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ABSTRACT

Temporal Flexibility, Breaks at Work, and the Motherhood Wage Gap*

We analyze the relationship between temporal flexibility at work (i.e., the ability to vary or change the time of beginning or ending work) and the motherhood wage gap of working parents, in the US. To that end, we first characterize temporal flexibility at work using the 2017-2018 Leave and Job Flexibilities (LJF) Module of the American Time Use Survey, which contains self-reported information on temporal flexibility at work. We find cross-occupation differences in the ability to vary or change work-times, with more than 70% of full-time workers having flexibility, in occupations such as computer and mathematical science, management, architecture, and engineering. Less than 40% of full-time workers in construction and extraction, education, training and library, or production have temporal flexibility at work. We examine the temporal flexibility of the gender gap among full-time working parents, using the American Time Use Survey for the years 2003-2019. Our analysis reveals that temporal flexibility has a U-shaped relationship with the wage rates of both fathers and mothers, and that temporal flexibility has a concave relationship with the motherhood wage gap, with a maximum being reached at the level of 55% of temporal flexibility. Our analysis of the structure of work hours reveals that temporal flexibility is reflected in how work hours are structured throughout the working day, and also serves as evidence that our measure of temporal flexibility captures the technologies of production, rather than the characteristics or motivations of a given company policy. This paper posits temporal flexibility as a factor affecting the motherhood wage gap.

JEL Classification: D63, J16, J22, J24, J31

Keywords: labour supply, gender wage gap, work interruptions, ATUS

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1. INTRODUCTION

Among the advances in society and the economy in the last century in the US, the converging roles of men and women are among the most important, which has been reflected in a convergence in earnings (Goldin, 2014). But still the gender wage gap in the US is substantial (Blau and Kahn, 2000;2017), despite the many cases women where have overtaken men in terms of education (Snyder and Dillow, 2011; Bauman and Cranney, 2020). In this chapter, we analyze how temporal flexibility at work is related to the gender wage gap among full-time working parents – the so-called motherhood wage gap. We characterize occupations in terms of the temporal flexibility reported by workers, and we report how this is reflected in work hours patterns throughout the working day for parents.

Despite that some authors contend that discrimination explains the current wage gender gap in the US, others argue that flexibility in the times of work is a major driver, and the gender wage gap would be considerably reduced if jobs were structured and remunerated to enhance temporal flexibility (Goldin, 2014). For instance, Goldin (2014) argues that the gender pay gap would be considerably reduced and might vanish altogether if firms did not have an incentive to disproportionately reward individuals who labored long hours and worked particular hours.

The theoretical framework proposed by Goldin (2014) states that if an employee is unavailable, and communicating the information to another employee is costly, the value of the individual to the firm will decline if the degree to which the worker has close substitutes decreases. Firms in many industries and occupations have an incentive to disproportionately reward individuals who work long hours (and particular hours), leaving aside the temporal flexibility of workers. Firms reward individuals who differ in their desire for various amenities connected with workplace flexibility, which includes the number of hours to be worked and also the particular hours worked, being "on call," providing "face time," being present for clients, group meetings, and the like (Goldin, 2014).

Within this framework, we first characterize temporal flexibility across the occupational spectrum in the US. To that end, we use the 2017-2018 Leave and Job Flexibilities (LJF Module) Module of the American Time Use Survey, which contains self-reported information on temporal flexibility at the work place. We measure temporal flexibility of workers with the question "Do you have flexible work hours that allow you

to vary or make changes in the times you begin and end work?", thus measuring self-perceived flexibility. We find large cross-occupation differences in the percentage of workers having the possibility to vary or make changes in the times they begin and end work. In occupations like computer and mathematical science, management, architecture, and engineering, more than 70% of workers report having temporal flexibility, while less than 40% of full-time workers in construction and extraction, education, training and library, and production have temporal flexibility at work.

We explore the relationship between temporal flexibility and the motherhood wage gap of full-time working parents in the US, using a sample of full-time workers with children from the American Time Use Survey for the years 2003 to 2019.[1] We estimate wage regressions in which temporal flexibility is imputed at the occupational level. Additionally, we show that temporal flexibility at work is reflected in the structuring of work hours throughout the working day. To that end, we use time diary information from full-time working parents in the ATUS 2003-2019 whose diaries correspond to working days (i.e., days when respondents devote 60 or more minutes to market work activities, excluding commuting). The structure of the time diaries allows us to compute the timing of interruptions, the number of interruptions, and the duration of work until an interruption for workers, and analyze the relationship between occupational temporal flexibility and these indicators.

We contribute to the literature by incorporating the temporal flexibility of jobs as a factor affecting the motherhood wage gap in the US (an underdeveloped field). We first document temporal flexibility for the whole spectrum of occupations, and classify those occupations in terms of temporal flexibility. Goldin (2014) analyzes occupational flexibility for technology and science, business, health, and law only, and finds that temporal flexibility has taken off in certain sectors, such as technology, science, and health, but is less apparent in the corporate, financial, and legal worlds. Our results are in line with Goldin (2014), since we find that occupations such as computer and mathematical science, and the life, physical, and social sciences are among the top occupations in terms of temporal flexibility, while health support, health practitioner, and technical do worse in terms of temporal flexibility.

[1] Parents are defined as individuals living in households with children under 18 who are the household head or the partner's household head.

Second, our chapter is related to the literature of the motherhood wag gap. Prior evidence has demonstrated the existence of the negative effect of motherhood on women's wages and opportunities for career advancement. Work interruptions, being shifted into part-time work, or a mother's choosing to enter a lower-paying job or occupation are among the explanatory variables (Molina and Montuenga, 2009; Glauber, 2018; Jee et al., 2019). The findings vary across geographical areas and countries, and also with educational attainment and skills. More recently, inflexibility at work has attracted some attention, and has been considered the nonpecuniary cost of many jobs. For instance, jobs in the so-called "gig economy" may provide more flexibility (e.g., Uber drivers can decide exactly when they want to work, instead of taking shifts assigned by a manager; Hall and Krueger 2018), though potentially at the cost of reducing workers' wages or their ability to work full-time when they wish to do so (Katz and Krueger, 2016). Some recent studies have tried to quantify the value of flexibility by eliciting willingness to pay for increased autonomy in hours of work (Mas and Pallais, 2017). Goldin (2014) relates temporal flexibility to the gender wage gap, concluding that the gap would be considerably reduced if jobs were structured and remunerated to enhance temporal flexibility (Goldin, 2014). We also examine this question, but the information about temporal flexibility is obtained directly from workers, and thus our measure of temporal flexibility captures the restrictions of the job (the production function).

