Women's labor supply - motherhood and work schedule flexibility

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Abstract

This paper analyzes the degree to which flextime reduces fertility-related career interruptions. In particular, I ask whether women with flextime return to work sooner and remain employed when they have young children. I quantify the resulting reduction in the earnings penalty from periods of non-employment due to child-care responsibilities. To answer this question, I develop a structural dynamic discrete choice model for the fertility and labor supply decisions of married and cohabiting women. The model allows flextime to directly affect preferences, the arrival rate of job offers and offered wages. I estimate the model using a sample drawn from the National Longitudinal Survey of Youth 1979. The estimates suggest a small positive willingness to pay for flextime in a full-time job of 2-3% of full-time quarterly earnings for women with one infant child or two children of any age. Moreover, her willingness to pay is increasing in her number of children. Jobs with flextime are also relatively scarce: only 17% of job offers are for full-time jobs with flextime. A counterfactual experiment shows that if flextime were available to all women with infant children, fertility would be largely unaffected while full-time work experience would increase by one quarter between marriage and age 40. As a result of the increased earnings and reduced disutility of work for women with young children, the present discounted value of utility between marriage and age 40 would increase by 2.7%, an increase equivalent to around 20% of annual full-time earnings.

Keywords: fertility, labor supply, work-hours flexibility, structural estimation, search model
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1 Introduction

This study investigates whether work schedule flexibility (flextime), an ostensibly family-friendly work amenity, reduces the career cost of children. Specifically, using a dynamic discrete choice model of women's joint fertility and labor supply decisions, I ascertain whether flextime enables women to remain employed when they have young children. Further, I determine whether flextime thereby reduces the earnings penalty associated with non-employment due to child care responsibilities.

These questions are relevant for two reasons. First, women now constitute just under half of the US labor force and over a third of working women have dependent children. More than half of mothers working full-time have flextime. Second, a growing literature has documented the importance of fertility-related career interruptions in explaining the *gender* wage gap and, accordingly, has refocused attention on the *motherhood* wage gap.

Flextime allows employees to choose start and end times, often from a prescribed menu, around "core" work hours or days. Based on this definition, flextime is related to but does *not* simply proxy for variation in hours of work. To illustrate this point, I use the Current Population Survey (CPS), a cross-sectional survey that adopts this definition of flextime and also reports detailed information on a worker's occupation and hours of work per week. The CPS reveals that around 35 per cent of workers have flextime. The data show a U-shaped distribution of flextime over hours, as shown in Figure 2, with those working both more and fewer than 40 hours more likely to have flextime. In addition, while the share of workers with flextime varies across occupations and industries, suggesting a link to the employers' production technology, we observe a great deal of within-occupation and within-industry variation.[1]

More detailed information on correlates of flextime can be obtained from the National Longitudinal Survey of Youth 1979 (NLSY79), a longitudinal survey which also gathers information on flextime. Among married women with children, flextime is significantly more prevalent among those with infants. Moreover, labor supply transitions around births appear related to flextime. For example, Table 1 shows that among married women working full-time before the birth of their first child, those *without* flextime in their pre-birth job are significantly more likely to stay at home following the birth than those with flextime in their pre-birth job. This also holds true at 1, 2, 3 and 4 years after the birth. Even after controlling for subsequent fertility and observable skill, this gap persists and remains significant on the first birth at 1, 3 and 4 years after the birth. Finally, as I show in Section 2.3, there is evidence of anticipatory sorting by women into flextime according to subsequent fertility. That is, the data show a significantly higher probability of transitions into jobs with flextime before, as opposed to following, the first birth. Taken together these empirical facts suggest that flextime is a facet of jobs that needs to be carefully accounted for if we want to understand the pace at which women return to work after a birth.

Therefore, to assess the importance of flextime in reducing fertility-related career interruptions, I propose and estimate a partial equilibrium dynamic discrete choice model of fertility and labor supply. I model the decision problem of a married or cohabiting woman, starting at the onset of her marriage

[1] In two forthcoming papers I provide a detailed descriptive analysis of work schedule flexibility using a range of US data sources. Using the Work Schedule supplements to the CPS I examine the characteristics of employees and jobs with flextime. I combine the rich data on schedules from the CPS with data from the Occupational Information Network (O*Net) database and task measures from the Dictionary of Occupational Titles to build a more comprehensive description of occupational characteristics that might be expected to be more compatible with flextime. In the second paper, I use the American Time Use Survey (ATUS) to study how workers with flextime use their time, focusing in particular on time spent on activities with children.

or cohabitation. I assume that the woman makes decisions on a quarterly frequency in order to best capture labor supply dynamics around births. The woman's preferences are defined over consumption, the number of children, hours of work, and flextime. Her labor supply choices are made conditional on receipts of job offers where a job is characterized by its hours of work, its hourly wage rate, and whether it offers flextime. Specifically, hours offers can be part-time or full-time, and full-time jobs may or may not feature the flextime amenity. Job offers arrive both on and off the job and arrival rates vary conditional on whether the woman is currently employed or not. I incorporate search frictions to allow for the observed anticipatory sorting of women into flextime according to subsequent fertility. Without these frictions, we should expect to observe women switching freely into a job with the desired hours or flextime only when it becomes desirable.

Wage dispersion arises due to differences in human capital, including actual experience, the quality of the job match, and wage differentials across hours and flextime for given human capital. The model features dynamic experience accumulation and I allow non-linearities in the effect of recent and more distant career interruptions on the wage. In addition, I assume part-time hours contribute to experience at half the pace of full-time hours experience. Given search frictions, the wage differentials between jobs across hours and flextime are not pure compensating differentials. Rather, the differentials arise both from preference heterogeneity for flextime and part-time hours as well as from equilibrium firm behavior. In an environment characterized by search frictions, wage posting and firm heterogeneity in the cost of supplying an amenity, Hwang, Mortensen, and Reed (1998) show that firms with lower costs will increase their profits, reduce turnover and increase the size of their labor force, by offering both higher wages and the amenity. As a result, the magnitude and even the sign of the differential in the wage offer associated with flextime cannot be predicted a priori but remains an empirical question.

The model-based approach provides important insights into the role of flextime in the interrelated dynamics of labor supply, experience accumulation, and fertility. First, the model allows us to understand the dynamic selection of women into jobs by hours and flextime status. Second, the model allows for unobserved permanent preference heterogeneity. Third, the estimated wages control for the bias arising from the dynamic selection into work due to endogenous experience accumulation and the impact of search frictions for jobs with and without the flextime amenity. Fourth, I use the estimated model for counterfactual policy analysis. Specifically, I compare the welfare, employment, and earnings effects of four counterfactual scenarios in which: (i) flextime is unavailable; (ii) a mandate to make flextime available while children are under 2 years of age assuming firms make no wage adjustment; (iii) a mandate to make flextime available while children are under 2 years of age incorporating a reasonable guess for a downward adjustment in wages, using the model estimates of willingness to pay to bound the wage adjustment; and (iv) a mandate allowing women with children under 2 years of age to choose between full-time hours with flextime and part-time hours assuming no wage adjustment. Scenario (iv) is designed to nest scenario (ii) in order to best compare the welfare effects of part-time and flextime. In each case I calculate the compensating variation and thus the unconditional cash transfer needed to provide the same welfare improvement.[2]

The main findings can be summarized as follows. First, flextime is preferred to full-time work without flextime by women with at least one infant child or with at least two children of any age. For these women

[2] An investigation of the joint impact of flextime and maternity leave policies is left for future research.

I estimate a small, positive and significant willingness to pay for flextime of between \$100 and \$200 or equivalently 2-3% of quarterly full-time earnings for a 'typical' woman in the sample. Flextime is found to be more valuable to women as their number of children increases and is more highly valued by women with infant children than without. Part-time jobs are preferred to full-time jobs with and without flextime, and deliver roughly \$1900 more utility per quarter than a full-time job without flextime for women with no children. As the number of children increases and if she has any infant children part-time hours are increasingly strongly preferred to full-time work with and without flextime. Second, despite the estimated positive willingness to pay for flextime among women with two or more children, I estimate a positive differential in the wage offer for full-time jobs with versus without flextime of around 14%. Third, despite the positive wage differential and the positive willingness to pay among many mothers, we observe roughly even shares of women working in each of these kinds of full-time jobs. Thus, it must be the case that jobs with flextime are relatively scarce. Indeed, the estimates suggest that this is the case: only around 17% of offers are for full-time jobs with flextime. In contrast, roughly 30% of offers received are for part-time jobs.

The counterfactual policy scenarios reveal that welfare would increase modestly if all full-time jobs offered to women with infant children provided flextime. Under this scenario, fertility by age 40 would be largely unaffected while full-time equivalent experience accumulated by age 40 would increase by one quarter of a year. The additional experience is accumulated as women re-allocate their quarters spent in employment from part-time jobs into full-time jobs with flextime. As a result women's potential wages at age 40 increase by 0.5%. Realized earnings between marriage and age 40 rise by 6.0%. The compensating variation associated with the welfare improvement from the higher earnings and consumption as well as from the reduced disutility of work for women with young children is roughly \$4,000, equivalent to 20% of annual full-time earnings. A policy to make part-time hours as well as flextime available to women with young children generates only a small additional welfare improvement.

The rest of the paper is organized as follows. I begin with a brief review of the related literature and detail my contribution. Section 2 describes the data and results from reduced form analysis in support of the model. Section 3 details the model. Solution of the model, estimation and identification are discussed in Section 4. Section 5 presents the results and model fit while the results from the counterfactual scenarios are discussed in Section 6. Section 7 concludes.

1.1 Related literature and contribution

While the gender wage gap has narrowed over recent decades, Waldfogel (1998) redirects our attention to the family or motherhood wage gap that remains. Indeed, a growing literature has documented the importance of fertility-related career interruptions in explaining this remaining wage gap. This literature also shows that more family-friendly jobs and occupations are associated with shorter career interruptions and smaller career costs of children. For example, Goldin and Katz (2008) and Leber Herr and Wolfram (2009) study Harvard University alumnae. Goldin and Katz (2008) find that physicians have the briefest non-employment spells after having a child with the smallest wage penalty for the lost experience. In contrast, those with MBAs took the greatest amount of time off for family reasons with the largest wage penalty (after normalizing the length of the non-work spells). Leber Herr and Wolfram (2009) develop an indicator for the flexibility of an occupation using information on the share of women working part-time as well as external rankings of particular firms' family friendliness. They find that those in a more flexible job before they had children are around 5 percentage points more likely to remain in work after motherhood. Goldin and Katz (2011) explore a larger number of highly paid occupations and document that business occupations penalize job interruptions the most and technology occupations the least. Glass and Riley (1998) study a small sample of US mothers and find that postpartum job attrition and turnover is lower if women can avoid mandatory overtime on their return to work and to a lesser extent if they have some schedule control. Bertrand, Goldin, and Katz (2009) examine University of Chicago MBA graduates' careers in more detail and similarly trace the gender gap in career outcomes and earnings to the presence of children and associated career discontinuities and shorter work hours. Adda, Dustmann, and Stevens (2011) also trace the impact of career interruptions and fertility outcomes on wage gaps using German data. They show that around three-quarters of the career cost of children is due to women's lower labor supply. The remainder is due to the wage costs of skill atrophy while not employed and to wage differences across occupations where women self-select into these occupations with their future fertility plans in mind.

A related literature considers the labor supply and wage effects of specific family-friendly work amenities. The majority of this literature studies maternity leave policies. One recent study, Lalive, Schlosser, Steinhauer, and Zweimüller (2011), shows that maternity leave job protection and cash benefits have little effect on wages but increase the medium-run labor market attachment of mothers in Austria. Rossin-Slater, Ruhm, and Waldfogel (2011) examine a new paid family leave policy in California and find that the policy increased the usual weekly work hours of employed mothers of one-to-three year-old children. Recent papers have considered other amenities. Felfe (2009) studies German women's marginal willingness to pay for a working schedule that is compatible with available childcare, namely evening or rotation shift-work. She finds that mothers are willing to give up between 36-56% of their wage for the more compatible working schedule. Flabbi and Moro (2012) consider US women's marginal willingness to pay for part-time hours in an equilibrium search model. Their estimates suggest that just over one-third of women place a small, positive value on the flexibility that part-time hours provide and that women with a college degree value those part-time hours more than women with only a high school degree. Oettinger (2011) explores the expansion in home-based work and declines in the associated wage penalty in the US between 1980 and 2000 linking it to a decline in the cost of providing home-based work arrangements as the use of information technology has proliferated.

