require evening and weekend shifts (such as security guards) may appear to be flexible in terms of our bunching measure but this may just be a reflection of a 24 hour production cycle. To address this issue, we rerun our regressions omitting occupations in which 12 percent or more workers report working evening and night shifts. We find our results are robust to omitting these occupations.

diary information over the previous day is recorded and respondents report their activities and starting and ending times. There are 17 aggregate activities and we focus on two activities, "work and work-related activities" and "caring for and helping household members". For each individual we calculate minutes spent on these activities for each hour of the day using information on starting and ending times. We restrict our sample to adults who are 18 to 65 years old. Our main sample of time-diary respondents consists of 106,620 observations. The full-time worker sample consists of 66,023 observations. To construct the ratio of hours worked in the 8 to 5 time interval at the occupation level we include only full-time workers who worked a minimum of 35 hours in their main job, consisting of 62,811 observations. For the regression analysis where we explore the impact of occupation-level $8to5ratio$ on wages, we include all individuals in the CPS, including those who are not time-use survey respondents. For this the sample sizes are considerably larger, with the sample consisting of 263,313 individuals who are full-time workers aged 18 to 65 with non-missing weekly wages. Since the time use surveys are conducted 3 months after the main CPS interviews we use variables such as age and work status that are collected at the time of the time use survey whenever possible. Some of the information, however, such as education, is available only in the main CPS data.

2.2 Timing of Work and Household Care

In this section we describe patterns of time use over the course of a single day for full-time workers by gender, marital status and parental status. These patterns show how time allocated to market work is constrained by the demands of family time and how those constraints differ for men and women. Figure 1 explores *when*

work happens. The figure graphs the average number of minutes worked by one-hour time bins for full-time workers. The figure shows that most (74 percent) work occurs during the 8 a.m. to 5 p.m. interval with a break between 12 p.m. to 1 p.m. Even among full-time workers, average minutes worked per hour is well below 60 which may reflect the fact that we are averaging over all 7 days of the week including weekends. Figure 2 graphs the average number of minutes worked by marital and parental status. The top panel shows work for married individuals, men and women, with at least one own child in the household, who work full-time. The bottom panel shows work for singles with no children. Even among full-time workers, women work less than men, with the gap being largest among those married with children. Table 1 further explores the gender differences in work for this group. The table shows that women work approximately 0.9 hours less on weekdays and 0.7 hours less on weekends. Column (5) controls for usual weekly hours worked reported in the activity summary file. Column (6) only includes workers who reported usual weekly hours less than 50. Both of these restrictions reduce the gap in hours worked but even among full-time workers who work less than 50 hours, married women with children work almost 0.5 hours less on weekdays relative to their male counterparts. However, the "missing hours" among women occur throughout the day and does not appear to have, at least among full-time workers, a notable temporal pattern.

Figure 3 graphs the temporal pattern of household care among full time workers who are married with children and singles without children.[5] The differences in the temporal pattern of work and household care, however, are notable. Both women and men with children report household care with noticeable bumps up

[5]Household care includes active child care and elder care where respondents report these activities as the primary activity. We do not include passive child care where it is reported as a secondary activity.

in the early morning and evening hours. The temporal pattern of care for full-time workers with children is negatively related to the temporal pattern of work, with the fewest minutes devoted to care activities during the 8 to 5 interval. However, even during the 8 to 5 interval, household care does not fall to zero. Table 2 shows that among married men and women with children, women engage in nearly 0.5 hours more household care during weekdays and 0.3 hours more on weekends. Different controls reduce the gap but the table shows that women significantly allocate more time to household care than men.

2.3 Differences in Household Care by Work Status and Spouse's Work Status

In this section, we provide further detail regarding differences in hours of child care provided by mothers and fathers. First we examine detailed care categories adopting a method introduced by Stewart (2010). Stewart (2010) defines three broad categories of child care: "routine", "enriching care", and "other." Included in routine care is physical care and looking after children. "Enriching care" includes activities such as reading to children and playing sports with children. "Other" includes more nebulous activities such as "organizing and planning for household children," "attending children's events," and "picking up and dropping off children." Table A.1 provides the full list of activities included in each of the three broad categories.

Table 3 compares the hours of each type of care performed by non-working married mothers, full-time married mothers, full-time single mothers, and full-time married fathers, respectively. The top panel reports hours during weekdays while the bottom panel reports hours during weekends. The table also separates

out households where at least one child is under the age of six (school age). Looking at hours of routine care in families with young children, we see (not surprisingly) that non-working mothers provide the most care, 1.4 hours, while full-time married mothers and full-time single mothers provide 1.0 and 0.8 hours respectively. Full-time married fathers provide considerably less, 0.4 hours. What is surprising is that non-working and full-time working mothers provide the same amount of care in the "other" category – all three groups provide 0.4 hours on a typical weekday. There are differences when we examine households with only older children but main point is that the child care provided by non-working and full-time working mothers is not as different as one might have thought, especially when it comes to the non-routine care categories. This type of child care does not constitute a lot of hours but the table shows that certain activities cannot be easily outsourced.

We also make comparisons across married fathers. Even though the overall hours of household care is low among fathers, it may be the case that fathers with working spouses differ from those with non-working spouses. We examine this question in the next set of tables. Table 4 compares work hours of married fathers by work status of the spouse. The table format is similar to Table 1 and examines work during the diary day among those who report being full-time workers. Instead of showing differences in the female-male gap, however, Table 4 shows the gap relative to fathers with non-working spouses. Fathers with part-time working spouses report 0.12 fewer hours of work on a weekday (not statistically significant) relative to fathers with non-working spouses whereas fathers with full-time working spouses report 0.25 fewer hours of work on a weekday (statistically significant). Table 5 compares gaps in hours of household care among fathers with

working and non-working spouses. The table shows that while fathers with part-time working spouses are on par with fathers with non-working spouses, fathers with full-time working spouses perform somewhere between 0.07 to 0.12 more hours of household care on a typical weekday relative to fathers with non-working spouses.

To summarize, we showed that married women with children who are full-time workers report fewer hours of work in the time diary data relative to their male counterparts– a phenomenon we call "missing hours." The "missing hours" occur throughout the day and is distinct from women being less likely to work long hours. Correspondingly, married women with children also perform more household care than men. The extra household care is unlikely to be routine child care since we are considering full-time working women. Instead, the extra hours are likely to consist of a catch-all "other" category which includes such activities as organizing and planning, driving children, attending doctor's appointments and children's activities. These activities add up to a small number of hours but are likely to entail costly work interruptions. Interestingly, when we separate out married fathers by the work status of their spouses, we find a similar pattern of "missing hours" and increased household care among men with full-time working spouses compared to men with non-working spouses. While we focus on the gender wage gap, we hypothesize that the pattern we describe here is likely to hold for all parents who have the main household care responsibilites.

2.4 Measure of Coordinated Work Schedules

Building on the previous section, we construct our measure of coordinated work schedules for different occupations. Call the time intervals between 12 a.m. and

8 a.m., between 8 a.m. and 5 p.m. and, between 5 p.m. and 12 a.m. A, B and C, respectively. A_{ij}, B_{ij}, and C_{ij} then refer to the sum of minutes worked by individual i in occupation j in those respective intervals. We sum over individuals to get occupation-level equivalents where w_i refers to the survey weight of the individual.

$$A_j = \sum_{i=1}^{N_j} w_i A_{ij}, B_j = \sum_{i=1}^{N_j} w_i B_{ij}, C_j = \sum_{i=1}^{N_j} w_i C_{ij}$$

Our measure of coordinated work schedules at the occupation level is the ratio of minutes worked in the 8 to 5 interval relative to total minutes worked.

$$ratio8to5_j = \frac{B_j}{A_j + B_j + C_j}.$$

We include only full-time workers in calculating this ratio. A higher ratio indicates that a greater amount of work in the occupation occurs during the standard 8 to 5 work day. We also standardize this measure by subtracting the mean and dividing by the standard deviation. We view a higher ratio as indicating the need for greater coordination, with more hours worked concentrated during peak hours.

Tables 6 and 7 report the occupation level ratios for 93 different occupation categories sorted from low to high ratios. Table 6 examines occupations that require less education, specifically those where the share of workers with a college degree is less than 0.4. Table 7 examines occupations with more educated workers.[6] We highlight some well-known occupations in Figure 4. Among occupations with relatively educated workers, "Lawyers, law clerks" and "Financial Analyst" have standardized ratios of 0.824 and 1.03, respectively. "Computer/software related" occupations have a standardized ratio of 0.759 and "Writers, authors, and new me-

[6]We mapped detailed 2002 Census occupation codes to detailed Standard Occupation Classification (SOC) codes and aggregated to 93 SOC categories.

dia" have a relatively low ratio of 0.485. "Physicians, therapists, nurses, dentists" have the lowest ratios at -0.274. In occupations with relatively less educated workers "Nursing, Psychiatric, and Home Health Aides" has a very low ratio of -1.638. "Cashiers, clerks, retail persons" has a ratio of -0.133. Occupations with relatively high ratios include "First-Line Supervisors of Retail , non retail Sales Workers" (0.534) and "Computer Operators" (0.964), and "Secretaries and Administrative Assistants" (1.434).

Columns 1 and 2 of the table also report the number of workers and the number of full-time workers in each occupation. As can be seen from the numbers reported in these columns, some occupations have only a few observations, raising concerns of sampling noise. In our regressions relating wages to our coordination measure, we keep only occupations with at least 100 full-time workers and end up with 76 occupations.[7]

How is our measure related to other occupational characteristics? Table 8 reports correlations of our measure of coordinated work schedules, *ratio8to5*, with other occupational characteristics reported in the O*NET data base.[8] The table shows that our measure points to the need for coordination with others in the workplace. Our measure is positively correlated with "developing and building teams," "establishing and maintaining interpersonal relationships," and "face to face discussions." On the other hand, it is negatively correlated with "assisting and caring for others."

One can view our measure as a rather arbitrary way to think about the concen-

[7]We have also run regressions including occupations with at least 100 full-time workers who report at least one work episode during the diary day, and found very similar results.

[8]We use the same method as Goldin (2014). O*NET reports scores on the importance of occupational characteristics for detailed SOC occupations. We downloaded these data from the O*NET database on November 22, 2017. We aggregate the indexes to our 93 occupations by taking a weighted average where the weights are the total number of full-time workers who are 18-65 in each detailed SOC occupation.

tration of working hours during a day as the peak hours are fixed to be between 8 and 5. As an alternative one could think of how concentrated the hours are during the day without pre-establishing the times of the day. In the following we provide an alternative measure of concentration based on the Herfindahl index.

Let $work_j^k$ be the total weighted time spent working in each day of the week-hour time bin k in occupation j,

$$work_j^k = \sum_{i=1}^{N_j} work_{ijk}.w_i$$

where i denotes individual in occupation j and w_i denotes the weight of individual i.

Let $share_j^k$ be the fraction of the total time spent in each occupation in each time bin and each day.

$$share_j^k = \frac{work_j^k}{\sum_k work_j^k}$$

Our concentration index measure is the Herfindahl index defined as:

$$cr_j = \sum_k (share_j^k)^2$$

The bottom row of Table 8 shows that our coordination measure, $ratio8to5$, and the Concentration Index measure are highly positively correlated, with the rank correlation equaling 0.75. The table also reports the rank correlation of our measure and the measure of "Male Overwork" used by Cortes and Pan (2016b). "Male Overwork" is defined as the fraction of male workers in the occupation who report working more than 50 hours per week. The correlation between these

two measures is 0.16, indicating that while our measure is positively related to the demand for long hours, it is by no means perfectly correlated. Thus, our measure captures another important aspect of hours requirements on the job such as the requirement to be present when others are present.

3 Coordinated Work Schedules and the Gender Wage Gap

In this section we analyze how our measure of coordinated work schedules is priced in the labor market, and how it impacts the gender wage gap. Specifically, we estimate the following regression at the individual level:

$$lnW_i = \beta_0 + \beta_1 * female_i + \beta_2\, ratio8to5_j + \beta_3\, female_i * ratio8to5_j + \beta_4\, X_i + \varepsilon_i \tag{1}$$

where lnW_i is the log of individual weekly earnings, $female_i$ is the female dummy, $ratio8to5_j$ is the ratio of hours worked in the 8 to 5 interval which varies at the occupation level j, X_i are other observable characteristics including a dummies for race and education and a quartic function in age. We also control for (log) hours worked last week so that the coefficients we report reflect gaps in the hourly wage. Our sample includes only full-time workers. β_1 measures the impact of the female dummy, β_2 measures the impact of working in occupations with a more concentrated work day, and β_3 captures how being female interacts with working in these occupations.

Table 9 reports the results of the regression. The top panel reports the results

for all full-time workers. Column (1) presents the baseline results. Women earn on average 22 percent less than men. Individuals in occupations with higher $ratio8to5$ earn higher wages, with a one standard deviation higher ratio leading to approximately 12 percent higher wages. The interaction term indicates that women suffer about a 5 percent higher penalty in these occupations. In column (2) we control for occupation-level education which reduces the size of the wage premium associated with these occupations and also the female-specific penalty. In column (3) we also control for the fraction of male workers in the occupation who report working more than 50 hours per week– the measure of "overwork" used by Cortes and Pan (2016b). The coefficient on the concentration measure is still significant although the female-specific penalty is no longer significant.