Third, this research is an important contribution to the better understanding of the impact, by gender, of new forms of work that have increased during the pandemic crisis and that are likely to remain and develop after it (e.g., ICT-based mobile work, Platform work, Employment sharing, Job sharing, Voucher-based work, Interim Management, Portfolio work etc.). Using data collected before the pandemic, this research is an important contribution to the study of the gender wage gap and time flexibility before the pandemic, and to a better understanding of the new and changed work forms during the pandemic, and the time flexibilities that are expected to remain after the pandemic ends.

The rest of the chapter is organized as follows. Section 2 describes the data, and presents empirical evidence on the motherhood wage gap and temporal flexibility across occupations. Section 3 analyzes the relationship between temporal flexibility and the gender wage gap. Section 4 presents an analysis of the relationship between temporal flexibility and the structure of work hours, and Section 5 sets out our main conclusions.

2. DATA

Temporal flexibility in the Leave and Job Flexibility Module

For the analysis of temporal flexibility, we use the 2017-2018 Leave and Job Flexibility (LJF) Module of the American Time Use Survey (ATUS) (see BLS (2018) for a full description of the dataset). The ATUS provides nationally representative estimates of how, where, and with whom Americans spend their time, and is the only federal survey providing data on the full range of non-market activities, from childcare to volunteering. The ATUS data provides us with socioeconomic variables about respondents, but also with information on individual time use based on diaries, where respondents report their activities during the 24 hours of the day, from 4 am to 4 am of the next day. The ATUS is considered the official time use survey of the US; it is sponsored by the Bureau of Labor Statistics, and conducted as part of the Current Population Survey (CPS) by the Census Bureau (BLS, 2020). The data is included as part of the Integrated Public Use Microdata Series (IPUMS) of the Institute for Social Research and Data Innovation of the University of Minnesota (Hofferth et al., 2020). Despite the fact that the ATUS survey has been conducted since 2003, it constitutes a cross-sectional database, where the same respondents are not interviewed every year. Thus, it is not a panel database.

In the ATUS, one diary is completed by a given respondent on a selected day of the week. Diaries are divided into episodes where the respondent records a main activity and, in some surveys, additional information such as a secondary activity carried out simultaneously with the primary activity, if the activity was done in the company of another individual, and where the activity took place.

Sponsored by the U.S. Department of Labor Women's Bureau, the 2017-18 Leave and Job Flexibilities Module was fielded with the American Time Use Survey (ATUS) from January 2017 through December 2018. The Module includes questions about worker access to and use of paid and unpaid leave, job flexibility, and individual work schedules. Respondents coded as employed wage and salary workers (except those who are self-employed) in the ATUS, and who complete the 24-hour diary, are selected for the Leave Module.

From the LJF Module we select full-time workers (Goldin, 2014). We exclude students, and retirees, to minimize the role of time-allocation decisions, such as education and retirement, that have a strong inter-temporal component over the life cycle (Aguiar and Hurst, 2007; Gimenez-Nadal and Sevilla, 2012). After selecting workers with non-

missing information on temporal flexibility, the final sample contains 7,386 full-time workers, with 3,935 male and 3,451 female workers.[2]

Temporal flexibility at work is measured via the question "Do you have flexible work hours that allow you to vary or make changes in the times you begin and end work?", with possible answers being "yes" (1) or "no" (0). This measure of job flexibility refers to temporal flexibility, and can be considered as self-perceived by workers. It is important to note that the temporal flexibility analyzed here may differ from the temporal flexibility that is reported by employers, and captures the restrictions of the job (i.e., the production function). In this sense, if firms do not value workers being there all the time, then there is temporal flexibility at work, and we would expect workers to say they have temporal flexibility.

The LJF Module includes information on occupations in the following classifications: 1) Management, 2) Business and financial operations, 3) Computer and mathematical science, 4) Architecture and engineering, 5) Life, physical, and social sciences, 6) Community and social service, 7) Legal, 8) Education, training, and library, 9) Arts, design, entertainment, sports, 10) Healthcare practitioner and technical, 11) Healthcare support, 12) Protective service, 13) Food preparation and serving related, 14) Buildings and grounds cleaning and maintenance, 15) Personal care and service, 16) Sales and related, 17) Office and administrative support, 18) Farming, fishing, and forestry, 19) Construction and extraction, 20) Installation, maintenance, and repair, 21) Production, and 22) Transportation and material moving.

We characterize temporal flexibility across occupations. To that end, for the group of the 22 pre-coded occupations included in the LJF Module, we compute the percentage of workers reporting having temporal flexibility at work. Table 1 shows the percentage of full-time (parents and non-parents) workers, where occupations are sorted from the highest to the lowest percentage. We observe that in occupations such as Computer and mathematical science, Management, Architecture, and Engineering, more than 70% of full-time workers report having temporal flexibility, while less than 40% of full-time

[2] The fact that we select all full-time workers, both parents and non-parents, allows us to obtain a general characterization of temporal flexibility of occupations, one of the main contributions of the Chapter. Otherwise, focusing on full-time working parents would be subject to sample bias in our measure of temporal flexibility. Furthermore, using parents only in the imputation of temporal flexibility would lead to reduced cell sizes in certain occupations.

workers in construction and extraction, education, training and library, and production have temporal flexibility at work.

Together with the proportion of workers reporting temporal flexibility, we report the occupation gender wage gap (that is, $(male - female)/male$). Here, we cannot identify a clear pattern of correlation between temporal flexibility and the gender gap across occupations. For instance, the gender wage gap in Computer and mathematical science is negative, indicating that females tend to be paid more than males. In occupations characterized by a high degree of temporal flexibility, the gender gap is small, for instance in Architecture and engineering (7.45%), but in occupations not characterized by a high degree of temporal flexibility, for instance Farming, fishing and forestry, the gender wage gap is also small (5.48%).

Wage rates of workers in the ATUS

For the analysis of wage rates, we again use data from the American Time Use Survey (ATUS), for the years 2003 to 2019.[3] We select non-student, non-retired full-time workers whose earnings are measured as hourly wages. Information on hourly wages is given directly by most respondents in the ATUS, and for those who do not report hourly wages directly we compute them as weekly earnings divided by the hours usually worked per week. Table 2 shows wage rates for the sample of full-time workers, by gender and the presence of children. Panel A shows wage rates for the sample of workers with children (i.e., respondents living with at least one child under 18 in the household). Wage rates are \$24.65/h for fathers and \$19.72/h for mothers, with the difference (\$4.92/h) representing a raw gender gap of 20% (of average male wage rates). Panel B shows wage rates for the sample of workers without children. Wage rates here are \$22.97/h for non-fathers and \$20.55/h for non-mothers, with the difference (\$2.43/h) representing a raw gender gap of 10.57%. Thus, the gender wage gap is larger in the group of parents than for the non-parents, indicating the existence of a motherhood gender gap (Waldfogel, 1998a1998b0; Lundberg and Rose, 2000; Harkness and Waldfogel, 2003; Davies and Pierre, 2005; Cukrowska-Torzewska and Matysiak, 2020). Given this focus on the motherhood wage gap, for the rest of the chapter we select full-time working parents of

[3] This period includes the Great Recession, with larger impacts on certain occupations and sectors, which also affected workers' work-time, and household and individual income, differently. For this reason, in the econometric model, we control for the year of the survey.

children. The final sample contains 41,266 full-time working parents, with 22,347 fathers and 18,919 mothers.

