High-Hours Occupations, Timing of Fertility, and Labor Supply of Skilled Women*

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Abstract

I study how occupational characteristics can affect women's timing of fertility and examine employment changes after childbirth depending on the timing of fertility and occupations. By considering occupational characteristics of time constraints and human capital depreciation among skilled occupations in the US, I find that college-educated women who work in high-hours occupations are more likely to delay their fertility. Moreover, I observe that a similar pattern of delaying fertility arises in occupations with interpersonal relationships, autonomy, and competitiveness. Finally, I show that women in high-hours occupations who delay fertility tend to decrease their labor supply after childbirth, mainly by reducing working hours or dropping out of the labor force rather than switching occupations.

Key words: Working long hours, Fertility timing, Human capital depreciation, Labor supply changes

JEL Codes: J13, J22, J24

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1 Introduction

After childbirth, women often reduce their labor supply such as dropping out of the labor force or working fewer hours (Bertrand et al. 2010; Goldin 2014; Kuziemko et al. 2018). Since the change in female employment due to childbirth is associated with life-cycle perspective earnings (Bertrand et al. 2010; Goldin 2014; Kleven et al. 2019), *when* to have a child—the timing of fertility can have a strong impact on future employment and earnings (Miller 2011; Wilde et al. 2010). For example, Rindfuss et al. (1996) show that, compared to less-educated women, college-educated women dramatically shifted their fertility toward older ages due to the higher opportunity cost of taking care of children. In the other direction, Miller (2011) shows that delaying fertility leads to a substantial increase in earnings, as women can accumulate more human capital the longer they work, especially if they are college educated.

Given that different occupational characteristics such as working long hours, flexibility, or competitive pressure play an important role in explaining women's career or labor supply decisions (Cha 2013; Cha and Weeden 2014; Cortés and Pan 2017 ; Goldin and Katz 2016; Yu and Kuo 2017), the type of occupation a woman has can be a key to understanding the timing of fertility. For example, prevalence of working long hours can affect the timing of fertility. In respect to time constraints for married mothers who balance both career and household work (Jacobs and Gerson 2004; Stone 2007), it is worth exploring how working long hours affects women's timing of fertility and labor supply after childbirth. Moreover, once a woman's career is interrupted by childbirth, it takes a while for her to adapt to work upon returning.[1] Because occupations differ in the extent to human capital depreciation, the costs of career interruptions after childbirth would vary substantially across occupations. Therefore, it is also important to consider how occupational characteristics, especially related to human capital depreciation, can affect the timing of fertility.

In this paper, I study how occupational characteristics can delay fertility and how women's labor supply after childbirth depends on the timing of fertility and occupations. As a main and starting point of occupational characteristics, I use working long hours, measured by the share of men working 50 or more hours per week. Then additional occupational characteristics related to human capital depreciation are considered. Thus, my empirical analysis focuses on three parts: 1) the relationship between high-hours occupations and women's age at first birth to exam-

[1] Previous literature shows that human capital depreciates during a woman's career interruption (Mincer and Polachek 1974; Mincer and Ofek 1982), and other literature emphasizes the importance of continuous work experience in earnings and wages (Light and Ureta 1995; Miller 2011).

ine whether job structures requiring working long hours cause women to delay their fertility; 2) the relationship between occupational features requiring larger human capital depreciation and women's delaying fertility; 3) employment after childbirth by considering the timing of fertility and their occupations.

Before the empirical analysis, I present a simple theoretical framework to understand how the human capital depreciation affects the timing of fertility and labor supply after childbirth. Based on a model from Fernández, Fogli, and Olivetti (2002) where utility consists of only consumption and childcare, I extend the model into three periods. In the model, a married woman decides the timing of fertility in either period 1 or period 2 as well as labor supply in every period. The married woman with a child splits her time endowment into market production and childcare, while a married woman before giving birth spends her entire time endowment only for market production. I assume that her wage rate after childbirth decreases to reflect the human capital depreciation, where the magnitude of depreciation rate varies across occupations. I show that a woman is more likely to delay fertility when her occupation has a higher depreciation rate in human capital. In addition, I show that a woman, who delays fertility in larger depreciation rate in human capital, is more likely to reduce her labor supply after childbirth.

To provide suggestive empirical evidence of the theoretical prediction, I use several US data: the 1980–2000 Census, the 2011 American Community Survey (ACS) three-year aggregate (2009–2011), the 2017 ACS five-year aggregate (2013–2017), the Occupational Information Network (O*NET), and the National Longitudinal Survey of Youth 1997 (NLSY97).

First, using 95 skilled occupations over four decades from the Census and ACS, I find that women working in high-hours occupations are likely to delay their fertility, focused on those who are aged 25–40, married, and have a bachelor's or advanced degree(s). Interestingly, this result is robust when excluding graduates, suggesting women do not simply delay their fertility due to additional schooling. One concern is reverse causality; i.e., more women who delay fertility in an occupation drive the prevalence of working long hours. By including a lead variable of the share of men working high-hours at time t+1, following Cortés and Pan (2016), I provide evidence that the relationship between high-hours occupations and delaying fertility is not entirely driven by reverse causality. I also address the concern of selection bias; i.e., women who are more work-oriented or prefer to remain childless voluntarily choose high-hours occupations. In my analysis, women in high-hours occupations have a rather higher probability of having one or more children, which is the opposite direction of the self-selection concern.

Next, I provide one suggestive explanation of delaying fertility with respect to human capital depreciation, in addition to time constraint. By merging various occupational characteristics in O*NET and the recent 2017 ACS five-year aggregate, I also observe a tendency of delaying fertility in occupations that require active interpersonal relationships, high levels of autonomy, and high competitiveness. Human capital depreciation may explain this connection as theoretical results predict. Since human capital is assumed to depreciate more in these occupations when careers are interrupted, I suggest that delaying fertility can be understood in the context of job continuity and lifetime earnings.[2]

Given that it seems to be rational for women in high-hours occupations to delay fertility, would women who delay fertility return to their occupations after childbirth? If not, would they drop out of the labor force or reduce their working hours? To answer these questions, I examine whether labor supply changes after childbirth are affected by the timing of fertility and their occupations using two different data: 1) a panel construction using the Census and ACS and 2) the NLSY97.

With the Census and ACS, I use the occupational distribution as a proxy for observing individuals who either switch occupations or drop out of the labor force in light of existing literature (Cunningham and Zalokar 1992; Gabriel and Schmitz 2007; Cortés and Pan 2017; Kosteas 2019). This distribution is measured as the share of a given group working in a particular occupation. Then to consider the employment change after the first birth, I examine the *change* in occupational distribution as women get older. The results show that women who delay fertility are more likely to exit high-hours occupations, while women who give birth early do not have any distinct tendency to exit their occupations. One potential explanation of this result is that motherhood could be more of a burden than expected due to time constraints from balancing both career and family (Bertrand 2013; Kuziemko et al. 2018). Especially, the difficulty of balancing could be the case for women who delay fertility in high-hours occupations.

Finally, using the NLSY97, I track women's employment changes at the individual level. I confirm that there is a positive and significant interaction between high-hours occupations and delaying fertility on employment changes, such as dropping out of the labor force and reducing working hours.[3] By analyzing each employment status, I find that women tend to not only drop out of the labor force but also reduce working hours after their first childbirth. In respect to human capital accumulation, this decrease in working hours seems to be rational, since women can

[2] I define human capital as the job expertise obtained by continuing a career, within similar education level.
[3] Due to the small sample size, high-hours occupations and delaying fertility are defined as dummy variables.

continue their careers. Thus, both analyses using the Census/ACS and the NLSY97 consistently show that women who delay fertility while working in high-hours occupations are more likely to reduce their labor supply after their first childbirth.

This paper is closely related to the literature on fertility decisions. Many prior studies examine fertility in respect to education (Amin and Behrman 2014; Baudin et al. 2015; Brewster and Rindfuss 2000; Rindfuss et al. 1996). Most of these papers show that compared to less-educated women, highly educated women have less fertility and bear children at later ages. While the aforementioned studies show the link between education and fertility, Miller (2011) and Wilde et al. (2010) show that delaying fertility increases wages and earnings of mothers in the US as women can accumulate more human capital. Although widely developed models analyze total fertility/fertility timing with education levels and/or earnings, the literature on the relationship between delaying fertility and occupational characteristics is limited. Adda et al. (2017) view that expectation about future desired fertility affects the women's choice of occupations, because skill depreciation varies across occupations. On the contrary, I assume that women consider the timing of fertility after developing their human capital first (education and occupations) as the similar view with Kuziemko et al. (2018).[4] Kuziemko et al. (2018) point out that dynamic labor supply model simply assumes that women fully anticipate human capital and fertility decisions, which is not likely in their empirical evidence.

This paper also contributes to the recent literature on employment of married mothers. Cha (2013) and Cortés and Pan (2016, 2017) find that mothers working in overwork or male-dominated occupations are more likely to exit the occupation or drop out of the labor force, but these studies do not address the timing of fertility or employment after childbirth. Fitzenberger et al. (2013) estimate the average treatment effect on the treated on employment, where treatment is first childbirth now against waiting using German data. They find that the causal effect of childbirth on female labor supply is large and persistent over time. Kuziemko et al. (2018) show that women in the US and UK experience a substantial drop in employment after their first childbirth. While Fitzenberger et al. (2013) or Kuziemko et al. (2018) consider the employment effect after the first birth, their analysis more focus on by different education level, not across occupations. Bertrand et al. (2010) or Goldin (2014) show that MBA female graduates experience job interruptions and

[4]Using German data, Adda et al. (2017) show that a woman who knows she will remain childless is more likely to work in occupations with abstract tasks rather than routine and manual occupations. However, their sample is limited to women who attend lower/intermediate-track schools (ending after grades 9 and 10 and without high-track schools), and the analysis also focuses on total fertility, not the timing of fertility.

reduction in working hours due to the presence of children, and those factors can account for future lower earnings path.

The rest of the paper is organized as follows. Section 2 presents a simple model of human capital depreciation, timing of fertility, and labor supply after childbirth. Section 3 introduces the data and descriptive statistics. Section 4 examines the relationship between high-hours occupations and women's average age at first birth. Section 5 explores the occupational characteristics related to human capital depreciation. Section 6 discusses employment changes after the first childbirth, depending on the timing of fertility and their occupations. Section 7 concludes.

2 Theoretical Framework

2.1 Model

In this section, I discuss the theoretical background to understand how the depreciation rate in human capital affects the timing of fertility and labor supply after childbirth. I construct a model based on Fernández, Fogli, and Olivetti (2002) and extend it into three periods. In the model, a married woman decides the timing of fertility between the period 1 and 2 as well as labor supply in every period.[5] The married woman can provide both market production and childcare, while the spouse can only provide market production. They consume the whole earnings from the market production in every period.

I introduce a woman's utility in each period t which consists of consumption plus childcare as below:

$$\max_{c_t,h_t} u_t = c_t + (1-h_t)^{\frac{1}{2}},$$

the budget constraint satisfies $c_t = w_t h_t$, where w_t is the wage rate for a woman in period t, h_t denotes the time spent on the market production, and $1 - h_t$ represents the time spent on the childcare.[6] Substituting the budget constraint into the utility function gives,

$$\max_{h_t} u_t = w_t h_t + (1-h_t)^{\frac{1}{2}}.$$

[5] Since my empirical work examines the timing of fertility, not the total fertility, I assume that a woman will have a child in either period 1 or 2.

[6] The budget constraint for a married woman should be $c_t = w_t h_t + N$, where N is a non-labor income, i.e., a husband's earnings. Since the husband is independent with the timing of fertility, his income is assumed to be fixed as N over time. In this analysis, N does not affect a woman's timing of fertility and labor supply, I will drop N.

The utility is linear in market production (and thus market earnings) and strictly concave in childcare, because childcare can only be provided by a woman, while consumption is still available with spouse's income. Therefore, the marginal utility for initial time spending in childcare (as h $\rightarrow$ 1) is greater than the marginal utility in market production.[7]

The lifetime utility is the sum of utilities in each period. I assume that the wage rate w does not change over time before she gives birth. After giving birth, her wage rate in the following period is lowered by the proportion ρ to reflect the less accumulated human capital by spending time on childcare. In the model, the married woman with a child splits her time endowment into market production and childcare, while a married woman before giving birth spends her entire time endowment only for market production.

$$U^i = u_1^i + u_2^i + u_3^i,$$

for $i = \{e, \ell\}$, e denotes early fertility and ℓ represents late fertility.