Meanwhile, there is only a small descriptive literature examining flextime directly. Golden (2001, 2008) documents the uneven distribution of flextime across gender, race and education using the CPS. Lesser skilled workers and disadvantaged demographic groups are less likely to have flextime while workers with non-standard schedules and working long full-time hours are more likely to have flextime. Among women, those with pre-schooled age children are slightly more likely to have flextime. Weeden (2005) also uses the CPS and examines the relationship between wages and flextime. She finds a wage premium for jobs with flextime even when using previous wages to control for unobserved skill. This wage premium is largest in non-manual occupations and is slightly larger for women. However, she finds little evidence to suggest that parental status affects the wage premium. Comfort, Johnson, and Wallace (2003) use the Canadian Workplace and Employee Survey (WES) and find similar patterns in the characteristics of workers that have flextime. The WES also has information on absences from work and they find that workers with flextime use fewer sick days suggesting one possible productivity benefit to firms from providing flextime.

The current paper makes four main contributions to the above literature. First, I contribute to the growing literature on fertility-related career interruptions. Of those closest in spirit to mine, Goldin and Katz (2008, 2011) and Adda, Dustmann, and Stevens (2011) use an ex-post classification of jobs or occupations as more or less family-friendly based on the average career interruptions or skill atrophy experienced by women in those jobs or occupations. Instead, I take a different approach and use self-reported data on flextime. That is, I employ direct information on whether a specific family-friendly amenity, namely flextime, is available to the worker. Second, I use a representative sample drawn from the NLSY79. Goldin and Katz use samples drawn from the upper end of the education distribution while Adda, Dustmann, and Stevens focus on women that at age 10 were tracked into the low to intermediate non-academic classes. Third, this study contributes to the literature on family-friendly work arrangements. As noted above, this literature has largely focused on maternity or parental leave. Flextime has received little attention in the economics literature, the exception being descriptive analyses as discussed above. I go beyond describing who has flextime and their wages, to uncover its availability and unbiased estimates of the willingness to pay for flextime. In addition, in contrast to parental leave, flextime is a job amenity that will remain relevant for working parents across many years of their children's lives. Fourth, the study contributes to the literature taking a structural approach to the study of fertility and female labor supply in a dynamic context, originated by Eckstein and Wolpin (1989). More recently, Francesconi (2002) has endogenized fertility and allowed for part-time and full-time hours and Adda, Dustmann, and Stevens (2011) have added an occupational choice and search frictions. Like Adda, Dustmann, and Stevens, I incorporate search frictions. However, rather than using occupation to classify how family-friendly a job is, I explicitly add a dimension of worker choice over the structure of hours, flextime.

2 Data and descriptive evidence

I draw a sample of women from the NLSY79, a longitudinal nationally representative survey which also gathers information on flextime for respondents' jobs. The survey samples a cohort of women born between 1957-1964.[3] I select a sample of 1974 married or cohabiting women in their first relationship that lasts for at least 2 years and create a quarterly calendar of their employment, wages and fertility behavior starting at the onset of marriage or cohabitation. Single women are excluded as their labor supply and fertility decisions will be different from those of married women. I include women with up to 4 children noting that of the NLSY79 representative sample, fewer than 4% of women have a fifth child. Appendix A provides more detail on the sample selection.

The NLSY79 has asked respondents whether their employer makes flexible hours or a flexible work schedule available to them from 1989 with regards to the first job and from 1994 about up to 5 jobs held. I use responses to this question in the estimation of the model. The model will thus treat flexibility as a discrete characteristic of a job - either the job has flexibility or it does not. Regrettably, this question does not capture a number of nuances in the extent of schedule flexibility that the respondent enjoys.

[3]For further details on the NLSY79 please refer to http://www.nlsinfo.org/nlsy79/docs/79html/tableofcontents.html.

For example, we do not have detailed information on how often she uses flextime, how much control the manager retains over when and how often flextime is used, or whether the flextime allows small or large changes to which hours of the day or week that she works. To my knowledge no representative dataset contains this level of detailed information.

In the remainder of this section I present descriptive evidence on flextime from the NLSY79. After briefly describing some key summary statistics, I explore the observed correlations between labor supply and fertility behavior, focusing on the role that flextime may play in women's choices. I then present evidence that suggests that jobs with flextime may be in limited supply and examine the associations between wages and flextime.

2.1 Sample summary statistics

Tables 2 and 3 present basic summary statistics on the sample used in estimation. We observe that on average women marry or begin to cohabit at roughly 23 years of age. On average, they wait around 2.5 years before having their first birth and have 1.5 children while in the sample. They have 13.9 years of education and while in the sample hold an average of 6.9 jobs in 52 quarters, accumulating 27 quarters of full-time experience and 10 quarters of part-time experience. When employed, these women work an average of 36 hours per week over all quarters in work, 20 hours if part-time, and 41 hours if full-time with or without flextime. Average hourly wages are \$11.90 across quarters in work, \$12.50 when working part-time, \$15.10 in full-time jobs with flextime and \$11.70 in full-time jobs without flextime.

2.2 Flextime and fertility

Table 4 presents the percentages of person-quarters in which the sample of married women are not employed (at home) and employed in each of the discrete labor supply choice options. It also shows the percentages of person-quarters in each labor supply choice by fertility. We observe the expected increase in the share at home as fertility rises. As the number of children increases to three, part-time employment rises and full-time employment falls. Among women-quarters in full-time hours, women are significantly more likely to have flextime across all numbers of children and whether or not she has any infant children. With controls for education, race, AFQT, husband's income and year dummies, among women working full-time hours, only those with 2 children are slightly more likely to have flextime (using either a fixed effects regression with clustered standard errors). Significant differences by fertility in the probability of work and the probability full-time vs part-time work remain for women across all numbers of children. However, these simple associations do not incorporate the effects of the potentially constrained supply of jobs with flextime or part-time hours or the dynamic selection of women into jobs more easily combined with child rearing responsibilities.

In contrast, the data do suggest that flextime is a job characteristic that is significantly related to job transitions around births and the pace at which women return to work after a birth. The two panels of Table 1 show the proportion of women (with one or more children, and with two or more children respectively) who returned to work within the first 6 months following a birth given they worked part-time, full-time with schedule flexibility or full-time without flexibility, prior to the birth of their first and second child. Note that a larger share of women previously in non-flexible full-time work stay at home following the birth than among those previously in flexible full-time work. I also find that this differential persists in the years following both the first and second births. Notice also that women previously in part-time work are most likely to be at home following a birth possibly suggesting a weaker attachment to the labor force given that part-time hours should be most easily combined with child-rearing.[4]

To assess whether the differentials in work probabilities seen after the birth in Table 1 are significant (both with and without controls for observables) I use linear probability models of the form:

$$Y_i = \beta_1(\text{pre-birth FT-Non-Flex})_i + \beta_2(\text{pre-birth FT-Flex})_i + \beta_3(\text{pre-birth PT})_i + \boldsymbol{\beta}_4 X_i + \boldsymbol{\beta}_5 Z_i + \epsilon_i.$$

Y_i is a dummy for being at home 1, 2, 3 or 4 years after a birth, for the ith mother. The regressors of interest are dummies for the work choice prior to the birth (part-time (PT), full-time flexible (FT-Flex) and full-time non-flexible (FT-Non-Flex) where the omitted category is being at home prior to birth). I add controls for her characteristics (X_i) and for a set of job characteristics (Z_i).[5] Table 5 presents results for the specifications for being at home one year after the first and second births.

I find that the probability of being at home a year after the first and second birth is significantly lower if the woman worked prior to the birth, as opposed to being at home. More importantly, in line with Table 1, those previously in full-time flexible work are the least likely to be at home one, two, three or four years after the birth, both with and without covariates.[6] This may suggest that work is easier with a child if the work schedule is flexible or that there is a greater attachment to the labor force among those in flexible work. At one through four years after the birth, the difference between the coefficients on part-time and full-time flexible work prior to the birth is significant at the 1% level for both birth 1 and birth 2 in the specification with no covariates. Following the first birth, when it is likely easier to work than after having a second child, I find that the differences between the coefficients on full-time flexible and non-flexible work prior to the birth are significant at the 5% level or better for one, three and four years after the birth both with and without covariates.

Further analysis (not shown here) indicates that the number of quarters spent at home in either the fourth and fifth years, sixth and seventh, or eight and ninth years after the first and second births produces the same pattern of results. That is, women in full-time hours jobs with flextime prior to the birth spend fewer quarters at home in the years following the birth than do those women who were in full-time hours jobs *without* flextime prior to the birth.

The data also reveal differences in the job-to-job transitions of women who never become mothers in the sample period and of mothers, both before and after the birth of their first child (see Figure 3). These job transitions show that just as non-mothers are more likely to work full-time, they are significantly more likely to transition into full-time work (39% and 45% of those who change jobs, change hours or change flexibility over any 2 quarter period start a full-time non-flextime or full-time with flextime job, respectively) than into part-time hours (16%). Considering women who subsequently become mothers, we observe that transitions into part-time hours jobs become more prevalent as we look across time from the three years before the birth to the five years following the first birth. Transitions to part-time hours

[4]Married men do not show the same labor supply patterns around the births of their children.

[5]X_i includes her age at the birth, her education (and its square), her AFQT (and its square), race, birthdate (in quarters), her actual experience prior to the birth and her spouse's education and income. Z_i includes categorical dummies for industry and occupation (major categories) of her pre-birth job, as well as a dummy for whether she had maternity leave in that job.

[6]Results for two, three or four years after the birth are not presented in the table but are available on request from the author.

increase from 22% to 28% of transitions, a statistically significant increase. At the same time we see that mothers are significantly more likely to switch into a job with flextime than into a full-time job without flextime. Furthermore, for mothers we observe that transitions into jobs with flextime are more prevalent in the 3 years prior to the first birth than following the birth. I discuss this finding further below as it suggests anticipatory sorting into jobs with flextime before births.

The descriptive evidence presented above suggests that there is an association between schedule flexibility at work and the work choices women and recent mothers make. Arguably, flextime is a facet of jobs that needs to be accounted for if we want to understand the pace at which women return to work after a birth. Importantly, the analysis so far is only suggestive of a role for flextime. Flextime may have a causal impact on the patterns of behavior discernible in the data but the patterns may also be the result of selection according to unobserved preferences. An assessment of the causal impact of flextime on career interruptions requires that I disentangle the effects of these two influences on behavior. The structural model estimates allow such an analysis.

2.3 Flextime, wages and job search

Given that schedule flexibility is a good, there must be either a wage cost incurred for flexibility or a constrained supply of flexible schedule jobs or both. Otherwise we should expect to see all agents in flexible schedule jobs. In contrast, the data show that roughly half of married or cohabiting women working full-time in 1994 report that they do *not* have a flexible schedule. For married men the share is 55%. Below, I present evidence that suggests there may be a constrained supply of flexible schedule jobs. I then explore the relationship between wages and flextime in the data and discuss potential sources of bias in the reduced form estimates of the marginal willingness to pay for the flextime amenity.

Evidence for future mothers sorting into jobs with flextime in anticipation of a birth would support a hypothesis of a constrained supply of flexible jobs. If it is hard to find or arrange a flexible schedule job when you need it, women likely to have a child could be expected to move into flexible schedule jobs in preparation for the arrival of the child.

Table 6 shows the results from regressing an indicator for a change into full-time flexible work (from full-time non-flexible work, part-time work or from non-employment) on an indicator for whether the quarter is in the three years prior to either the first birth or the second birth. I include controls for years of education, a full-set of age (in years) dummies and a full set of dummies for each of the years following the birth to ensure that the variable of interest is not picking up any non-linear patterns in work changes associated with age or time. We see that women are significantly more likely to change into a flexible job in the lead up to either the first or second birth than in the years following that birth. The predicted probability of starting a job with flextime at the sample means increases to 6.1% from 2.2% and to 3.7% from 1.9% in the three years leading up to the first and second births respectively.

The data show that women and the sub-sample of mothers with flextime tend to have higher wages and higher wage residuals controlling for observable skill (Table 7, columns 1 and 2). However, there are a number of sources of bias in this estimate of the flextime wage differential. First, heterogeneity across women in unobserved skills and in unearned incomes may be positively correlated with the wage and can be expected to induce an upward bias in these estimates. Second, the distribution of firm costs of providing flextime will also affect the observed wage differentials.[7] In addition, Hwang, Mortensen, and Reed (1998) show that with labor market search frictions and cost heterogeneity across firms, firms may find it profit maximizing to offer jobs comprising both higher wages and the amenity. Their model shows that any wage differential between jobs with and without flextime is not a pure compensating differential but is instead a function of preferences, firm costs *and* search parameters.

As noted, a woman with high unobserved productivity will likely be earning a high wage and will be more likely to be offered flexibility at work in order for the firm to retain her skills. Indeed, in a regression with person-fixed effects (Table 7, column 3) to control for unobserved heterogeneity in productivity and preferences, we observe that the coefficient on flexibility is smaller by a factor of 5 although it remains significant and positive.[8]

These wage differential estimates control for unobserved worker heterogeneity but do not incorporate a role for search frictions and so are unlikely to provide an unbiased estimate of the marginal willingness to pay for flextime. The true marginal willingness to pay for flextime may be larger or smaller than these estimates. Indeed, the structural dynamic model estimated in this paper incorporates search frictions and finds that offered wages in jobs with flextime are 14% higher than those in jobs without flextime and that the estimated preference for a job with flextime relative to one without flextime ranges from –18% to 33% (of quarterly full time earnings) depending on a woman's number of children and in particular, infant children.