For the sample of parents, we indicate the percentage of workers reporting having temporal flexibility at work, by occupation.[4] When we consider the average value of our measure of temporal flexibility at work for both fathers and mothers (Table 3), the values for fathers and mothers are 53.9 and 53.1 respectively, and a t-type test of differences in means indicates that the average values for fathers and mothers are statistically different from each other. Thus, it seems that fathers, in comparison to mothers, work in occupations where temporal flexibility at work is greater.

Other socio-demographic characteristics of workers that can be obtained from the ATUS include age, race, and the years of education, in line with Table 1 of Goldin (2014). Race is defined with the following categories: 1) White only, 2) Black only, 3) American Indian, Alaskan Native, 4) Asian only, 5) Hawaiian Pacific Islander only, 6) White-Black, 7) White-American Indian, 8) White-Asian, White-Hawaiian, Black-American Indian, White-Black-American Indian, and White-Black-Hawaiian. Race is recoded to "White" (i.e., White only) and "Black" (i.e., Black only), and the rest of the categories are included in "Other Races". Education is defined according to years of schooling, and recoded to "Primary education", "Secondary education", and "University education". Table 3 shows average values of socio-demographic characteristics, by gender. We observe that working fathers are older (38.83) than mothers (37.79), with this difference being statistically significant at the 99 percent level. There are also statistically significant differences in the race of parents, as the group of fathers has a comparatively higher proportion of white workers, while the group of mothers has a comparatively higher proportion of black workers. Regarding the level of education, female workers have more years of education; on average 14.84 years whereas male workers have 14.29 years of education. Furthermore, full-time working fathers work 3.89 more hours per week than their female counterparts, and full-time fathers have more children under 18 in their households in comparison to full-time working mothers.

[4] For instance, given that computer and mathematical science have a value of 82.80 regarding temporal flexibility at work, for all those parents reporting working in this occupation, we impute the value of 82.80 as a measure of temporal flexibility.

3. TEMPORAL FLEXILIBITY AND THE GENDER WAGE GAP

In this Section, we analyze the relationship between temporal flexibility and the motherhood wage gap, first estimating a wage equation where we explore the motherhood wage gap net of differences in observed socio-demographic characteristics. We estimate the following Ordinary Least Squared (OLS) model:

$$log(W_i) = \alpha + \beta_1 Father_i + \partial X_i + \varepsilon_i \quad (1)$$

where $log(W_i)$ measures the log of the wage rate (\$/hour) of parent "i" and $Father_i$ represents a dummy variable to indicate the gender of parent "i", X_i is a vector of socio-demographic controls which include – following Goldin (2014) – age and its square, two dummy variables to control for whether respondent is White or Black (vs. rest of races), two dummy variables to control for secondary (high school degree and some college) and university (college degree and more) education, with the reference level of education being less than high school degree, a variable to control for the usual hours of work per week, and another variable to control for the number of children under 18 in the household. We also include a vector of dummy variables for industry of parent "i" (pre-coded in the ATUS), a variable to control for the year of the survey. Standard errors are robust and clustered at the occupational level. The coefficient of interest is β_1, which is considered a measure of the motherhood wage gap, and we expect β_1 to be positive ($\beta_1 > 0$) since fathers have higher wage rates than mothers.

We next introduce temporal flexibility in the equation, where we allow for gender differentials in the relationship between temporal flexibility and wages. We estimate the following OLS model:

$$log(W_i) = \alpha + \beta_1 Father_i + \beta_2 TF_i + \beta_3 TF_i * Father_i + \partial X_i + \varepsilon_i \quad (2)$$

where $log(W_i)$ measures the log of the wage rate (\$/hour) of parent "i", $Father_i$ is a dummy variable to indicate the gender of parent "i", and TF_i measures the temporal flexibility in worker "i"'s occupation. We include the interaction term $TF_i * Father$ to explore whether temporal flexibility has a gendered effect on wages. TF_i is measured at the occupation level, to avoid endogeneity problems, since unobserved factors of workers may be related to both the wage rate and the temporal flexibility reported by worker "i". β_2 measures the relationship between wages and temporal flexibility, and we expect $\beta_2 > 0$ as in Goldin (2014). β_3 is the differential gender effect of temporal flexibility on wages, and according to Goldin (2014) we expect β_3 to be negative (β_3<0) given that more

flexibility in the occupation has been found to reduce the wage gender gap, and thus should be of the opposite sign than β_1.

We also allow for non-linearities in the relationship between temporal flexibility and the motherhood wage gap, and we include the squared terms of flexibility and its interaction with the male dummy. We estimate the following Equation:

$$log(W_i) = \alpha + \beta_1 Father_i + \beta_2 TF_i + \beta_3 TF_i^2 + \beta_4 TF_i * Father_i + \beta_5 TF_i^2 * Father + \partial X_i + \varepsilon_i \quad (3)$$

where $log(W_i)$ measures the log of the wage rate ($/hour) of parent "i", $Father_i$ is a dummy variable to indicate the gender of parent "i". We include the terms TF_i^2 and $TF_i^2 * Father$ to explore whether there are non-linear gendered effects in the relationship between temporal flexibility and wages.

Columns (1) and (2) of Table 4 show the results of estimating Equation (1). According to Column (1), the raw (unconditional) motherhood wage gap is around 20% of the father's wage, consistent with the results shown in Table 2. Furthermore, Column (2) shows that after controlling for observable socio-demographic characteristics, the motherhood wage gap stands at 20% of the father's wage rate, indicating that this gap cannot be explained by gender differences in socio-demographic characteristics, which is consistent with prior analyses (Goldin, 2014).