Suppose that a woman has early fertility in period 1. Since she gives birth in period 1, the utility in period 1 includes childcare and the wage rate in period 2 is lowered into ρw. The maximization problem is as follows:

$$\begin{aligned} \max_{h_1^e, h_2^e, h_3^e} U^e &= u_1^e + u_2^e + u_3^e \\ &= \{wh_1^e + (1-h_1^e)^{\frac{1}{2}}\} + \{\rho w h_2^e + (1-h_2^e)^{\frac{1}{2}}\} + \{\rho w h_3^e + (1-h_3^e)^{\frac{1}{2}}\}. \end{aligned} \tag{1}$$

The first order conditions with respect to h_1^e, h_2^e, and h_3^e are

$$\begin{aligned} w - \frac{1}{2}(1-h_1^e)^{-\frac{1}{2}} &= 0, \\ \rho w - \frac{1}{2}(1-h_2^e)^{-\frac{1}{2}} &= 0, \\ \rho w - \frac{1}{2}(1-h_3^e)^{-\frac{1}{2}} &= 0. \end{aligned}$$

Therefore we have the solutions, $h_1^e = 1 - (\frac{1}{2w})^2$, $h_2^e = h_3^e = 1 - (\frac{1}{2\rho w})^2$.[8] Note that compared to h_1^e, she reduces her labor supply in period 2, due to the depreciated wage, ρw.

On the other hand, now suppose that a woman has late fertility in period 2. Since she does not

[7]The main results do not change even though the utility is assumed to be strictly concave in consumption, as long as the marginal utility in childcare is greater than the marginal utility in market production.

[8]To satisfy the interior solution, $h_t^e \in (0,1)$, for $t = 1,2,3$, $w > \frac{1}{2}$ in period 1, $w > \frac{1}{2\rho}$ in period 2 and 3 are required.

give birth in period 1, the utility in period 1 only comes from the market production, and the wage rate remains at w in period 2 and then decreases to ρw in period 3. The maximization problem is as follows:

$$\begin{aligned} \max_{h_2^\ell, h_3^\ell} U^\ell &= u_1^\ell + u_2^\ell + u_3^\ell \\ &= w + \{wh_2^\ell + (1-h_2^\ell)^{\frac{1}{2}}\} + \{\rho w h_3^\ell + (1-h_3^\ell)^{\frac{1}{2}}\}. \end{aligned} \tag{2}$$

Since she spends her time only for market production in period 1, $h_1^\ell = 1$ in this case. Then, we have solutions, $h_2^\ell = 1 - (\frac{1}{2w})^2$ and $h_3^\ell = 1 - (\frac{1}{2\rho w})^2$. Notice that $h_2^\ell > h_2^e$, because the wage for a woman who delays fertility remains the same as w. After the childbirth, the wage decreases to ρw in period 3, so $h_3^\ell = h_3^e$.

2.2 Timing of Fertility

The lifetime utilities for women who has early fertility and who has late fertility can be calculated as U^ℓ, U^e:

$$U^\ell = w + \Big[w\Big\{1 - \Big(\frac{1}{2w}\Big)^2\Big\} + \frac{1}{2w}\Big] + \Big[\rho w\Big\{1 - \Big(\frac{1}{2\rho w}\Big)^2\Big\} + \frac{1}{2\rho w}\Big] \tag{3}$$

$$U^e = \Big[w\Big\{1 - \Big(\frac{1}{2w}\Big)^2\Big\} + \frac{1}{2w}\Big] + \Big[\rho w\Big\{1 - (\frac{1}{2\rho w}\Big)^2\Big\} + \frac{1}{2\rho w}\Big] + \Big[\rho w\Big\{1 - \Big(\frac{1}{2\rho w}\Big)^2\Big\} + \frac{1}{2\rho w}\Big] \tag{4}$$

Therefore, an individual woman decides to have late fertility if and only if $U^\ell > U^e$. By subtracting eq.(4) from eq.(3), we have

$$\begin{aligned} U^\ell - U^e &= \underbrace{-\frac{1}{4w}}_{A<0} + \underbrace{\Big[w\Big\{1 - \Big(\frac{1}{2w}\Big)^2\Big\} + \frac{1}{2w} - \rho w\Big\{1 - \Big(\frac{1}{2\rho w}\Big)^2\Big\} - \frac{1}{2\rho w}\Big]}_{B>0} \\ &= -\frac{1}{4w} + \Big[(1-\rho)w + \frac{1}{4w}(1 - \frac{1}{\rho})\Big]. \end{aligned} \tag{5}$$

Term A in equation (5) is the utility loss from not having a child in period 1. Since the marginal utility for the childcare is greater than that for the market production, the woman who has late fertility has the lower utility in period 1 than the woman who has early fertility. On the contrary, term B in equation (5) is the utility gain from receiving the same wage, w, without depreciation of wage in period 2. Note that term B is always strictly positive because the utility in period 2, $u_2 = w\Big\{1 - \Big(\frac{1}{2w}\Big)^2\Big\} + \frac{1}{2w}$, increases with w and the wage rate falls into ρw when she gives birth early.[9]

Now I can consider how the timing of fertility is affected by the depreciation rate of human capital. Taking a derivative with respect to ρ gives,

$$\frac{\partial(U^\ell - U^e)}{\partial \rho} = -w + \frac{1}{4\rho^2 w} = -w\Big\{1 - (\frac{1}{2\rho w})^2\Big\} = -wh_2^e < 0.$$

Therefore, when ρ decreases, the utility gain from delaying fertility is relatively larger. Hence, a woman is more likely to delay fertility when her occupation has a higher depreciation rate in human capital.

2.3 Labor Supply after Childbirth

Previously, I show that when ρ is relatively low, a woman is more likely to have late fertility. Let's consider two different cases with ρ_l and ρ_h, where $\rho_l < \rho_h$. If the depreciation rate is low as ρ_l, the woman will choose to delay fertility, whereas if it is high as ρ_h, she will choose to give birth early. Therefore, we can check how the labor supply after childbirth depends on both the human capital depreciation and the timing of fertility by comparing these two cases.

In the case that a woman has late fertility with ρ_l in period 2, labor supply after childbirth is $h_3^\ell = 1 - (\frac{1}{2\rho_l w})^2$, whereas if a woman has early fertility with ρ_h in period 1, labor supply after childbirth is $h_2^e = 1 - (\frac{1}{2\rho_h w})^2$. Notice that a woman who delays fertility with ρ_l is more likely to reduce labor supply because of $\rho_l < \rho_h$.

In summary, my theoretical results predict that a woman is more likely to delay fertility as her human capital depreciates more upon returning to work after childbirth. Moreover, a woman who delays fertility in larger depreciation rate in human capital is more likely to reduce her labor supply after childbirth.

[9] Given the utility function in period 2,

$$u_2 = w\Big\{1 - \Big(\frac{1}{2w}\Big)^2\Big\} + \frac{1}{2w} = w + \frac{1}{4w},$$

by taking a derivative with respect to w, we have

$$\frac{\partial u_2}{\partial w} = 1 - \frac{1}{4w^2} = 1 - \Big(\frac{1}{2w}\Big)^2 > 0.$$

3 Data and descriptive statistics

3.1 US Census and American Community Survey

For the main analysis, I use data from the 1980, 1990, and 2000 US Census; the 2011 ACS three-year aggregate; and the 2017 ACS five-year aggregate.[10] The sample consists of native-born individuals with at least a bachelor's degree who are working full time (35 hours or more) and for wages.[11] To construct a consistent set of occupations over the survey time periods, I use Dorn's (2009) occupation classification.[12] Following Cortés and Pan (2019), I then limit the sample to those who work in 95 skilled occupations.[13] I define working high-hours as working 50 or more hours per week, and construct the share of men working high-hours in an occupation among college-educated men aged 25–55 (Kuhn and Lozano 2008; Cha and Weeden 2014; Cortés and Pan 2016). Age at first birth is calculated as a woman's current age minus the oldest child's age among married women with children.[14]

Table 1 summarizes the descriptive statistics for the Census and ACS data. Panel A shows that for married women with children, there are modest increases in average age, having an advanced degree (master's/doctoral and professional degree), and age at first birth from 1980 to 2017.[15] Panel B shows that at the occupation level, age at first birth increases over time, from 26.61 in 1980 to 29.04 in 2017. The share of men working 50 or more hours also significantly increases, especially until 2000. For example, in 1980 this ratio was 0.29; it increased to 0.43 in 2000 and then decreased to 0.35 in 2017.[16]

The share of men working high-hours varies across occupations, as shown in Table A2. In 2010, for example, physicians, chief executives, lawyers, financial specialists, and marketing specialists have relatively high shares of men working high-hours. The change in this share from 1980 to 2010 also varies by occupations. Over the time period, chief executives (32.7 percent) have the largest

[10] I refer to the 2011 ACS data as corresponding to the 2010 time period.

[11] Flags for occupation and women's age are dropped from the sample.

[12] In addition to Dorn's occupation classification, occupation codes are modified using the crosswalk between 2009 ACS and 2010–2011 ACS from Integrated Public Use Microdata Series (IPUMS).

[13] Cortés and Pan (2019) define skilled occupations as satisfying at least two of the following three conditions: 1) managerial and professional specialty occupations (codes 3-200), 2) share of college-educated workers in 2010 is higher than the share of college-educated workers in the working population, and 3) men's median income in 2010 is greater than that across occupations. Table A2 provides a list of the 95 skilled occupations.

[14] Age at first birth below 21 is excluded from the sample, since the paper focuses on the timing of fertility for working women.

[15] See Table A1 for summary statistics of individual-level married men with children.

[16] This trend on the share of working high-hours is consistent with Kuhn and Lozano (2008). Using the Current Population Survey (CPS) from 1979 to 2006, they find that the increase in working long hours was the strongest before 1990 and reversed somewhat after 2000.

increase in share of men working high-hours, and other occupations such as engineers, financial specialists, lawyers, and human resources managers show a relatively large increase in prevalence of working long hours. On the contrary, librarians, social workers, registered nurses, teachers, and pharmacists have relatively low share of men working high-hours. Over time, pharmacists see a large decline in prevalence of working long hours (–14.7 percent). Similarly, funeral directors, religious workers, veterinarians, and respiratory therapists also see a decrease in prevalence of working long hours over time.

Figure 1 illustrates the trend in women's average age at first birth by year/education level, which is the main interest variable in this paper. The figure shows an increase in women's age at first birth for all education levels over the past few decades. Within the same education level, women's average age at first birth increases over time, especially for highly educated women (college graduates and advanced degree graduates). For example, the increase in women's age at first birth for high school graduates from 1980 to 2017 is 0.9 years, whereas the increases in women's age at first birth for college graduates and advanced degree graduates are 2.3 and 3.0 years, respectively. Moreover, the gap in ages at first birth between less-educated and highly educated women increases over time. For instance, there was a 3.3-year gap between high school graduates and college graduates in 1980, whereas the gap increased to 4.7 years in 2017. These results show that mostly highly educated women appear to delay fertility over time.

3.2 Occupational Information Network

I use the O*NET to understand the occupational characteristics of high-hours occupations (version 23.0, released in 2018). The O*NET is a database containing hundreds of occupation-specific descriptions. From two classifications of "work context" and "work activities," I choose eight occupational characteristics related to human capital depreciation. Then I divide into three categories: interpersonal relationships, autonomy, and competitiveness. The O*NET creates indexes for occupational characteristics by averaging responses—on a 1–5 scale in most cases (e.g., time pressure 1: never; 5: everyday). Since the O*NET occupation codes are different from those in the ACS, I first match them using the crosswalk from the IPUMS and the O*NET. If one occupation code in the ACS corresponds to several O*NET codes, O*NET characteristics are weighted by the number of sample in each O*NET category.[17] Each of the O*NET characteristics are normalized to

[17]For example, the post-secondary teacher in the ACS corresponds to several codes in the O*NET, such as business teachers, computer science teachers, and math science teachers.

have a mean of zero and a standard deviation of one.

3.3 National Longitudinal Survey of Youth 1997

To examine labor supply changes after childbirth, I use the NLSY97, a panel data set that covers 8,984 individuals. Respondents were born between 1980 and 1984 and were 32–38 at the time of last survey year in 2017. They were interviewed annually from 1997 to 2010 and then biannually from 2011. I focus on married college-educated women who gave birth after age 22, were working full time, and were not self-employed at the year of their first birth.[18] Women who divorced, separated, or were widowed after their first childbirth are excluded from the sample. Women who gave birth in 2012, 2014, or 2016 are dropped due to the biannual survey construction, and women who gave birth in 2017 are also dropped because changes in employment status after childbirth are not observable.