3 A model of fertility, labor supply and schedule flexibility

The model describes the sequential decision problem of a married or cohabiting woman starting at the onset of her marriage or cohabitation.[9] The model is partial equilibrium and time is discrete. In order to best capture labor supply dynamics around births, the woman makes decisions on a quarterly frequency.[10] The woman's preferences are defined over consumption, the number of children, hours of work, and flextime. Each quarter she makes a conception choice and a labor supply choice, subject to technological constraints. Her labor supply choices are made conditional on receipts of job offers where a job is characterized by its hours of work, availability of flextime, and an hourly wage rate. Specifically, hours offers can be part-time or full-time and jobs that offer full-time hours may or may not offer the flextime amenity.

Essentially, the model is a standard dynamic discrete choice model of fertility and work (see also Eckstein and Wolpin (1989), Francesconi (2002) and Adda, Dustmann, and Stevens (2011)). To elucidate the role of flextime in decisions I extend the model in three ways. First, full-time jobs with flextime may deliver different utility flows than jobs with part-time hours or full-time jobs without flextime. Second,

[7] Firm side considerations include hours coordination productivity costs (Siow (1990)) and variation in the costs of turnover or absenteeism where schedule flexibility may be offered to retain staff and minimize unexpected absences.

[8] Table 7 also shows equivalent results for men and the sub-sample of fathers. Here we observe that the size of the wage premium for jobs with flextime is smaller in the OLS specifications than for women, perhaps because men have a weaker preference for flextime relative to women and so are less willing to pay for the amenity. Yet, the fixed effects specification reduces the size of the wage premium for jobs with flextime to a magnitude that is very similar to that found for women.

[9] Decision period 1 starts at the beginning of her first marriage or cohabitation that lasts for at least two years. I do not model the marriage decision. The horizon is finite and the last decision period (period T) is the quarter in which the woman is 40 years old.

[10] A longer decision period of an annual frequency would hide preparatory search behavior ahead of a birth as well as differences in the time to return to work.

the wages of flextime jobs are allowed to differ from those of part-time and full-time jobs without flextime. Third, flextime job offers may arrive at a different rate from those of part-time and full-time jobs without flextime.

3.1 Choices and preferences

Each quarter, the woman is assumed to make both a conception choice, indexed by m (for motherhood), and a discrete labor supply choice, indexed by j (for job). Conditional on offers received, her labor supply choice is between full-time hours (more than 30 hours per week) ($j = \text{FT}$), full-time hours with flextime ($j = \text{Flex}$), part-time hours (30 or fewer hours per week) ($j = \text{PT}$) or non-employment ($j = 0$). In principle, a choice of part-time hours with or without flextime is possible however the data did not suggest a flextime split within part-time hours was empirically relevant.

A woman is endowed with preferences over current period consumption (c_t), the number of children (n_t) and leisure. Utility is linear in consumption and I allow for income effects and possible complementarities between consumption and leisure and consumption and the number of children by allowing the utility from consumption to interact with each of the work choices and with the number of children. She may experience disutility from time spent at work which varies by the hours and flextime associated with her current job. If she has children, she may experience additional disutility from hours increasing in the number of children and this additional disutility is allowed to vary over hours and whether she has flextime. To investigate whether flextime is more useful when children are very young, I also allow for additional disutility from work if she has any children under 2 years of age, again allowing the disutility to vary over hours and whether she has flextime. I allow for this additional disutility from work when her child is very young as children likely require more intensive care at that time.[11] To match the empirical spacing of births of roughly 2-3 years between births, I include an indicator variable for being either pregnant while any of her children are under 2 years of age or having 2 children under the age of 2 years. To match the high proportion of women in non-employment when young (likely due to continued education) I allow for additional utility from non-employment when between 16 and 20 years old and between 20 and 23 years old.

I incorporate individual time-varying heterogeneity in preferences that has both a permanent and transitory component. Shocks to preferences (elements of a vector of shocks, ε) are alternative-specific and potentially correlated across choices but uncorrelated over time. These capture random variation in the compatibility between choices, such as that between deciding to have an additional child and working in a full-time job with flextime. Permanent unobserved heterogeneity ($\omega = \{1, 2, 3\}$) enters in preferences for the number of children, for hours and for flextime.[12]

[11] While we might reasonably assume women have preferences over the quality of their children, the data are to rich enough to support separate identification of this channel. Thus, estimates of the utility from the number of children are a reduced form for both the number and quality. Similarly, the interactions between preferences for children and preferences for flextime or fewer hours are reduced forms for the technological role that the flextime or fewer hours play in producing child quality.

[12] While present estimates do not allow for permanent unobserved preference heterogeneity, I am currently estimating the model with 3 unobserved types allowing for correlated preference *and* productivity heterogeneity.

In summary the flow utility function in any period is:[13]

$$u(c, n, \mathrm{FT}, \mathrm{Flex}, \mathrm{PT}; \Omega_0, \varepsilon, \omega) \tag{1}$$

3.2 Technology and constraints

3.2.1 Conception technology

I assume women make a conception decision in each period, except if she is currently pregnant (generating a minimum spacing between births of 3 quarters). Following Adda, Dustmann, and Stevens (2011), if she decides to conceive, a child is born in the next period with a known probability π_{age}, where π_{age} is a function of age to mimic the medically documented decline in fecundity with age. All successful conceptions result in live births 3 quarters later. I also assume that all births are the result of a conception decision, that is, unplanned pregnancies do not occur. While this assumption is clearly a departure from reality, the model can still match the timing of births by capturing the uncertainty over births through the preference shocks - a positive preference shock can imitate an unexpected pregnancy. Last, I assume that maximum fertility is four children and I exclude the possibility of multiple births (twins and triplets).

3.2.2 Budget constraint

Her per-period budget constraint is

$$c_t = (250h_t)w_{j,t} + Y_t^H. \tag{2}$$

Consumption of the composite good, c_t, is equal to husband's earnings plus the current hourly wage multiplied by 250 hours (in a quarter) if she works part-time ($h_t = 1$) and by 500 hours is she works full-time ($h_t = 2$). Without data on specific expenditure (in goods or time) on children, monetary, time and psychic costs will not be distinguishable and so monetary costs are not included in the budget constraint. Instead, the utility from children will be net of costs. Note that the wage is allowed to differ across hours and flexibility, that is, across work choices $j = \{2, 3, 4\}$.

Following much of the literature, I assume a process for her husband's earnings, Y_t^H (see for example, Francesconi (2002), Van Der Klaauw (1996) and Eckstein and Wolpin (1989)). His labor supply is assumed exogenous and he is assumed to participate in the labor market. His earnings process is,

$$Y_t^H = Z_t'\beta + \epsilon_t^H \tag{3}$$

where Z_t' is a vector of a subset of her characteristics. I use a quadratic in her age to capture his movement along the life cycle earnings path, a quadratic in the difference between her age in period t and her age at the start of marriage (or cohabitation if earlier) and a dummy for whether she has a college degree.[14] ϵ_t^H is an idiosyncratic earnings shock. I assume that her husband's earnings, though stochastic, are realized

[13] Appendix B details the exact functional form.

[14] While a dummy for race was found to be significant, I do not allow for differences by race in the initial conditions, Ω_0 or elsewhere in the model and thus I exclude it here also. Non-whites comprise around 15% of the sample and allowing for differences in her husband's earnings, her wage and her preferences by race is left for future work.

only after the woman makes her work and fertility decisions for the period. Thus, given utility is assumed additive in consumption, only expected husband earnings matter for her decisions.

3.2.3 Offer technology

Each quarter, the woman makes her labor supply choice conditional on receipt of a job offer. Job offers arrive both on and off the job and arrival rates vary conditional on whether the woman is currently employed or not. If she is not currently employed she will receive an offer with probability λ_0, $0 < \lambda_0 < 1$, and if she is currently employed, she receives an offer for a new job with probability λ_E (E for employed), $0 < \lambda_E < 1$.

Given receipt of a job offer, the offer will be for a job characterized by its hours of work, availability of flextime, and an hourly wage rate. Hours offers can be part-time or full-time and jobs that offer full-time hours may or may not feature the flextime amenity. Thus, with probability λ_{FT} the job offered will entail full-time hours but no flextime, with probability λ_{Flex} the job will entail full-time hours and flextime and with probability $(1 - \lambda_{\text{FT}} - \lambda_{\text{Flex}})$ the job will entail part-time hours. Naturally, $0 < \lambda_{\text{FT}} + \lambda_{\text{Flex}} < 1$.

Each offer will also have an associated match quality ν that operates as a mean-shift in the hourly wage rate. This match quality is treated as part of the job and persists as long as the woman remains in that job. It is used to capture the idea that if a particular job is a good match and thus has a high wage, the woman is more likely to remain in that job all else equal.

If employed, she may always opt to remain in her current job. All exits are assumed to be quits.

3.2.4 Wage function

The offered wage for job k is:

$$\ln w_{kt} = \boldsymbol{\theta}'\text{HC}_t + \phi_1\text{Flex}_k + \phi_2\text{FT}_k + \nu_k + \varepsilon_t^w \tag{4}$$

That is, wage dispersion arises due to: (i) differences in human capital, including actual experience and an individual-specific productivity type; (ii) a match quality term, ν_k; and (iii) wage differentials across hours and flextime for given human capital. Flex_k and FT_k are dummy variables that indicate the hours-flexibility status of her current job, with part-time work left as the omitted category. ε_t^w is an idiosyncratic shock to period t wages realized only after the period t decision is made.

3.2.5 Human capital

Her human capital evolves over time according to:

$$\boldsymbol{\theta}'\text{HC}_t = \mu_0^\omega + \theta_1\text{Age at marriage}_t + \theta_2\text{educ}_t + \theta_3\text{AFQT} + \phi_3 X_t^q + \phi_4 X_t^Y \tag{5}$$

Human capital is a function of her age at marriage (to proxy for experience accumulated prior to marriage) and accumulated actual experience, which is captured using recent quarters of participation, X_t^q, and the stock of less recent experience, X_t^Y. I discuss the details of this specification of experience immediately below. Her human capital is also a function of her permanent characteristics, namely her

AFQT score, her education and mean productivity, μ_0^{ω}.[15]

I use two variables, X_t^Y and X_t^q, to capture accumulated actual experience. X_t^q counts the number of quarters in work during the most recent year and X_t^Y counts complete years of experience up to, but not including, the most recent year. This approach allows non-linearities in the effect of recent and more distant career interruptions on the wage. X_t^q allows identification of the costs of recent time out of the labor force which is advantageous given my focus on work transitions around the time of the birth. X_t^Y, capturing total years of accumulated full-time or equivalent experience, abstracts from the differences in experience between women that took similar amounts of time off work in the distant past.[16] Blau and Kahn (2011) show the importance of tracking full-time and part-time experience when assessing wage returns to women's on the job human capital accumulation. Therefore, part-time experience is assumed to add to complete years of full-time or equivalent experience at half the rate of full-time experience.

3.3 State space

Each woman is characterized by a vector of initial conditions, Ω_0. Included are her age at marriage or cohabitation, her education, her AFQT score, her labor supply choice in the period before she marries or begins cohabiting, and her permanent individual-specific component, ω. That is,

$$\Omega_0 = (\text{Age at marriage}, \text{Educ}, \text{AFQT}, j_0, \omega)$$

In any decision period, the woman's state space is denoted by Ω_t. It comprises her initial conditions, her period t preference shocks $\boldsymbol{\varepsilon}_t$ and her time-varying predetermined state space variables. These are the age of her four children (each from pre-conception to 9 quarters of age) at the start of the current quarter, her labor supply choice in the previous quarter j_{t-1}, her match quality in the job in the previous quarter if employed ν_{t-1}[17], and her accumulated experience from marriage or cohabitation up to the start of the current period. The experience state space variables are X_t^q and X_t^Y, as well as 4 additional state variables that are required to increment experience. These are indicators for the 3 previous quarters of participation in h_{t-2}, h_{t-3} and h_{t-4} and a counter for the number of quarters of experience in the most recent year in Z_t. All of these predetermined state variables evolve endogenously, that is, are the results of prior labor supply and conception choices. Thus we have:

$$\Omega_t = \left(\Omega_0, \boldsymbol{\varepsilon}_t, \text{kid}^1\text{age}_t, \text{kid}^2\text{age}_t, \text{kid}^3\text{age}_t, \text{kid}^4\text{age}_t, j_{t-1}, \nu_{t-1}, X_t^q, h_{t-2}, h_{t-3}, h_{t-4}, X_t^Y, Z_t\right)$$

Evolution of the state vector is detailed in Appendix B.2.