When we turn to the relationship between the gender wage gap and temporal flexibility at work, Column 3 shows the results of estimating Equation (2) where the indicator of temporal flexibility and its interaction with the male dummy is included. We observe that the male dummy turns out to be non-statistically significant. Thus, we observe that when temporal flexibility is introduced in the wage equation, the motherhood wage gap vanishes, which may indicate that differences in temporal flexibility at work of fathers and mothers may be at the root of the observed motherhood wage gap.[5] The variable for temporal flexibility is positive and statistically significant at the 99% level, indicating that occupations with higher wage rates are also those with comparatively higher temporal flexibility. This resembles the reasoning given by Goldin (2014), who argues that in occupations with a relatively higher degree of temporal flexibility, the cost of communicating the information when workers are not available is relatively low, and

[5] It may also reflect differences among occupations concerning frequency by gender. There is some pre-selection by gender "before" the entry to the labor market and the selection of the occupations by men and women.

workers in those occupations are not penalized when they work fewer hours or are not in their workplaces at specific hours.

However, the interaction term between temporal flexibility and the male dummy is positive, indicating that temporal flexibility in the occupation benefits fathers (in comparison to mothers). This is against the main prediction of the theoretical framework, which argues that more temporal flexibility would reduce the (motherhood) wage gap. In this sense, it seems that in occupations with higher temporal flexibility the motherhood wage gap increases.

Goldin (2014) reports that while temporal flexibility is related to a lower gender wage gap, this effect is concentrated on science and technology occupations, while in other occupations, such as law or business, the author does not find this evidence. Thus, it may be that the relationship between flexibility and the gender wage gap is not linear. We explore this next by introducing a quadratic specification of temporal flexibility (resembling Goldin's nonlinearity in the earnings function). Column (4) of Table 4 shows the results of estimating Equation (3), where we introduce the squared term of temporal flexibility and its interaction with the male dummy.

We observe that β_2=-3.336 and β_3=3.880, indicating that temporal flexibility has an inverted-U shaped relationship with wage rates, with the minimum of the relationship between temporal flexibility and wages being reached at the level of 43 percent of temporal flexibility. However, there is a gender difference in this relationship, since for men β_2 =-1.521 (β_2+β_4=-3.336+1.815) and β_3 =2.296 (β_3+β_5=3.88-1.584), which puts the minimum of the relationship between temporal flexibility and wages at the level of 33 percent of temporal flexibility, in the case of fathers. This implies that the positive effects of temporal flexibility on wages begins at lower levels of temporal flexibility for fathers.

We now analyze where the maximum level of the motherhood wage gap is reached in terms of temporal flexibility. To that end, we use coefficients from Equation (3) to predict wages for fathers and mothers according to the possible levels of temporal flexibility in the occupations, and we also compute the motherhood wage gap according to these levels of temporal flexibility. Figure 1 shows graphically the evolution of fathers and mothers

wages, and the motherhood wage gap, in relation to temporal flexibility.[6] When we focus on the motherhood wage gap, it is negative (i.e., mothers have higher wages than fathers) when temporal flexibility is set to zero. This negative motherhood wage gap decreases as temporal flexibility increases, and reaches a value around zero at 20 percent of temporal flexibility. Then, as temporal flexibility continues to grow, the motherhood wage gap turns positive and increases to a maximum of 55 percent of temporal flexibility - where the motherhood wage gap is 24 percent - from where the motherhood wage gap declines as temporal flexibility increases, reaching a value close to zero (1.5 percent) when temporal flexibility is set to 95%. Thus, according to these predictions, the motherhood wage gap is maximum at the level of 55 percent of temporal flexibility, and temporal flexibility has an inverted-U shaped relationship with the motherhood wage gap. This is consistent with the data shown in Table 1, as the occupations with the highest values of temporal flexibility at work (e.g., computer and mathematical science, and architecture and engineering) are the occupations with the smallest gender gap.

4. WORK INTERRUPTIONS AND TEMPORAL FLEXIBILITY

For the analysis of interruptions at work, we use data from the American Time Use Survey (ATUS) for the years 2003 to 2019, which includes individual time use based on diaries. The advantage of 24-hour self-reported diary data over other types of survey based on stylized questionnaires, is that diaries produce more reliable and accurate estimates (Bonke, 2005; Kan, 2008). Thus, time use diaries have become the gold standard in the analysis of worker daily behaviors (Aguiar and Hurst, 2007, 2009; Guryan et al., 2008; Gimenez-Nadal and Sevilla, 2012).

We select full-time working parents resembling the sample selected for the analysis of the motherhood wage gap. Furthermore, given that we want to analyze the structure of work hours during working days, we additionally select workers who devote at least one hour to market work activities during the diary day, excluding commuting. We limit our analysis to primary activities because secondary activity information is not available in the survey. This sample selection leaves us with 21,494 respondents (diaries) corresponding to 11,867 fathers and 9,627 mothers.

[6] Minimum and maximum levels of temporal flexibility are set to zero and one, and we explore variations in temporal flexibility of 0.05 units. Results are shown in Table A1 in the Appendix.

We select episodes in the diary in which the respondent is between the beginning and the end of their work schedule. With all the episodes included between the beginning and the end of the work schedule we compute the following variables: time in (work) interruptions, number of (work) interruptions, time working until an (work) interruption, and working time. *Time in interruptions* is defined as the time spent in non-work activities while at work (between the beginning and the end of the work schedule), following Hamermesh (1990), Gimenez-Nadal, Molina and Velilla, (2018), Burda, Genadeck and Hamermesh (2020) and Gimenez-Nadal and Sevilla (2021), and includes all the time spent in an activity other than paid work during the time the respondent is at work (i.e., time spent not working during the work period).[7] *Number of interruptions* is measured as the number of spells where workers do any non-work activity. *Working time until an interruption* is computed by dividing the total amount of time spent working by the number of work spells in a given diary day. *Working time* is computed as the total time devoted to market work activities, and is measured in hours per day.

Table 5 shows an example of a working day from a randomly chosen respondent in the American Time Use Survey. The diarist spent 8 hours and 40 minutes at work, starting work at 8:00 am, when the first episode of paid work was recorded in the diary, and finishing at 4:40 pm. Of the 8 hours and 40 minutes that the respondent spent at work, 7 hours and 30 minutes were spent working. There were 3 work spells of 3 hours, 2 hours and 10 minutes, and 2 hours and 20 minutes, respectively. The first work spell starts at 8:00 am and lasts until 11:00 am. From 11:00 am to 11:20 am the respondent records having a snack, followed by relax/do nothing from 11:20 am to 12:00 pm. The respondent goes back to work at 12:00 pm, finishing this second work spell to have a lunch break at 2:10 pm. The third work spell starts at 2:20 pm and lasts until 4:40 pm.