Table 2 provides summary statistics for the NLSY97. The total number of observations is 750 with 199 individuals, so the average of employment status is 3.8 times per person. Among changes in employment status, the percentage of those dropping out of the labor force is 9 percent and the percentage of those switching an occupation and workplace is 11 percent.[19] Reducing working hours are the most common changes in employment status after childbirth: the percentage of those switching to part time (less than 35 hours per week) is 13 percent, and the percentages of those reducing their working hours by more than 5 hours or 10 percent are 25 percent, respectively.

4 High-hours occupations and women's average age at first birth

In this section, I discuss how occupational characteristics affect women's timing of fertility. As a main measure of occupational characteristics, I use working long hours, as measured by the share of men working 50 or more hours per week.[20] Kuhn and Lozano (2008) find that in the US, working long hours is increasing over time, especially for college-educated, salaried men. Though the increase in working high-hours reversed somewhat after 2000 in the US, its prevalence still remains still higher than in other countries (Cortés and Pan 2016). Cortés and Pan (2017) use the

[18] Survey years from 2003 are included in the sample when oldest respondents became age 22.

[19] I consider both changes in occupation and workplace together because the change in occupation can also occur due to a promotion in the same workplace. Note that the information on workplace comes from the weekly employment number provided in the NLSY97.

[20] Note that I use the share of *men* working high-hours in an occupation to exclude any possible endogeneity between the share of *women* working high-hours and women's timing of fertility in an occupation.

prevalence of working 50 or more hours as a proxy for workplace inflexibility and Cha (2013) mentions that occupations with working long hours are mostly male-dominated.[21] Prevalence of working long hours is also discussed as the reason for persistent earnings gap (Bertrand et al. 2010; Cha and Weeden 2014; Goldin and Katz 2011).

Since high-hours occupations are more likely to cause time constraints for married mothers who, unlike men, need to balance career and household work (Jacobs and Gerson 2004; Stone 2007), it is meaningful to study the relationship between high-hours occupations and women's age at first birth. Using the Census and the ACS from 1980–2010, I study this relationship with panel construction at the occupation level and address possible concerns such as additional schooling, reverse causality, or self-selection. Then, using the recent ACS, I check whether the previous panel construction is consistent at the individual level and, more importantly, how spouses' high-hours occupations affect women's timing of having a child and vice versa.

4.1 Share of men working high-hours and women's average age at first birth at the occupation level

To study the relationship between the share of men working high-hours and married women's timing of fertility while working in an occupation, I begin by showing a descriptive illustration using cross-occupation data from 1980 to 2010. As Figure 2 shows, in each decade there is a clear, positive cross-occupation relationship between the share of men working 50 or more hours per week and women's average age at first birth. Women tend to delay their fertility while working in occupations with a higher share of men working high-hours. This tendency is somewhat weaker in 1980 but becomes stronger in other periods.[22]

To examine the effect of the share men working high-hours on women's average timing of fertility by occupation, the following regression is estimated:

$$Age\ at\ first\ birth_{ot} = \alpha + \beta \cdot Share\ of\ high\_hours_{ot} + \eta \cdot X_{ot} + \phi_o + \phi_t + \epsilon_{ot}, \tag{6}$$

where o and t refer to an occupation and each decade, respectively. Age at first birth in the main regression implies the average women's age at their first birth among married women aged 25–40 in

[21] Using the American Time Use Survey (ATUS), Cortés and Pan (2016) find that working long hours is highly correlated with workplace flexibility, such as working on weekends or non-standard hours. Cha (2013) argues that working long hours is strongly associated with a higher proportion of men in the workplace, including nonprofessional occupations such as production, operative, and protective service occupations.

[22] Note that this correlation in Figure 2 is robust when excluding graduates.

each occupation level. Share of high hours is defined as the ratio of men working 50 or more hours per week among college-educated male workers aged 25–55. X_{ot} is a vector of control variables such as average log wages of men and women, married women's average number of children, and share of master's or doctoral degree by dependent variables.[23] ϕ_o and ϕ_t are occupation and time fixed effects, respectively. Standard errors are clustered at the occupation level, and the regression is weighted by the number of individuals of the dependent variable.[24]

Table 3 presents the result of the regression in equation (6). Column (1) of Table 3 considers only occupation and year fixed effects, while column (2) also includes control variables such as log wages of men and women, number of children, and the share of those with a master's or doctoral degree. The estimated coefficients on the share of men working high-hours in an occupation in columns (1)–(2) are both positive and significant at the 1 percent level. The coefficient in column (2) indicates that the 10 percent increase in the prevalence of working long hours in an occupation is associated with the increase in age at first birth by 0.23.

Women may delay their fertility due to additional schooling rather than working long hours. It is worth emphasizing that the coefficient in column (2) is significant after controlling for the share of women with master's or doctoral degrees. To further address this concern, when I exclude women with advanced degrees, the regression coefficient of college graduates in column (3) is similar in magnitude to column (2) and is still significant. These two points provide evidence that women do not simply delay their fertility because of additional schooling.

On the other hand, one might think that men working in high-hours occupations also tend to delay having a child. To check this possibility, I estimate a regression for married men aged 25–40 instead of married women. The coefficient in this regression, shown in column (4), is not only smaller in magnitude than the ones in columns (2)–(3) but is also statistically insignificant. This result can be interpreted that the timing of having a child depends on women's occupations rather than men's due to time out of the labor force during pregnancy and after birth.

To check the robustness of the main regression, I first expand the age composition by including older groups in Table 4. In column (1) of Panel A, the baseline coefficient on the share of men working high-hours is 2.303. When I expand the age composition of married women into ages 25–

[23]Note that the average number of children is fixed for those aged 25–40, but the share of those with a master's or doctoral degree depends on the group of dependent variables. For example, when the dependent variable is married women aged 25–55 with children, the share of those with a master's or doctoral degree is calculated by that of married women aged 25–55 with children.

[24]Note that if the proportions of miscarriage, abortion, or infertility are positively related to high-hours occupations, the β in equation (1) can be over-estimated. On the other hand, if there are 1) women who still defer the childbirth after age 40, or 2) women who delay the childbirth but eventually end up with no child, then the β can be under-estimated.

45, 25–50, or 25–55, the estimated coefficients become somewhat smaller in magnitude but are still significant at the 5 percent level. Therefore, the relationship between high-hours occupations and delaying fertility is robust to different age compositions of married women. Second, I apply the alternative measure of working long hours such as more than 41, 45, or 55 hours. The coefficients in Panel B of Table 4 become larger as the measure of working long hours changes from 41 hours (2.015) to 55 hours (3.559), suggesting the positive association between high-hours occupations and women's age at first birth is robust to different measures of working long hours.

Before turning to the analysis at the individual level, two possible concerns should be addressed. First, there could be a possibility of reverse causality that more women who delay fertility drive the prevalence of working long hours. If the occupation has more women who delay fertility, then it is more likely to have fewer women in the occupation with children, that drives the prevalence of working long hours in that occupation. To address this possibility, following Cortés and Pan (2016), I also include the lead variable of the share of men working high-hours at time t+1.[25] If women who delay fertility cause the prevalence of working long hours, one might have expected to see that the share at t+1 should be significantly correlated with women's age at first birth. Panel C of Table 4 shows that the lead variable of the share of men working high-hours is not significant and has a negative sign for any alternative measures of high hours. Moreover, the coefficients on this share at time t are similar in magnitude than that of Panel B and are statistically significant. Therefore, there is an evidence that the relationship between prevalence of working long hours and delaying fertility is not entirely driven by reverse causality.

The other concern is selection bias: it is possible that women who are more likely to remain childless or are more work-oriented choose high-hours occupations. If this is the case, high-hours occupations do not cause women to delay fertility, but rather work-oriented women self-select into high-hours occupations. To address this concern, instead of women's age at first birth, I replace the dependent variable with the women's average number of children or the ratio of having children. If women self-select their occupations, one might have expected to that the share of men working high-hours should be negatively associated with the women's average number of children or the ratio of having children. Table A3 presents the regression results with various dependent variables. When including only occupation and year fixed effects, none of the alternative dependent variables is significant in Panel A. When I add other control variables, the coefficients in columns

[25]For the share of men working high-hours at t+1 year in 2010, I use the 2017 ACS five-year aggregate. Thus, the number of observations remains the same.

(1)–(3) in Panel B are significant at the 5 percent level, but the signs are positive, which is the opposite direction of the selection bias concern. Hence, there is an evidence that the tendency to delay fertility while working in high-hours occupations is not entirely driven by self-selection.[26]

4.2 Evidence from individual-level analysis: Role of spouse's occupation

The previous section shows that women working in high-hours occupations tend to delay their fertility, with panel construction at the occupation level. In this section, I explore whether this relationship is consistent at the individual level using the recent 2017 ACS five-year aggregate. More importantly, by adding spouses' characteristics, we can understand how they affect the timing of having a child, especially when the spouses work in high-hours occupations.

The sample consists of native-born married individuals aged 25–55 with at least a bachelor's degree, are working full time (35 hours or more), and have a spouse with at least a bachelor's degree.[27] The sample is restricted to individuals working in 95 skilled occupations, as shown in Table A2.

To study the effect of a spouse's high-hours occupation on a woman's age at first birth at the individual level, the following regression is estimated:

$$Age\ at\ first\ birth_{io} = \alpha + \beta \cdot Share\ of\ high\_hours_o + \eta \cdot X_i^{'} + \gamma \cdot Share\ of\ high\_hours_o^{sp} + \epsilon_{io}, \quad (7)$$

where i and o refer to an individual and occupation, respectively. Age at first birth is a woman's individual age at first birth and the share men of working high-hours follows the same definition in equation (6). The vector X_i includes not only individual-level characteristics, such as number of children, age, age^2, a vector of race dummies, a dummy variable of having a graduate degree, and log hourly wage; it also includes spouses' characteristics such as age, race, education, and log hourly wage. The share of men working high-hours in a given *spouse's* occupation is included in some specifications, and then the sample is further restricted to spouses working in 95 skilled occupations in this case.[28] Standard errors are clustered at the occupation level and regression is weighted by personal weight.

[26] This test of addressing the concern of selection bias cannot fully rule out the possibility of self-selection, because the sample is already selected from those who only remain in the labor market.

[27] Out of the total sample with spouse information (533,992), 73 percent of respondents have spouses with at least a bachelor's degree (389,395).

[28] Out of the sample with spouses who have at least a bachelor's degree (389,395), 73 percent of spouses work in 95 skilled occupations (284,565).

The regression results on the main interest group of married women aged 25–40 are presented in columns (1)–(4) of Table 5. The estimated coefficient after controlling for individual-level characteristics of respondents and spouses is 1.343 in column (2), while the coefficient is 3.796 in column (1) without all controls. Next, to understand how a spouse's occupation affects a woman's timing of fertility, I include the share of men working high-hours in a given *spouse's* occupation in column (3). The magnitude of the coefficient on the share of men working high-hours in one's own occupation is 1.202, which is similar to column (2). The share of men working high-hours in a spouse's occupation is also significantly associated with a woman's age at first birth, but the magnitude of the coefficient is smaller, 0.792. Therefore, delaying fertility of a married woman is more affected by her own occupation rather than her spouse's occupation.

Since the marriage year is available from the 2008 ACS, we can check the robustness of the coefficient on the share of men working high-hours in a given occupation by controlling a woman's age at marriage. The estimated coefficients on share of men working high-hours in one's own occupation or a spouse's occupation in column (4) become somewhat smaller than column (3), but they are still significant. The coefficient on a woman's age at marriage is also positively and significantly associated with a woman's age at first birth. This suggests that, even holding a woman's age at marriage constant, a woman tends to delay her fertility when she works in a high-hours occupation rather than when her spouse works in high-hours occupation.

To check whether the estimation is consistent by age group, I expand the women's age composition in columns (5)–(7) using a preferred estimate in column (3).[29] As expected, the coefficients on the share of men working high-hours in one's own occupation are similar in magnitude and are significant. On the other hand, the size of coefficients on the share of men working high-hours in a given *spouse's* occupation become smaller and less significant when including older groups. This implies that when a spouse's occupation has a higher share of working high-hours, younger women are more likely to delay having a child than older women.

Finally, we can examine whether a married *man* delays having a child when both he and his wife work in a high-hours occupation. I estimate the regression for married men by age groups using the preferred estimate in column (3). The coefficients on the share of men working high-hours in one's own occupation in columns (8)–(11) of Table 5 are positive but not statistically significant except for married men aged 25–40. On the contrary, the coefficients on the share of

[29]Since the control variable of the age at marriage is highly correlated with the age at first birth, the estimation in column (3), which excludes the age at marriage, is preferred.

men working high-hours in a *spouse's* occupation are significant at the 1 percent level and larger in magnitude for all age groups of married men. This result implies that a man's age at first birth increases when his wife works in a high-hours occupation rather than he works in a high-hours occupation. Even though having a child is a joint decision between spouses, the wife's occupation plays an important role in the timing of having a child compared to husband's, as the wife is the one who experiences a career interruption due to fertility.