3.3.1 Shocks

At the beginning of each quarter before making her decision each woman realizes a vector, $\boldsymbol{\varepsilon}_t = \{\varepsilon_t^{m,j}\}_{m\in M, j\in J}$, of preference shocks. These shocks are alternative-specific and serially uncorrelated over time. The shocks may be correlated across choices.

[15]Current estimates do not allow for unobserved permanent type heterogeneity in μ_0. I am currently estimating the model with 3 unobserved types allowing for correlated preference *and* productivity heterogeneity.

[16]Gayle and Miller (2006) find that recent work experience is more valuable than more distant experience.

[17]For simplicity, I assume that at marriage or cohabitation each woman who was working was in a job with the lowest match quality.

3.3.2 Unobserved permanent preference and productivity heterogeneity

There are permanent components in preferences for children, hours and flexibility and in labor market productivity, μ_0. These are collected in the vector ω. This heterogeneity is incorporated following Heckman and Singer (1984) using discrete mass points. The mass points and their probabilities are estimated.

3.4 Decision problem

3.4.1 Decision periods prior to the last

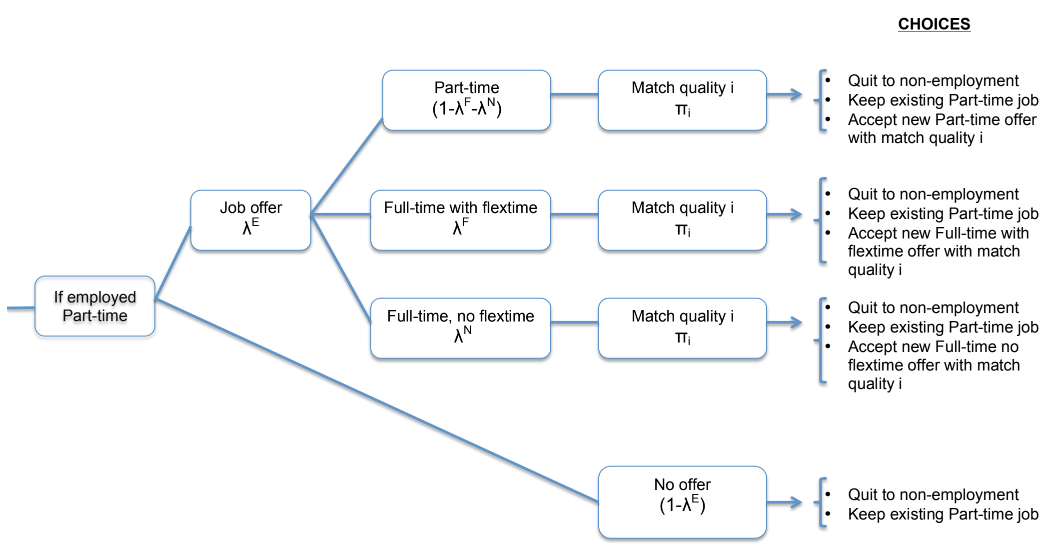
Taking the above preferences, technologies and constraints, the woman's problem can be represented as a recursive problem. In each quarter, conditional on the state vector the woman makes a joint work and conception choice to maximize the sum of her current flow utility and her discounted expected future utility value. That is,

$$V_t(\Omega_t) = \max_{j \in J, m \in M} U_t^{j,m}(\Omega_t) + \beta \mathbb{E}\left[V_{t+1}(\Omega_{t+1}) | \Omega_t, d_t^{j,m}\right] \tag{6}$$

$d_t^{j,m}$ is an indicator equal to 1 if choices j and m are made in period t. Recall that $j = 1, \ldots, 4$ indexes the employment choices and $m = 0, 1$ indexes the $m$otherhood or conception choice. The expectation is taken over future shocks and is conditional on current state vector and choices. β is the discount rate.

Appendix B presents a full description of the formal model. Here, I describe, as an example, the expected future value calculations a woman makes if she chooses part-time employment in the current quarter. Figure 1 shows the structure of her choices conditional on the offers received.

Figure 1: Future labor supply choices available given the offer structure and part-time employment in the current period



For example, taking the uppermost branch, if with probability λ_E she receives a job offer, then with probability $(1 - \lambda_F - \lambda_N)$ the offer is for a job with part-time hours, and with probability π_i (for $i = 1, \ldots, 5$) it is an offer for a job with match quality ν_i. Thus, to form the expected future value for the uppermost branch, she compares the value from quitting into non-employment, keeping the part-time job she has in period t, or accepting the newly offered part-time job. Thus, when calculating $(V_{t+1}(\Omega_{t+1})|\Omega_t, d_t^{PT,m})$, she must calculate the expected value of each of the listed choices on the far right-hand side of the figure and then take the offer probability weighted average of the highest value choice from each branch of the tree. In addition, if she is not pregnant in t and does not choose to conceive in period t, her expected future value calculations also compare the value of conceiving or not in $t+1$.

3.4.2 Final decision period and terminal value function approximation

I assume period T corresponds to age 40 for the women in the model. I choose to set the final decision period at age 40 years because the model is designed to explore and capture the behavior of women at and in the few years after birth.

In period T women make their final decisions on labor supply and fertility. I assume that from age 40 women are no longer fecund, but that they will work until age 60 at which point I assume they retire. Then, the value in T can be captured as:

$$V_T^{j,m}(\Omega_T) = U_T^{j,m}(\Omega_T) + \sum_{\tau=s}^{60} \beta^{\tau-s} \mathbb{E}\widetilde{V}_{T+1}(\Omega_{T+1}|\Omega_T, d_T^{j,m=0}) \tag{7}$$

for $\tau = 40, ..., 60$ years of age.

It is important for the question of interest that I am able to assess the medium-term experience effects of her work choices during this prime fertility age when the expected conflicts between work time and home production time are likely greatest. That is, has schedule flexibility reduced the extent of skill depreciation by reducing the time out of the labor force? How has schedule flexibility affected their medium run earnings potential? The approximation for the terminal value function, that is, how to form the continuation value $\widetilde{V}_{T+1}$, is chosen with these questions in mind. Namely, it incorporates the impact of lost work experience accumulation at these young ages on the future potential wage. I discuss the precise approximation adopted in Appendix B.1.

4 Solution and estimation of the model

4.1 Model solution

The model is solved by backward recursion from the final decision period, T, to the age at marriage. I use Monte Carlo integration to integrate out the initial conditions, Ω_0.[18] Similarly, in solving the model the preference shocks in future values are integrated out. Because the state space is large, I use state space interpolation in the model solution.[19]

[18] The dimension of Ω_0 is 59 resulting from interacting 4 possible ages at marriage, 2 education groups (<16 years and 16 or more years), 2 AFQT groups (above and below the sample median) and 4 work choices in the quarter before marriage. The dimension increases to 177 when I allow for three preference types.

[19] I solve the model at a random selection of state space points and use linear regressions to form predictions for the interpolated Emax values. The linear interpolation regression has quadratics in the state space variables on the right hand side (a cubic induced too much multicollinearity). I interpolate for model periods 8 and above. When interpolating, the percentage of state space points at which I actually solve the model ranges from 0.07-3% (corresponding to between 9750

4.1.1 Jobs and wages

When solving the the model, ideally I would treat the match quality in the wage, ν, as an idiosyncratic shock with a continuous support. However, to do so would introduce a continuous state variable. Thus, as a computationally practical alternative, I assume ν is distributed as a discretized normal $N(\mu_\nu, \sigma_\nu^2)$ with five points of support. Each of the five points of support for ν, $\nu_1, \ldots, \nu_5$ (where ν_5 is the highest match quality) has an associated probability, $\pi_1, \ldots, \pi_5$. Following Kennan (2006), the best discrete n-point approximation has equally weighted support points, thus the support points and probabilities do not need to be estimated. Using a normalization of $\mu_\nu = 0$, the only parameter that needs be estimated for ν is σ_ν^2.

A woman in the model remains in her job k so long as her hours and flexibility status do not change and so long as she does not accept a new wage offer. Thus, she retains her draw of match quality ν_k for as long as she remains in job k. Empirically, I will infer that her job will have changed if the job identification number changes or if she changes hours or flextime status.

Under the timing assumption that the idiosyncratic wage shock is only realized after decisions are made, I add this shock $\varepsilon_t^w \sim \log N(0, \sigma_{\epsilon^H})$ to log wages after solving the model, that is, when estimating the model parameters. σ_{ε^w} must be estimated.

4.1.2 Husband's earnings

As noted in Section 3.2.2, her husband's earnings are realized only after the woman makes her work and fertility decisions for the period. Thus, given the utility function is additive in consumption, only her expectation of her husband's earnings matters for her decisions. Thus, when solving the model I can estimate the β parameters for his earnings outside the model and assume that women form their expectations regarding their spouse's earnings according to this process, that is, using $\bar{Y}_t^H = Z_t'\hat{\beta}$. Parameter estimates for β can be found in Table 8.[20]

By estimating the process outside of the model and as a function of the woman's characteristics, I also avoid problems arising from missing data on observed husband income. Under the timing assumption that the husband's earnings are only realized after decisions are made, I add idiosyncratic earnings shocks $\epsilon_t^H \sim \log N(0, \sigma_{\epsilon^H})$ to the predicted earnings after solving the model. σ_{ϵ^H} must be estimated.[21]

4.2 Estimation approach

I estimate the model using simulated method of moments (SMM) and analytical standard errors for the estimates are formed using numerical gradient methods. Further details can be found in Appendix C.

and 2600 points) and the solution takes around 4 minutes for the longest horizon of 96 quarters.

[20] While I also have data on her spouse's educational achievement, including this would add to the state space and as is shown in Table 8, its inclusion indicates that (as expected) education is highly correlated across spouses and adding his education largely results in smaller coefficient estimates on her education.

[21] Given that I estimate her husband's earning process outside the model, there is scope to extend the sample to include single, separated and divorced women (treating the marital decision as exogenous) by allowing for a more flexible non-labor income process.

4.3 Moments

The moments chosen are a set of conditional and unconditional means and standard deviations of key variables. For example, I match the proportions of women in part-time, flextime or full-time work, the proportions of women with 0, 1, 2, 3, or 4 children, the transitions of women across the employment choices, durations in each employment choice, average experience and log wages and average changes in and probabilities of change in wages. Conditioning variables include age, age at marriage, education, AFQT, husband's income, the number of children and the age structure of children (is the youngest an infant). A detailed listing of the moments matched in estimation can be found in Appendix D.

In survey years prior to 1989, the NLSY79 data I am using does not ask the question on schedule flexibility. The model assumes that: (i) λ_{Flex} is constant over calendar time; and (ii) is exogenously missing in pre-1989 data. The first assumption can be addressed in robustness checks by considering differences in behavior under smaller and larger probabilities of flextime offers or by estimating the model separately on the first and last 3 birth cohorts in the data and examining whether there are significant differences in the offer probabilities. The second assumption is not so far-fetched given the question is simply not asked before that year in the survey so the data is missing for an exogenous reason. To deal with the missing data on flextime pre-1989 I can simply adjust the moments I match such that, for any moments related to the labor supply choice I match moments for: (i) the non-employment, part-time, full-time labor supply choice across all years of the sample data and; (ii) the with and without flextime choice within full-time hours using only sample data from 1989 and for women of the appropriate age to these survey years.

The sample of women from the NLSY includes women that divorce prior to age 40 and women that attrit from the survey prior to age 40. I do not model the attrition or divorce. Under the assumptions of the model, the attrition and divorce is random and uncorrelated with behavior captured in the model. Notice however, that women leave the data sample as they age (due to either attrition or divorce) so a simple solution is to match moments that condition on age.

4.4 Identification

It is not possible to provide a rigorous proof of identification for the parameters of the model. Here I provide intuitive arguments regarding how the parameters are identified. To support the intuitive arguments, I also established identification in a local neighborhood of a selected subset of the parameters via simulation.[22]

In a standard search model with on-the-job search, identification of the offer probabilities λ_H and λ_E, the probability of receiving an offer when non-employed or employed, respectively, as well as the distribution of offered wages is assured with data on durations in non-employment, accepted wages when transitioning out of non-employment, the transition rate of workers across jobs and from work into non-employment. As shown by Flinn and Heckman (1982), a functional form assumption is needed for the distribution of offered wages as we do not observe offered wages below the reservation wage. I assume a log-normal form. For a more detailed discussion see Eckstein and van den Berg (2007).

[22] This procedure entails computation of the moments and criterion function value at and around the estimated parameter values. I then check whether the plots of the resulting simulated moments cross the data moments as I vary the selected parameter value and check the shape of the criterion function in the neighborhood of the selected parameter value. Results of these identification simulations are available on request.

In the model estimated here, there are additional search parameters. Namely, the probability of receiving a flextime or full-time (without flextime) offer conditional on having received a job offer at all in a quarter. With multiple job spells and transitions across types of jobs as well as the accepted wages in these jobs, I identify the offer probabilities for part-time, flextime or full-time jobs. The human capital terms in the wage function can be identified from conditional mean log wages. The coefficients on flextime and full-time (without flextime) are identified from the observed changes in wages associated with changes in hours and flextime within women. The match quality ν_k can be identified from changes in wages across jobs especially those job changes that do not also result in a change in hours or flextime status.