The time in interruptions is 1 hour and 10 minutes. Of this time, the respondent spent 40 minutes in leisure activities (relax/do nothing), while the other 30 minutes were spent in meals at work. There are two interruptions: a first interruption between 11:00 and 12:00, with one leisure activity and a snack, and a second interruption from 14:10 to 14:20 with a meal. The respondent works for an average of two and a half hours before an

[7] The minimum slot of time that is considered is 10 minutes. Any break less than 10 minutes is not registered.

interruption, which is calculated by dividing the 7 hours and 30 minutes that the respondent is working over the 3 work spells recorded in the diary.

Table 6 shows summary statistics for the sample of full-time working parents who devote at least one hour to market work activities in the diary day, selected from the ATUS 2003-19. Regarding our indicators of interruptions at work, we observe that fathers (mothers) spend 1.28 (1.22) hours per working day in interruptions, have 1.50 (1.43) interruptions, and spend 4.14 (3.94) hours working until an interruption. Thus, fathers spend 4 (0.06*60 minutes) more minutes in breaks, have 0.07 more interruptions, and spend 12 (0.192*60 minutes) more minutes working until an interruption, with these differences being statistically significant at standard levels. Thus, fathers have more time in interruptions and have more interruptions, but spend more time working until interruptions, which may seem contradictory. However, this is consistent with the fact that fathers spend more time working in comparison to mothers, as fathers and mothers spend 8.68 ad 8.05 hours working respectively, a difference of 36 minutes (0.62*60 minutes) and statistically significant. When we divide our three indicators by the time working during the day, we do not obtain statistically significant differences in the time of interruptions nor the number of interruptions, while mothers spend comparatively more time working until an interruption (conditional on working time). Thus, conditional on working time of mothers and fathers, mothers work longer before having a work interruption.

We now examine how temporal flexibility is related to the structure of work hours, by analyzing the relationship between temporal flexibility and our indicators of work interruptions. To that end, we estimate the following Ordinary Least Squares (OLS) model for each indicator of work interruptions, as follows:

$$E_i = \mu + \beta_1 TF_i + \beta_2 TF_i^2 + \beta_3 X_i + \varepsilon_i \quad (4)$$

where E_i represents our indicators of work interruptions/working time for worker "i" and TF_i and TF_i^2 measure the temporal flexibility in worker i's occupation and its square. In the same way that there are non-linearities in the relationship between temporal flexibility and the motherhood wage gap, we allow for non-linearities in the relationship between temporal flexibility and our measures of interruptions. The vector X_i includes the same socio-demographic characteristics as in Equations (1) to (3), and ε_i is the error term. TF_i is measured at the occupation level, to avoid endogeneity problems, since unobserved

factors of workers may be related to both the structure of work and the temporal flexibility reported by worker "i".[8]

Table 7 shows the results of estimating Equation (4) for the four dependent variables. We observe that temporal flexibility is related to the number of interruptions (Column (2)) and the time working until an interruption. In particular, temporal flexibility has a U-shaped relationship to the number of interruptions, with the minimum level of interruptions reached at the level of 71 percent of temporal flexibility. The case of the time working until an interruption has an inverted-u shaped relationship with temporal flexibility, with the maximum time working until an interruption reached at the level of 33 percent of temporal flexibility. Given that the minimum level of temporal flexibility in our datasets is 29.17 percent, these results indicate that temporal flexibility has an increasing relationship with the time working until interruption in most of the occupational spectrum, increasing the time working until an interruption as temporal flexibility increases. Furthermore, the fact that our measure of temporal flexibility is related to the structure of work hours indicates that we are capturing the technology of production and not some aspect of policy.[9]

5. CONCLUSIONS

The most common explanation for mothers earning less than non-mothers is that the loss of individual skills, as well as the depreciation of experience, is associated with the period spent out-of-work resulting from childbearing and child caring. Explanations for the existence of the motherhood wage penalty include the fatigue experienced by a woman who cares for her children at home, leading to less effort being dedicated to her job activity. The greater effort dedicated to home activities decreases as the child grows older, and increases as a higher level of education is required at work. Another important factor is that women show a preference for jobs that allow them to combine household schedules with their work schedule, in exchange for a lower wage. Additional explanations are related to discrimination, which may explain why firms assume that all women will interrupt their working career at some time, although they may not

[8] See Table A2 in the Appendix for values of the variables of interest across occupational groups.

[9] The technology of production, which differs by occupation/sector, determines both temporal flexibility and the number of interruptions/time working until an interruption. Thus, temporal flexibility and work interruptions are not independent.

subsequently have children, in such a way that firms tend to place them in jobs that have a lesser human capital requirement. These positions require less training, and consequently pay lower wages.

In this chapter, we have explored the relationship between temporal flexibility and the motherhood wage gap of full-time working parents in the US, using a sample of full-time workers with children from the American Time Use Survey of the years 2003-2019. Our analysis reveals that occupations with higher wages are also those with comparatively higher temporal flexibility, that temporal flexibility has an inverted-U shaped relationship with wage rates, and also with the motherhood wage gap with a maximum reached at the level of 55 percent of temporal flexibility. Our results are consistent with Goldin (2014), since we find that occupations such as computer and mathematical science, and the life, physical, and social sciences, are among the top occupations in terms of temporal flexibility, while health support, health practitioner, and technical do less well in terms of temporal flexibility.

Additionally, we observe that temporal flexibility has a U-shaped relationship with the number of interruptions, and an inverted-U shaped relationship with the time working until an interruption, with the maximum time working before an interruption is reached at the level of 33 percent of temporal flexibility. These results are consistent with a theoretical model of production where the disruption cost of interruptions is costly (Adams-Prassl 2020; Covielo, Ichino and Persico, 2015); temporal flexibility allows for a decrease in those costs, and indicates that our measure of temporal flexibility captures the technology of production and not any element of policy (that may or not be applied).

Child care activities, and support time associated with motherhood and fatherhood, differ substantially across children's age (Guryan, Hurst and Kearney, 2008; Gimenez-Nadal and Sevilla, 2016). However, this difference is not considered here since sample cell sizes prevent us from developing a more detailed analysis according to childrens' age. A future line of research could consider whether the relationship between temporal flexibility at work and the gender wage gap varies with the age of the youngest child. It is expected that there are, in fact, differences according to the age of children, given that for parents with youngest children temporal flexibility at work may be more important in the day-to-day functioning of their households.