5 Occupational characteristics of high-hours occupations in terms of human capital depreciation

The previous section highlights that women working in high-hours occupations tend to delay fertility. Given that married mothers need to balance both career and household work (Jcobs and Gerson 2004; Stone 2007), high-hours occupations can be an additional time constraint for them. Then would the time constraint be the only reason of delaying fertility? In this section, I explore other possible reason of delaying fertility other than time constraint. More specifically, I provide one suggestive explanation of delaying fertility with respect to human capital depreciation. When women's careers are interrupted by childbirth, their skills could become obsolete and personal relationships could drift apart. Moreover, upon returning to work, women might need a longer time or more effort to adapt. I hypothesize that these types of human capital depreciation can arise more frequently in high-hours occupations. For example, high-hours occupations are likely to require more personal relationships, autonomy, and competitiveness. As a result, human capital depreciation can be greater in high-hours occupations when work experience is discontinued due to childbirth.

It is worth emphasizing that human capital in this section is not the standard definition of human capital that can be explained by education level. Here I define human capital as job expertise from career continuity within similar education level. Earlier literature shows that human capital depreciates during a woman's career interruption (Mincer and Polachek 1974; Mincer and Ofek 1982).[30] Light and Ureta (1995) and Miller (2011) emphasize the importance of continuous work experience in earnings and wages.[31] In this respect, I understand women delaying fertility in the

[30]Using the NLSY68, these studies show that the depreciation rate increases in the level of education and becomes greater for women with more years of experience at the time of the interruption.

[31]Light and Ureta (1995) show that 12 percent of the gender wage gap can be explained by the different timing of work experience. Their estimation shows that the return to continuous work experience is higher than the standard work experience models. Miller (2011) finds that delaying motherhood can influence women's career path, such as increases in earnings and wages.

context of work continuity and lifetime earnings.

To study various occupational characteristics related to human capital depreciation, I use the O*NET which is a database containing hundreds of occupation-specific characteristics (version 23.0, released in 2018). Out of two classifications of "work context" and "work activities" in the O*NET, I choose eight occupational characteristics that would be closely related to human capital depreciation. Then I group them into three categories—interpersonal relationships, autonomy, and competitiveness. Interpersonal relationships consist of having contact with others, establishing and maintaining interpersonal relationships, coordinating or leading others, and having impact of decisions on co-workers or company results. Autonomy is measured by unstructured work, the freedom to make decisions, or decision-making frequency. Last, competitiveness is measured by the level of competition.

To consider the relationship between prevalence of working long hours and human capital depreciation, I merge several occupation-based indexes from the O*NET with a similar time-frame 2017 ACS five-year aggregate.[32] Given the distribution of share of men working high-hours by occupation level from the ACS, I extract two groups—one from below the 25 percentile (low-hours occupations) and the other from above the 75 percentile (high-hours occupations). For each group of occupations, I compute the mean and standard deviation of each O*NET characteristics in Table A4. All mean values for the three categories with eight characteristics are larger for the group of high-hours occupations than the group of low-hours occupations. This descriptive statistics suggest that the group of high-hours occupations is more likely to have active interpersonal relationships, high degrees of autonomy, and higher competitiveness. Figure 3 illustrates the strong positive cross-occupation relationship between the share of men working high-hours and the three occupational categories, respectively.

Because high-hours occupations are closely associated with occupational features with larger human capital depreciation, I also estimate the relationship between women's average age at first birth and average indexes representing human capital depreciation. From the equation (6), I replace the share of men working high-hours with the averaged indexes of occupational characteristics in human capital depreciation. Thus, I estimate the following regression:

$$Age\ at\ first\ birth_o = \alpha + \beta \cdot Human\ capital\ depreciation_o + \eta \cdot X_o + \epsilon_o, \tag{8}$$

[32] I use the recent 2017 ACS five-year aggregate to match O*NET's occupational characteristics because the O*NET database began in the 2000s and is constantly updated with current occupational features.

where o refers to occupation. The averaged indexes of occupational characteristics are normalized to have a mean of zero and a standard deviation of one.[33]

In Table 6, when including characteristics of interpersonal relationships, autonomy, competitiveness, respectively in columns (1)–(3), the estimated coefficients are statistically significant except for autonomy in column (2) (p-value =0.114). I then estimate the association between indexes of human capital depreciation and women's age at first birth by averaging all eight characteristics in column (4).[34] The result shows that a one standard deviation increase in the normalized average index is associated with women's average age at first birth by 0.177, suggesting women who work in occupations that require active interpersonal relationships, high autonomy, and high competitiveness are more likely to delay fertility. One possible explanation is that women delay fertility in occupations that have a higher depreciation of human capital when careers are interrupted.[35] Moreover, when including both occupational characteristics of working high-hours (i.e., duration of the typical work week) and high-human capital in column (6), the magnitude of coefficients become larger and more statistically significant. This result can be interpreted that not only the time constraint by working long hours but also occupational features of larger skill depreciation lead to delayed fertility.

To better understand the timing of fertility and human capital depreciation, Figure 4 provides a theoretical background using two earnings profiles for occupations with lower and higher depreciation rates, respectively. For simplicity, suppose that the earnings profile for a woman without a child is the same across occupations with profile oc. Suppose that a woman can have different timings of fertility, at time t_e and t_l, respectively, and the time out of the labor force after childbirth is one year for both cases.

In Figure 4(a), a woman decides the timing of fertility between t_e and t_ℓ by comparing forgone earnings due to one year of work experience interruption (light gray areas) and the opportunity of raising her earnings profile by delaying fertility (dark gray area). In this case, the net gain of delaying fertility is not sizable, so her timing of fertility does not impact her lifetime earnings. On the other hand, when it comes to a higher depreciation rate of human capital in Figure 4(b), the loss in her lifetime earnings profile after childbirth (dark gray area) becomes greater when she

[33] There are possible limitations of averaging several characteristics: 1) occupational characteristics are not independent, 2) even though that each distribution is independent, I assume that weights are the same across occupational characteristics following other papers (Goldin 2014; Yu and Kuo 2017).

[34] Due to the possible multicollinearity of three categories, those characteristics are averaged and then normalized instead of estimating with separate β's.

[35] Using the O*NET and the NLSY 97, Yu and Kuo (2017) find that mothers have a bigger wage penalty when their occupations impose more competitive pressure.

gives birth at an earlier age, t_e. Additionally, if a new earnings profile after childbirth has a lower return on experience due to reduced opportunities for training/promotion or reluctance to invest in developing new skills at work (Miller 2011), the loss can be even larger. Therefore, when the depreciation rate of human capital is higher and the return to experience after childbirth is lower than that for a woman without a child, the timing of fertility can be delayed in the context of lifetime earnings and careers.[36]

To summarize, I show that high-hours occupations are closely related to occupations imposing interpersonal relationships, autonomy, and competitiveness. Since women in these occupations are more likely to delay fertility, I suggest the possibility that women tend to delay their fertility in occupations where human capital depreciation is more likely to be greater. Thus, delaying fertility can be a rational behavior in terms of work continuity and lifetime earnings.

6 Employment after childbirth

In this section, I explore how women's employment change after childbirth, depending on the timing of fertility and their occupations. For example, given that lawyers tend to delay fertility compared to elementary school teachers, would their labor supply decisions after childbirth be different from elementary school teachers' decisions? If women change their employment after childbirth, are they more likely to drop out of the labor force, reduce working hours, or change occupations?

To answer these questions, I conduct two different analyses using the Census/ACS and the NLSY97, respectively. First, I construct a panel using the Census and the ACS at the occupation level. This panel has a sufficient number of observations over time but cannot track labor supply changes at the individual level. To overcome this limitation, I also use the NLSY97 individual panel as supportive evidence, though the sample size is small.

6.1 Evidence from the Census/ACS

Using the 1980–2000 Census and the 2011 ACS three-year aggregate, I construct a panel data at the an occupation-level. I use the occupational distribution as a proxy for observing individuals who either switch occupations or drop out of the labor force (Cunningham and Zalokar 1992; Gabriel and Schmitz 2007; Cortés and Pan 2017; Kosteas 2019). The occupational distribution for a given

[36] For details on earnings profiles, see Blau et al. (2013) and Miller (2011).

interest group is measured as the share of the given group working in a particular occupation. Then to consider the change in labor supply after the first childbirth, I examine the *change* in occupational distribution as women get older.

Specifically, the following regression is estimated:

$$\frac{women\_gr(i+1)_{ot}}{women\_gr(i+1)_t} - \frac{women\_gr(i)_{ot}}{women\_gr(i)_t} = \alpha + \beta \cdot Share\ of\ high\_hours_{ot} + \eta \cdot X_{ot} + \phi_o + \phi_t + \epsilon_{ot}, \quad (9)$$

where o and t refer to an occupation and each period, respectively. The estimation is the same as equation (6), except for the dependent variable. The dependent variable here is the *change* in occupational distribution of a given demographic group. To capture labor supply changes as women age following the first birth, I divide the sample into three intervals (i) by ages—young, intermediate, and older.[37] Based on three intervals, two demographic groups are defined by the timing of fertility: women who have their first birth in the young interval and women who delay fertility in the intermediate interval.[38] $women\_gr(i)$ represents the demographic group of women whose current ages are in the same interval as ages at first birth, whereas $women\_gr(i+1)$ refers to the group of women whose current ages are in the next age interval. For example, for women who delay fertility in the 2011 ACS, $\frac{women\_gr(i)_{ot}}{women\_gr(i)_t}$ indicates the occupational distribution of women whose current ages and ages at first birth are both in the ages 29–35 interval, while $\frac{women\_gr(i+1)_{ot}}{women\_gr(i+1)_t}$ indicates the occupational distribution of women whose ages at first birth are in the ages 29–35 interval but whose current ages are between ages 36–42. The difference in the occupational distribution over time implies how much a given demographic group in that occupation relatively enter or leave as they age. Therefore, if the coefficient β in equation (9) is negative, a given demographic group is more likely to exit high-hours occupations when they get older.

An analysis of the prevalence of working long hours on change in occupational distribution is given in Table 7. Main demographic group is women who delay fertility among intermediate ages cohort in columns (1)–(3). In column (1), the estimated coefficient on the share of men working high-hours when controlling only occupation and year fixed effects is –0.161, but it is not statistically significant. Interestingly, when including the average number of children, the coefficient becomes larger in magnitude (–0.255) and is statistically significant at the 5 percent level. The coefficient remains robust (–0.221) when including other control variables such as log wages of men/women and the share of graduates, meaning a 10 percent increase in the share of men

[37] For example, ages 23–28, ages 29–35, and ages 36–42.

[38] Based on women's median age at first birth in each period, I define two demographic groups; note that these groups mostly include women whose ages at first birth are between the 5th and the 95th percentile of the distribution.

working high-hours is associated with a 2.2 percentage point reduction in the employment share of women who delay fertility as they age.

It is worth emphasizing that the coefficient on the average number of children of married women is positive and statistically significant. In column (3) of Table 7, the 0.1 increase in the average number of children is associated with a 2.3 percentage point increase in the employment share of women who delay fertility as they age. One explanation of this result can be that women after the first birth tend to work continuously in occupations that have a higher share of female employees with children. Notice that the coefficient on the share of men working high-hours becomes significant only when including average number of children of married women—this suggests that women- or family-friendly work environments can play an important role for women's labor supply decisions after the first birth.[39]

For women who do not delay fertility in young ages cohort, the coefficients β in columns (6)–(8) of Table 7 become smaller and are not statistically significant. This result can be interpreted as women who give birth early do not have a distinct tendency to exit high-hours occupations.[40] In this respect, it is somewhat puzzling that women who delay fertility to maximize their lifetime earnings and job expertise are more likely to exit high-hours occupations after childbirth. One potential explanation is that highly educated women underestimate the effect of motherhood on employment. Kuziemko et al.(2018) show that highly educated women underestimate the difficulty of balancing both a career and childcare, so this under-estimation causes them to become pessimistic on performing both market work and household work. Similarly, Bertrand (2013) finds that college-educated women who achieve the double goal of career and family do not have a greater life satisfaction—combination of career and family gives rather increase in sadness,stress, and tiredness. Even though they do not consider the employment beliefs or emotional well-being by occupations or timing of fertility, motherhood could be more of a burden in high-hours occu-

[39] As an additional exercise, I also estimate column (3) using the married *men*'s average number of children. In this case both coefficients on the share of men working high-hours and the number of children do not provide significant estimates (not reported). This result further supports that a family-friendly work environment is more closely related to women's average number of children rather than men's.