The outcome of the utility function is choices over labor supply and fertility each period. Choices are made conditional on exogenous and predetermined variables including age, age at marriage, education, AFQT, husband's income, the number of children and the age structure of children. Thus, proportions of women by age in each labor supply choice and proportions with a given number of children conditioned on the appropriate exogenous and predetermined variables will identify the parameters of the utility function. Identification of the parameters in the terminal value function is more subtle, but these should be identified from the difference in the effects of the state variables in T and in earlier periods. The distribution of types and the differences in utility parameters by types are likewise identified by the variation in choices and outcomes observed in the data. More specifically, persistent differences in choices made by otherwise observationally identical agents are a likely indication that these agents differ in their unobservable characteristics. Naturally, if the number of unobserved preference types were to approach the number of observations and were allowed to vary with time, the data could be fit perfectly. Discipline is imposed by using a small number of types and requiring the unobserved heterogeneity to be permanent.

5 Results

I begin by discussing the the model's goodness of fit in Section 5.1. I then describe individual parameter estimates. I explore the model's predictions for experience accumulation in Section 5.3.

5.1 Goodness of fit

Estimates are still being refined to further improve the model fit. As shown in Table 14, the fit of the choice distribution does not yet pass statistical tests as we reject the equality of the choice distributions when aggregating across all ages from marriage through to 40 years of age and when aggregating from age 24 years to age 40 years at all conventional levels of statistical significance. In particular, the model over-predicts the probability of conception, the share of women not in work and under-predicts the share of women in full-time work. However, for ages 24 years and older, the model fits the *relative* shares of women in full-time work with and without flextime reasonably well. Table 16 shows the true and predicted transition probability matrix across hours, flextime and in and out of non-employment. The model over-predicts the persistence of non-employment and under-predicts the persistence in full-time work, especially in full-time work without flextime. In contrast, the fit of predicted average wages is reasonable.

5.2 Parameter estimates

Preliminary parameter estimates for the model without permanent unobserved heterogeneity in preferences or productivity are detailed in Tables 9-13 and are discussed here.[23] The estimates are highly significant with the exception of the standard deviation of the measurement error in husband income. The discount factor β is set to an annual factor of 0.95 appropriately adjusted for the quarterly decision period. All dollar amounts reported are in year 2000 dollars.

Direct flow utility from children exhibits diminishing marginal returns in the number of children. The estimates suggest that the first child provides \$775 in flow utility per quarter while two children provide \$190 of flow utility. Subsequent children provide negative direct utility. The estimates also suggest a small substitution effect between the number of children and consumption such that for each additional \$1000 of consumption (or income), the marginal utility of an additional child is -\$4.

The relative disutilities of hours and flextime conform with expectations. The estimates suggest complementarities between leisure (or non-work time more generally) and consumption. Part-time hours inflict the smallest disutility and full-time hours inflict the largest. The differences in disutilities are estimates of the per-period static willingness to pay for part-time hours and for flextime, relative to full-time hours without flextime.

These estimates suggest that women with no children experience around \$1900 less disutility per quarter when working part-time rather than full-time. That difference in disutility, or willingness to pay for part-time hours, is equivalent to around 70% of the difference in estimated earnings between part-time and full-time jobs for the 'typical' woman in the sample. [24] As the number of children increases, part-time hours are increasingly strongly preferred to full-time work with and without flextime. In addition, if any children are under the age of 2 years, part-time hours are still more strongly preferred to full-time work of any kind.

The estimates suggest that women without children do not prefer full-time jobs with flextime over those without flextime. In fact, they prefer full-time jobs *without* flextime and have a willingness to pay for jobs without flextime of roughly 18% of quarterly full-time earnings for a typical woman. However, as expected, the preference for flextime over full-time work without flextime is increasing in the number of children and is higher still if any of her children are infants (younger than 2 years of age). That is, while working full-time with flextime, the penalty per child for working full-time with flextime is \$450 but if working without flextime is larger, at \$950. Furthermore, if any children are under the age of 2 years, full-time work with flextime is more strongly preferred to full-time hours without flextime. Thus, for women with two children of any age or with one infant child, I estimate a small positive preference and willingness to pay for flextime of \$110-170 or 2-3% of of quarterly full-time earnings for a typical woman. This willingness to pay increases to \$640-700 or roughly 12% of quarterly full-time earnings for a typical woman if she has three children or two children and at least one infant. At most, with four children including an infant, her willingness to pay increases to \$1750 or 33% of earnings.

Turning to the offer probability estimates, women receive job offers more frequently from non-employment (with probability 0.95 in a quarter) than when searching on-the-job (with probability 0.70).

[23] Estimates for the model with unobserved permanent preference and productivity heterogeneity are forthcoming.

[24] For the typical woman, I use a 27 year old woman with 14 years of education, AFQT above the sample median, with 2.5 years of effective full-time experience and who has worked in 2.7 of the previous 4 quarters. It has been 5 years since she was married.

Given the estimated preference for flextime over full-time jobs without flextime among women with children, but the roughly even shares of women observed to be working in each of these kinds of full-time jobs, it must be the case that jobs with flextime are harder to come by. Indeed, I find that conditional on having received a job offer, that offer will be for a full-time job *without* flextime with probability 0.54, while the job will have flextime with only 0.17 probability. That is, the model estimates suggest that the supply of jobs with flextime is relatively constrained. Part-time job offers are received with probability 0.29 conditional on having received a job offer. Thus, when not currently employed, women can expect to wait 3.5 years to receive an offer for a job with flextime with 90% probability and 2 years to receive an offer for a part-time job with 90% probability.

The estimates on the permanent human capital characteristics in the offered wage distribution are in line with expectations. Wages are 21% higher for women with a college degree or more than for women with less than a 4-year college degree. Those with an AFQT score above the sample median enjoy a wage offer premium of 16%. Turning to endogenously accumulated human capital, recent experience has a much larger effect on the wage offer than does more distant experience.[25] Each quarter of participation in the most recent year adds 5.2% to the offered wage while each full year of full-time or equivalent experience adds 1.8% to the wage.[26]

The estimates suggest that offered wages for a job with full-time hours with flextime are 22% higher than those for a part-time job. The difference between offered wages for full-time hours without flextime and part-time hours is smaller at 8%. Thus, I estimate a positive differential in the wage offer for full-time jobs with versus without flextime of 14%. That is, despite an estimated positive willingness to pay for flextime among women with at least two children or one infant child, the offered wage is higher for a job with flextime in contrast to the standard prediction (in a competitive labor market model) of a compensating differential in wages. As noted previously, this is not an unexpected finding given the presence of search frictions in the labor market.

5.3 Experience accumulation

The model predicts that on average women will work for 35 quarters of the maximum 78 average quarters in sample between marriage and age 40 (see the uppermost panel of Table 19). On average, 14 of these quarters of participation will be in part-time jobs and thus 7 effective years of full-time experience are accumulated by age 40 on average. Splitting this up into two sub-samples by years of education reveals that women with 16 or more years of education participate in 2 extra quarters (compared to those with less than a college degree) suggesting that their higher wages induces them to work more and that this effect dominates the income effects of the higher earnings of their husbands. These women are also more likely to work in full-time jobs without flextime and less likely to work part-time.

[25] I include her age at marriage in the wage offer function to control for differences across women in the potential experience accumulated by marriage.

[26] Ermisch and Wright (1993) find that the rate of return to experience is 60% lower in a part-time job than in a full-time job. Blundell, Dias, Meghir, and Shaw (2011) find an even larger difference, estimating that human capital accumulated from part-time hours is one quarter or less than that from full-time hours in the UK. In future work, I will examine the sensitivity of the findings to the assumptions that experience in a job with flextime is equivalent to experience in a full-time job without flextime and that one year of part-time experience adds only half a year to accumulated 'full-time or equivalent' experience.

6 Counterfactual scenarios

Here I present the results of a series of four counterfactual experiments. Namely, I compare the welfare, fertility, employment and earnings effects of changes in the availability of flextime and part-time hours. In each case I consider whether career interruptions associated with child-rearing are reduced, that is, whether additional experience is accumulated. I also calculate the compensating variation associated with each change in welfare. In those cases in which welfare improves, this compensating variation could be paid to women as a cash transfer on the birth of a child in lieu of implementation of the suggested work-life balance policy. Tables 19, 20 and 21 present the results.

Initially, I consider the welfare loss in a counterfactual world where flextime is unavailable. While imagining flextime to be entirely unavailable is a somewhat unrealistic experiment, it does suggest the scale of the likely welfare gains and fertility effects from flextime. This may be policy relevant in some southern European countries and newer EU member countries in which policy-makers are presently trying to expand flextime from a low base (Plantenga and Remery (2009)).[27]

I then consider counterfactual scenarios in which I increase access to flextime. Thus, in the second counterfactual I consider a mandate to make flextime available while children are under 2 years of age assuming that wage offers remain unchanged despite the change in the probability of a flextime job offer. Third, I again mandate flextime for women with infant children but I allow for a wage response. Namely, for job offers made to women with infant children, I reduce the wage offer for these jobs by 14% to provide a potential lower bound on the likely welfare improvement from an increase in flextime availability. I select this reduction in wages because it brings the wage for a full-time job with flextime down to the point that it is equal to the wage for a full-time job without flextime. Fourth, I explore whether there is any additional welfare gain if the mandate also requires that firms offer women with infant children the option of part-time hours as well as the option for full-time work with flextime. In this case, I again assume that there is no wage adjustment. This fourth counterfactual nests the second counterfactual scenario.

In all of the experiments I assume that the probability of receiving a job offer of any kind is unchanged. This abstracts from the possibility that firms might respond to flextime or part-time mandates by discriminating against women who have young children, or who could be expected to be likely (judging by their age or marital status) to have children, by offering these women fewer jobs of any kind.

Work is ongoing to compare these counterfactuals to the effects of unpaid maternity leave policies. During the years spanned by the data used in this study, the Family and Medical Leave Act mandated access to just under 1 quarter of unpaid maternity leave in 1993. Nevertheless, access is still limited to around half of employees by work history and firm size requirements for eligibility (Rossin-Slater, Ruhm, and Waldfogel (2011)) thus it is of interest to consider the relative effects of a maternity leave mandate and the flextime mandate.

[27]For example, the 2004 Eurostat labor force survey finds that only 15% of employees have flextime in Spain and Greece (Plantenga and Remery (2009)). In contrast, CPS data from 1997 onwards shows that around 35% of employees have flextime in the US.

6.1 Counterfactual 1: No flextime available

Here I present results from a simulation of a counterfactual in which there are no flextime jobs offered. Under this scenario, women increase the number of quarters of labor force participation by one quarter (see the second panel of Table 19). However, effective full-time equivalent experience decreases by 2 quarters on average as women substitute part-time work for working in full-time jobs with flextime. Part-time work is more easily combined with raising children, and thus we also observe a slight increase in completed fertility (see Table 20).

Potential wages at age 35 fall by 0.6% on average due to the reduced experience accumulated (see Table 21). The decline in wages is larger for women with more than a college degree as their effective experience accumulated is more strongly affected. The decline in potential wages and the direct effect of fewer quarters in full-time work reduces the present discounted value of earnings between marriage and age 40 by 12% on average. As a result, welfare falls by 13.6% on average, or equivalently by $20,000 or just less than annual full-time earnings for a typical woman in the sample.

6.2 Counterfactual 2: Mandating flextime for women with children under 2 years of age with no wage adjustment

Now I describe the effects of an increase in the availability of flextime such that all full-time offers made to women with children between 0–2 years of age are required to offer flextime while assuming that wages do not adjust to the change in offer probabilities. Under this scenario, a woman will receive an offer of a full-time job without flextime with estimated probability 0.54. Under the policy, if she receives a full-time offer without flextime, she must also be offered a full-time job with flextime. Then she optimizes, choosing between the full-time job without flextime, the full-time job with flextime, keeping her existing job if currently working, or quitting to non-employment. Thus, conditional on receiving a job offer at all, in this experiment she receives a part-time offer with estimated probability 0.29, with probability 0.17 she receives only a full-time offer with flextime and with probability 0.54 she receives both a full-time offer with flextime and a full-time offer without flextime. Thus, λ_{Flex} is increased from its estimated value to the estimated value of $\lambda_{\text{Flex}} + \lambda_{\text{FT}}$. Once her child turns 2 years of age, I assume she can hold onto any job she is in, but the probability of receiving a job offer with flextime reverts to its estimated value of 0.17. Women without children or whose children are all over 2 years of age receive job offers with the estimated probabilities.