The bottom two panels report results separately by marital and parental status. Panel B reports results for single men and women. Notably the interaction terms are all insignificant pointing to the fact that there is no penalty for women associated with coordinated work schedules. Panel C reports results for married men and women with children. The female interaction terms are larger and significant which suggests that the results pooling over all workers reported in the top panel were largely due to the married with children group.

These regressions indicate that workers in occupations where most adhere to a standard 8 to 5 schedule are paid a higher wage. However, the gender gap in these occupations is larger. This pattern is particularly pronounced when we restrict our sample to married men and women with children, strongly suggesting that conflicts related to work and family time play an important role.

One objection to our interpretation of the results is that employers may be practicing statistical discrimination against married women with children and the level

of discrimination is particularly severe in occupations with coordinated schedules. This alternative interpretation, while closely related, suggests that it is not necessarily the temporal constraints that women face due to household care responsibilities that are at play. To further investigate this alternative explanation, we examine different groups of married men (with children) who are full-time workers, differentiated by the work status of their wives. We already saw in Tables 4 and 5 that fathers with full-time working spouses had similar patterns of "missing hours" and increased household care relative to fathers with non-working spouses. In Table 10 we investigate whether these constraints imposed by care responsibilities translate into wage penalties. Table 10 reports the results of a regression in a similar format as Table 9 but we now make comparisons among men only. The sample includes all married men with children matched to a spouse in the CPS data. The variables "Wife PT" and "Wife FT" are indicators equal to 1 if the wife works part-time or the wife works full-time respectively. The omitted category is "Wife Not Working." The coefficients indicate that married men with full-time working wives earn approximately 5 percent less than married men with non-working wives indicating either selection or specialization effects. The coefficients of interest however are the interaction terms which indicate that a one standard deviation higher ratio leads to a 4 percent higher penalty for men with part-time working wives, and a 5-6 percent penalty for men with full-time working wives. Table 10 shows that the phenomenon is not unique to comparisons between men and women but is more general and applies where there is balancing between work and household care. It's possible that the direction of causality is the opposite– that spouses with less earning power engage in more household care. Regardless, our argument is that there is a systematic wage penalty associated with doing household care related to

our coordination measure. While we focus on the gender wage gap in our paper, the important message here is that the work-family conflict we identify is more widely applicable to all parents with care responsibilities.

In the appendix, we conduct various robustness exercises in support of our main results. Table A.2 examines results separately for college and non-college workers. Among married men and women with children, the extra wage penalty associated with coordinated schedules for women is larger for college-educated women. However, there is still a similar pattern even among non-college women. One concern with our measure is whether it is confounded with the prevalence of evening and night shifts. Nurses, for example, work shifts and are at work during all hours of the day and the occupation would have low coordination requirements according to our measure. However, this may just be reflecting a 24-hour production cycle. To address this issue, in Table A.3 we delete occupations in which 12 percent or more workers report working evening and night shifts based on the 2004 Work Schedule Supplement. This cutoff results in deleting the top quartile of occupations based on this measure which leaves us with 55 occupations. As Table A.3 shows, our results are robust to omitting these occupations. Aside from evening and night shifts, our measure is also strongly negatively correlated with the fraction of workers who work other types of shifts such as "rotating shifts," "split shifts," "irregular schedule," and "other shifts." Occupations with shift work appear to have low coordination needs and may reflect the fact that while workers may work with others in a shift, it is easy to substitute one worker for another in most cases. Table A.4 in the appendix also reports regression results using our alternative measure of concentrated hours based on the Herfindahl Index. These results are qualitatively very similar.

To complement our reduced-form analysis, in what follows we build a model with the essential elements suggested by our empirical work and conduct counterfactual exercises.

4 The Model

Environment The economy is populated by a continuum of male and female workers of equal masses which sum to 1. Everyone lives for one period and values consumption of a market good, denoted by c, and a home good denoted by h. People rank bundles of the two goods according to a Cobb-Douglas utility function:

$$u(c,h) = (c)^{\nu^s}(h)^{1-\nu^s}, \tag{2}$$

where ν^s represents the weight of market goods in utility for gender s with $s = f, m$.

Two aspects of the preferences are worth noting. First, males and females differ in the relative value they give to the home good. This asymmetry should not be taken literally as a fundamental difference in preferences. It is a convenient way to capture observed differences in hours of household care between males and females. This difference may reflect social norms, differences in bargaining power, discrimination, etc., but an explicit modeling of these features is outside the scope of the paper. A second and related aspect is that the decision unit is the individual and not the household. The reason for doing so is data limitations. Specifically, observations in the ATUS are at the individual level, and there is no information on spousal time allocation.

Workers have one unit of time, a fraction of which can be supplied in a labor

market that features J occupations and which are labeled using the integer j. Occupations are mutually exclusive; workers can only work in one occupation. Workers receive a wage w_j per unit of time they supply in occupation j. Earnings from the supply of labor is how workers finance purchases of the market good c.

Prior to choosing an occupation, each individual draws a vector of taste parameters for occupations, Ω_i, from gender-specific distributions $F(\theta_{j,s})$. Thus, each individual i is represented by the vector

$$\Omega_i = \{\theta_{i,1}, \ldots, \theta_{i,J}\}$$

.

Each element of the vector, $\theta_{i,j}$, represents the taste for occupation j and are independent across occupations.

Time is divided into two sub-periods of equal length. We label the first period as "prime" (or 1), and the second period as "home" (or 2). We associate the first period in the model with the 8 a.m. to 5 p.m. period in the data.[9] Workers do not exclusively choose how to split their unit of time between working in the market and home care; they also choose how much to allocate to either activity during each sub-period. We denote by h^i and l^i, respectively, the home care and work choices in sub-period t. Since the total time used must add up to one, the following identity must hold:

$$h^i_{j,1} + l^i_{j,1} + h^i_{j,2} + l^i_{j,2} = 1. \tag{3}$$

Since either sub-period represents half of total time, the following must also be

[9]That our prime period starts at the beginning of the "day", as opposed to the middle (as in the data) is an innocuous assumption. It is convenient and nothing of substance changes if we assume that the prime period starts in the middle of the day.

true:

$$h^i_{j,t} + l^i_{j,t} = 0.5, \tag{4}$$

for each sub-period t.

The empirical evidence in Section 2 shows that the distribution of working hours during the day is not uniform. Workers bunch hours at particular times of the day and the degree of bunching is higher in certain occupations. This evidence, coupled with data from O*NET (see Table 8), suggests that in some occupations the need to coordinate workers' schedules is stronger. For example, some occupations rely more on team production where workers' tasks are complementary, while in others individuals work mostly on their own. This difference in the production technology translates into a friction on an individual's supply of labor. If an individual's tasks are complementary with others' in the same occupation, not supplying labor when others do has a productivity penalty. For example, missing a team project meeting has a productivity penalty. This penalty is likely to differ across occupations. Returning to our model, while we do not explicitly model the production technologies that lead to coordination needs, we assume that not supplying labor during prime time has a penalty. More specifically, a reduced form way of capturing the importance of coordinating workers' schedules is given by a reduction in the effective hours of work when labor is not supplied during prime time:

$$l^i_j = l^i_{j,1} + l^i_{j,2} - (0.5 - l^i_{j,1})^{\alpha_j} \quad with \quad \alpha_j => 0 \quad \text{for} \quad j = 1, ..., J. \tag{5}$$

The parameter α_j drives the penalty for not supplying labor during prime time in occupation j.

This specification allows for large productivity losses in some occupations when a worker postpones working time to the second period ("home"). The penalty is large in occupations with a low α_j, while in those with a high α_j the loss is minimal. The maximum amount of time any worker (male of female) can work in the prime period is 0.5. For a given amount of work, supplying more home care time during period 1 leads to a lower productivity per hour. The extent of the productivity loss is occupation- but not gender-specific. Although α is exogenous, and thus our model is silent about the source of these differences, one interpretation is that workers coordinate because productivity rises when everyone is present. By convention, this coordination takes place during the period we call prime time.

The production of home goods employs hours both within prime and home time according to a Cobb-Douglas technology:

$$h^i = \left[(h_1^i)^\rho + (h_2^i)^\rho \right]^{\frac{1}{\rho}}, \tag{6}$$

where ρ is the parameter that governs the elasticity of substitution between the supply of home care time across the two time periods. If ρ <1, home care in different periods are imperfect substitutes.

On the production side, there is a set of J intermediate goods producers indexed by j. We associate the production of an intermediate good with an occupation. Each produces an amount X_j of the intermediate good. Production employs a linear technology in effective units of labor N_j; that is, $X_j = A_j N_j$, where A_j is a total factor productivity parameter.[10] Markets are competitive and the producer faces prices for her good p_j and wages w_j.

[10]The role of the total factor productivity parameters is only to help deliver the empirical distribution of earnings across occupations. Replicating that distribution is necessary to obtain a plausible gender wage gap.

The producer of intermediate good j solves the following maximization problem:

$$\max_{N_j} p_j X_j - N_j w_j \tag{7}$$

subject to the available technology $X_j = A_j N_j$. The solution to the problem is $p_j = w_j$. Intermediate goods producers sell to a final goods producer. The technology for producing a certain amount Y of the final good from a vector of quantities of intermediate services $\{X_1, \ldots, X_J\}$ is described by,

$$Y = \prod_{j=1}^{J} \left\{ X_j^{\kappa_j} \right\}. \tag{8}$$

with $\sum_{j=1}^{J} \kappa_j = 1$ (Cobb-Douglas).

The final good producer solves the following maximization problem:

$$\max_{\{X_1,\ldots,X_J\}} \prod_{j=1}^{J} \{X_j\}^{\kappa_j} - \sum_{j=1}^{J} p_j X_j. \tag{9}$$

Note that in equilibrium $X_j = A_j N_j$ and $p_j = w_j / A_j$, so that this maximization problem implicitly defines labor demand functions $\left\{ N_j = N_j^d(w_j, N_{-j}) \right\}_{j=1}^{J}$

Individual's Decision Problem The amount of effective labor supplied by a worker of gender s in occupation j is l_j^s. Effective labor is compensated at a rate w_j per unit.

The value of occupation j for an individual of gender s is:

$$V_j^s(\theta_j^s) = \theta_j^s \left\{ \max_{c^s, l_{j,1}^s, l_{j,2}^s, h_{j,1}^s, h_{j,2}^s} \{u(c^s, h^s)\} \right\} \tag{10}$$

$$s.t. \tag{11}$$

$$c^s = l_j^s w_j \tag{12}$$

$$h_{j,2}^s + l_{j,2}^s = 0.5 \tag{13}$$

$$h_{j,1}^s + l_{j,1}^s + h_{j,2}^s + l_{j,2}^s = 1 \tag{14}$$

$$l_j^s = l_{j,1}^s + l_{j,2}^s - (0.5 - l_{j,1}^s)^{\alpha_j} \quad with \quad \alpha_j \geq 0 \tag{15}$$

$$h_j^s = ((h_{j,1}^s)^\rho + (h_{j,2}^s)^\rho)^{\frac{1}{\rho}} \tag{16}$$

Each individual chooses from the set of J occupations the one that yields the highest utility.

$$\widehat{j^s} = argmax \left\{ W_1^s, \ldots, W_J^s \right\} \tag{17}$$

where $W_{\widehat{j}}^s$ for an individual i of gender s is defined as

$$W_{\widehat{j}}^s = \left\{ V_{\widehat{j}}^s | \Omega_i \right\}. \tag{18}$$

The occupational choice determines an endogenous distribution of male and female workers across occupations. Let μ_j^s denote the mass of gender s workers in occupation j, then $\sum_{j=1}^J (\mu_j^f + \mu_j^m) = 1$. Define $\mu_j = \mu_j^f + \mu_j^m$ as the size of occupation j.

Aggregation and Equilibrium Given wages, individuals solve the optimization problem yielding value functions $\left\{ V_j^s \right\}_{j=1}^J$.

For an occupation j, its population satisfies $\mu_j^s = Prob(W_j^s > W_{-j}^s)$ where we

define the vector W^s_{-j} to be equal to $\left\{W^s_1, \ldots, W^s_{j-1}, W^s_{j+1}, \ldots, W^s_J\right\}$.

For occupation j, the total labor input is defined as,

$$N_j = \frac{\mu^m_j}{\mu_j}(l^m_{j,1} + l^m_{j,2} - (0.5 - l^m_{j,1})^{\alpha_j}) + \frac{\mu^f_j}{\mu_j}(l^f_{j,1} + l^f_{j,2} - (0.5 - l^f_{j,1})^{\alpha_j}). \tag{19}$$

In addition, in equilibrium:

$$w_j = \kappa_j A_j^{\kappa_j} N_j^{\kappa_j - 1} \prod_{-j} \left\{X^{\kappa_{-j}}_{-j}\right\}. \tag{20}$$

Given individual's occupational and hours choices our model predicts *ratio*8*to*5's for working hours for each occupation which we denote as $ratio8to5_j$. Following the definition of these indicators presented above, its model counterpart is given by:

$$ratio8to5_j = \frac{\mu^m_j}{\mu_j}\frac{l^m_{j,1}}{(l^m_{j,1} + l^m_{j,2})} + \frac{\mu^f_j}{\mu_j}\frac{l^f_{j,1}}{(l^f_{j,1} + l^f_{j,2})}. \tag{21}$$

where μ_j is the fraction of workers in occupation j, and μ^m_j and μ^f_j are the fraction of males and females in occupation j, respectively.