[40] Strictly speaking, the analysis presented here has some limitations. By constructing $women\_gr(i)$ as women whose current ages are in the same interval as age at first birth (for example, current ages and ages at first birth are both in the 23–28 interval), there are some women whose current age is 28 but their age at first birth is 23 (5-year gap). Similarly, by defining $women\_gr(i+1)$ as women whose current ages are in the next age interval to ages at first birth (for example, current ages are in the 29–35 interval and ages at first birth are in the 23–28 interval), some women may be 29 years old and give birth at 28 (1-year gap). In this case, the latter does not always reflect the larger gap between current ages and ages at first birth. I assume that, *on average*, the regression captures the difference in occupational distribution as they age. The regressions are not presented here; I only include samples, where $women\_gr(i+1)$ always have larger gaps in ages than $women\_gr(i)$. The estimated coefficients are quite robust, –0.202 with a 5 percent significance level for women who delay fertility and –0.083 with no significance for women who do not delay fertility.

pations due to time constraints from this balancing, especially for those who delay fertility.

Notice that the age intervals for the two demographic groups are different: For women who do not delay fertility, $women\_gr(i)$ and $women\_gr(i+1)$ represent young and intermediate age intervals, whereas for women who delay fertility, they represent intermediate and older age intervals. Therefore, there is a possibility that women naturally exit high-hours occupations as they become older for reasons such as competitiveness, intensity, or time pressure.[41] In that case, the tendency to exit high-hours occupations arises due to natural age effects rather than to labor supply changes after childbirth.

To address this concern, I conduct falsification tests by estimating equation (9) for women without children and men in the same age intervals as women who give birth.[42] The results of these falsification tests are presented in Table 7. For women without children in the intermediate age cohort, the estimated coefficient on the share of working high-hours in column (4) is less significant, and the magnitude (–0.084) is much smaller than women who delay fertility. Moreover, for women without children in the young age cohort, the coefficient β is not significant. For men, the coefficients are not statistically significant and have mixed signs for all age cohorts in columns (5) and (10). These results suggest that the tendency for women who delay fertility to exit high-hours occupations is not entirely driven by natural age effects but instead arises due to labor supply decisions *after childbirth*.

Note that there could be some limitations of using the Census and the ACS, since those data are cross-sectional. For example, I implicitly assume that women in different age intervals follow the same lifetime path related to labor supply decisions given a demographic group. Thus, in the following section I use the NLSY97 as supportive and complementary evidence, because it enables us to track labor supply changes at the individual level.

6.2 Evidence from the NLSY97

The previous section shows that women who delay fertility tend to exit high-hours occupations, while women who give birth early do not. In this section, I study labor supply decisions after the first birth at the individual level. By using the NLSY97, I can check the consistency with the

[41] The tendency to naturally exit the occupation can arise in both labor supply and demand sides. Workers can voluntarily exit high-hours occupations or employees may not want to hire older workers any longer.

[42] Since these falsification groups have no age at first birth, the difference in occupational distributions only depends on the current ages. For example, for women without children in the intermediate age cohort in the 2011 ACS, $women\_gr(i)$ indicates women whose current ages are in the 29–35 cohort, while $women\_gr(i+1)$ represents women whose current ages are in the 36–42 cohort.

Census/ACS.

The sample consists of married women who have at least a bachelor's degree and had their first birth after at least age 22. To examine the changes in employment after the first birth, the sample is limited to women who were working full time at the year of first birth, except for those who are self-employed. To control the unobserved characteristics between employment and marital status, I exclude from the sample women who divorced, separated, or were widowed after the first birth. The total number of observations is 750 with 199 individuals, so the average of employment status is 3.8 times per person.

To analyze whether labor supply changes differ by either occupations or the timing of fertility, I then estimate the following regression:

$$\begin{aligned} Employment\_change_{it} &= \alpha + \beta_1 \; High\_hours_{io} + \beta_2 \; Delay\_fertility_i \\ &+ \beta_3 \; (High\_hours_{io} \times Delay\_fertility_i) + \delta X_{it} + \phi_t + \epsilon_{it}, \end{aligned} \tag{10}$$

where i,t, and o refer to individual, each survey year, and occupation, respectively. I characterize the changes in employment status as six cases: drop out of the labor force, reduce working hours as (i) working less than 35 hours per week (part-time worker), ii) reducing working hours more than 5 hours, iii) reducing working hours more than 10 percent, change both occupation and workplace, or switch to self-employment. The dependent variable, $Employment\_change$, is a dummy variable for a combination of the six employment changes.

Due to the small sample size, high-hours occupations are now defined as the share of employees working 45 or more hours per week being higher than the median share across occupations (16.54 percent). $High\_hours$ is a dummy variable equal to one if a woman worked in a high-hours occupation during the year of first birth. $Delay\_fertility$ is also a dummy variable equal to one if the first birth occurred after at least age 30.[43] X_{it} includes control variables such as age, age^2, vector of race dummies, number of children, and a dummy variable for having a graduate degree. ϕ_t refers to the year fixed effects, and the error term is clustered at the individual level. The individual weights given by the NLSY97 are applied in regressions. The main interest variable is the interaction term between $High\_hours$ and $Delay\_fertility$. If the coefficient β_3 is positive, there is a positive effect of the interaction term on employment changes.

In Table 8, I report the regression results for each employment change in columns (1)–(6) and combinations of employment changes in columns (7)–(9). The coefficient β_3 on dropping out of

[43] Age 30 is based on the median (29) and mean age at first birth (28.72) among 199 individuals.

the labor force is positive and marginally significant (0.113) in column (1), implying that women in high-hours occupations who delay fertility are more likely to drop out of the labor force. Second, for three different definitions of reducing working hours, the coefficients of the interaction term in columns (3)–(4) are greater in magnitude (0.206 and 0.188, respectively) than in column (2) (0.132), since reducing working hours by more than 5 hours or by 10 percent are more relaxed definitions than switching to part time. On the contrary, the coefficients of the interaction term for switching occupations/workplaces and switch to self-employment are not significant in columns (5)–(6). However, these two results in columns (5)–(6) might not be reliable because regular rotations can be also counted in switching occupations/workplaces, and the cases of becoming self-employed is quite small, as shown in Table 2.[44] Using dropping out of the labor force and reducing working hours, which are significant in each case, three combinations of employment changes are estimated in columns (7)–(9). All three coefficients of the interaction term become more significant and greater in magnitude. As expected, when using the relaxed definitions of reducing working hours in columns (8)–(9), the coefficients of the interaction term are larger (0.319 and 0.302, respectively) than the coefficient in column (7) (0.246).[45]

In the previous section with the Census/ACS, occupational distribution is used as a proxy for observing individuals who exit the occupations, but either switching an occupation or dropping out of the labor force are not distinguishable from each other. On the other hand, the NLSY97 enables us to track each employment change. The results in Table 8 suggest that rather than switching an occupation, women are more likely to drop out of the labor force and reduce working hours after their first childbirth. Moreover, by considering individual working hours, the NLSY97 can capture the significance of reducing working hours by more than 5 hours or 10 percent *within full-time status*, which is not possible in the Census/ACS. In respect to human capital, women in high-hours occupations who delay fertility seem to be somewhat rational, as they can continue their career by reducing working hours.

As an additional exercise, I estimate the same regression in equation (10) by creating a vector of four dummies using high-hours occupation and delaying fertility. By doing so, I can compare employment changes, especially for women who delayed fertility, in occupations with different

[44]For example, a woman who worked as an elementary school teacher can become a middle school teacher due to educational demand.

[45]For the robustness check, I additionally include the control variable of spousal income because women's labor supply after childbirth may vary with spousal income (Bertrand et al. 2010; Goldin 2014). The estimated results shows qualitatively similar results even though the sample size reduces to 703 due to the missing observations.

working hours. More specifically, the following regression is estimated:

$$\begin{aligned} Employment\_change_{it} = \alpha + \beta_1\ High\_hours_{io} \cdot delay\_fertility_i + \beta_2\ High\_hours_{io} \cdot not\_delay\_fertility_i \\ + \beta_3\ Not\_high\_hours_{io} \cdot not\_delay\_fertility_i + \delta X_{it} + \phi_t + \epsilon_{it} \end{aligned} . \quad (11)$$

The base group is women who delayed fertility but were not working in high-hours occupations at the year of their first childbirth. Therefore, the coefficient β_1 implies the relative employment change for women who delayed fertility and were working in high-hours occupations, compared to the base group. In columns (7)–(9) of Table A5, the coefficients β_1 on combinations of dropping out of the labor force and reducing working hours are all positive and significant. This result confirms the previous analysis results using the Census and ACS—women who delay fertility are more likely to exit the occupations when working in high-hours occupations.

In summary, I find that there is a positive and significant interaction between high-hours occupations and delaying fertility on employment changes, such as dropping out of the labor force and reducing working hours. Thus, both analyses using the Census/ACS and the NLSY97 provide a consistent result that women who delay fertility and work in high-hours occupations are more likely to reduce their labor supply. This finding is also closely related to the previous literature showing that mothers are more likely to exit high-hours occupations (Cha 2013; Cortés and Pan 2016, 2017; Goldin 2014) or educated women exhibit statistically significant declines in employment after their first childbirth (Bertrand et al. 2010; Fitzenberger 2013; Kuziemko et al. 2018; Schank and Wallace 2019).

7 Conclusion

In this paper, I examine the relationship between high-hours occupations, women's age at first birth, and employment changes after childbirth. The results show that women working in high-hours occupations tend to delay fertility. This behavior can be understood with respect to human capital depreciation: since high-hours occupations require interpersonal relationships, autonomy, and competitiveness, human capital can depreciate more in those occupations when careers are interrupted. Therefore, one possible explanation is that women working in high-hours occupations tend to delay fertility to maximize their lifetime earnings. I also find that women who delay fertility in high-hours occupations tend to decrease their labor supply after the first birth, mainly by reducing working hours or dropping out of the labor force.

Due to the lack of hourly wages in each occupation for women who continue working after childbirth, directly measuring the magnitude of human capital depreciation is limited.[46] Moreover, it is difficult to determine if women plan to change their labor supply after childbirth at the beginning of their career or if they change it unexpectedly after giving birth in my analysis. When women change their labor supply decisions unexpectedly, motherhood would be more of a burden than expected (Kuziemko et al. 2018). Therefore, future studies on the reasoning behind this labor supply change should be pursued, such as examining social norms or unequal gender roles (Arpino et al. 2015; Bertrand et al. 2015; Bertrand et al. 2016; Fernández and Fogli 2009; Myoung et al. 2020; Raley et al. 2012). Finally, to reconcile both women's career and mother's role in the household, further research is needed on policy instruments such as extended parental leave and active job training after the interruption of careers.

[46]Yu and Kuo (2017) examine the motherhood wage penalty by occupational characteristics using the NLSY97. Respondents were in their mid-30s in last round of the NLSY97, so focusing on college-educated women, especially those who gave birth after age 30, would be still limited.