In the third panel of Table 19 we see that the policy does, as expected, increase the accumulated effective experience, between marriage and age 40, by one quarter on average while leaving the total quarters of participation essentially unchanged. Women reallocate their time in the workforce from part-time work and from full-time work without flextime into full-time work with flextime. The effects are strongest for women with less than a college degree since it is this sub-group that spends a greater share of their life in part-time work in the baseline. Fertility is largely unaffected (see the third panel of Table 20).

The second panel of Table 21 shows that, by the age of 40, women's potential wages would increase by 0.5% on average as a result of the additional experience accumulation. From this, in combination with the higher wages earned in flextime jobs (recall, estimates suggest that offered wages are 14% higher full-time jobs with flextime than in full-time jobs without flextime), the present discounted value of realized earnings between marriage and age 40 increases by 6.0% on average. The effects are largest for women with less than a college degree in line with the stronger effects on experience accumulation for these women.

Realized utility increases for all women and on average by 2.7% as a result of the increase in earnings and thus consumption and due to the reduced disutility of work in periods when they have children, and in particular young children. On average the corresponding compensating variation is just over \$4000 or 20% of annual full-time earnings. Spread over the average number of 2.3 children born to each woman, a cash transfer of roughly \$1750 per child would need to be paid to each woman to attain the same welfare improvement. This per child compensating variation is equivalent to roughly one-third of quarterly full-time earnings for a typical woman in the sample.

6.3 Counterfactual 3: Mandating flextime for women with children under 2 years of age *with* wage adjustment

In this counterfactual scenario, all full-time offers made to women with children between 0–2 years of age must offer flextime. However, here I also allow for a wage adjustment. Specifically, I assume that wages will adjust downwards by 14% for offers of flextime jobs made when women have an infant child.[28] I select this reduction in wages because it reduces the wage in a full-time job with flextime to the wage in a full-time job without flextime. This chosen wage adjustment represents a likely upper bound on the size of the downward adjustment to wages. Thus the results of this counterfactual scenario can be interpreted as a lower bound on any welfare, fertility or earnings effects of the flextime mandate policy.

This downward pressure on equilibrium wages may occur under this policy mandate as firms with higher costs of providing flextime are mandated to do so for this population of recent mothers. However, laws often prevent firms from tailoring wage offers by demographics, therefore given that women with no children, and possibly also men, do not have a positive willingness to pay for flextime, it is possible that firms would not reduce wages by the full extent modeled here. If firms were to reduce wages by this amount, women with no children and potentially women with older children and men may be unlikely to accept the job offer. In addition, there may be some offsetting upward pressure on wage offers for jobs with flextime flowing from the reduction in the scarcity of flextime jobs as suggested by Hwang, Mortensen, and Reed (1998)'s equilibrium search model for jobs comprising a wage and an amenity (previously mentioned in Section 2.3).

Results are shown in the fourth panel of Tables 19 and 20 and in the third panel of 21. On average, this counterfactual has small negative effects on experience and potential wages and welfare. On average, accumulated effective experience would fall by one quarter and women would reduce the number of quarters spent in jobs with flextime by one quarter in comparison with the baseline. Fertility is again largely unaffected.

Because the wages in flextime are now lower, and there is only a small reduction in the number of quarters spent in jobs with flextime, the present discounted value of earnings falls by more than 6% on average largely due to the decline in wage in flextime jobs. Despite this sizeable fall in earnings and because the reduction in the number of quarters spent in flextime is only small, the next effect on welfare

[28] An alternative scenario would adjust wages in all offered flextime jobs under the assumption that wage discrimination on the basis of family status would not be permitted.

is limited to a slight decline of -0.5%. As argued above, the wage cost used may be an upper bound on the size of any adjustment. Thus, on balance the results from this counterfactual scenario and the scenario with no wage cost, suggest that we can likely expect a small positive welfare effect if flextime were more widely available.

6.4 Counterfactual 4: Also mandating part-time hours availability for women with children under 2 years of age

In this simulated counterfactual scenario all job offers made to women with children between 0–2 years of age must offer part-time hours. In addition, all full-time job offers must offer flextime. This nests the second counterfactual above (in Section 6.2). Specifically, each woman who receives an offer of a full-time job without flextime with estimated probability 0.54, will also be able to elect to accept that job but with flextime or accept that job but work only part-time hours. If she receives a flextime job offer, with estimated probability 0.17 (conditional on having received a job offer that quarter), she will also be able to accept that job but work only part-time hours. Thus, λ_{PT} is increased from its estimated value of 0.29 to 1 *and* λ_{Flex} is increased from its estimated value of 0.17 to 0.71 (just as it was in Section 6.2). Once her child turns 2 years old, she can hold onto any job she is in, but the probability of receiving a part-time job offer reverts to its estimated value of 0.29 and the quarterly probability of receiving a full-time offer with flextime reverts to 0.17.

The lower-most panels of Tables 19-21 document the findings for this counterfactual simulation. As in the other counterfactual scenarios, fertility remains unchanged. On average, this counterfactual simulation shows similar although slightly smaller experience effects to those observed in the scenario in which only flextime was mandated. The experience effects are more moderate here because there is a smaller drop in the number of quarters spent in part-time work than in the counterfactual simulation that increased the availability of only flextime jobs. As a result, potential wages increase slightly by just 0.2% on average and the realized present discounted value of earnings between marriage and age 40 increases by 3.1% on average. On net, while part-time is preferred to flextime and full-time work without flextime, it generates much lower income because of its lower hours and furthermore has a human capital accumulation cost. Thus, the present discounted value of utility increases by only slightly more than in the flextime-only policy scenario.

This suggests that for firms considering ways to retain productive staff, implementing a flextime program may be as effective as allowing part-time hours. In addition, implementing flextime rather than allowing part-time hours may ensure staff remain more engaged with and committed to the firm as they will still be working full-time hours although these kinds of effects are outside of the scope of this model.

7 Conclusions

In this paper I develop and estimate a dynamic structural model of joint fertility and labor supply decisions. I use the model to quantify the effect of flextime in reducing fertility-related career interruptions. The model estimates confirm that flextime is a work amenity that is relevant to fertility behavior and has substantial effects on fertility-related differences in experience accumulation during a woman's prime child-bearing years. I estimate a willingness to pay for flextime that ranges from –18% to 33% and flextime is preferred to full-time work without flextime by women with an infant child or at least two children of any age. The preference for flextime is found to be increasing in the number of children and flextime is even more strongly preferred by women with infant children. Women have a positive willingness to pay for part-time work even when they have no children but again this preference for part-time is stronger among mothers.

In addition, I present estimates of the price of the flextime amenity in the offered wage distribution. I find that a job with flextime will be offered with wages that are 14% higher than for a job without flextime. This estimate accounts for the selection of women into jobs according to unobserved preferences and endogenous experience accumulation as well as the impact of labor market search frictions. Search frictions are found to be empirically important. The data reveal anticipatory sorting into jobs with flextime prior to having a birth which we should only observe if women cannot freely switch into a flextime job when it becomes desirable. In line with this observable behavior, my model estimates suggest that search frictions are relevant. I estimate that of all full-time job offers received, only a quarter of those offer flextime. That is, I estimate that flextime is relatively scarce.

In light of these findings, I present counterfactual simulations in which I consider experience accumulation and fertility effects under a scenario in which flextime is not available and scenarios in which I increase the availability of flextime. The simulations suggest that if flextime were unavailable, women would substitute into part-time work. Earnings and consumption decline due to the reduced full-time or equivalent experience accumulation while fertility increases only very slightly. The result is a substantial fall in welfare of 13.6%. In contrast, implementing a policy to increase the availability of flextime while women have any infant children has a positive welfare effect. Welfare increases by up to 2.7% depending on the extent to which offered wages are reduced in response to the policy. A cash transfer of up to $1750 for each child born would need to be paid to each woman to attain the same welfare improvement. This per child compensating variation is equivalent to roughly one-third of quarterly full-time earnings for a typical woman in the sample. The welfare effects derive from both the reduction in the disutility of full-time work when women have children and can more frequently work in jobs with flextime as well as from the increase in utility from higher consumption. Consumption increases due to the the increased experience accumulation and thus higher potential wages and from the higher earnings in flextime jobs.

The results of the counterfactual simulations and the estimated preference for flextime among women with children and particularly those with infant children are consistent with the findings of the literature examining the differences in career interruptions between more or less family-friendly jobs or occupations. My estimates of the preference for part-time jobs are larger than those estimated for part-time work by Flabbi and Moro (2012) although they study a sample of older women (between the ages of 35 and 50) and only allow for observable differences in education, as well as unobserved preference heterogeneity. However, Felfe (2009) finds that German women are prepared to give up between 36-56% of their wage for a childcare-compatible work schedule. My estimate of a willingness to pay for flextime of up to a maximum of 33% of quarterly full-time earnings depending on family structure is more modest.

While the estimated welfare effects here are partial equilibrium in line with the estimated model, they provide a useful guide to the likely effects of increases in the availability of flextime on the labor supply and fertility behavior of women. If policy makers were to implement a mandate requiring firms to make flextime available to women with infant children, they could use these findings as a preliminary input into any assessment of the likely effects on the well-being of female employees. While we might be concerned about the negative impacts of such a policy on firm productivity given potential coordination costs of flextime, these impacts may not be as large as one might first expect. First, any such policy might, similarly to the Family and Medical Leave Act, be restricted to apply only to firms employing more than 50 employees and workers who meet minimum firm tenure requirements. In addition, data from the CPS show that a policy mandate limited to women with infant children would affect a small subset of workers and thus firms. More specifically, across occupations the share of workers affected ranges from only 0.6% of workers in transport and manufacturing occupations to under 6% in administrative support occupations and across industries, from 0.4% in mining to just under 7% of workers in health related and social services industries.

In addition, the policy is not estimated to reduce fertility. Thus, despite generating a modest increase in labor supply, this does not come at a cost to population growth. In many countries, declining fertility rates are a core policy concern. Family-friendly policies such as flextime are one possible way that policy makers could encourage female labor force participation without negatively affecting fertility rates.

Lastly, while the model studied here assumes that firms can observe worker productivity, if productivity is not easily observed by firms, firms may interpret requests for flextime as a signal of lower productivity or commitment to the job. Altonji and Oldham (2003) and Rebitzer and Taylor (1995) detail a model with these features in which workers have heterogeneous preferences for vacation time and for hours, respectively. As workers signal their quality through their choice of hours or vacation time, an equilibrium may result in which hours in the typical job are too long and vacation time too short. Laws stipulating minimum working conditions may be welfare-improving if adverse selection is important enough. A similar theory could apply with flextime: concerned that offering flextime will attract may attract a lower-quality work force, fewer firms, and thus fewer jobs than optimal, will offer the amenity. This theory suggests further reasons to expect welfare-improving effects from a flextime mandate. Moreover, the empirical evidence does suggest that requests for flextime may be interpreted as signals of lower productivity or at least that workers worry that this will be the case. Kelly and Moen (2007) cite a number of papers from the human resources literature that find that many employees worry that using or requesting flexible work arrangements will signal to management that they are not committed to the organization. In addition, using both survey and laboratory experiment evidence, Leslie, Manchester, Park, and Mehng (2012) show that the use of flexible work practices (FWP) results in career premiums when mangers assume that employees use FWPs to enhance productivity and find some evidence that FWP use results in career penalties when managers assume it is requested and used to accommodate personal needs.

Future research could extend upon the findings here to consider a fully-fledged equilibrium labor market model to better capture the interactions of firms and workers in bargaining for wages and the flextime amenity. Flinn and Dey (2005) consider such a equilibrium model of health insurance provision and wage determination. Other extensions might examine the impact of imperfect information on worker quality and preferences on the provision of flextime, explore the welfare effects of flextime on the population of single mothers and include a dimension of occupational choice.

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Table 1: Share of women returning to work after the first birth, conditional on hours-flextime in the pre-birth job

	Proportion that return to work	
	within 6 months	Never
1st birth pre-birth job was:		
Part-time	0.66	0.03
Full-time with flextime	0.81	0.08
Full-time *without* flextime	0.72	0.03
2nd birth pre-birth job was:		
Part-time	0.75	0.04
Full-time with flextime	0.89	0.00
Full-time *without* flextime	0.85	0.01

Note: The pre-birth job is the job held in the quarter immediately before the birth, or if she does not work in that quarter, it is the job held 2 quarters prior to the birth.

Table 2: Summary statistics on married women from the NLSY79 (sample size 1974)

Variable	Mean	Std Dev
Age	29.1	4.2
Age at marriage or cohabitation	22.5	4.1
Age at first birth	25.1	5.0
Age at second birth	28.2	4.8
Age at third birth	30.1	4.7
Age at fourth birth	31.7	4.5
Completed fertility†	1.5	1.1
Number of children	1.0	0.8
Number of children if positive	1.7	0.6
Ideal number of children in 1982	2.6	1.0
Husband's quarterly earnings‡	10002.2	7622.4
Education (in yrs)	13.9	2.4
AFQT (percentile)	52.1	27.8
Race is white	0.8	0.4
Number of jobs held$^{\diamond}$	6.9	5.4
Total experience (in quarters)†	37.0	22.3
Part-time experience †	9.5	12.9
Full-time flexible experience$^{\dagger *}$	8.8	12.5
Full-time non-flexible experience †	18.7	16.0
Hours per week	35.7	7.8
Hourly wage‡	11.9	6.4
Number of quarters in sample	52.3	24.1

† Experience and completed fertility are at final quarter in sample, i.e. at age 40.
‡in 2000 dollars.
$^{\diamond}$ Total count over the sample period.
* Flextime experience is accumulated starting from 1989.