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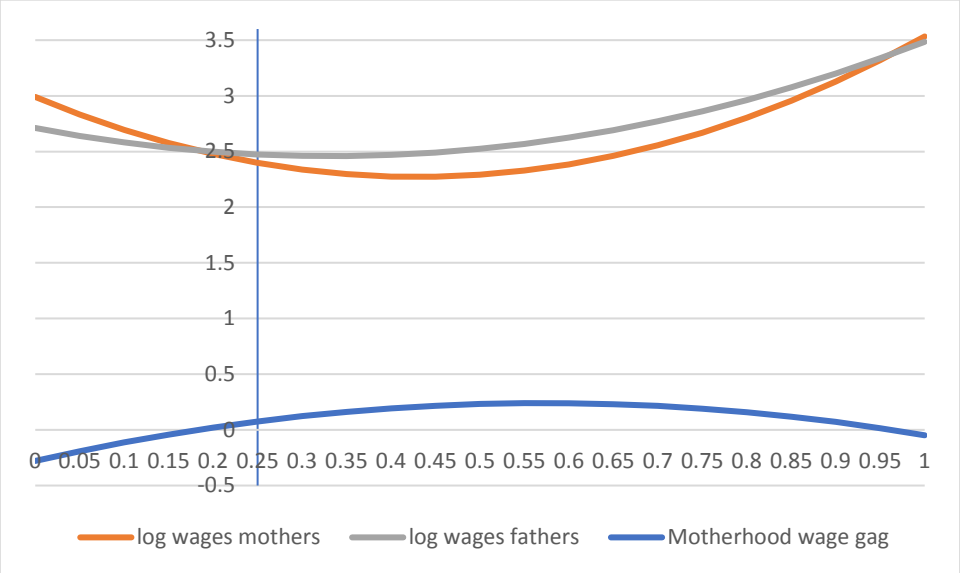
Figure 1. Temporal flexibility, wages, and the motherhood wage gap



Notes: Data come from the American Time Use Survey 2003-2019. Figure plots wage rates from fathers and mothers predicted from the following Equation: $log(W_i) = \alpha + \beta_1 Male_i + \beta_2 TF_i + \beta_3 TF_i^2 + \beta_4 TF_i * Male_i + \beta_5 TF_i^2 * Male + \partial X_i + \varepsilon_i$, and predicted values are obtained at mean sample values . The motherhood wage gap is obtained as the difference between log wages of fathers and log wages of mothers, with a positive value indicating a positive motherhood wage gap. See Table A1 in the Appendix for a description of the values obtained for each level of temporal flexibility.

Table 1. Temporal flexibility and the gender wage gap

	Temporal flexibility	Gender wage gap ((m-f)/m)
Computer and mathematical science	82.80%	-4.93%
Architecture and engineering	82.23%	7.45%
Life, physical, and social science	74.26%	19.29%
Management	74.04%	17.42%
Business and financial operations	73.11%	17.73%
Community and social service	70.99%	15.46%
Arts, design, entertainment, sports	68.74%	12.19%
Legal	66.58%	27.57%
Sales and related	64.85%	24.11%
Food preparation and serving related	62.36%	11.85%
Office and administrative support	52.80%	7.00%
Personal care and service	45.55%	27.43%
Healthcare practitioner and technical	45.21%	19.33%
Farming, fishing, and forestry	44.20%	5.48%
Installation, maintenance, and repair	43.19%	24.72%
Building and grounds cleaning and maintenance	42.81%	17.69%
Protective service	42.38%	12.58%
Healthcare support	39.27%	39.82%
Transportation and material moving	38.11%	17.81%
Construction and extraction	34.70%	34.19%
Education, training, and library	30.11%	20.35%
Production	29.17%	19.95%

Notes: Data come from the Leave and Job Flexibility (LJF) Module (2017/2018) of the American Time Use Survey. Sample is restricted to full-time workers (n=7,386 obs. All the average values reported in Table 1 are obtained using individual sample weights included in the LJF Module. N=…Temporal flexibility is measured as the percentage of workers answering yes to the question "Do you have flexible work hours that allow you to vary or make changes in the times you begin and end work?". The occupational categories are those originally included in the American Time Use Survey. Gender wage gap is measured as the difference between the average log wage rate of male workers and the average log wage rate of female workers, divided by average log wage rate of male workers. Wage rates are measured in dollars per hour.

Table 2. The motherhood wage gap

	Males		Females			
	Mean	**SD**	**Mean**	**SD**	**Diff**	**p-value diff**
	Panel A: Individuals with children					
Wage rate	24.649	(15.469)	19.720	(13.031)	4.929	(<0.01)
Nº Observations	22,347		18,919			
	Panel B: Individuals without children					
Wage rate	22.976	(14.130)	20.547	(12.506)	2.429	(<0.01)
Nº Observations	20,474		18,616			

Notes: Data come from the American Time Use Survey 2003-2019. Sample is restricted to full-time workers. Wage rates are measured in dollars per hour. The presence of children considers children under 18 in the household of respondent. Standard deviations in parenthesis. *Diff* is measured as male`s wage rate minus female's wage rate. *P-value diff* represents the p-value of a t-type test of equality of sample means, and a p-value lower than 0.05 indicates that the difference between sample means is statistically significant at standard levels.

Table 3. Sum Stats of socio-demographic characteristics

	Full-time working fathers		Full-time working mothers			
	Mean	Std. Dev.	Mean	Std. Dev.	Diff	P-value Diff
Wage rate	24.649	(15.469)	19.720	(13.031)	4.929	(<0.01)
Temporal flexibility	0.539	(0.254)	0.531	(0.227)	0.008	(<0.01)
Socio-Demographics						
Age	38.830	(9.793)	37.798	(9.482)	1.032	(<0.01)
White	0.840	(0.367)	0.773	(0.419)	0.067	(<0.01)
Black	0.085	(0.280)	0.154	(0.361)	-0.068	(<0.01)
Primary education	0.126	(0.332)	0.081	(0.273)	0.045	(<0.01)
Secondary education	0.518	(0.500)	0.540	(0.498)	-0.022	(<0.01)
University education	0.356	(0.479)	0.379	(0.485)	-0.023	(<0.01)
Hours of work per week	46.170	(9.395)	42.282	(6.819)	3.888	(<0.01)
Number of children <18	1.916	(0.973)	1.758	(0.915)	0.158	(<0.01)
Observations	22,347		18,919			

Notes: Data come from the American Time Use Survey 2003-2019. Sample is restricted to full-time workers with at least one child under 18 in the household. Standard deviations in parenthesis. *Diff* is measured as male´s minus female's average value of the socio-demographic characteristic of reference. *P-value diff* represents the p-value of a t-type test of equality of sample means, and a p-value lower than 0.05 indicates that the difference between sample means is statistically significant at standard levels.