Before we take this model to the data and examine the role of coordination frictions in accounting for the gender gap, we illustrate the model's mechanisms using a simpler version than the one described above.

5 Model Mechanics in a Simple Case

We restrict attention to an economy with only two occupations. We provide a numerical example choosing illustrative values of the parameters to uncover the

main mechanisms. We analyze three environments which differ in the degree of heterogeneity among workers, detailed below. There is a set of parameters that are common across these economies. Earnings in each occupation represent an equal share in final aggregate income, i.e $\kappa_1 = \kappa_2 = 0.5$. The parameters that govern the productivity penalty due to the coordination of workers are $\alpha_1 = 0.8$ and $\alpha_2 = 2.8$. In other words, in occupation 1 coordination is much more important. Table 11 summarizes the results of each of the experiments that are described below.

Economy 1: Homogeneous Agents without Gender Differences This economy features a mass of size 1 of workers who have the same weight for market consumption: $\nu_m = \nu_f = 0.8$. The parameter driving the elasticity of substitution between home care time at the two time periods of the day (between h_1 and h_2), ρ, is set to 0.6. The results are shown in Panel A of Table 11.

Consumption goods and household care are substitutes. More market consumption implies more market time and less time allocated to household care. The equilibrium features sorting into occupations, with a larger mass of workers choosing occupation 2. Because of the higher α, productivity losses due to coordination are smaller in occupation 2. As a result, occupation 2 is more attractive. Despite the higher cost, the final goods technology rules out an equilibrium in which no one chooses occupation 1. Wages adjust to leave workers indifferent between the two occupations. The higher wage results in a higher supply of labor in occupation 1. Hence, $l_1 + l_2$ is larger. However, they have to pay a higher penalty and as a result effective hours are equal across occupations. To summarize, workers in occupation 1 supply more market work and less household care. The opposite is true in occupation 2. Why is the bunching ratio higher in occupation 1? Because workers, in an attempt to minimize the hours penalty, bunch hours to

a larger extent in the prime period. Prime time cannot be exclusively devoted to work, however, because home care cannot be substituted perfectly across the two sub-periods. Finally, since workers in occupation 1 devote relatively more hours to work in prime time they end up devoting relatively more hours of household care during home time (h_2)

Economy 2: Gender Differences in Household Care Responsibilities We now consider the case of an economy where males and females are differentiated by the weight in market consumption ν. Half of the workers have $\nu = 0.9$ (male) and half have $\nu = 0.7$ (female), i.e. females have stronger preferences for household care. The results are shown in Panel B of Table 11.

Due to their different preferences, females and males do not sort randomly into the two occupations. Females have a relatively higher preference for household care and thus they populate only occupation 2, the high α occupation. Occupation 2 allows females to supply household care without paying too high an hours penalty. In addition, since household care hours are complementary during the day, more total household care time means a higher supply of household care hours both within prime and home time, i.e. household care hours need to be smoothed during the day. Occupation 2 allows them to do that at a relatively lower cost. Males have a comparative advantage in occupation 1. Because they want to supply more labor, they downplay the importance of the penalty when choosing their occupation. As a result, a higher proportion of males work in occupation 1.

To summarize, workers in occupation 2 spend a bit more time in home care (because the wage is lower). Consequently, raw hours, effective hours worked, and earnings, are all lower. Therefore, in equilibrium there is a gender gap in earnings of 3%. Much of the gender gap is due to earnings differentials between

occupations - occupation 1 is only male while occupation 2 is mostly female.

Economy 3: Gender Differences in Household Care Responsibilities and Tastes for Occupations We now consider the case of economy 2, but we incorporate gender differences in tastes for each occupation which results in 50% of workers being female in each occupation. The results are shown in Panel C of Table 11.

Conditional in working on occupation 1, females want to work more than if they are in occupation 2 since they want to minimize the coordination cost. However, they will work less than males since they want to supply relatively more time to household care. As a result they will end up paying a higher cost in terms of effective hours and thus their earnings per hour are going to be lower than males. This is also the case for males and females in occupation 2, but the effects are lower given that α is higher. For this reason, the gender earnings gap per hour is higher in occupation 1. In equilibrium, this example features a gender gap in earnings per hour of 5% in occupation 1 and no gender earnings gap in occupation 2. The aggregate gender earnings gap for this economy is also 3%. While the aggregate earnings gap is the same as in economy 2, the gender gap in this economy is entirely driven by earnings differences within occupations due to the fact that women have fewer effective hours.[11]

As in the other economies, conditional on being in occupation 1, workers want to supply more time in prime time to minimize the coordination cost, and as in the other cases, the bunching ratio is higher in occupation 1. Therefore, the example reflects the negative correlation between the bunching ratio and the gender earnings gap we find in the empirical part of the paper.

[11]Note that in this particular example the share of workers in each occupation is 50% so all the differences in earnings per hour come from differences in effective hours and not from differences in the wage rates across occupations.

6 Quantitative Analysis

To assess the quantitative predictions of the model, we calibrate the model using aggregates from the US labor market. We restrict the analysis to 22 occupations by further aggregating the 93 occupations using cross-walks provided by the SOC codes. We also restrict the sample to married men and women with children in the household. Among other variables of interest, solving the model yields bunching ratios, $ratio8to5$, for work and home care, as well as earnings for men and women in each occupation.

6.1 Calibration

We assume that the distribution of tastes is Frechet with a common dispersion parameter.[12] Thus, we assume that for an occupation j and a gender g taste shocks are drawn from,

$$F(\theta_{j,g}) = Prob(\theta_{j,g} \leq \theta_0) = exp(-T_{j,g}\theta_0^{-\xi}) \tag{22}$$

The calibration chooses values for a total of 113 parameters:

$$\left(\{\alpha_j\}_{j=1}^{22}, \{\kappa_j\}_{j=1}^{22}, \{T_{j,m}\}_{j=1}^{22}, \{T_{j,f}\}_{j=1}^{22}, \{A_j\}_{j=1}^{22}, \rho, \nu^f, \nu^m\right).$$

The vector of labor shares $\{\kappa_1, ..., \kappa_{22}\}$ can be calculated directly from the data. Since output is only a function of labor, κ_j is the share of earnings of occupation j in total earnings. The remaining parameter values are chosen to minimize the distance between the moments in the data and the ones generated by the model.[13]

[12] This assumption is typical in discrete choice models and made for tractability.

[13] Because the paper is not concerned with the distribution of tastes within occupations, setting a common dispersion parameter is irrelevant. We could assume either a different common dispersion parameter or a different dispersion parameter by occupation and gender. Doing so would yield

The moments we pick to match are the following: the bunching ratios, $ratio8to5$, the fraction of females relative to males within an occupation, the fraction of employment in each occupation, the average earnings per hour for each occupation, the fraction of working time for males and females, and the ratio of the average bunching ratio of work to the average bunching ratio of home care. The value of the last moment is largely influenced by ρ. A high value of ρ implies a low home care ratio (little home care takes place during prime time).[14]

Table 12 shows the values for the occupation-specific moments we match. Table 13 illustrates the model fit by showing the correlation between the targeted moments in the data and in the model. The model fit is quite good. The parameter values we obtain are shown in Table 14. The most interesting set of parameters are the α's. Their distribution is rather skewed and their correlation with the bunching ratios is -0.60. In other words, the bunching ratio across occupations is mainly determined by the α but not completely (otherwise the two would be perfectly negatively correlated). The share of females in an occupation also plays an important role. The work bunching ratio of females is higher than that of males, so if an occupation is 90% female (as is, for example, Healthcare Support) it must have a larger α than an occupation with the same bunching ratio but only 30% females. The skewness is an artifact of coordination costs being virtually zero for a large α. There is little information about coordination costs for an α that exceeds 50. It is also worth noting that we estimate a relatively low value of ρ (0.46) which implies that household care in different periods are less than perfect substitutes for each other.

different values for the (female) Frechet parameters driving the mean for the model to be consistent with the empirical female shares across occupations.

[14]Because we only model two activities and we normalize the length of each period to be 0.5, the model can't deliver either work or home care bunching ratios in levels. Therefore we target the ratio.

In Table 15 we return to the regressions reported in Section 3 but now compare results from data and the model. The first column displays the coefficients on the female dummy, the bunching ratio, and the interaction between the two using data.[15] The second column shows the analogous coefficients from our model-simulated data. The bunching ratio coefficient is 0.30 in the model and is larger than in the data because there are fewer elements affecting earnings per hour in the model. The coefficient on the interaction between the bunching ratio and the female dummy is -0.05. What drives the positive relationship between the gender gap and the bunching ratio in the model? The coordination cost is higher the lower the α, which translates into a higher bunching ratio. Since females supply more home care, and home care is not perfectly substitutable across hours of the day, they supply fewer market hours during the prime period. As a result, they lose hours and their compensation reflects that loss. To summarize, the coefficient values show that the relative penalty suffered by women in high bunching ratio occupations is about the same in the data and the model. The overall premium that both males and females get in high bunching ratio occupations, however, appears to be higher in the model.

6.2 The Baseline Economy

Solving the model for the set of calibrated parameter values delivers an equilibrium that features males and females making labor supply decisions over occupations and hours and as a result, the mechanisms in the model generate a gender wage gap in each occupation and an economy-wide gender wage gap. Table 16 reports the baseline results. The overall gender wage gap is 23% in the data and 6.6%

[15]Note that the coefficients will not exactly match those in Table 9 due to the fact that our occupation measure is aggregated to 22 groups.

in the baseline model. As mentioned above, this economy-wide gender wage gap can be decomposed into the between and within occupation components. More specifically, let the earnings ratio between males and females for the whole economy be defined as $egap = e_m - e_f$, where e_m and e_f represent the log of the earnings of males and females, respectively. Then,

$$egap = \sum_{j=1}^{J} \left(\gamma_{m,j} e_{m,j} - \gamma_{f,j} e_{f,j} \right), \tag{23}$$

where $\gamma_{m,j}$ and $\gamma_{f,j}$ are the proportions of males and females in occupation j over total males and females in the population. Thus,

$$egap = \sum_{j=1}^{J} (\gamma_{m,j} - \gamma_{f,j}) e_{m,j} + \sum_{j=1}^{J} \gamma_{f,j} (e_{m,j} - e_{f,j}), \tag{24}$$

where $\sum_{j=1}^{J} (\gamma_{m,j} - \gamma_{f,j}) e_{m,j}$ is the between component and $\sum_{j=1}^{J} \gamma_{f,j} (e_{m,j} - e_{f,j})$ is the within component.

In the data, as shown in Table 16, the within component is 26.8% while the between component is -3.9%. This is broadly consistent with Goldin (2014) who finds that the bulk of the gender wage gap exists within occupations and only a small component is due to the between portion. The model predicts a within component of 6.2% which accounts for 23% of the within component in the data and 27% of the overall gender gap. The model also generates a between component of 0.4%. The endogenous channel in our model– the interaction between preferences and coordination costs– has implications for the both the within and between components. Although this channel influences mostly the within component it also affects the between component due to the effect on the sorting of women into occupations. While it explains a substantial component of the within component it does not

account for the majority, indicating that there are other forces in the economy that affect the gender wage gap within an occupation.

6.3 Counterfactual Experiments

In this section we conduct counterfactual experiments to asses the the impact of various parameters on the gender wage gap. The key parameters of interest that we focus on are the α's which reflect coordination costs, the ν's which reflect preferences for consumption and for household care, and ρ which determines the elasticity of substitution between household care at different times of the day.

6.3.1 Coordination of Schedules and the Gender Wage Gap

In the first experiment we set all α's to be equal across occupations and set it at a relatively high value of 2.92 (reflecting low coordination costs) which is the value estimated for "Health Care Support." One motivation for such an experiment is changing technology such as on-line connections and internet technology which lowers the costs of coordinating with other workers. Since in this experiment women still have a higher preference for household care (lower ν), everything else equal, they will work less and allocate more hours to home production relative to men. However, the costs of doing so will be lowered.

The gender gap falls from 6.6% (baseline) to 2.7%. As shown in the third row of Table 16 the within component falls from 6.2% to 2.2%. The within component falls substantially because with a relatively high α, the penalty for not working during prime time is lower. As a result, despite women's larger supply of household care their earnings per hour are now much closer to male earnings. Figure 5 shows the within component of the gender gap (vertical axis) when this counterfactual is

repeated for different values of α (horizontal axis). Low values of α such as that for "Management," for example, imply a large within component of around 10%. As α becomes larger the coordination costs become negligible and the within occupation gender gap approaches zero. Figure 5 shows that there is little difference between moderately high α's and very high α's– that is, once α reaches a value of 5 and greater, the within-occupation gender gap essentially disappears.