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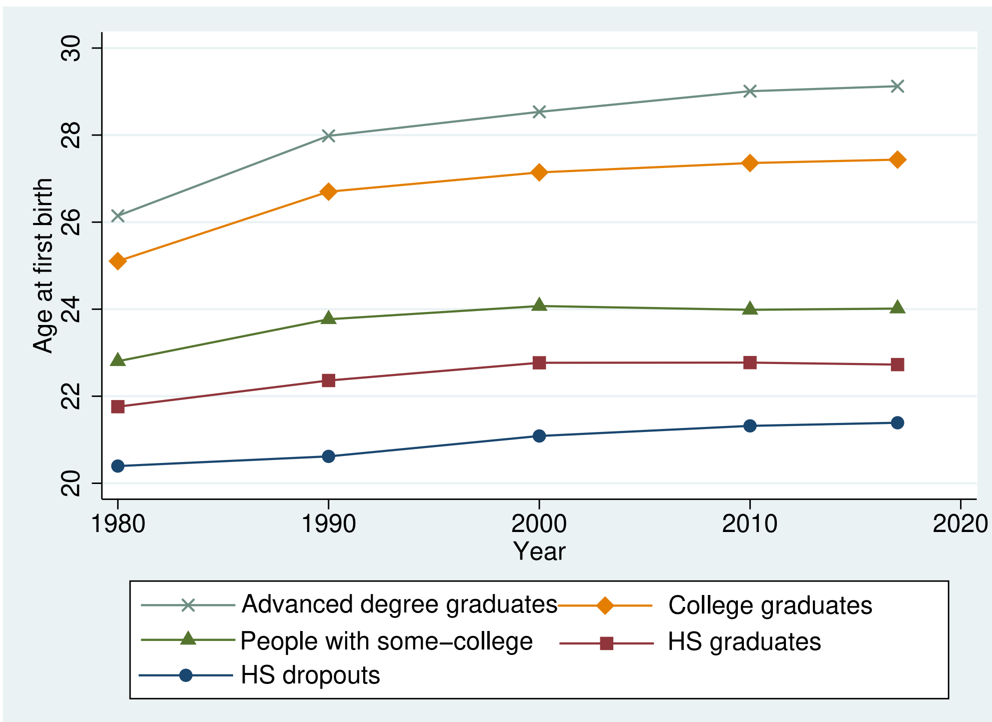
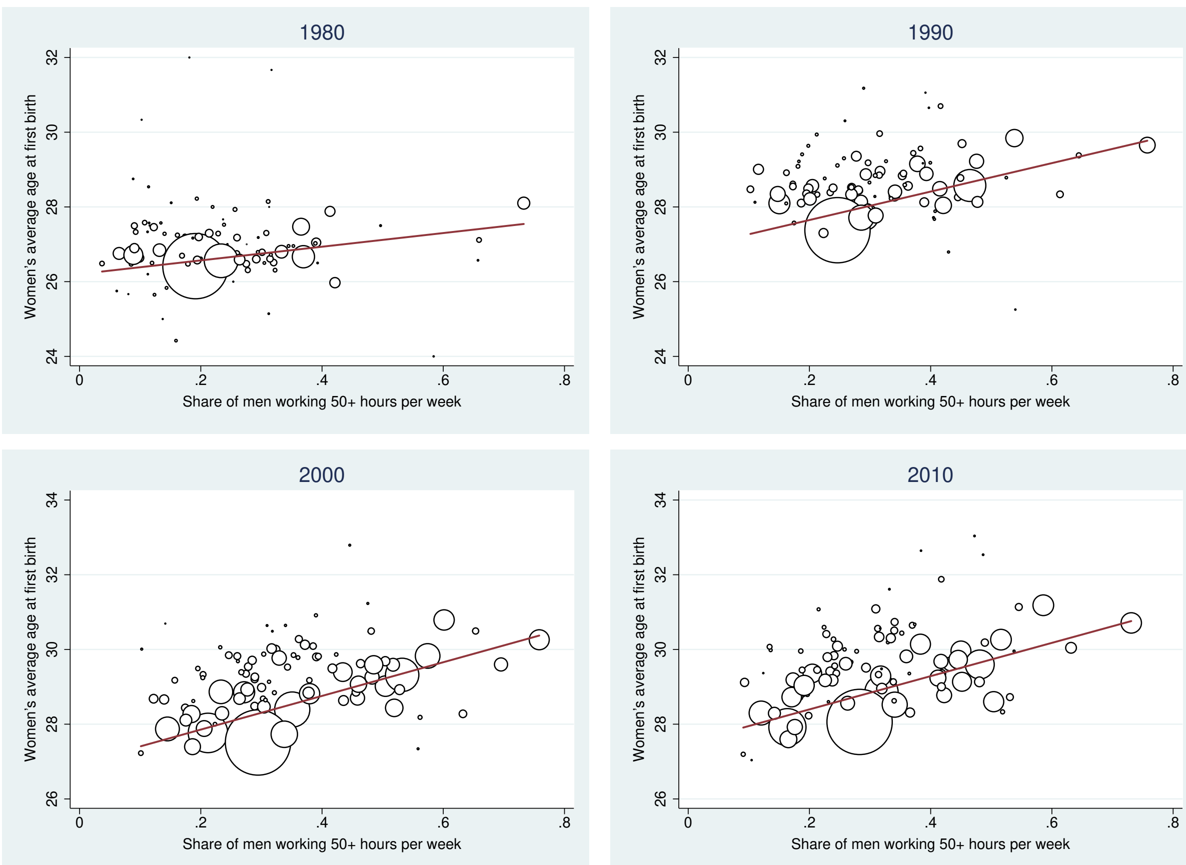
Figure 1: Women's average age at first birth by year/education level



Notes: Data are from the 1980 to 2000 US Census, the 2011 ACS three-year aggregate (2009-2011), and the 2017 ACS five-year aggregate (2013-2017). The sample consists of native-born married women aged 25–40 with at least a bachelor's degree who are working full time (35 hours or more) and for wages in reported week.

Figure 2: Cross-occupation relationship between the share of men working high-hours and women's average age at first birth

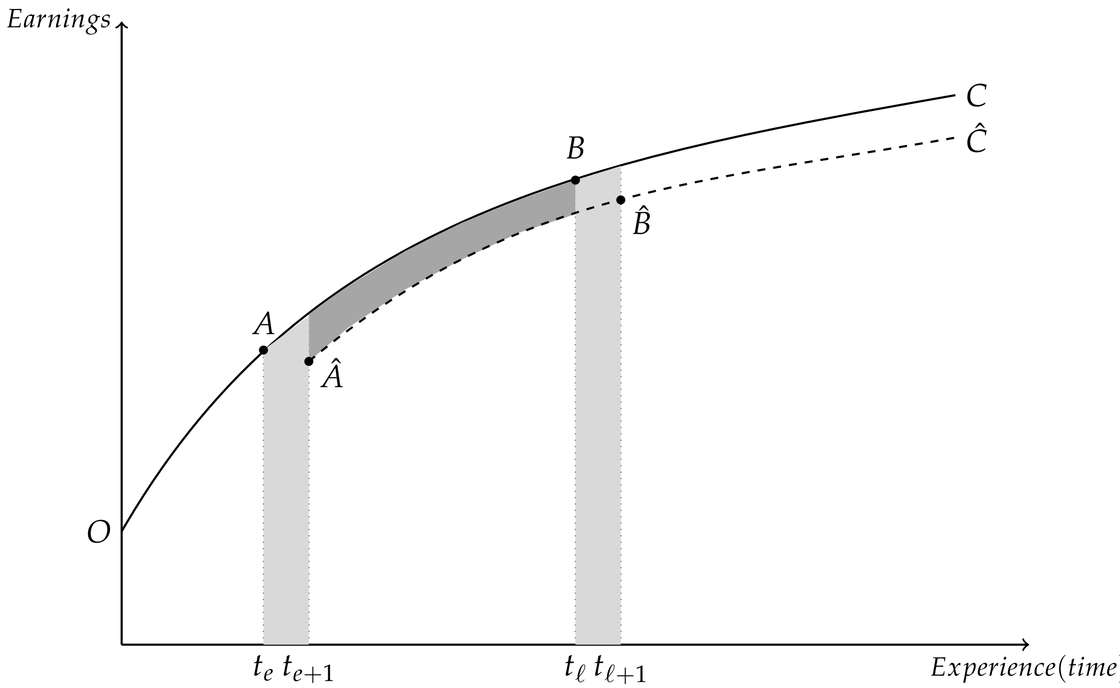


Notes: The unit of observation is an occupation. Data are from the 1980 to 2000 US Census and the 2011 ACS 3-year aggregate (2009-2011). Share of men working 50+ hours per week is constructed among college-educated male workers aged 25–55 in each occupation. Age at first birth is calculated among married women aged 25–40 who have children. The figures include 95 skilled-occupations and are weighted by the number of married women with children aged 25-40 in each occupation.

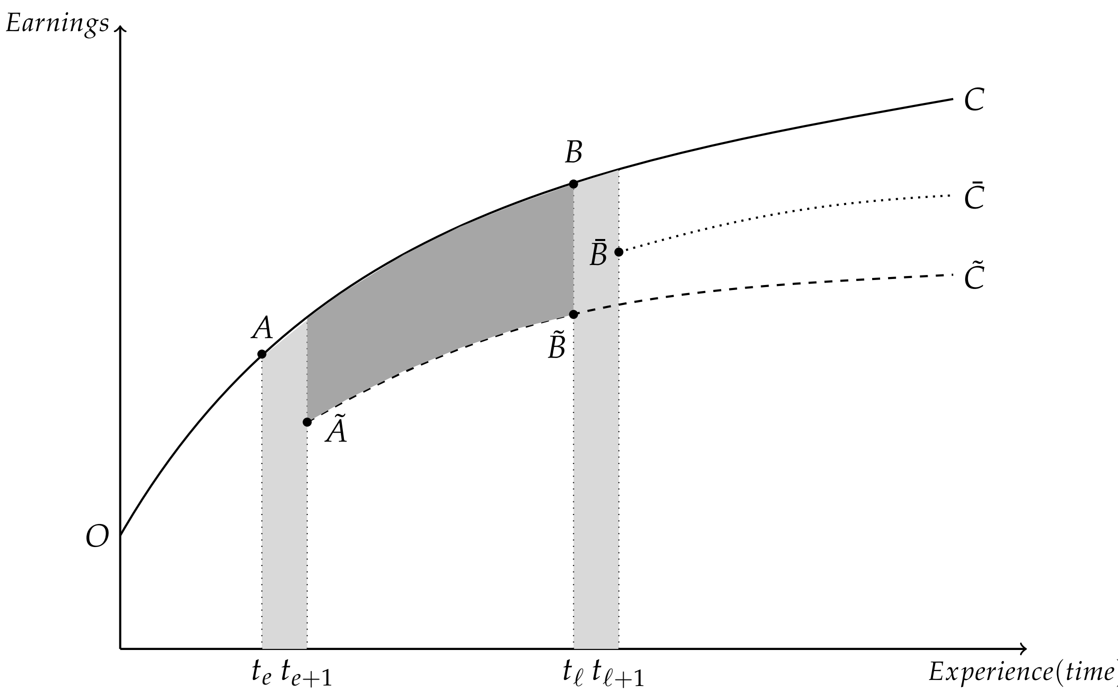
Figure 3: Cross-occupation relationship between the share of men working high-hours and other occupational characteristics

Notes: The unit of observation is an occupation. Data is from the 2017 ACS five-year aggregate and the O*NET. Interpersonal relationships consist of having contact with others, establishing and maintaining interpersonal relationships, coordinating or leading others, and having impact of decisions on co-workers or company results. Autonomy contains structured vs. unstructured work, freedom to make decisions, and frequency of decision making. Competitiveness refers to the level of competition. All three categories are normalized to have a mean of zero and a standard deviation of one, respectively.

Figure 4: Earnings profiles and the timings of fertility depending on the human capital depreciation



(a) Occupations with lower depreciation rate of human capital



Notes: t_e refers to early fertility and t_ℓ indicates later fertility. Assume that the time out of the labor force during childbirth is one year.

Table 1: Summary statistics for the Census/ACS

Panel A.Individual Level					
	1980	1990	2000	2010	2017
Married women with children					
Age	37.34	38.78	40.39	40.66	40.89
	(7.49)	(6.74)	(7.25)	(7.41)	(7.24)
Black	0.10	0.08	0.07	0.08	0.07
	(0.30)	(0.27)	(0.26)	(0.26)	(0.26)
Hispanic	0.02	0.02	0.03	0.05	0.06
	(0.15)	(0.15)	(0.18)	(0.22)	(0.24)
White non-Hispanic	0.83	0.83	0.79	0.74	0.72
	(0.38)	(0.38)	(0.41)	(0.44)	(0.45)
Others	0.05	0.07	0.10	0.14	0.14
	(0.22)	(0.25)	(0.30)	(0.34)	(0.35)
Masters	0.38	0.32	0.31	0.34	0.36
	(0.49)	(0.47)	(0.46)	(0.47)	(0.48)
Doctoral and Professional degree	0.12	0.08	0.10	0.11	0.12
	(0.33)	(0.28)	(0.30)	(0.31)	(0.33)
Hourly wage	12.84	15.87	18.26	20.01	20.45
	(6.17)	(8.89)	(12.92)	(13.64)	(14.87)
Working more than 50 hours	0.08	0.14	0.20	0.21	0.21
	(0.28)	(0.35)	(0.40)	(0.40)	(0.41)
Age at first birth	26.55	27.82	29.16	29.66	29.87
	(4.35)	(4.49)	(4.86)	(4.98)	(4.96)
N	55,602	113,184	155,806	136,915	247,413
Panel B.Occupation Level					
Females' age at first birth	26.61	28.04	28.54	28.93	29.04
	(0.39)	(0.71)	(0.92)	(0.91)	(0.91)
Share (men working$\geqslant$50 hrs)	0.29	0.37	0.43	0.38	0.35
	(0.15)	(0.14)	(0.15)	(0.14)	(0.14)
Log(Hourly wage for male)	2.79	2.93	3.00	3.05	3.04
	(0.18)	(0.20)	(0.24)	(0.24)	(0.25)
Log(Hourly wage for female)	2.45	2.64	2.72	2.78	2.77
	(0.08)	(0.11)	(0.15)	(0.20)	(0.22)
Females' number of children	0.96	1.03	1.05	1.18	1.19
	(0.21)	(0.28)	(0.19)	(0.19)	(0.19)
Females' share of graduates	0.48	0.35	0.34	0.45	0.49
	(0.15)	(0.19)	(0.21)	(0.23)	(0.23)
N	95	95	95	95	95

Notes: Data are from the 1980 to 2000 US Census, the 2011 ACS three-year aggregate (2009-2011), and the 2017 ACS five-year aggregate (2013-2017). The sample consists of native-born individuals aged 25–55 with at least a bachelor's degree who are working full time (35 hours or more) and for wages in reported week. Age at first birth, number of children, and share of graduates in Panel B are calculated among married women aged 25–40. Summary statistics are weighted by individual weight (Panel A) and by cell size (Panel B). Standard deviations are reported in parentheses. See Table A1 for summary statistics of individual level, married men with children.