Table 4. Temporal flexibility and wage rates

Wage rate	1 eq. (1)	2 eq. (1)	3 eq. (2)	4 eq. (3)
Father	0.208***	0.210***	0.092	-0.279*
	(0.036)	(0.020)	(0.066)	(0.163)
Temporal flexiblity	-	-	0.802***	-3.336***
	-	-	(0.118)	(0.649)
Temporal flexiblity squared	-	-	-	3.880***
	-	-	-	(0.581)
Temporal flexiblity*father	-	-	0.216**	1.815***
	-	-	-0.105	(0.628)
Temporal flexibility squared*father	-	-	-	-1.584***
	-	-	-	(0.562)
Age	-	0.071***	0.064***	0.061***
	-	(0.003)	(0.003)	(0.003)
Age squared	-	-0.074***	-0.066***	-0.063***
	-	(0.004)	(0.003)	(0.003)
White	-	-0.076***	-0.057***	-0.043**
	-	(0.025)	(0.021)	(0.020)
Black	-	-0.216***	-0.177***	-0.156***
	-	(0.029)	(0.025)	(0.026)
Hours worked per week	-	-0.001	-0.002**	-0.002**
	-	(0.001)	(0.001)	(0.001)
Number of children <18	-	-0.015***	-0.010***	-0.009**
	-	(0.004)	(0.004)	(0.004)
Year of survey	-	0.023***	0.022***	0.021***
	-	(0.001)	(0.001)	(0.001)
Constant	2.867***	-44.037***	-42.688***	-40.347***
	(0.039)	(1.901)	(1.857)	(1.938)
Observations	41,266	41,266	41,266	41,266
R-squared	0.03	0.347	0.404	0.417

Notes: Robust standard errors clustered at the occupational level in parenthesis. Data come from the American Time Use Survey 2003-2019. Sample is restricted to full-time workers with at least one child under 18 in the household. Columns (1) and (2) show results of estimating the equation $log(W_i) = \alpha + \beta_1 Father_i + \partial X_i + \varepsilon_i$ where $log(W_i)$ measures the log of the wage rate ($/hour) of parent "i" and $Male_i$ represents a dummy variable to indicate the gender of parent "i", X_i is a vector of socio-demographic controls which includes age and its squared, two dummy variable to control for whether respondent is White or Black (vs. rest of races), two dummy variables to control for secondary (e.g., high school degree and some college) and university (e.g., college degree and more) education, with the reference level of education being less than high school degree, a variable to control for the usual hours of work per week, and another variable to control for the number of children under 18 in the household. We also include a vector of dummy variables for industry of parent "i", and a variable to control for the year of the survey. Column (3) shows the results of estimating the equation $log(W_i) = \alpha + \beta_1 Father_i + \beta_2 TF_i + \beta_3 TF_i * Father_i + \partial X_i + \varepsilon_i$, where we include the interaction term $TF_i * Father_i$ to explore whether temporal flexibility has a gendered effect on wages. Column (4) shows the results of estimating Equation $log(W_i) = \alpha + \beta_1 Father_i + \beta_2 TF_i + \beta_3 TF_i^2 + \beta_4 TF_i * Male_i + \beta_5 TF_i^2 * Father + \partial X_i + \varepsilon_i$ (3), where the interaction terms TF_i^2 and $TF_i^2 * Father$ explore whether there are non-linear gendered effects in the relationship between temporal flexibility and wages.

Table 5. Example of the consumption and frequency of on-the-job leisure

Start time	Finish time	Activity type	Duration
8:00 a.m.	11:00 a.m.	Paid work	3.00
11:00 a.m.	11:20 a.m.	Meals or snacks in other places	0.33
11:20 a.m.	12:00 p.m.	Relax/do nothing	0.66
12:00 p.m.	2:10 p.m.	Paid work	2.16
2:10 p.m.	2:20 p.m.	Work breaks	0.16
2:02 p.m.	4:40 p.m.	Paid work	2.33
Time at work (hours)			8.20
Working time (hours)			7.50
Time in breaks (hours)			1.16
Number of breaks			2.00
Working time until taking a break (hours)			2.50

Notes: The example comes from the American Time Use Survey 2003-2019. *Time in interruptions* is defined as the time spent in non-work activities while at work and is measured in hours per day. *Number of interruptions* is measured as the number of spells where workers do any non-work activity. *Working time until an interruption* is computed by dividing the total amount of time spent working by the number of work spells in a given diary day, and is measured in hours per day. *Working time* is defined as the total time devoted to market work activities during the day, and is measured in hours per day.

Table 6. Sum Stats of interruptions for parents

	Fathers		Mothers			P-value
	Mean	**SD**	**Mean**	**SD**	**Diff**	**diff**
Breaks						
Time in interruptions	1.281	(1.811)	1.219	(1.710)	0.062	(0.01)
Time in interruptions/working time	0.178	(0.463)	0.182	(0.498)	-0.004	(0.51)
Number of interruptions	1.500	(1.084)	1.429	(1.076)	0.071	(<0.01)
Number of interruptions/working time	0.179	(0.148)	0.183	(0.157)	-0.004	(0.06)
Time working until interruption	4.135	(2.386)	3.943	(2.134)	0.192	(<0.01)
Time working until interruption/working time	0.491	(0.242)	0.505	(0.246)	-0.015	(<0.01)
Working time	8.676	(2.458)	8.053	(2.154)	0.623	(<0.01)
Observations	11,867		9,627			

Notes: Data come from the American Time Use Survey 2003-2019. Sample is restricted to full-time working parents of children under 18. *Time in interruptions* is defined as the time spent in non-work activities while at work and is measured in hours per day. *Number of interruptions* is measured as the number of spells where workers do any non-work activity. *Working time until an interruption* is computed by dividing the total amount of time spent working by the number of work spells in a given diary day, and is measured in hours per day. *Working time* is defined as the total time devoted to market work activities during the day, and is measured in hours per day. *Diff* is measured as male´s minus female's average value of the socio-demographic characteristic of references. *P-value diff* represents the p-value of a t-type test of equality of sample means, and a p-value lower than 0.05 indicates that the difference between sample means is statistically significant at standard levels.