The between component rises slightly when we equalize α's across occupations. Both males and females move to occupations with initially low α's because the coordination penalty is now lower. These occupations are even more attractive to women so the female share rises in these occupations. This effect by itself decreases the across component. To assess the size of this effect, in Table 16 we separately report the gender wage gap across occupations holding earnings and occupation sizes fixed at their baseline values. This column, which we label "Sorting," isolates the effect of rising female share in initially low α occupations. If sorting were the only effect, the between occupation gender gap would drop from 0.4 in the baseline to -0.1. However, in equilibrium, earnings and occupation sizes also change. Because men initially had higher representation in low α occupations which experienced the rise in earnings and size, this counteracts the sorting effect.

6.3.2 A Change in Female Household Care Hours

In this experiment we make male and female preferences for household care more equal. One possible interpretation is a change in social norms that equalize the household care responsibilities of males and females. We reduce the gap in the ν's by 50% by reducing ν_m to 0.52 and raising ν_f to 0.44. The within component falls from 6.2% to 3.1%. The reason for the fall is that an increase in ν_f increases the amount of work during prime time. This lowers the penalty that females face.

An alternative way of looking at this counterfactual is shown in Figure 6. The horizontal axis measures the distance between ν's (a value of 0.15 is equal to the baseline and a value of 0 means $\nu_m = \nu_f$). On the vertical axis we measure the within component of the gender gap. As the distance between the ν's drops, the within component goes to zero. The rate at which it drops to zero depends on the occupation. As occupations are defined by their α, we plot the within component against the within component for occupations with a small value of α, 0.6; a middle value, 1.5; and a high value, 12. When α is large, i.e. coordination costs are low, the within component is virtually zero even when women supply substantially more home care than men. For an occupation such as "Architecture and Engineers" with ($\alpha \approx 0.6$), then the within gender gap is low only when preferences between males and females are similar.

Interestingly, the between component rises so that the overall gender gap rises slightly to 6.8%. As a result of the ν's changing, women are now more likely to move into low α occupations. This sorting effect alone would reduce the between occupation gender gap from 0.4 in the baseline case to -0.4. However, in equilibrium, earnings and occupation sizes change. In this case, because women now prefer to work more, their labor supply rises. This happens in all occupations, but the effect is bigger in occupations which are relatively more populated by women. As a result, wages in female-intensive occupations fall (responding to the larger supply) leading to an increase in the between component.

6.3.3 A Change in the Ability to Smooth Household Care During the Day

In our model, the value of ρ determines the elasticity of substitution between household care time during the two parts of the day. A high value of ρ means that it is relatively easy to substitute household care activities throughout the day. In our

baseline calibration $\rho = 0.46$ which indicates household care activities are fairly substitutable but imperfectly so. Although the timing of these activities may be difficult to change (reflecting an imperfect degree of substitution), someone other than the parent could be responsible for undertaking them. For example, curricular education normally takes place in a school during normal business hours, but parents outsource that activity to school teachers and staff. As shown in Section 2.3 we focus on care (i.e. doctor's appointments, school meetings, homework supervision) which may be hard to outsource. What exactly determines the degree of substitution is not clear. One interpretation is that there are constraints on the time of the day in which some activities take place. For example, an appointment with a school teacher normally takes place before 5pm. An alternative interpretation is that they reflect parenting styles of modern societies, a recent phenomenon that has been extensively studied for instance by Doepke and Zilibotti (2019).

In order to study the effect of changes in the ability to substitute household care time during the day, we perform a counterfactual exercise in which we increase ρ. As in our baseline case, women put more value on household care activities and allocate more time to household care relative to men. The main difference is that compared to the baseline case women can now more easily distribute the household care to off-peak times so they do not incur a productivity loss. As a result, the within gender wage gap decreases as predicted. The increase in ρ has little effect on sorting. However, there is again a substantial increase in the between occupation gender gap in equilibrium. Productivity and earnings rise in low α occupations. Since men initially had higher representation in these occupations, the between occupation component of the gender wage gap rises.

7 Final Remarks

Although women have made remarkable gains in the labor market over the past five decades, there is still a substantial gap in their earnings relative to men. Most of the unexplained gap is associated with earnings gaps that arises within occupations. In this paper we explore a mechanism which can explain why the gender gap differs across occupations.

Central to our analysis is the joint decision of workers to allocate time to market work and to household care. Using time-diary data we document that married women with children who report being full-time workers work less on the job and do more household care than their male counterparts. We also document that occupations vary in the degree to which total hours worked in the occupation are concentrated during peak hours of the day– a measure which we interpret as reflecting the degree of coordinated work schedules in the occupation. Our measure of an (in)flexible work schedule is therefore distinct from other papers in the literature which focus on the quantity of hours worked. We find that while men and single women receive a wage premium in occupations with concentrated schedules, married women with children much less of one. Conditional on being in an occupation, less working time (more household care time) at peak hours of the day entails a productivity loss and thus earnings are lowered for women relative to men. We calibrate our model to US data and show that the greater demand for household care time by women together with the coordination of work time required in different occupations generates a gender wage gap of 6.6 percent which corresponds to approximately 30% of the observed gender earnings gap among married men and women with children. If occupation-level coordination was set equal to the level of "Health Care Support"– an occupation with relatively

low coordination, the gender gap due to women's higher demand for household time falls by more than half to 2.7%.

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Figures

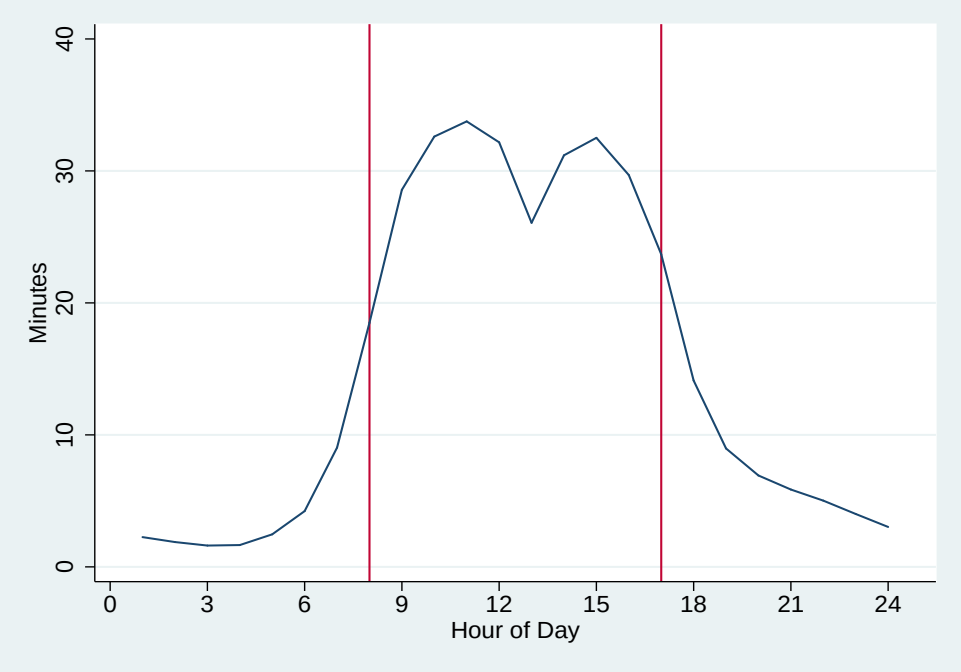

Figure 1: Work among Full-time Workers

Notes: Data are from the 2003-2014 American Time Use Surveys (ATUS). The figure is based on 18-65 year old workers who reported working full-time in the activity summary file. "Work" corresponds to minutes spent on "work and work-related activities" at each hour based on starting and ending times in the time diary data. The figure includes both weekdays and weekends.

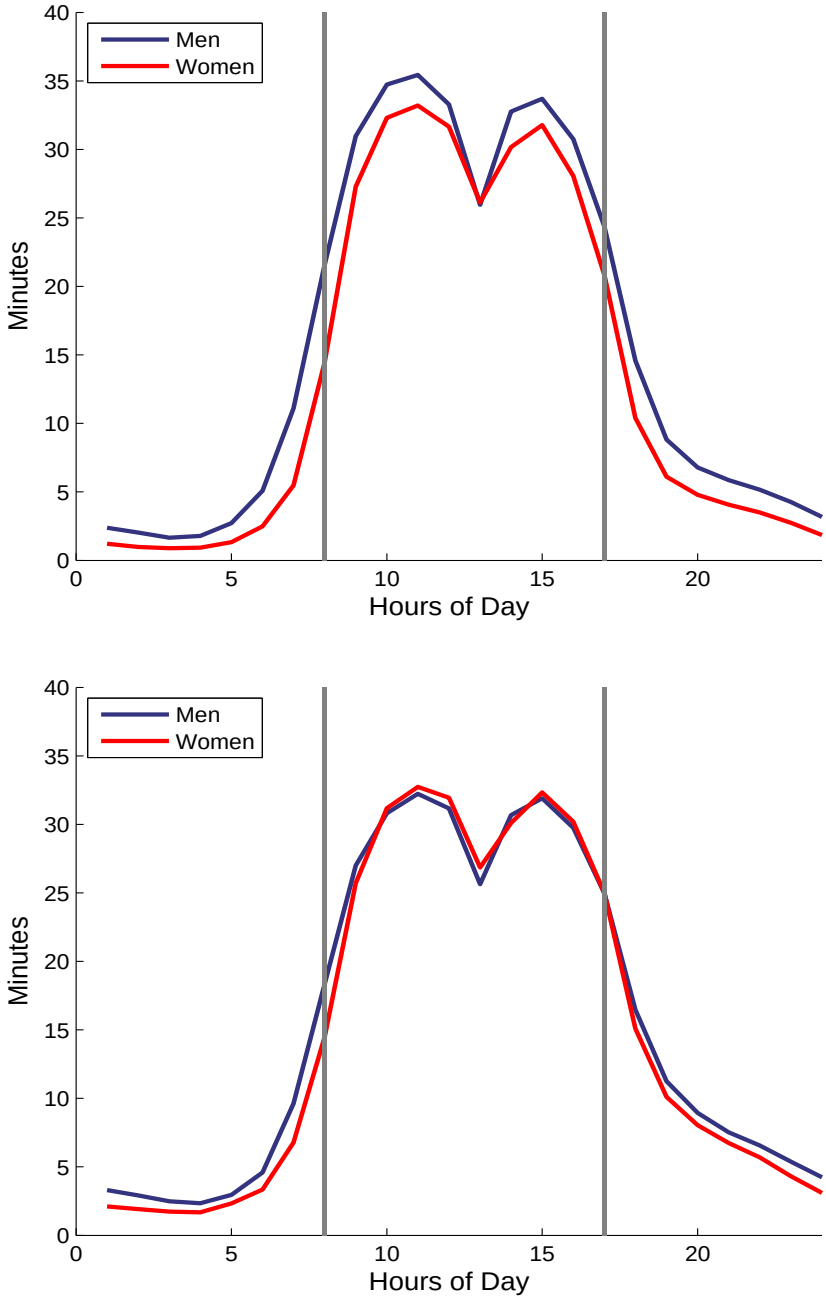

Figure 2: Work among Full-time Workers

Notes: Data are from the 2003-2014 American Time Use Surveys (ATUS). The figure is based on 18-65 year old workers who reported working full-time in the activity summary file. The top panel includes workers who are married with at least one own child in the household. The bottom panel includes workers who are single and without children. "Work" corresponds to minutes spent on "work and work-related activities" at each hour based on starting and ending times in the time diary data. The figure includes both weekdays and weekends.