Table 2: Summary statistics for the NLSY97

Variable	N	Mean	SD	Min	Max
Race and Ethnicity					
Black	199	0.04	0.20	0	1
Hispanic	199	0.04	0.20	0	1
White non-Hispanic	199	0.91	0.28	0	1
Others	199	0.01	0.07	0	1
Age at first birth	199	28.72	2.58	23	35
Year of birth	199	2010.51	2.71	2004	2015
Graduates	199	0.46	0.50	0	1
Changes on employment statuses					
Drop out of the labor force	750	0.09	0.28	0	1
Switch to the self-employed	750	0.06	0.23	0	1
Switch an occupation & workplace	750	0.11	0.31	0	1
Switch to a part-time worker	750	0.13	0.34	0	1
Reduce working hours more than 5 hours	750	0.25	0.43	0	1
Reduce working hours more than 10 percent	750	0.25	0.43	0	1

Notes: Data is from the NLSY97 (2003-20117). The sample consists of married women who have at least a bachelor's degree and had their first birth after at least age 22. The sample is limited to women who were working full time at the year of childbirth, except for those who are self-employed. Women who divorced, separated, or were widowed after the first childbirth are excluded from the sample. Also, women who have their first birth in 2012, 2014, or 2016 dropped due to the survey construction of the NLSY97. Summary statistics are weighted by individual weights given by the NLSY97.

Table 3: The relationship between the share of men working high-hours and women's average age at first birth: Occupation level

	(1) Married women	(2) Married women	(3) College graduates	(4) Married men
High-hours	3.057***	2.303***	2.462***	1.466
	(0.944)	(0.568)	(0.691)	(0.907)
Controls	No	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	379	379	365	380
R^2	0.936	0.957	0.927	0.968

Notes: Clustered standard errors in parentheses,* p<0.10, ** p<0.05, *** p<0.01. The unit of observation is an occupation by year. Data are from the 1980 to 2000 US Census and the 2011 ACS three-year aggregate (2009-2011). The sample consists of native-born individuals aged 25–55 with at least a bachelor's degree who are working full time (35 hours or more) and for wages in reported week. Control variables include log wages of men and women aged 25–55, average number of children of women aged 25–40, and share of master's or doctoral degrees in a given demographic group. Podiatrists in 1980 is no observation, so the number of observations is 379. Regression is weighted by the number of individuals of the dependent variable.

Table 4: Robustness tests on the relationship between the share of men working high-hours and women's average age at first birth: Occupation level

Panel A. Alternative age group				
	(1)	(2)	(3)	(4)
	ages 25-40	ages 25-45	ages 25-50	ages 25-55
High-hours	2.303***	2.014***	1.741**	1.778**
	(0.568)	(0.725)	(0.749)	(0.824)
Controls	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	379	379	379	379
R^2	0.957	0.961	0.967	0.966
Panel B. Alternative definition of working high-hours				
	(1)	(2)	(3)	(4)
	41+	45+	50+	55+
High-hours	2.015***	2.113***	2.303***	3.559***
	(0.564)	(0.565)	(0.568)	(0.865)
Controls	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	379	379	379	379
R^2	0.957	0.957	0.957	0.958
Panel C. Including t+1 of high hours				
	(1)	(2)	(3)	(4)
	41+	45+	50+	55+
High-hours	2.372***	2.536***	2.571***	3.665***
	(0.705)	(0.705)	(0.642)	(1.061)
High-hours (t+1)	-1.280	-1.436	-0.833	-0.330
	(1.080)	(1.034)	(0.896)	(1.386)
Controls	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	379	379	379	379
R^2	0.958	0.958	0.957	0.958

Notes: Clustered standard errors in parentheses,* $p<0.10$, ** $p<0.05$, *** $p<0.01$. The unit of observation is an occupation by year.Data is from the 1980 to 2000 US Census and the 2011 ACS 3-year aggregate (2009-2011). The sample consists of native-born individuals aged 25–55 with at least a bachelor's degree who are working full time (35 hours or more) and for wages in reported week. Control variables include log wages of men and women aged 25–55, average number of children of women aged 25–40, and share of master's or doctoral degrees in a given demographic group. Regression is weighted by the number of individuals of the dependent variable.

Table 5: The relationship between the share of men working high-hours in an occupation and a woman's age at first birth: Individual level cross-sectional analysis

	Married women							Married men			
	25-40				25-45	25-50	25-55	25-40	25-45	25-50	25-55
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Share of high-hours	3.796***	1.285***	1.156***	0.737***	1.572***	1.695***	1.812***	0.501**	0.389	0.282	0.246
	(0.600)	(0.305)	(0.317)	(0.212)	(0.414)	(0.444)	(0.470)	(0.228)	(0.309)	(0.314)	(0.324)
Share of high-hours$_{sp}$			0.718***	0.317***	0.419***	0.292**	0.286**	0.820***	1.199***	1.358***	1.507***
			(0.144)	(0.106)	(0.131)	(0.123)	(0.124)	(0.113)	(0.139)	(0.112)	(0.119)
Age at marriage				0.371***							
				(0.013)							
Controls											
Age, Race, Children	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Graduate degree, Log wage	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Share of high hours$_{sp}$	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year of Marriage	No	No	No	Yes	No	No	No	No	No	No	No
Spouse Characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	71,571	63,441	51,663	51,663	75,272	94,491	106,619	54,099	83,925	110,053	128,424

Notes: Cluster standard errors in parentheses,* $p<0.10$, ** $p<0.05$, *** $p<0.01$. Data is from the 2017 ACS five-year aggregate (2013-2017). The sample consists of native-born married individuals aged 25–55 with at least a bachelor's degree, are working full time (35 hours or more), and have a spouse with at least a bachelor's degree. Control variable includes age, age^2, a vector of race dummies, a dummy variable of having a graduate degree, and log hourly wage; it also includes spouses' characteristics such as age, race, education, and log hourly wage. The share of men working high-hours in a give *spouse's* occupation is included in some specifications, and then the sample if further restricted to spouses working in 95 skilled occupations in this case. The Regression is weighted by personal weight.

Table 6: The relationship between high-human capital occupations and women's average age at first birth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Human capital depreciation	0.151*	0.126	0.172**	0.177**		0.182**	0.173**
	(0.083)	(0.079)	(0.083)	(0.073)		(0.070)	(0.069)
Duration of typical work week					0.146*	0.152**	0.123*
					(0.074)	(0.071)	(0.074)
Interaction term							0.106*
							(0.055)
Interpersonal relationships	Yes	No	No	Yes	No	Yes	Yes
Autonomy	No	Yes	No	Yes	No	Yes	Yes
Competitiveness	No	No	Yes	Yes	No	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	94	94	94	94	94	94	94

Notes: Robust standard errors in parentheses,* $p<0.10$, ** $p<0.05$, *** $p<0.01$. The unit of observation is an occupation. Data is from the 2017 ACS five-year aggregate and the O*NET (version 23.0, released in 2018). For easier interpretation, average of O*NET indexes are re-normalized to have a mean of zero and a standard deviation of one. Interpersonal relationships consist of having contact with others, establishing and maintaining interpersonal relationships, coordinating or leading others, and having impact of decisions on co-workers or company results. Autonomy contains structured vs. unstructured work, freedom to make decisions, and frequency of decision making. Competitiveness refers to the level of competition. Duration of typical work week is a direct measure of working high-hours from the O*NET. Control variables include log wages of men and women, average number of children of married women, the share of women having a graduate degree. Out of 95 skilled occupations, teachers, n.e.c (159) are excluded from the regression due to the missing O*NET characteristics corresponding to that.

Table 7: The relationship between the share of men working high-hours and change in occupational distribution, by ages cohort (Census/ACS)

	Intermediate ages cohort					Young ages cohort				
	Delaying fertility			Women without children	Men	Not delaying fertility			Women without children	Men
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Share of high-hours	-0.161	-0.255**	-0.221**	-0.084*	-0.006	-0.063	-0.082	-0.048	-0.010	0.023
	(0.154)	(0.123)	(0.104)	(0.043)	(0.015)	(0.096)	(0.058)	(0.046)	(0.030)	(0.020)
Average number of children		0.266**	0.230**	0.078**	0.019*		0.114***	0.065**	0.020	0.010
		(0.121)	(0.107)	(0.037)	(0.010)		(0.038)	(0.025)	(0.015)	(0.008)
Controls										
Number of children	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Log wages of men and women	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Share of graduates	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	361	361	361	360	361	336	336	336	336	336
R^2	0.188	0.542	0.559	0.473	0.860	0.241	0.445	0.572	0.446	0.848

Notes: Cluster standard errors in parentheses,* p<0.10, ** p<0.05, *** p<0.01. The unit of observation is an occupation by year. Data are from the 1980 to 2000 US Census and the 2011 ACS 3-year aggregate (2009-2011). The sample consists of native-born individuals aged 25–55 with at least a bachelor's degree who are working full time (35 hours or more) and for wages in reported week. Control variables include log wages of men and women aged 25–55, average number of children of women aged 25–40, and share of master's or doctoral degrees in a given demographic group. Regression is weighted by the number of individuals of the dependent variable.

Table 8: Employment changes after the first childbirth (NLSY97)

	O.L.F (1)	Part-time (2)	$Hours \geq 5hrs$ (3)	$Hours \geq 10\%$ (4)	$Change\_occ$ (5)	$Change\_selfemp$ (6)	O.L.F&part (7)	O.L.F&5hrs (8)	O.L.F&10% (9)
High_hours· Delaying fertility	0.113*	0.132*	0.206**	0.188*	0.069	0.071	0.246***	0.319***	0.302***
	(0.060)	(0.073)	(0.099)	(0.103)	(0.061)	(0.046)	(0.089)	(0.108)	(0.113)
High_hours	-0.039	-0.090*	0.040	0.011	-0.012	-0.007	-0.129**	0.001	-0.029
	(0.049)	(0.051)	(0.065)	(0.061)	(0.050)	(0.039)	(0.062)	(0.072)	(0.068)
Delaying fertility	-0.056	-0.176**	-0.245***	-0.234***	-0.062	-0.046	-0.231***	-0.300***	-0.290***
	(0.045)	(0.069)	(0.078)	(0.087)	(0.047)	(0.030)	(0.077)	(0.082)	(0.092)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	750	750	750	750	750	750	750	750	750

Notes: Data is from the NLSY97 (2003-20117). The sample consists of married women who have at least a bachelor's degree and had their first birth after at least age 22. The sample is limited to women who were working full time at the year of childbirth, except for those who are self-employed. Women who divorced, separated, or were widowed after the first childbirth are excluded from the sample. Control variables include age, age^2, vector of race dummies, number of children, and a dummy variable for having a graduate degree. The error term is clustered at the individual level and individual weights given by the NLSY97 are applied in regressions. Dependent variables in each column are as below:

- Column (1) O.L.F: drop out of the labor force
- Column (2) Part-time: working less than 35 hours per week
- Column (3) $Hours \geq 5hrs$: reducing working hours more than 5 hours
- Column (4) $Hours \geq 10\%$: reducing working hours more than 10 percent
- Column (5) $Change\_occ$: change both occupation and workplace
- Column (6) $Change\_selfemp$: change to self-employment
- Column (7): column (1) + column (2)
- Column (8): column (1) + column (3)
- Column (9): column (1) + column (4)

Appendix 1

Table A1: Summary statistics for the Census/ACS, married men with children

Panel A.Micro Data					
	1980	1990	2000	2010	2017
Married men with children					
Age	39.30	40.37	41.79	42.26	42.40
	(7.58)	(6.79)	(7.03)	(7.10)	(7.09)
Black	0.03	0.04	0.04	0.05	0.05
	(0.17)	(0.18)	(0.20)	(0.21)	(0.21)
Hispanic	0.02	0.02	0.03	0.04	0.05
	(0.14)	(0.14)	(0.16)	(0.20)	(0.22)
White non-Hispanic	0.91	0.89	0.84	0.77	0.74
	(0.28)	(0.32)	(0.37)	(0.42)	(0.44)
Others	0.04	0.06	0.09	0.14	0.16
	(0.19)	(0.23)	(0.29)	(0.34)	(0.37)
Masters	0.30	0.26	0.26	0.28	0.30
	(0.46)	(0.44)	(0.44)	(0.45)	(0.46)
Doctoral and Professional degree	0.28	0.19	0.19	0.16	0.16
	(0.45)	(0.40)	(0.39)	(0.37)	(0.36)
Hourly wage	19.81	24.01	27.55	28.89	29.61
	(9.98)	(15.84)	(21.98)	(20.94)	(22.44)
Working more than 50 hours	0.32	0.39	0.45	0.40	0.38
	(0.46)	(0.49)	(0.50)	(0.49)	(0.48)
Age at first birth	28.23	29.40	30.86	31.52	31.70
	(4.70)	(4.89)	(5.10)	(5.05)	(5.01)
N	197,890	239,105	260,567	190,497	306,646

Notes: Data are from the 1980 to 2000 US Census and the 2011 ACS three-year aggregate (2009-2011), and the 2017 five-year aggregate ACS. The sample consists of native-born individuals aged 25–55 with at least a bachelor's degree who are working full time (35 hours or more) and for wages in reported week.