Table 7. Temporal flexibility and work interruptions

	Time in interruptions	Number of interruptions	Time until an interruption	Working time
Temporal flexibility	-1.302	-1.605**	3.850***	-0.373
	(0.994)	(0.750)	(1.326)	(0.902)
Temporal flexibility squared	(1.294)	1.131*	-2.908**	(0.323)
	(0.882)	(0.668)	(1.215)	(0.815)
Male	0.180***	0.136***	-0.243***	0.051
	(0.032)	(0.022)	(0.048)	(0.045)
Age	-0.007	-0.019***	0.053***	0.022*
	(0.008)	(0.006)	(0.011)	(0.013)
Age squared	0.007	0.025***	-0.067***	-0.031**
	(0.010)	(0.007)	(0.013)	(0.016)
White	-0.151***	-0.206***	0.354***	0.002
	(0.058)	(0.030)	(0.057)	(0.068)
Black	-0.136**	-0.113***	0.140*	0.030
	(0.066)	(0.041)	(0.077)	(0.091)
Hours worked per week	0.026***	0.009***	0.026***	0.065***
	(0.002)	(0.001)	(0.003)	(0.003)
Secondary Education	-0.076	-0.105***	0.341***	0.180**
	(0.072)	(0.034)	(0.066)	(0.071)
University education	0.193***	-0.227***	0.352***	-0.007
	(0.073)	(0.043)	(0.092)	(0.082)
Number of children <18	-0.019	-0.025***	0.046**	0.006
	(0.015)	(0.009)	(0.019)	(0.017)
Number of episodes in diary	0.052***	0.050***	-0.128***	-0.087***
	(0.003)	(0.002)	(0.004)	(0.004)
Year of survey	(0.002)	-0.009***	0.021***	0.009**
	(0.003)	(0.002)	(0.003)	(0.004)
Constant	5.126	20.208***	-41.053***	-12.720
	(5.746)	(4.165)	(6.931)	(7.885)
Observations	21,494	21,494	21,494	21,494
R-squared	0.085	0.136	0.200	0.160

Notes: Robust standard errors clustered at the occupation level in parenthesis. Data come from the American Time Use Survey 2003-2019. Sample is restricted to full-time working parents of children under 18. *Time in interruptions* is defined as the time spent in non-work activities while at work and is measured in hours per day. *Number of interruptions* is measured as the number of spells where workers do any non-work activity. *Working time until an interruption* is computed by dividing the total amount of time spent working by the number of work spells in a given diary day, and is measured in hours per day. *Working time* is defined as the total time devoted to market work activities during the day, and is measured in hours per day. We estimate the equation $E_i = \mu + \beta_1 TF_i + \beta_2 TF_i^2 + \beta_3 X_i + \varepsilon_i$, where E_i represents our indicators of work interruptions for worker "i" and TF_i and TF_i^2 measure the temporal flexibility in worker i's occupation and its square. The vector X_i includes the same socio-demographic characteristics as in Equations (1) to (3), and ε_i is the error term.

APPENDIX.

Table A1. Predictions of wage rates for parents according to temporal flexibility

Temporal Flexibility	Predicated log wages mothers	Predicted log wages fathers	Motherhood wage gap
0.00	2.98905	2.71005	-0.279
0.05	2.83195	2.63974	-0.19221
0.10	2.69425	2.58091	-0.11334
0.15	2.57595	2.53356	-0.04239
0.20	2.47705	2.49769	0.02064
0.25	2.39755	2.4733	0.07575
0.30	2.33745	2.46039	0.12294
0.35	2.29675	2.45896	0.16221
0.40	2.27545	2.46901	0.19356
0.45	2.27355	2.49054	0.21699
0.50	2.29105	2.52355	0.2325
0.55	2.32795	2.56804	0.24009
0.60	2.38425	2.62401	0.23976
0.65	2.45995	2.69146	0.23151
0.70	2.55505	2.77039	0.21534
0.75	2.66955	2.8608	0.19125
0.80	2.80345	2.96269	0.15924
0.85	2.95675	3.07606	0.11931
0.90	3.12945	3.20091	0.07146
0.95	3.32155	3.33724	0.01569
1.00	3.53305	3.48505	-0.048

Notes: Data come from the American Time Use Survey 2003-2019. Figure plots wage rates from fathers and mothers predicted from the following Equation: $log(W_i) = \alpha + \beta_1 Male_i + \beta_2 TF_i + \beta_3 TF_i^2 + \beta_4 TF_i * Male_i + \beta_5 TF_i^2 * Male + \partial X_i + \varepsilon_i$, and predicted values are obtained at mean sample values . The motherhood wage gap is obtained as the difference between log wages of fathers and log wages of mothers, with a positive value indicating a positive motherhood wage gap. Predicted values for mothers are obtained as log wage= 2.98905-3.336*TF_i+3.88*TF_i^2. Predicted values for fathers are obtained as log wage= 2.98905+(-3.336+1.815)*TF_i+(3.88-1.584*TF_i^2)-0.279.

Table A2. Temporal flexibility and interruptions at work

Occupation	Temporal Flexilbity	Time in interruptions	Number of Interruption	Time working until interruptions	Time working
Computer and mathematical science	82.80%	1.613	1.615	3.645	8.249
Architecture and engineering	82.23%	1.225	1.401	4.169	8.507
Life, physical, and social science	74.26%	1.522	1.426	4.046	8.043
Management	74.04%	1.486	1.379	4.378	8.629
Business and financial operations	73.11%	1.590	1.491	3.850	8.286
Community and social service	70.99%	1.772	1.405	3.843	7.924
Arts, design, entertainment, sports	68.74%	1.681	1.488	3.841	8.159
Legal	66.58%	1.414	1.482	3.917	8.313
Sales and related	64.85%	1.278	1.366	4.285	8.393
Food preparation and serving related	62.36%	0.806	1.015	4.897	8.265
Office and administrative support	52.80%	1.033	1.546	3.850	8.185
Personal care and service	45.55%	1.137	1.857	3.790	9.292
Healthcare practitioner and technical	45.21%	1.164	1.160	5.443	9.431
Farming, fishing, and forestry	44.20%	1.280	1.322	4.144	8.076
Installation, maintenance, and repair	43.19%	0.965	1.545	3.977	8.682
Building and grounds cleaning and maintenance	42.81%	1.253	1.284	4.521	8.780
Protective service	42.38%	1.100	1.532	3.643	8.040
Healthcare support	39.27%	1.102	1.539	3.848	8.265
Transportation and material moving	38.11%	1.146	1.590	4.159	8.770
Construction and extraction	34.70%	0.944	1.528	3.990	8.667
Education, training, and library	30.11%	0.949	1.880	3.450	8.576
Production	29.17%	1.820	1.403	3.653	7.828

Data come from the American Time Use Survey 2003-2019. Sample is restricted to full-time working parents of children under 18. *Time in interruptions* is defined as the time spent in non-work activities while at work and is measured in hours per day. *Number of interruptions* is measured as the number of spells where workers do any non-work activity. *Working time until an interruption* is computed by dividing the total amount of time spent working by the number of work spells in a given diary day, and is measured in hours per day. *Working time* is defined as the total time devoted to market work activities during the day, and is measured in hours per day.