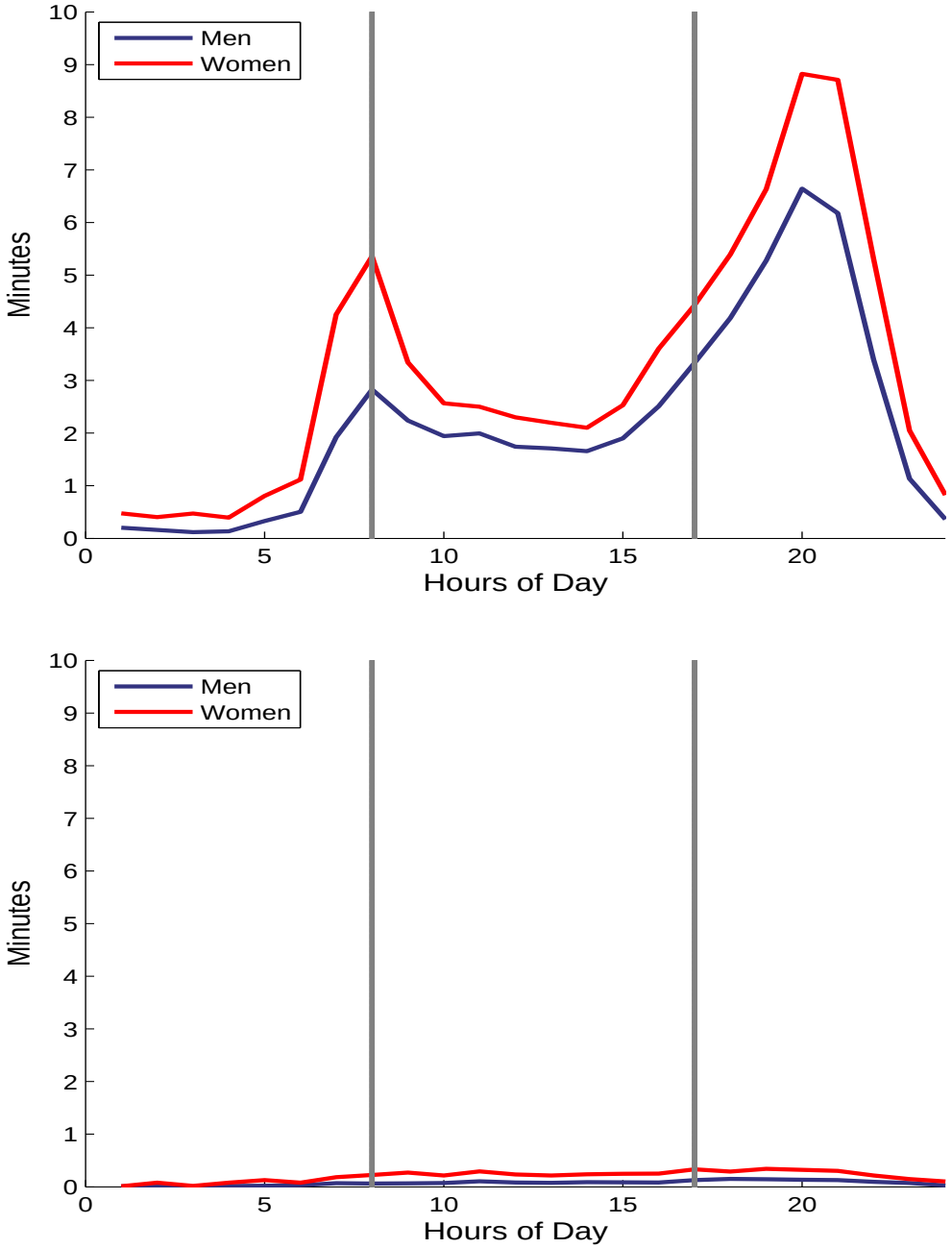

Figure 3: Household Care among Full-time Workers

Notes: Data are from the 2003-2014 American Time Use Surveys (ATUS). The figure is based on 18-65 year old workers who reported working full-time in the activity summary file. The top panel includes workers who are married with at least one own child in the household. The bottom panel includes workers who are single and without children. "Household Care" corresponds to minutes spent on "caring for and helping household members" at each hour based on starting and ending times in the time diary data. The figure includes both weekdays and weekends.

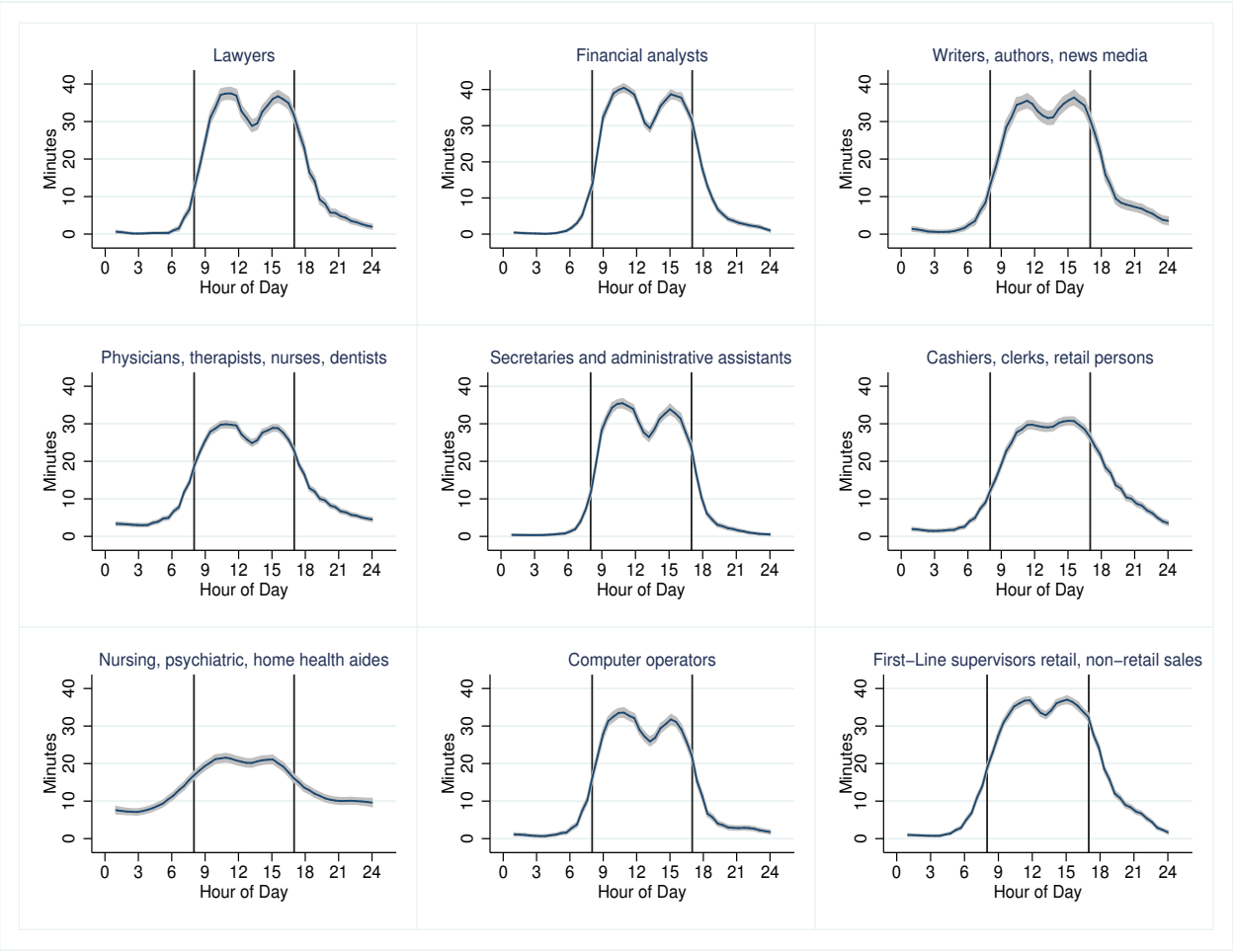

Figure 4: Timing of Work in Selected Occupations

Notes: Data are from the 2003-2014 American Time Use Surveys (ATUS). The figure is based on 18-65 year old workers who reported working full-time in the activity summary file. "Work" corresponds to minutes spent on "work and work-related activities" at each hour based on starting and ending times in the time diary data. The figure includes both weekdays and weekends. The figures display smoothed values from local polynomial regressions. We mapped detailed 2002 Census occupation codes to detailed Standard Occupation Classification (SOC) codes and aggregated to 93 SOC categories.

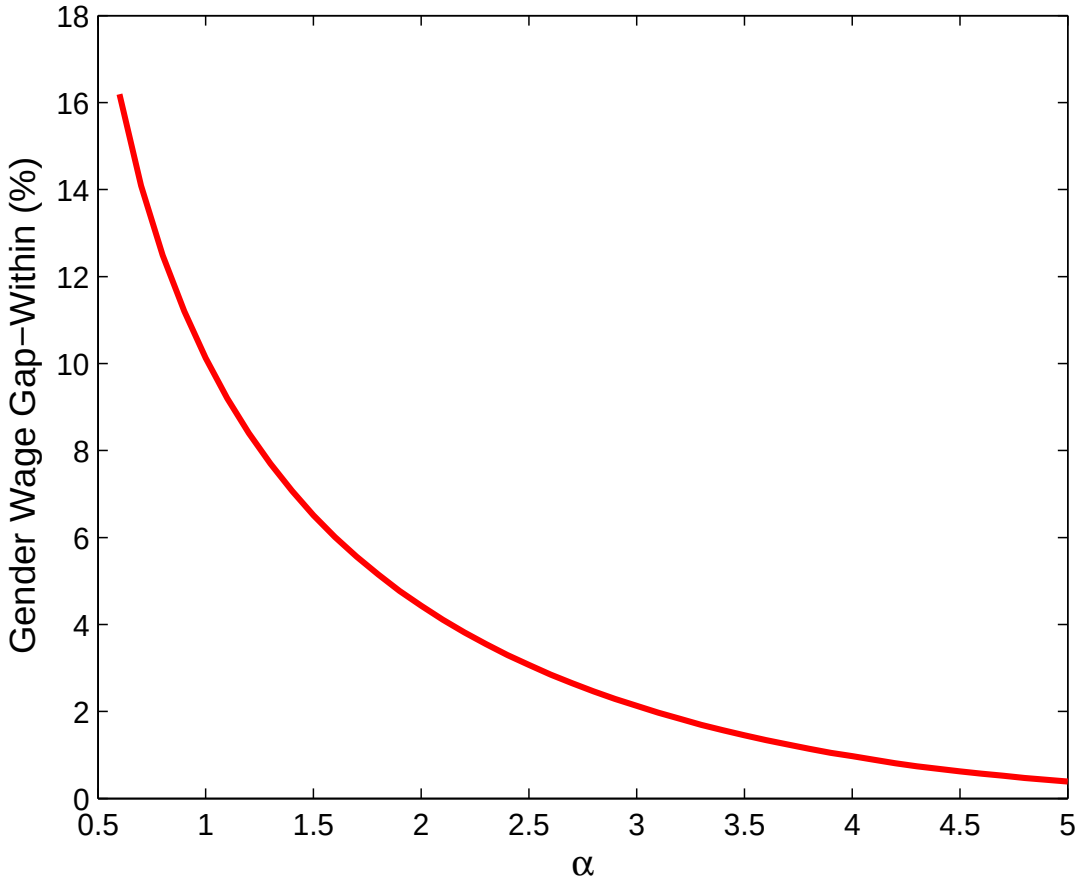

Figure 5: Gender Earnings Gap Within Occupations: The Effect of α

Notes: The figure shows the value of the within component of the gender wage gap (y-axis), as defined in Section 6, for the whole economy when the parameter α (x-axis) is equal for every occupation and takes values from 0.6 (the minimum estimated value for our baseline economy) to 5.

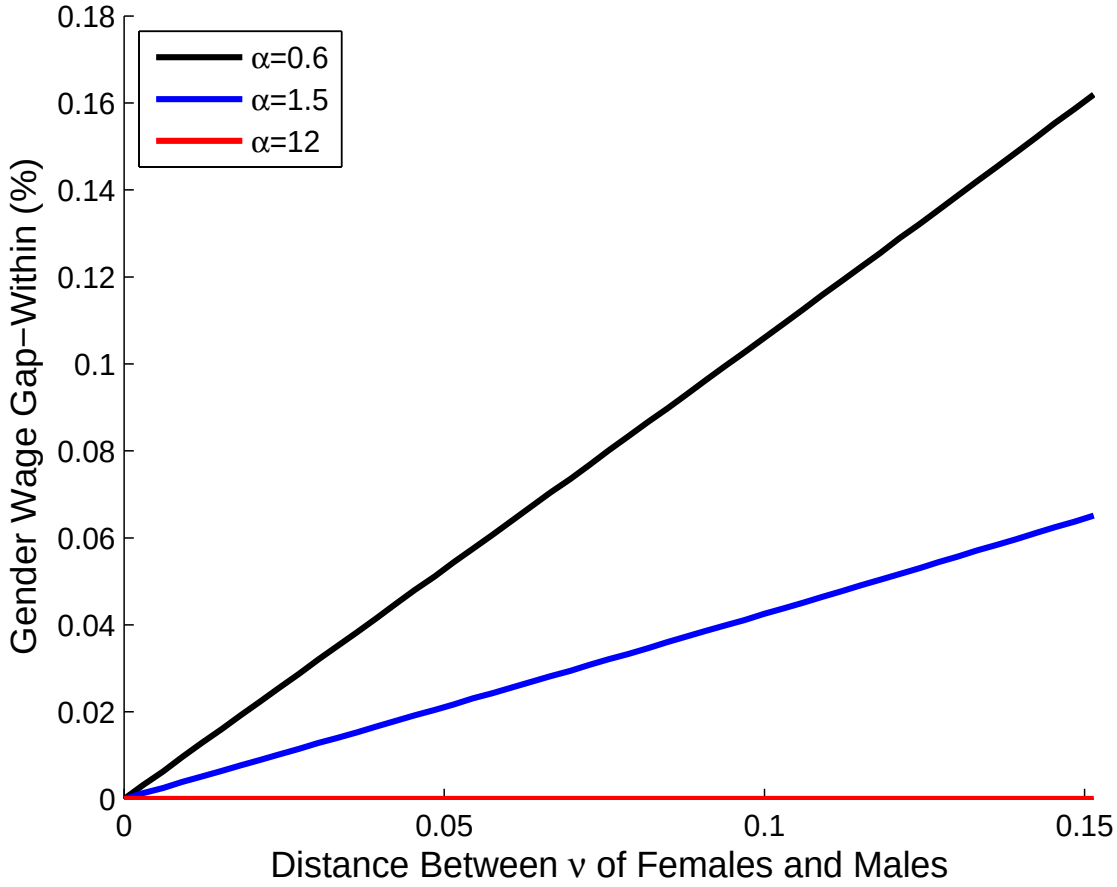

Figure 6: Gender Earnings Gap Within Occupations: The Effect of ν

Notes: The figure shows the value of the within component of the gender wage gap (y-axis), as defined in Section 6, for the whole economy when we change the difference between females and males in the value of parameter ν (x-axis). The value of 0.15 on the x-axis is the difference in the value of the parameter ν for females and males obtained in the calibration of the baseline economy, that is $\nu_f = 0.40$ and $\nu_m = 0.55$. The figure shows the value of the within earnings gap (y-axis) as we decrease the value of ν_m and increase the value of ν_f. In this way, the distance between νs decreases and, a value of 0 on the x-axis indicates that $\nu_m = \nu_f$.