Table 3: Mean observable characteristics (over person-quarters) for married women by hours-flextime from the NLSY79

Variable	Non-employed	Part-time	Full-time with flextime	Full-time without flextime
Number of children	1.5	1.4	1.3	0.8
Number of children if positive	1.9	1.9	1.9	1.6
Husband's quarterly earnings‡	13051.9	12400.9	10364.1	8919.3
Hours per week	−−	20	40.7	41.1
Hourly wage‡	−−	12.5	15.1	11.7
Number of observations	24635	18777	17458*	36837*

‡in 2000 dollars.

* The unevenness in sample-size across flextime within full-time is because the flextime variable is only available from 1989.

Table 4: Labor supply

	Percentages of person-quarters in:				Percentage point difference:
	Non-employment	Part-time	Full-time with flextime	Full-time without flextime	Full-time with vs. without flextime
All women, 1989-2000					
	23.2	20.9	30.0	25.9	4.0***
By number of children, for years 1989-2000					
0	9.7	11.8	41.2	37.3	3.9***
1	21.7	19.1	31.6	27.5	4.1***
2	26.8	24.8	26.3	22.2	4.1***
3	33.8	26.7	21.9	17.6	4.3***
4	36.2	22.7	22.1	19.1	3.1**
By whether she has any infants (N>0), for years 1989-2000					
No	24.8	23.1	28.4	23.8	4.6***
Yes	34.3	24.1	22.0	19.6	2.3***

Note: ***, **, * indicate significance at the 1, 5, and 10% levels in a two-sided test of the percentage point difference.

Table 5: Linear probability model for being at home (vs. in work) 1 year after the first or second birth

	Birth 1		Birth 2	
Work choice prior to birth				
Part-time	-0.517^{***}	-0.252	-0.507^{***}	-0.428^{**}
	(0.100)	(0.143)	(0.043)	(0.139)
Full-time flexible	-0.678^{***}	-0.268	-0.756^{***}	-0.477^{**}
	(0.102)	(0.146)	(0.052)	(0.146)
Full-time non-flexible	-0.545^{***}	-0.167	-0.591^{***}	-0.434^{**}
	(0.097)	(0.144)	(0.043)	(0.141)
Full set of covariates	No	Yes	No	Yes
P-values for equality of coefficient on 'full-time with flextime' and coefficient on...				
Part-time	0.000	0.755	0.000	0.306
Full-time without flextime	0.001	0.020	0.000	0.330
Observations	1133	1133	929	929
R-squared	0.040	0.179	0.219	0.368

Notes: Standard errors shown in parentheses. ***, **, * indicate significance at the 1, 5, and 10% levels. Std errors are unclustered as data is collapsed to a cross-section. The full set of covariates is listed in footnote 5.

Table 6: Probit marginal effects for changes into a flexible job

	Birth 1	Birth 2
In the 3 years prior to the birth	0.038^{***}	0.018^{***}
	(0.009)	(0.006)
Proportion starting flextime at anytime	0.025	0.021

** $p<0.05$, Clustered std errors in parentheses

Sample is mothers between 3 years prior and 10 years after the first or second birth in each regression respectively. Controls for years of education and a full set of dummies for age at the relevant birth and for each year (year 0-10) after the birth were included.

Table 7: Coefficient estimates on flextime, from regressions of log wages on flextime

	OLS	OLS	FE
All women[†]	0.129***	0.121***	0.0285**
	(0.0227)	(0.0213)	(0.0132)
Observations	31602	31602	31602
R^2	0.095	0.208	0.082
Number of id			1393
Mothers[‡]	0.143***	0.131***	0.0241*
	(0.0250)	(0.0235)	(0.0135)
Observations	26903	26903	26903
R^2	0.096	0.204	0.079
Number of id			1231
All men[a]	0.0953***	0.0481***	0.0296***
	(0.0175)	(0.0157)	(0.0097)
Observations	49645	49645	49645
R^2	0.114	0.237	0.109
Number of id			1655
Fathers[b]	0.0960***	0.0464***	0.0298***
	(0.0187)	(0.0167)	(0.0105)
Observations	43261	43261	43261
R^2	0.088	0.249	0.083
Number of id			1547
Potential Exp controls	Yes	Yes	Yes
Observable skill controls	No	Yes	-

*** p<0.01, ** p<0.05, * p<0.1, Clustered standard errors in parentheses. All data is quarters of full-time work from 1989-2000

[†] Sample of cohabiting and married women

[‡] Sample of cohabiting and married *mothers* in quarters following the first birth

[a] Sample of married men

[b] Sample of married *fathers* in quarters following the first birth

Table 8: Husband's earnings model - Dependent variable is the log of her spouse's real income

Variables	Preferred	Incl. spouse educ
Age	0.0875***	0.0667***
	(0.0175)	(0.0171)
Age squared	-0.000682**	-0.000528*
	(0.000291)	(0.000283)
Age - Age at marriage	0.0291***	0.0366***
	(0.00667)	(0.00651)
(Age - Age at marriage) squared	-0.00195***	-0.00178***
	(0.000327)	(0.000315)
College graduate	0.256***	0.0662*
	(0.0335)	(0.0356)
Spouse's education (years)†		0.0768***
		(0.00675)
Constant	6.909***	6.317***
	(0.251)	(0.251)
Observations	67015	66972
R^2	0.146	0.189
No. of women	1775	1766

*** p<0.01, ** p<0.05, * p<0.1, Robust (clustered) standard errors in parentheses

† For a few women, the husband's education is missing leading to the smaller sample size

Table 9: Estimated utility parameters

Description	Symbol	Estimate	Standard error
Consumption × Part-time hours†	α_{11}	-0.0248	0.0013***
Consumption × Flextime (full-time hours)†	α_{12}	-0.0248	$--$
Consumption × Full-time hours (no flextime)†	α_{13}	-0.0248	$--$
Consumption × # of children	α_{14}	-0.0038	0.0001***
Number of children	α_{21}	1457.09	61.14***
Squared number of children	α_{22}	-680.87	34.56***
Pregnant when previous child < 2 yrs old	α_{23}	-70258.51	5962.56***
Part-time hours	α_{3}	-2053.26	122.99***
Part-time hours × # of children	α_{31}	-58.72	0.77***
Part-time hours × infant present	α_{32}	12.03	0.90***
Flextime (full-time hours)	α_{4}	-4903.00	35.08***
Flextime × # of children	α_{41}	-448.72	24.06***
Flextime × infant present	α_{42}	-513.08	39.95***
Full-time hours (no flextime)	α_{5}	-3959.18	15.19***
Full-time hours × # of children	α_{51}	-975.57	26.70***
Full-time hours × infant present	α_{52}	-1099.07	48.92***
Non-employment when aged 16-19.75 yrs	α_{61}	-948.08	18.18***
Non-employment when aged 20-22.75 yrs	α_{62}	-1697.76	158.21***
Assumed discount factor	β	0.987	$-$

*** p<0.01, ** p<0.05, * p<0.1, Standard errors constructed with numerical gradient methods with a step-size equal to 1% of the parameter estimate value. † These three parameters are constrained to be equal.

Table 10: Estimated offer probability parameters

Description	Symbol	Estimate	Standard error
Quarterly probability of receiving a job offer if:			
in non-employment	λ_H	0.945	0.033***
in employment	λ_E	0.704	0.071***
Conditional on receiving an offer, probability that the given job offer is for a:			
Flextime job	λ_{Flex}	0.168	0.009***
Fulltime job	λ_{FT}	0.539	0.001***

*** p<0.01, ** p<0.05, * p<0.1, Standard errors constructed with numerical gradient methods with a step-size equal to 1% of the parameter estimate value.

Table 11: Estimated wage and budget constraint parameters

Description	Symbol	Estimate	Standard error
Mean productivity	μ_0	0.574	0.045***
Age at marriage	θ_1	0.062	0.003***
Education (College)	θ_2	0.212	0.019***
AFQT above the sample median	θ_3	0.155	0.016***
Premium on flextime (over part-time)	ϕ_1	0.222	0.002***
Premium on fulltime (over part-time)	ϕ_2	0.081	0.005***
Recent participation X^q	ϕ_3	0.052	0.001***
Years of experience X^Y	ϕ_4	0.018	0.001***
Variance of match quality distribution	σ^2_ν	0.143	0.015***
Std. dev. of idiosyncratic log wage shock	σ_{ε^w}	0.757	0.290***
Std. dev. of idiosyncratic shock to husband's log earnings	σ_{ε^H}	0.123	0.368

*** p<0.01, ** p<0.05, * p<0.1, Standard errors constructed with numerical gradient methods with a step-size equal to 1% of the parameter estimate value.

Table 12: Estimated variances of preference shocks

Description	Symbol	Estimate	Standard error
Non-employment & no conception	$\sigma^2_{\varepsilon_{j=1,m=0}}$	10.566	0.672***
Non-employment & tries to conceive	$\sigma^2_{\varepsilon_{j=1,m=1}}$	5.775	0.063***
Part-time hours & no conception	$\sigma^2_{\varepsilon_{j=2,m=0}}$	10.692	0.347***
Part-time hours & tries to conceive	$\sigma^2_{\varepsilon_{j=2,m=1}}$	10.030	0.486***
Flextime & no conception	$\sigma^2_{\varepsilon_{j=3,m=0}}$	17.782	1.600***
Flextime & tries to conceive	$\sigma^2_{\varepsilon_{j=3,m=1}}$	7.060	0.656***
Full-time hours & no conception	$\sigma^2_{\varepsilon_{j=4,m=0}}$	17.437	0.560***
Full-time hours & tries to conceive	$\sigma^2_{\varepsilon_{j=4,m=1}}$	6.332	0.154***
Assumed covariance of preference shocks	$\rho_{\varepsilon_j,\varepsilon_k}$	0	

*** p<0.01, ** p<0.05, * p<0.1, Standard errors constructed with numerical gradient methods with a step-size equal to 1% of the parameter estimate value.

Table 13: Estimated terminal value parameters

Description	Symbol	Estimate	Standard error
Part-time in $T-1$	ξ_1	81.030	2.270***
Flextime in $T-1$	ξ_2	70.532	18.533***
Full-time in $T-1$	ξ_3	52.268	0.648***
1 quarter of recent experience	ξ_4	39.769	1.694***
2 quarters of recent experience	ξ_5	35.354	1.128***
3 quarters of recent experience	ξ_6	53.951	3.617***
4 quarters of recent experience	ξ_7	75.078	7.045***
Has 1 child	ξ_8	8.367	0.462***
Has 2 children	ξ_9	15.929	0.636***
Has 3 children	ξ_{10}	13.382	0.901***
Has 4 children	ξ_{11}	13.314	0.148***
Youngest child is still an infant	ξ_{12}	2.092	0.058***

*** p<0.01, ** p<0.05, * p<0.1, Standard errors constructed with numerical gradient methods with a step-size equal to 1% of the parameter estimate value.