Table A2: A list of 95 skilled-occupations in the Census/ACS

occ1990dd	Occupation	Share of men working high-hours in 2010 (%)	Changes in shares (2010-1980)
84	Physicians	73.1	-0.2
4	Chief executives, public administrators, and legislators	63.2	32.7
178	Lawyers and judges	58.6	17.3
86	Veterinarians	54.5	-11.2
34	Business and promotion agents	53.8	22.5
176	Clergy and religious workers	53.1	-12.8
199	Athletes, sports instructors, and officials	51.9	2.2
13	Managers and specialists in marketing, advertising, PR	51.6	12.6
14	Managers in education and related fields	50.4	17.1
255	Financial services sales occupations	48.9	17.4
258	Sales engineers	48.7	21.1
22	Managers and administrators, n.e.c.	48.1	11.2
254	Real estate sales occupations	48.0	5.9
88	Podiatrists	47.2	6.0
7	Financial managers	45.2	19.6
19	Funeral directors	45.0	-13.4
274	Salespersons, n.e.c	44.5	15.4
8	Human resources and labor relations managers	43.2	15.7
15	Managers of medicine and health occupations	42.2	12.1
18	Managers of properties and real state	41.8	9.6
47	Petroleum, mining, and geological engineers	41.8	10.5
106	Physician assistants	41.8	2.5
187	Actors, directors, and producers	41.8	7.3
26	Management analysts	41.7	10.9
25	Other financial specialists	41.2	21.3
226	Airplane pilots and navigators	38.4	6.7
154	Subject instructors, college	38.3	1.8
186	Musicians and composers	37.4	8.0
166	Economists, market and survey researchers	37.0	14.1
253	Insurance sales occupations	36.6	5.2
77	Agricultural and food scientists	36.5	19.0
37	Management support occupations	36.0	16.6
188	Painters, sculptors, craft-artists, and printmakers	35.2	7.5
157	Secondary school teachers	34.1	10.7
256	Advertising and related sales jobs	34.1	8.4
183	Writers and authors	34.0	2.9
189	Photographers	34.0	4.5
97	Dieticians and nutritionists	33.8	7.9
83	Medical scientists	33.4	-5.5
89	Other health and therapy occupations	33.2	7.9
45	Metallurgical and materials engineers	33.2	23.0
48	Chemical engineers	32.9	21.7
33	Purchasing managers, agents, and buyers, n.e.c	32.0	14.3
69	Physicists and astronomists	31.9	13.8
23	Accountants and auditors	31.9	14.5
27	Personnel, HR, training	31.7	14.1
198	Announcers	31.7	7.3
76	Physical scientists, n.e.c.	31.5	17.8

Table A2: A list of 95 skilled-occupations in the Census/ACS (Continued)

occ1990dd	Occupation	Share of men working high-hours in 2010 (%)	Changes in shares (2010-1980)
56	Industrial engineers	31.4	19.0
43	Architects	31.3	8.4
195	Editors and reporters	31.0	9.6
418	Police and detectives public service	29.3	5.5
156	Primary school teachers	28.3	9.2
194	Art/entertainment performers and related occupations	27.8	-7.5
57	Mechanical engineers	26.9	15.4
159	Teachers, n.e.c	26.3	-0.1
185	Designers	26.0	6.6
66	Actuaries	25.8	14.5
167	Psychologists	24.6	5.0
53	Civil engineers	24.4	11.0
55	Electrical engineers	24.2	14.8
59	Engineers and other professionals, n.e.c	24.0	10.0
169	Social scientists and sociologists, n.e.c.	24.0	4.0
103	Physical therapists	23.8	-2.2
36	Inspectors and compliance officers, outside	23.4	11.5
79	Foresters and conservations scientists	23.1	8.0
99	Occupational therapists	23.0	19.3
68	Mathematicians and statisticians	22.9	14.4
85	Dentists	22.8	0.8
234	Legal assistants and paralegals	22.6	4.7
87	Optometrists	22.4	-1.3
165	Archivists and curators	21.5	2.8
65	Operations and systems researchers and analysts	21.3	10.5
64	Computer systems analysts and computer scientists	20.5	8.2
73	Chemists	20.3	11.2
24	Insurance underwriters	19.9	11.0
44	Aerospace engineers	19.7	11.6
229	Computer software developers	19.1	10.1
78	Biological scientists	18.8	1.4
75	Geologists	18.6	0.3
104	Speech therapists	18.5	8.7
105	Therapists, n.e.c	18.2	8.9
158	Special education teachers	17.6	0.7
96	Pharmacists	17.3	-14.7
163	Vocational and educational counsellors	17.1	3.9
155	Kindergarten and earlier school teachers	16.5	-3.3
95	Registered nurses	16.4	-1.8
177	Welfare service workers	14.2	-1.7
173	Urban and regional planners	13.6	2.2
184	Technical writers	13.4	-2.7
74	Atmospheric and space scientists	12.4	0.8
174	Social workers	12.0	3.2
227	Air traffic controllers	10.5	4.3
164	Librarians	9.3	2.8
98	Respiratory therapists	9.1	-5.3

Notes: occ1990dd is Dorn's (2009) occupation classification. HR = human resources; n.e.c = not elsewhere classified; PR = public relations.

Table A3: Robustness tests on the relationship between the share of men working high-hours and women's average age at first birth: Occupation level

Panel A. Without Controls				
	(1)	(2)	(3)	(4)
	Num_children	Ratio(≥ one kid)	Ratio(≥ two kids)	Ratio(≥ three kids)
High-hours	0.360	0.239	0.155	-0.011
	(0.365)	(0.162)	(0.154)	(0.049)
Controls	No	No	No	No
Occupation FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	380	380	380	380
R^2	0.862	0.833	0.841	0.853
Panel B. With Controls				
	(1)	(2)	(3)	(4)
	Num_children	Ratio(≥ one kid)	Ratio(≥ two kids)	Ratio(≥ three kids)
High-hours	0.522**	0.270**	0.231**	0.033
	(0.249)	(0.109)	(0.105)	(0.036)
Controls	Yes	Yes	Yes	Yes
Occupation FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	380	380	380	380
R^2	0.897	0.885	0.877	0.869

Notes: Clustered standard errors in parentheses,* p<0.10, ** p<0.05, *** p<0.01. The unit of observation is an occupation by year. Data is from the 1980 to 2000 US Census and the 2011 ACS three-year aggregate (2009-2011). The sample consists of native-born individuals aged 25–55 with at least a bachelor's degree who are working full time (35 hours or more) and for wages in reported week. Dependent variable is the number of children, ratio of having more than one child, two children, three children among married women aged 25–40, respectively. Control variables include log wages of men and women aged 25–55 and share of master's or doctoral degrees among married women aged 25–40 with children. Regression is weighted by the number of married women aged 25–40.

Table A4: The relationship between the share of men working high-hours and O*NET characteristics

O*NET characteristics	Share of men working high-hours in ACS		
	Low	High	Differences in means
Interpersonal relationships			
Contact with others	0.08	0.51	0.43**
	(0.90)	(0.46)	
Establishing and maintaining interpersonal relationships	-0.13	0.46	0.59*
	(1.11)	(0.85)	
Coordinate or lead others	-0.08	0.66	0.74***
	(0.82)	(0.94)	
Impact of decisions on co-workers or company results	-0.23	0.60	0.83***
	(1.05)	(0.78)	
Autonomy			
Structured vs. unstructured work	-0.45	0.54	0.99***
	(0.87)	(0.91)	
Freedom to make decisions	-0.16	0.43	0.59**
	(0.84)	(1.01)	
Frequency of decision making	-0.07	0.59	0.66**
	(1.08)	(0.66)	
Competitiveness			
Level of competition	-0.59	0.31	0.90***
	(0.85)	(1.02)	

Notes: Standard deviations are reported in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Data is from the O*NET (Version 23.0, released in 2018) and the 2017 ACS five-year aggregate. Given the distribution of the share of men working high-hours across occupations, I extract two groups, on from below 25 percentile and the other from above 75 percentile. Each of the O*NET characteristics are normalized to have a mean of 0 and a standard deviation of 1. The questionnaire from the O*NET are as below:

- Contact with others: How much contact with others (by telephone, face-to-face, or otherwise) is required to perform your current job?
- Establishing and maintaining interpersonal relationships: Developing constructive and cooperative working relationships with others, and maintaining them over time.
- Coordinate or lead others: In your current job, how important are interactions that require you to coordinate or lead others in accomplishing work activities (not as a supervisor or team leader)?
- Impact of decisions on co-workers or company results: What results do your decisions usually have on other people or the image or reputation or financial resources of your employer?
- Structured vs. unstructured work: To what extent is this job structured for the worker, rather than allowing the worker to determine tasks, priorities, and goals? (1-no freedom, 5- a lot of freedom)
- Freedom to make decisions: In your current job, how much freedom do you have to make decisions without supervision?
- Frequency of decision making: How frequently is the worker required to make decisions that affect other people, the financial resources, and/or the image and reputation of the organization?
- Level of competition: To what extent does this job require the worker to compete or to be aware of competitive pressures?

Table A5: Changes in employment status after the first childbirth (NLSY97)

	O.L.F	Part-time	$Hours \geq 5hrs$	$Hours \geq 10\%$	$Change\_occ$	$Change\_selfemp$	O.L.F&part	O.L.F&5hrs	O.L.F&10%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
High-hours· delaying fertility	0.074**	0.043	0.246***	0.199**	0.058*	0.064**	0.117*	0.320***	0.273***
	(0.036)	(0.050)	(0.075)	(0.082)	(0.034)	(0.028)	(0.062)	(0.081)	(0.090)
High-hours· non delaying fertility	0.016	0.086	0.285***	0.245***	0.050*	0.039	0.102*	0.301***	0.261***
	(0.029)	(0.054)	(0.071)	(0.080)	(0.027)	(0.027)	(0.060)	(0.073)	(0.084)
Non-high-hours· non delaying fertility	0.056	0.176**	0.245***	0.234***	0.062	0.046	0.231***	0.300***	0.290***
	(0.045)	(0.069)	(0.078)	(0.087)	(0.047)	(0.030)	(0.077)	(0.082)	(0.092)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	750	750	750	750	750	750	750	750	750

Notes: Data is from the NLSY97 (2003-20117). The sample consists of married women who have at least a bachelor's degree and had their first birth after at least age 22. The sample is limited to women who were working full time at the year of childbirth, except for those who are self-employed. Women who divorced, separated, or were widowed after the first childbirth are excluded from the sample. Control variables include age, age^2, vector of race dummies, number of children, and a dummy variable for having a graduate degree. The error term is clustered at the individual level and individual weights given by the NLSY97 are applied in regressions. Dependent variables in each column are as below:

- Column (1) O.L.F: drop out of the labor force
- Column (2) Part-time: working less than 35 hours per week
- Column (3) $Hours \geq 5hrs$: reducing working hours more than 5 hours
- Column (4) $Hours \geq 10\%$: reducing working hours more than 10 percent
- Column (5) $Change\_occ$: change both occupation and workplace
- Column (6) $Change\_selfemp$: change to self-employment
- Column (7): column (1) + column (2)
- Column (8): column (1) + column (3)
- Column (9): column (1) + column (4)