Tables

Table 1: Work among Full-time Workers, Married with Children

	Weekday	Weekend	Weekday			
Female Gap in Work Hours	-0.898***	-0.749***	-0.901***	-0.911***	-0.703***	-0.490***
	(0.0694)	(0.0674)	(0.0692)	(0.0702)	(0.0698)	(0.0768)
Observations	12113	12344	12113	12113	12113	8393
Day of Week and Year			x	x	x	x
Education, Age and Race				x	x	x
Usual Weekly Hours					x	x
Usual Weekly Hours less than 50						x
Average Hours, Men	7.904	2.163				
Average Hours, Women	7.006	1.414				
Average Hours, Total	7.611	1.906				

Notes: Data are from the 2003-2014 American Time Use Surveys (ATUS). The table is based on 18-65 year old workers who reported working full-time in the activity summary file who are married with at least one own child in the household. "Work" corresponds to minutes spent on "work and work-related activities" at each hour based on starting and ending times in the time diary data. Each column reports the coefficient on the "female" dummy with various additional controls. Column (5) controls for usual weekly hours worked reported in the activity summary file. Column (6) only includes workers who reported usual weekly hours of less than 50.

Table 2: Household Care among Full-time Workers, Married with Children

	Weekday	Weekend	Weekday			
Female Gap in Household Hours	0.436***	0.264***	0.436***	0.349***	0.319***	0.266***
	(0.0276)	(0.0332)	(0.0276)	(0.0270)	(0.0272)	(0.0327)
Observations	12113	12344	12113	12113	12113	8393
Day of Week and Year			x	x	x	x
Education, Age and Race				x	x	x
Usual Weekly Hours					x	x
Usual Weekly Hours less than 50						x
Average Hours, Men	0.821	1.002				
Average Hours, Women	1.257	1.267				
Average Hours, Total	0.963	1.093				

Notes: Data are from the 2003-2014 American Time Use Surveys (ATUS). The table is based on 18-65 year old workers who reported working full-time in the activity summary file who are married with at least one own child in the household. "Household Care" corresponds to minutes spent on "caring for and helping household members" at each hour based on starting and ending times in the time diary data. Each column reports the coefficient on the "female" dummy with various additional controls. Column (5) controls for usual weekly hours worked reported in the activity summary file. Column (6) only includes workers who reported usual weekly hours of less than 50.

Table 3: Household Care Activities of Parents by Marital and Work Status (Hours)

Panel A: Weekday

	Females			Males
Activity	Married NW	Married FT	Single FT	Married FT
With Children Aged Less Than 6				
Routine	1.4	1.0	0.8	0.4
Enrichment	0.6	0.4	0.3	0.3
Other	0.4	0.4	0.4	0.1
With Children Aged 6-18 Only				
Routine	0.4	0.2	0.2	0.1
Enrichment	0.6	0.4	0.3	0.3
Other	0.4	0.2	0.3	0.1

Panel B: Weekend

	Females			Males
Activity	Married NW	Married FT	Single FT	Married FT
With Children Aged Less Than 6				
Routine	1.0	0.9	0.7	0.4
Enrichment	0.4	0.4	0.3	0.3
Other	0.1	0.1	0.1	0.1
With Children Aged 6-18 Only				
Routine	0.2	0.1	0.1	0.1
Enrichment	0.5	0.4	0.4	0.3
Other	0.1	0.1	0.1	8.6

Note: The table shows the average time in hours allocated to household care activities by parents. Panel A is on weekdays and B on weekends. The three aggregate categories of activities are "Routine," "Enrichment" and "Other", which includes activities such as "Organization and planning," "Attending household children's events," "Picking up/dropping off household children," and "Meetings and school conferences," among others. See Appendix for detailed activities that are included in each category. Married NW refers to married women who are not working, Married FT refers to men and women who are married and working full-time, Single FT refers to single women who are working full-time.

Table 4: Working Hours Gap Relative to Fathers with a Non-working Spouse

	Weekday	Weekend	Weekday			
Fathers with Part-time Spouse	-0.121	-0.0290	-0.104	-0.163	-0.185	-0.247*
	(0.116)	(0.121)	(0.116)	(0.117)	(0.115)	(0.144)
Fathers with Full-time Spouse	-0.253**	0.00497	-0.249**	-0.269**	-0.245**	-0.160
	(0.0928)	(0.0967)	(0.0926)	(0.0945)	(0.0927)	(0.114)
Observations	7769	7784	7769	7769	7769	4766
Day of Week and Year			x	x	x	x
Education, Age and Race				x	x	x
Usual Weekly Hours					x	x
Usual Weekly Hours less than 50						x
Average Hours, Fathers with Non-working Spouse	8.040	2.164				
Average Hours, Fathers with Part-time Spouse	7.919	2.135				
Average Hours, Fathers with Full-time Spouse	7.788	2.169				

Notes: Notes: Data are from the 2003-2014 American Time Use Surveys (ATUS). The table is based on 18-65 year old men who reported working full-time in the activity summary file who are married with at least one own child in the household. "Work" corresponds to minutes spent on "work and work-related activities" at each hour based on starting and ending times in the time diary data. Each column reports the coefficient on the "part-time spouse" dummy and the "full-time spouse" dummy with the omitted group being "non-working spouse". Column (5) controls for usual weekly hours worked reported in the activity summary file. Column (6) only includes workers who reported usual weekly hours of less than 50.

Table 5: Household Care Hours Gap Relative to Fathers with a Non-working Spouse

	Weekday	Weekend	Weekday			
Fathers with Part-time Spouse	0.0702	0.0642	0.0739*	0.0885**	0.0925**	0.0650
	(0.0429)	(0.0551)	(0.0429)	(0.0424)	(0.0422)	(0.0594)
Fathers with Full-time Spouse	0.0715**	-0.103**	0.0707**	0.112***	0.108**	0.115**
	(0.0342)	(0.0439)	(0.0342)	(0.0341)	(0.0339)	(0.0469)
Observations	7769	7784	7769	7769	7769	4766
Day of Week and Year			x	x	x	x
Education, Age and Race				x	x	x
Usual Weekly Hours					x	x
Usual Weekly Hours less than 50						x
Average Hours, Fathers with Non-working Spouse	0.776	1.036				
Average Hours, Fathers with Part-time Spouse	0.846	1.101				
Average Hours, Fathers with Full-time Spouse	0.847	0.934				

Notes: Data are from the 2003-2014 American Time Use Surveys (ATUS). The table is based on 18-65 year old men who reported working full-time in the activity summary file who are married with at least one own child in the household. "Household Care" corresponds to minutes spent on " caring for and helping household members" at each hour based on starting and ending times in the time diary data. Each column reports the coefficient on the "part-time spouse" dummy and the "full-time spouse" dummy with the omitted group being "non-working spouse". Column (5) controls for usual weekly hours worked reported on the activity summary file. Column (6) only includes workers who reported usual weekly hours less than 50.

Table 6: Ratio8to5 For Occupations With Fraction Of College $\leq .4$

	Occupations	# Workers	# FT Workers	Work	Work_Std	% Females
1	Fishers and Related Fishing Workers	13	5	0.304	-3.799	0.071
2	Firefighters	176	167	0.504	-2.018	0.036
3	Forest and Conservation Workers,logging	34	26	0.533	-1.765	0.005
4	Nursing, Psychiatric, and Home Health Aides	1195	746	0.547	-1.638	0.881
5	Ushers, Lobby Attendants, and Ticket Takers	132	65	0.550	-1.613	0.534
6	Combined Food Preparation and Serving Workers, Including Fast Food	1086	422	0.553	-1.581	0.687
7	Wardens,jailors,correctional officers	754	716	0.557	-1.551	0.145
8	Dishwashers,hosts,hostesses	320	113	0.565	-1.480	0.531
9	Police and Detectives,protective service	200	188	0.577	-1.367	0.187
10	extraction,mining related	90	77	0.579	-1.354	0.009
11	Railroad Brake, Signal, and Switch Operators	72	69	0.581	-1.338	0.016
12	Crossing Guards,animal control, lifeguards etc	558	426	0.597	-1.189	0.281
13	Transportation Attendants, except Flight Attendants	101	73	0.598	-1.187	0.134
14	Helpers, Construction Trades	39	30	0.619	-0.994	0.029
15	Chefs Head Cooks	429	337	0.624	-0.954	0.512
16	Laborers and Freight, Stock, and Material Movers	1668	1327	0.633	-0.876	0.179
17	Molders and Molding Machine Setters, Operators, and Tenders, Metal and Plastic	1018	965	0.633	-0.872	0.096
18	Miscellaneous Assemblers and Fabricators	627	567	0.633	-0.868	0.386
19	Cooks,Food Preparation Workers	1122	639	0.637	-0.834	0.455
20	Baggage Porters, trans.attendants,tour and travel	92	52	0.642	-0.791	0.321
21	Inspectors, Testers, Sorters, Samplers, and Weighers	1558	1362	0.643	-0.784	0.365
22	Miscellaneous Plant and System Operators	161	152	0.645	-0.764	0.087
23	First-Line Supervisors of Production and Operating Workers	509	485	0.650	-0.725	0.194
24	Telephone and related Operators	55	45	0.658	-0.653	0.673
25	Bookbinders and Bindery Workers, printing press operators	160	139	0.658	-0.650	0.187
26	Food Processing Workers, All Other	324	249	0.658	-0.649	0.393
27	Ship and Boat Captains and Operators	20	17	0.663	-0.606	0.189
28	Motor Vehicle Operators, All Other	2042	1581	0.664	-0.600	0.139
29	Maids and housekeeping cleaners	1964	1219	0.668	-0.562	0.514
30	Dispatchers,office clerks , cargo agents	1861	1517	0.673	-0.514	0.377
31	Agricultural Inspectors, animal breeders etc	467	372	0.674	-0.511	0.243
32	Supervisors of Transportation and Material Moving Workers	128	116	0.694	-0.328	0.206
33	Child care,Personal Care and Service Workers, All Other	1549	789	0.705	-0.231	0.847
34	Medical Records and Health Information Technicians	1336	976	0.709	-0.195	0.761
35	Cashiers,clers,retail persons	2678	1373	0.716	-0.133	0.624
36	First-Line Supervisors of Gaming Workers,personal service	166	125	0.720	-0.100	0.513
37	Tailors, Dressmakers, and Sewers etc	355	277	0.736	0.039	0.609
38	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	293	228	0.741	0.088	0.246
39	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	35	31	0.741	0.089	0.076
40	First-Line Supervisors of Retail , non retail Sales Workers	2471	2156	0.755	0.213	0.371
41	installation, maintenance workers	1202	1088	0.757	0.233	0.038
42	Carpenters,woodworkers	108	94	0.777	0.406	0.228
43	First-Line Supervisors of Construction Trades and Extraction Workers	442	400	0.777	0.409	0.039
44	Animal Trainers,Nonfarm Animal Caretakers	110	71	0.780	0.433	0.694
45	Automotive Mechanics	921	829	0.780	0.436	0.010
46	First-Line Supervisors of Mechanics, Installers, and Repairers	213	210	0.782	0.451	0.065
47	First-Line Supervisors of Office and Administrative Support Workers	987	873	0.791	0.534	0.682
48	Plasterers and Stucco Masons, repair works	3079	2549	0.802	0.628	0.025
49	Engineering,drafters and related Technicians	413	373	0.804	0.644	0.183
50	Electronic Equipment Installers and Repairers, Motor Vehicles	402	363	0.806	0.663	0.102
51	other Construction and Related Workers	199	182	0.807	0.672	0.069
52	Grounds Maintenance Workers	551	372	0.809	0.695	0.057
53	personal appearance workers	511	263	0.816	0.754	0.861
54	Eligibility Interviewers, Government Programs, other clerks	2624	1961	0.824	0.824	0.757
55	Medical Assistants	678	399	0.833	0.904	0.891
56	Computer Operators	1614	1249	0.840	0.964	0.786
57	teacher assist,other teaching support	655	359	0.860	1.144	0.895
58	Clerks	1580	1171	0.863	1.170	0.888
59	Secretaries and Administrative Assistants	1964	1515	0.893	1.434	0.962
60	Occupational Therapy Assistants and Aides	50	37	0.923	1.706	0.766
61	Morticians, Undertakers, and Funeral Directors	12	6	0.925	1.719	0.100
		46173	34583	0.696	-0.309	0.364

Notes: Data are from the 2003-2014 American Time Use Surveys (ATUS). The figure is based on 18-65 year old workers. Full-time work and occupations are based on the main job. We mapped detailed 2002 Census occupation codes to detailed Standard Occupation Classification (SOC) codes and aggregated to 93 SOC categories. "Ratio8to5" is the ratio of total hours worked by all full-time workers during the hours 8 a.m. to 5 p.m. relative to total minutes worked in each occupation category. "Ratio8to5std" reports standardized values with mean zero and standard deviation equal to 1. The table keeps those occupations where the fraction of college workers in the occupation is less than 0.4. The bottom row reports sums and (unweighted) means.

Table 7: Ratio8to5 for Occupations With Fraction Of College $\geq$.4

	Occupations	# Workers	# FT Workers	Work	Work_Std	% Females
1	Geological, chemical, natural science Technicians	172	137	0.620	-0.984	0.402
2	Air Traffic Controllers and Airfield Operations Specialists	95	70	0.657	-0.658	0.099
3	Photographers, sound and light technicians,other media support	163	100	0.689	-0.371	0.241
4	Directors,clergy, Religious Activities and Education	357	267	0.700	-0.280	0.295
5	Podiatrists, therapists,nurses, dentists	3344	2429	0.700	-0.274	0.736
6	sports ,entertainment	383	195	0.702	-0.255	0.365
7	other teachers	455	212	0.762	0.271	0.623
8	Post secondary teachers	931	610	0.765	0.301	0.458
9	other miscellaneous managers	5553	4656	0.767	0.316	0.386
10	Writers and Authors,news media	518	388	0.786	0.485	0.545
11	Chief Executives, general managers	1601	1458	0.788	0.501	0.304
12	Door-to-Door Sales Workers, News and Street Vendors, and Related Workers	842	497	0.789	0.517	0.613
13	Designers, artists	570	408	0.809	0.696	0.546
14	computer/software related	2281	2118	0.817	0.759	0.232
15	pre school, middle School Teachers	3463	2881	0.817	0.761	0.805
16	Sales Representatives, Wholesale and Manufacturing	784	698	0.819	0.780	0.277
17	Surveyors, Cartographers,architects, and Photogrammetrists	160	134	0.820	0.786	0.230
18	Engineers	1257	1195	0.822	0.810	0.132
19	Lawyers	712	628	0.824	0.824	0.345
20	Transportation, industrial,HR, admin managers	1880	1780	0.828	0.858	0.403
21	Miscellaneous Community and Social Service Specialists	1210	1024	0.829	0.871	0.750
22	Public Relations, Fundraising, advert, marketing	709	652	0.831	0.885	0.424
23	astronomers, ennv., physical science	266	246	0.835	0.920	0.368
24	Training and development specialists,business operations	2049	1787	0.838	0.953	0.565
25	Other Healthcare Practitioners and health care support	50	43	0.838	0.954	0.483
26	Travel,sales Agents	994	860	0.839	0.962	0.417
27	Financial Analysts,Accountant,Auditors	2021	1785	0.847	1.033	0.516
28	Social sciences	274	228	0.850	1.053	0.652
29	natural science, biology scientists	208	193	0.856	1.107	0.529
30	Math,stats, operations research, actuaries	116	107	0.872	1.252	0.484
31	curators,librarians,lib technicians	187	142	0.898	1.486	0.762
32	Paralegals,legal support	359	300	0.901	1.508	0.842
		33964	28228	0.797	0.588	0.463

Notes: Data are from the 2003-2014 American Time Use Surveys (ATUS). The figure is based on 18-65 year old workers. Full-time work and occupations are based on the main job. We mapped detailed 2002 Census occupation codes to detailed Standard Occupation Classification (SOC) codes and aggregated to 93 SOC categories. "Ratio8to5" is the ratio of total hours worked by all full-time workers during the hours 8 a.m. to 5 p.m. relative to total minutes worked in each occupation category. "Ratio8to5std" reports standardized values with mean zero and standard deviation equal to 1. The table keeps those occupations where the fraction of college workers in the occupation is greater or equal to 0.4. The bottom row reports sums and (unweighted) means.

Table 8: Rank Correlations between Importance of Occupational Characteristics and Ratio8to5

#Cat.	Name: O*NET Characteristic	Corr. Coeff.
1	Assisting and caring for others	-0.1828
2	Coaching and developing others	0.1283
3	Developing_and_Building_Teams	0.1380
4	Establishing_and_Maintaining_Interpersonal_Relationships	0.3777
5	Face-to-Face_Discussions	0.2964
7	Social orientation	0.1528
8	Training_and_Teaching_Others	-0.0379
10	Guiding_Directing_and_Motivating_Subordinates	0.1204
	Concentration Index	0.7544
	Male Overwork	0.1567

Notes: The table shows rank correlations between the importance of O*NET occupational characteristics and our standardized *Ratio8to5* for 93 SOC occupations. The bottom rows show rank correlations between *Ratio8to5* and our concentration index and between *Ratio8to5* and "Male Overwork." *Ratio8to5* is the ratio of total hours worked by all full-time workers during the hours 8 a.m. to 5 p.m. relative to total hours worked in each occupation category in the ATUS time diary data. O*NET defines the importance of occupational characteristics for detailed SOC occupations. We aggregate the indexes to our 93 occupations by taking a weighted average where the weights are the total number of workers in each detailed SOC occupation. The concentration index is measured for 93 occupations and is the Herfindahl index of the share of hours worked in each day of the week/hour of day interval. "Male Overwork" is the share of male workers in the occupation who worked more than 50 hours per week.

Table 9: Gender Gap in Log Weekly Earnings by Coordination Measure Ratio8to5

	(1) baseline	(2) baseline+agg educ	(3) baseline+agg educ+ overwrk
Panel A: All			
female	-0.217***	-0.252***	-0.245***
	(0.0223)	(0.0161)	(0.0173)
ratio8to5	0.119***	0.0668**	0.0704**
	(0.0248)	(0.0260)	(0.0263)
femaleXratio8to5	-0.0472*	-0.0394*	-0.0321
	(0.0250)	(0.0210)	(0.0209)
Observations	259565	259565	259565
Panel B: Single Without Children			
female	-0.136***	-0.169***	-0.165***
	(0.0183)	(0.0155)	(0.0164)
ratio8to5	0.106***	0.0617**	0.0627**
	(0.0211)	(0.0281)	(0.0277)
femaleXratio8to5	-0.0151	-0.0132	-0.0102
	(0.0203)	(0.0214)	(0.0214)
Observations	72299	72299	72299
Panel C: Married With Children			
female	-0.261***	-0.295***	-0.287***
	(0.0264)	(0.0186)	(0.0197)
ratio8to5	0.114***	0.0681**	0.0727**
	(0.0280)	(0.0263)	(0.0284)
femaleXratio8to5	-0.0615*	-0.0548**	-0.0455*
	(0.0312)	(0.0237)	(0.0237)
Observations	108846	108846	108846

Notes: Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .001$. Data are from the 2003-2014 ATUS-CPS files. CPS data includes all individuals in the final interview month selected to participate in the ATUS and members of their households. The sample includes 18-65 year old workers who reported usual weekly hours $\geq$35 and had positive weekly earnings. The tables report the coefficients from regression of log weekly earnings on the female dummy, *Ratio8to5*, and the interaction term. *Ratio8to5* is measured for 93 occupation categories but we keep only 76 occupations with at least 100 ATUS respondents in the regression. Additional controls include a quartic in age, log weekly hours on the main job, education dummies, race dummies, and year dummies. Column (2) includes the average education level in the occupation as an additional control. Column (3) also includes the share of workers in the occupation who work more than 50 hours per week. Standard errors are clustered at the occupation level. Occupations with *Ratio8to5* beyond 2 standard deviations from the mean have been dropped.

Table 10: Log Weekly Earnings of Males by Working Status of Spouse and Coordination Measure Ratio8to5 – Married with Children

	(1) baseline	(2) baseline+agg educ	(3) baseline+agg educ+ overwrk
ratio8to5	0.154***	0.115***	0.117***
	(0.0330)	(0.0287)	(0.0303)
Spouse PT	0.0170	0.0127	0.0122
	(0.0112)	(0.0112)	(0.0114)
Spouse FT	-0.0417**	-0.0471**	-0.0461***
	(0.0138)	(0.0139)	(0.0133)
Spouse PT X ratio8to5	-0.0381**	-0.0440***	-0.0435***
	(0.0111)	(0.0101)	(0.0100)
Spouse FT X ratio8to5	-0.0534***	-0.0570***	-0.0574***
	(0.0142)	(0.0146)	(0.0143)
Observations	67058	67058	67058

Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .001$. Data are from 2003-2014 ATUS-CPS files. CPS data include individuals in the final interview month selected to participate in the ATUS and members of their households. The sample includes married men with children who are full-time workers and are 18-65 years old. "Spouse PT" is an indicator of a male worker who has a part-time working spouse. Similarly, "Spouse FT" refers to a male with a full-time working spouse. Additional controls include a quartic in age, log weekly hours on the main job, education dummies, race dummies, and year dummies. Column (2) includes the average education level in the occupation as additional control. Column (3) also includes the share of workers in the occupation who work more than 50 hours per week. Standard errors are clustered at the occupation level. Occupations where less than 100 ATUS respondents are used as well as those with *Ratio8to5* beyond 2 standard deviations from the mean have been dropped.

Table 11: A Simple Case with Gender Differences

Occupation	% Workers	Bunching Ratio	Earnings	$l_1 + l_2$	l	% Females	E. Gap
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: No Gender Differences							
1	0.49	0.58	0.41	0.83	0.80		
2	0.51	0.53	0.39	0.81	0.80		
Panel B: Gender-Specific ν							
1	0.44	0.55	0.46	0.91	0.90	0	
2	0.56	0.52	0.35	0.73	0.73	89	
Gender Earnings Gap	1.031						
Panel C: Gender-Specific ν and Tastes							
1	0.50	0.60	0.40	0.81	0.79	50	1.05
2	0.50	0.51	0.40	0.81	0.80	50	1.00
Gender Earnings Gap	1.026						

Note: This table shows the results of the numerical exercises described in Section 5. Panel A refers to the case with no gender differences, i.e. homogeneous agents. Panel B is the case with gender differences in the preferences for household care, governed by parameter ν. Panel C describes the same case of Panel B but we add gender specific taste shocks. Panel D describes the case of a reduction in the elasticity of substitution in household care time during the day. Column (1) refers to the different occupations considered, 1 and 2. Column (2) describes the share of total workers in each occupation. Column (3) is the bunching ratio as defined in Section 2. Column (4) contains the earnings in equilibrium in each occupation. Column (5) contains the total number of working hours in each occupation. Column (6) presents the total number of effective hours, Column (7) the share of females in each occupation, and Column (8) the gender gap in earnings per hour in each occupation. Finally, in Panel B, C, and D, the table reports the ratio of earnings of males over females for the whole economy, denoted as the gender earnings gap.

Table 12: Moments

Occupation no.	Occupation	Labor Share	$8to5ratio$	Av. Earn. Per Hour	% Fem.
1	Management	0.185	0.807	1.00	0.31
2	Business and financial operations	0.062	0.856	0.90	0.52
3	Computer and mathematical	0.053	0.837	1.08	0.22
4	Architecture and engineering	0.042	0.825	1.03	0.08
5	Life, physical, and social science	0.014	0.830	0.96	0.34
6	Community and social service occupations	0.016	0.778	0.67	0.54
7	Legal	0.021	0.863	1.09	0.46
8	Education, training, and library	0.069	0.834	0.72	0.72
9	Arts, design, entertainment, sports, and media	0.014	0.817	0.82	0.33
10	Healthcare practitioners and technical	0.068	0.723	0.88	0.70
11	Healthcare support	0.009	0.710	0.42	0.87
12	Protective service	0.030	0.592	0.73	0.12
13	Food preparation and serving related	0.012	0.604	0.37	0.46
14	Building and grounds cleaning and maintenance	0.017	0.715	0.40	0.31
15	Personal care and service	0.008	0.667	0.42	0.73
16	Sales and related	0.091	0.788	0.72	0.34
17	Office and administrative support	0.085	0.826	0.54	0.72
18	Farming, fishing, and forestry	0.004	0.627	0.33	0.24
19	Construction and extraction	0.055	0.791	0.62	0.01
20	Installation, maintenance, and repair	0.042	0.764	0.65	0.03
21	Production	0.057	0.648	0.52	0.23
22	Transportation and material moving	0.045	0.659	0.51	0.11

Note: The table presents the occupational level moments we use in our calibration. Labor shares are calculated by dividing the total earnings of workers in each occupation by the total mass of earnings in the sample. The $8to5ratio$ is our measure of coordination using time use data obtained as we explain in the text. We also report the average earnings per hour of workers in each of the occupations ($Av.Earn.PerHour$) and the share of females in the total number of workers in each occupation ($\%Fem.$).

Table 13: Model Fit

Panel A: Occupational-level Moments

Moment	Correlation Coeff. Model-Data
Labor Shares	1.00
8*to*5*ratio*	1.00
Average Earnings Per Hour	1.00
% Females	0.98
Occupational Shares	0.84

Panel B: Economy-wide Moments

Moment	Data	Model
Av. Hours Worked Male	0.63	0.61
Av. Hours Worked Female	0.54	0.47
8*to*5*ratio* Work/8*to*5*ratio* Household Care	2.03	2.06

Note: The table shows the model fit by comparing the value of the targeted moments in the data and in the model. For the economy-wide moments we show their values in the data and in the model (Panel A). For the occupational-level targeted moments we show in Panel B, for each targeted moment, the correlation across occupations between the value of the moments in the data and in the model. In the case of average hours targeted, they are as a percentage of an assumed time allocation of 10 hours a day.

Table 14: Parameter Values

Panel A: Occupational-specific Parameters

Occupation no.	Occupation	κ	α	A	T_f	T_m
1	Management	0.185	1.02	0.87	4.61	1.22
2	Business and financial operations	0.062	0.82	0.40	8.03	0.70
3	Computer and mathematical	0.053	0.65	0.57	2.06	0.86
4	Architecture and engineering	0.042	0.64	0.77	0.65	0.82
5	Life, physical, and social science	0.014	0.81	2.36	0.87	0.22
6	Community and social service occupations	0.016	1.50	1.12	2.55	0.39
7	Legal	0.021	0.65	1.87	1.56	0.20
8	Education, training, and library	0.069	1.41	0.23	21.16	0.29
9	Arts, design, entertainment, sports, and media	0.014	0.92	2.00	1.00	0.27
10	Healthcare practitioners and technical	0.068	2.69	0.36	13.88	0.25
11	Healthcare support	0.009	2.92	1.55	4.69	0.13
12	Protective service	0.030	47.05	1.01	0.84	0.83
13	Food preparation and serving related	0.012	166.82	1.16	3.93	0.62
14	Building and grounds cleaning and maintenance	0.017	2.25	0.73	4.03	0.99
15	Personal care and service	0.008	3.73	2.30	3.63	0.10
16	Sales and related	0.091	1.31	0.98	5.63	1.13
17	Office and administrative support	0.085	1.49	0.10	45.49	0.57
18	Farming, fishing, and forestry	0.004	66.19	3.73	0.65	0.31
19	Construction and extraction	0.055	0.85	0.54	0.18	1.98
20	Installation, maintenance, and repair	0.042	1.16	0.51	0.37	1.68
21	Production	0.057	3.56	0.38	5.36	2.22
22	Transportation and material moving	0.045	2.94	0.71	1.63	1.75

Panel B: Rest of Parameters

ρ	0.46
ν_f	0.40
ν_m	0.55

Note: Panel A shows the values of the parameters that are specific to the different occupations and Panel B the values obtained for the utility function, ν_m and ν_f, for males and females, respectively. In addition, Panel B presents the value obtained for the parameter that governs the elasticity of substitution of the technology for household care, ρ.

Table 15: Regressions: Model vs. Data

	Data	Model
female	-0.272***	-0.07
	(0.004)	(0.17)
ratio8to5	0.086***	0.30***
	(0.002)	(*nil*)
femaleXratio8to5	-0.015***	-0.05
	(0.004)	(0.23)

Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$. Note: This table shows the estimates of the regression using the data for married workers with children (column Data) and the estimates of the same regression using data generated by the model in its baseline calibration (column Model). The dependent variable is earnings per hour.

Table 16: Gender Earnings Gap (%)

	Overall	Between	Between (Sorting)	Within
Data	22.9	-3.9	-	26.8
Baseline	6.6	0.4	-	6.2
Equal α ($\alpha = 2.92$)	2.7	0.5	-0.1	2.2
50% Drop in $\nu_m - \nu_f$	6.8	3.7	-0.4	3.1
Increase in ρ	7.2	2.7	0.3	4.5

Note: The table shows the overall gender wage gap (Overall) and its decomposition into the portion explained by the differences in the gender wage gap across occupations (Across) and the portion explained by differences in earnings between males and females within occupations (Within). The column labeled Between (Sorting) shows a between gender gap when earnings across occupations and occupation sizes are fixed at their Baseline values. The table shows the values in the data, in the baseline economy and in two counterfactual economies: (i) when the parameter α is the same across occupations and equal to 2.92 (the one corresponding to Healthcare support), (ii) when the difference between the values for ν_m and ν_f decreases by 50%, and (iii) when ρ – the parameter that drives the elasticity of substitution between child care across the two time periods – rises from about 0.46 to 0.65.

Appendix

Table A.1: Classification of Activities among Routine Care, Enrichment Care, and Other

Routine Childcare	
030101	Physical care of household children
030101	Physical care of household children
030301	Providing medical care to household children
Enriching childcare (children of all ages)	
030102	Reading to/with household children
030103	Playing with household children, not sports
030104	Arts and crafts with household children
030105	Playing sports with household children
030106	Talking with/listening to household children
030107	Helping/teaching household children (not related to education)
030201	Homework (household children)
030203	Homeschooling of household children
030101	Physical care of household children
030101	Physical care of household children
030301	Providing medical care to household children
Enriching childcare (children ages 2+)	
1201	Socializing and communicating
120307	Playing games
120309	Arts and crafts as a hobby
120310	Collecting as a hobby
120311	Hobbies, except arts 8c crafts and collecting
120401	Attending performances
120402	Attending museums
120403	Attending movies/films
1301	Participating in sports
1302	Attending sporting event
Other childcare	
030108	Organization and planning for household children
030110	Attending household children's events
030111	Waiting for/with household children
030112	Picking up/dropping off household children
030199	Caring for and helping household children, not elsewhere classified
030202	Meetings and school conferences (household children)
030204	Waiting associated with household children's education
030299	Activities related to household children's education, not elsewhere classified
030302	Obtaining medical care for household children
030303	Waiting associated with household children's health
030399	Activities related to household children's health, not elsewhere classified
170301	Travel related to caring for and helping household children
180301	Travel related to caring for and helping household children
180302	Travel related to household children's education
180303	Travel related to household children's health

Note. A child must be present during enriching care activities. For children ages 2+, enriching childcare includes leisure activities during which the child was present (see text for further details).

Table A.2: Gender Gap in Log Weekly Earnings – Married with Children, by College/Non-College

	(1) baseline	(2) baseline+agg educ	(3) baseline+agg educ+ overwrk
Panel A: College			
female	-0.169***	-0.212***	-0.216***
	(0.0407)	(0.0265)	(0.0297)
ratio8to5	0.149***	0.0817**	0.102**
	(0.0423)	(0.0368)	(0.0457)
femaleXratio8to5	-0.158**	-0.114**	-0.0810**
	(0.0542)	(0.0402)	(0.0388)
Observations	42929	42929	42929
Panel B: Non-College			
female	-0.286***	-0.326***	-0.324***
	(0.0206)	(0.0197)	(0.0202)
ratio8to5	0.110***	0.0744**	0.0746**
	(0.0282)	(0.0307)	(0.0310)
femaleXratio8to5	-0.0480*	-0.0579**	-0.0558**
	(0.0277)	(0.0266)	(0.0266)
Observations	65917	65917	65917

Notes: Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .001$. Data are from 2003-2014 ATUS-CPS files. CPS data includes all individuals in the final interview month selected to participate in the ATUS and members of their households. The sample includes 18-65 year old workers who reported usual weekly hours $\geq$35, had positive weekly earnings, and are married with at least one own child in the household. "College" refers to those who hold at least a bachelors degree. The tables report coefficients from regression of log weekly earnings on female dummy, *Ratio8to5*, and the interaction term. *Ratio8to5* is measured for 93 occupation categories but we keep only 76 occupations with at least 100 ATUS respondents in the regression. Additional controls include a quartic in age, log weekly hours on the main job, education dummies, race dummies, and year dummies. Column (2) includes the average education level in the occupation as additional control. Column (3) also includes the share of workers in the occupation who work more than 50 hours per week. Standard errors are clustered at the occupation level. Occupations with *Ratio8to5* beyond 2 standard deviations from the mean have been dropped.

Table A.3: Gender Gap in Log Weekly Earnings: Omitting Occupations with More than 12 Percent Evening and Night Shift Workers

	(1) baseline	(2) baseline+agg educ	(3) baseline+agg educ+ overwrk
Panel A: All			
female	-0.181***	-0.240***	-0.239***
	(0.0511)	(0.0351)	(0.0349)
ratio8to5	0.110**	0.0606*	0.112**
	(0.0365)	(0.0328)	(0.0387)
femaleXratio8to5	-0.102*	-0.0566	-0.0448
	(0.0602)	(0.0451)	(0.0459)
Observations	196165	196165	196165
Panel B: Single Without Children			
female	-0.127**	-0.173***	-0.172***
	(0.0472)	(0.0319)	(0.0312)
ratio8to5	0.0978**	0.0571	0.0909**
	(0.0343)	(0.0345)	(0.0380)
femaleXratio8to5	-0.0401	-0.0125	-0.00857
	(0.0579)	(0.0434)	(0.0436)
Observations	51117	51117	51117
Panel C: Married With Children			
female	-0.196***	-0.255***	-0.255***
	(0.0497)	(0.0384)	(0.0387)
ratio8to5	0.117**	0.0741**	0.126**
	(0.0398)	(0.0345)	(0.0415)
femaleXratio8to5	-0.153**	-0.107**	-0.0916*
	(0.0604)	(0.0497)	(0.0505)
Observations	86498	86498	86498

Notes: Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .001$. Data are from the 2003-2014 ATUS-CPS files. CPS data includes all individuals in the final interview month selected to participate in the ATUS and members of their households. The sample includes 18-65 year old workers who reported usual weekly hours $\geq$35 and had positive weekly earnings. The table reports the coefficients from regression of log weekly earnings on the female dummy, *Ratio8to5*, and the interaction term. *Ratio8to5* is measured for 93 occupation categories but we keep only 76 occupations with at least 100 ATUS respondents in the regression. Additional controls include a quartic polynomial in age, log weekly hours on the main job, education dummies, race dummies, and year dummies. Share of workers in the occupation who are evening and night shift workers was calculated using the May 2004 Work Schedule Supplement and merged with the individual level CPS data. Occupations in which more than 12 percent report working evening and night shifts were omitted from the regressions. This cutoff results in deleting the top quartile of occupations based on this measure which reduces the number of occupations to 55. Column (2) includes the average education level in the occupation as an additional control. Column (3) also includes the share of workers in the occupation who work more than 50 hours per week. Standard errors are clustered at the occupation level. Occupations with *Ratio8to5* beyond 2 standard deviations from the mean have been dropped.

Table A.4: Gender Gap in Log Weekly Earnings by Concentration Index

	(1) baseline	(2) baseline+agg educ	(3) baseline+agg educ+ overwrk
Panel A: All			
female	-0.237***	-0.270***	-0.258***
	(0.0194)	(0.0175)	(0.0187)
conc index	0.119***	0.0698**	0.0797**
	(0.0224)	(0.0239)	(0.0239)
femaleXconc index	-0.0678**	-0.0532**	-0.0470**
	(0.0237)	(0.0205)	(0.0203)
Observations	259565	259565	259565
Panel B: Single Without Children			
female	-0.145***	-0.177***	-0.172***
	(0.0174)	(0.0179)	(0.0187)
conc index	0.113***	0.0724**	0.0770**
	(0.0190)	(0.0255)	(0.0248)
femaleXconc index	-0.0353*	-0.0295	-0.0257
	(0.0205)	(0.0208)	(0.0204)
Observations	72299	72299	72299
Panel C: Married With Children			
female	-0.284***	-0.317***	-0.305***
	(0.0205)	(0.0188)	(0.0200)
conc index	0.111***	0.0670**	0.0783**
	(0.0250)	(0.0242)	(0.0262)
femaleXconc index	-0.0831**	-0.0680**	-0.0612**
	(0.0290)	(0.0238)	(0.0242)
Observations	108846	108846	108846

Notes: Standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .001$. Data are from 2003-2014 ATUS-CPS files. CPS data includes all individuals in the final interview month selected to participate in the ATUS and members of their households. The sample includes 18-65 year old workers who reported usual weekly hours $\geq$35 and had positive weekly earnings. "Concentration Index" is measured for 93 occupations and is the Herfindahl index of the share of hours worked in each day of the week/hour of day interval. The tables report coefficients from regression of log weekly earnings on female dummy, concentration index and the interaction term. Additional controls include a quartic in age, log weekly hours on the main job, education dummies, race dummies, and year dummies. Column (2) includes the average education level in the occupation as additional control. Column (3) also includes the share of workers in the occupation who work more than 50 hours per week. Standard errors are clustered at the occupation level.