Table 14: Goodness of fit - Equality of choice distribution and Chi-square test

	Percentages of observations in each choice	
	Data	Simulated
	All years and ages	
Non-empl. & do not conceive	24.8	54.51
Non-empl. & conceive	0.24	1.04
Part-time & do not conceive	18.91	17.27
Part-time & conceive	0.24	0.33
All Full-time & do not conceive	54.86	25.24
All Full-time & conceive	0.96	1.61
Chi-square test statistic for equality of choice distribution		
Test statistic	52.01	
P-value (5 d.o.f)	0.00	
	1989+ and 24 yrs+	
Non-empl. & do not conceive	23.07	54.85
Non-empl. & conceive	0.05	0.98
Part-time & do not conceive	20.71	17.72
Part-time & conceive	0.08	0.32
Full-time w' flextime & do not conceive	29.8	14.46
Full-time w' flextime & conceive	0.27	0.51
Full-time, no flextime & do not conceive	25.77	10.12
Full-time, no flextime & conceive	0.25	1.03
Chi-square test statistic for equality of choice distribution		
Test statistic	36.37	
P-value (7 d.o.f.)	0.00	

Table 15: Goodness of fit - Shares in work choices by age

	Part-time		Any full-time		Full-time with flextime		Full-time without flextime	
Age	Data	Simulated	Data	Simulated	Data	Simulated	Data	Simulated
16-22	0.182	0.241	0.446	0.267				
22.25-26	0.159	0.104	0.594	0.153				
26.25-29	0.170	0.162	0.589	0.204	0.294	0.060	0.295	0.144
29.25-32	0.208	0.213	0.544	0.383	0.276	0.144	0.267	0.239
32.25-36	0.225	0.220	0.548	0.603	0.291	0.299	0.256	0.304
36.25-40	0.236	0.134	0.554	0.791	0.320	0.443	0.234	0.347

Table 16: Goodness of fit - Work transition matrix

	Destination work choice, in quarter t			
	Non-employment	Part-time	Full-time with flextime	Full-time without flextime
	Data			
in quarter t-1				
Non-employment	0.898	0.048	0.009	0.045
Part-time	0.056	0.874	0.017	0.053
Full-time with flextime	0.013	0.017	0.932	0.039
Full-time without flextime	0.036	0.024	0.028	0.913
	Simulated data			
Non-employment	0.927	0.028	0.011	0.035
Part-time	0.088	0.870	0.021	0.021
Full-time with flextime	0.056	0.015	0.910	0.020
Full-time without flextime	0.141	0.029	0.041	0.789

Table 17: Goodness of fit - Shares with 0-3 children by age

	No children		One child		Two children		Three children	
Age	Data	Simulated	Data	Simulated	Data	Simulated	Data	Simulated
16-22	0.571	0.825	0.364	0.133	0.057	0.028	0.003	
22.25-26	0.514	0.531	0.306	0.132	0.147	0.244	0.012	
26.25-29	0.400	0.423	0.284	0.181	0.241	0.243	0.064	0.054
29.25-32	0.313	0.380	0.240	0.146	0.315	0.217	0.112	0.072
32.25-36	0.220	0.350	0.210	0.036	0.373	0.287	0.159	0.061
36.25-40	0.173	0.342	0.166	0.011	0.413	0.213	0.194	0.115

Table 18: Goodness of fit - Log wages by age

Age	Data	Simulated
16-19.75	1.886	1.944
20-22.75	2.068	1.973
23-25.75	2.241	2.179
26-28.75	2.362	2.321
29-30.75	2.444	2.393
31-33.75	2.477	2.441
34-36.75	2.523	2.527
37-40	2.546	2.592

Table 19: Experience accumulation with baseline estimates and under counterfactual scenarios

		Avg. Total participation in quarters	Avg. Total Experience PT valued at 1/2	Quarters worked PT	Quarters worked Flex	Quarters worked FT
Baseline						
Sample	All	35	28	14	12	10
	16+ yrs edu	36	34	5	19	13
	<16 yrs edu	34	25	18	8	8
Scenario 1: If flextime were unavailable						
Sample	All	36	26	19	0	17
	16+ yrs edu	36	32	9	0	28
	<16 yrs edu	36	24	23	0	12
Scenario 2: Flextime mandate for women with a child under 2yrs old						
No wage adjustment						
Sample	All	35	29	12	15	8
	16+ yrs edu	36	35	3	23	10
	<16 yrs edu	34	27	16	11	8
Scenario 3: Flextime mandate for women with a child under 2yrs old						
With wage adjustment†						
Sample	All	33	27	13	11	9
	16+ yrs edu	36	33	5	17	14
	<16 yrs edu	32	24	17	8	8
Scenario 4: Part-time & flextime mandate for women with a child under 2yrs old						
Sample	All	35	28	13	14	8
	16+ yrs edu	37	35	4	23	10
	<16 yrs edu	34	26	17	10	7

Average maximum possible quarters of experience: 78

†Wage adjustment is a potential lower bound corresponding to a 14% reduction in the wage equivalent to the reducing the flextime wage to the regular fulltime (without flextime) wage.

Table 20: Completed fertility and age at first birth with baseline estimates and under counterfactual scenarios

		Completed fertility	Age at first birth
Baseline			
Sample	All	2.34	26.34
	16+ yrs edu	2.17	28.58
	<16 yrs edu	2.41	25.54
Scenario 1: If flextime were unavailable			
Sample	All	2.36	26.30
	16+ yrs edu	2.20	28.58
	<16 yrs edu	2.43	25.48
Scenario 2: Flextime mandate for women with a child under 2yrs old			
No wage adjustment			
Sample	All	2.34	26.37
	16+ yrs edu	2.17	28.62
	<16 yrs edu	2.41	25.56
Scenario 3: Flextime mandate for women with a child under 2yrs old			
With wage adjustment†			
Sample	All	2.33	26.36
	16+ yrs edu	2.15	28.61
	<16 yrs edu	2.40	25.55
Scenario 4: Part-time & flextime mandate for women with a child under 2yrs old			
Sample	All	2.33	26.35
	16+ yrs edu	2.17	28.62
	<16 yrs edu	2.40	25.54

†Wage adjustment is a potential lower bound corresponding to a 14% reduction in the wage equivalent to the reducing the flextime wage to the regular fulltime (without flextime) wage.

Table 21: Predicted changes in potential wages at age 40 and present discounted value of realized earnings and realized utility between marriage and age 40

		Percentage changes from baseline in:		
		Potential wages at age 40	PDV of realized earnings	PDV of realized utility
Scenario 1: If flextime were unavailable				
Sample	All	-0.6	-12.0	-13.6
	16+ yrs edu	-0.8	-11.6	-10.4
	<16 yrs edu	-0.5	-12.5	-18.7
Scenario 2: Flextime mandate for women with a child under 2yrs old				
No wage adjustment				
Sample	All	0.5	6.0	2.7
	16+ yrs edu	0.3	3.6	2.5
	<16 yrs edu	0.5	8.5	3.1
Scenario 3: Flextime mandate for women with a child under 2yrs old				
With wage adjustment[†]				
Sample	All	-0.5	-6.3	-0.2
	16+ yrs edu	-0.3	-5.1	0.3
	<16 yrs edu	-0.6	-7.6	-1.1
Scenario 4: Part-time & flextime mandate for women with a child under 2yrs old				
Sample	All	0.2	3.1	3.1
	16+ yrs edu	0.2	3.6	2.7
	<16 yrs edu	0.1	2.6	3.7

[†]Wage adjustment is a potential lower bound corresponding to a 14% reduction in the wage equivalent to the reducing the flextime wage to the regular fulltime (without flextime) wage.

Figure 2: Schedule flexibility and full-time hours

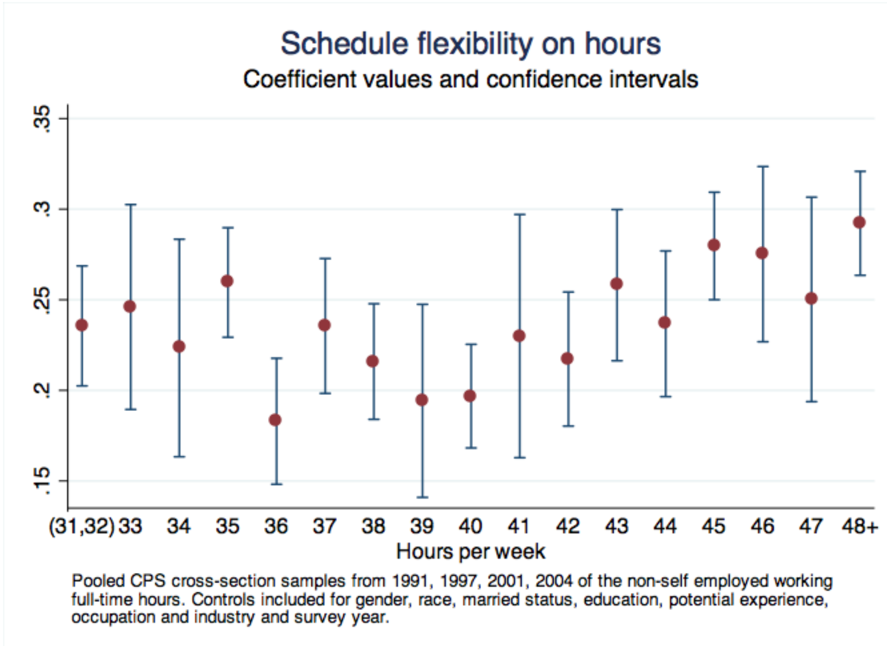
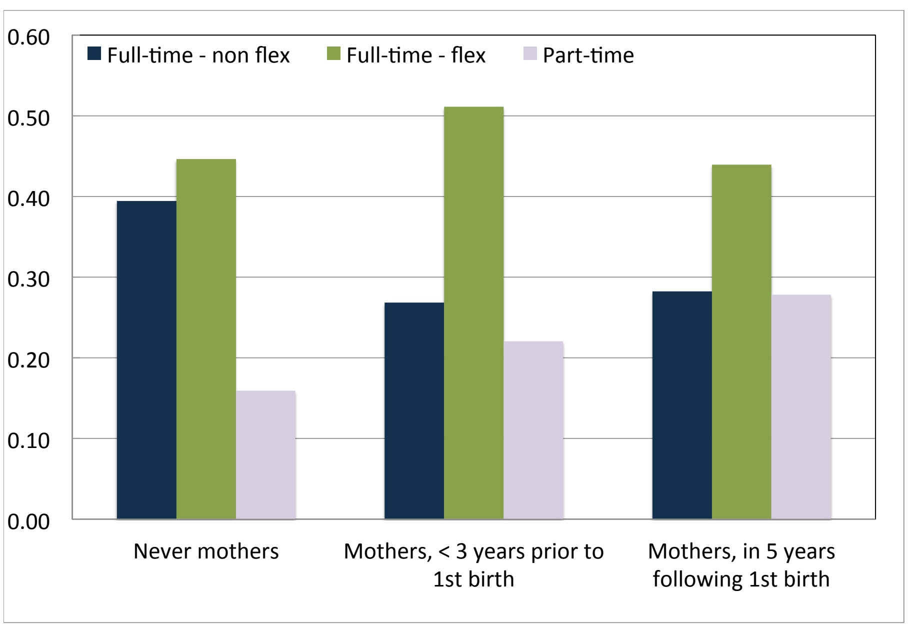


Figure 3: Share of married or cohabiting women taking up a non-flexible, flexible or part-time job over any 2 quarter period (Data from 1989-2000)



Appendices

A Data - sample selection

The sample comprises women from the representative cross-section sample from the NLSY79. Sample selection proceeds as:

- Exclude women with completed fertility of 5 or more kids (by the end of 2006)
- Select women ages 16 and older
- Select their first relationship (married or cohabiting) that meets the requirement that it last for at least 2 years beyond 1979. I allow that they may still be in education during this relationship. Keep the quarters of data during that relationship. In addition, some women (fewer than 4%) had children prior to this relationship. For these women, I include all quarters back to 3 quarters prior to their first birth (again excluding any conceptions before the age of 16).
- Exclude women who conceived their first child when they were younger that 16 years old (approximately 4.5% of the person-quarters).
- Exclude women with twin or triplet births (less than 2% of person-quarters).
- Exclude women with no AFQT score (approximately 5% of the person-quarters).
- Exclude quarters in which each woman is older than 40 years of age (that is, exclude quarters from age 40.25 years inclusive).
- Exclude women who do not have at least 8 quarters of data.

Identifying the relevant marriage or cohabitation The first relationship (marriage or cohabitation) that lasts for at least 2 years beyond 1979 is identified by: (i) dating the start and end of the first, second and third marriages and extending the start of marriage to the start of cohabitation where relevant; (ii) dating the start and end of all cohabitations that do not subsequently become marriages. I then select the earliest marriage or cohabitation that lasts at least 2 years and lasts at least 2 years beyond the first interview date in 1979 if already in progress at that interview.

Job identification and characteristics Job information (on the job characteristics hours, industry, occupation, hourly rate of pay, flextime and maternity leave availability) is constructed from the work history and employer supplements section of the NLSY79 surveys. From the available information, a calendar of jobs held can be constructed. A job and an employer are equivalent concepts in the survey and I collate the reported information on every employer for whom a respondent worked since the last interview, including the CPS employer, which is identified within the data set by a yearly job number (Job #1 - Job #5). I initially identify the start and stop dates for each job (filling in missings with the date of the last interview (DLI) or DLI less tenure where necessary). This allows me to set up a person-job-year long data set with observations on job characteristics per job per year. From that, I construct a jobid number that indexes the jobs held over time throughout the longitudinal panel consecutively.

Jobs that last more than one survey and so are asked about more than once will potentially have different reports of job characteristics year by year. I record these within job changes in characteristics and allow wage growth within a job and changes in hours and flextime within a job. The result is a quarterly series of employers (or jobs) and the associated job characteristics.

Notice that I assume the hours, wage and flextime for a job are static within a quarter. If a job begins in a given quarter, or ends in a given quarter, I assume that job's characteristics apply for the whole quarter. For example, if they were not employed in January and report starting a given job in February working 25 hours per week, I record that respondent as employed part-time in that quarter (January to March). An alternative would have been to make a sum of the weekly hours across the actual weeks worked in that job from the start-week of the job. If a job spanned the whole quarter, the individual would end up with the same hours status using either method. But if the respondent changed jobs and hours during the quarter I would sum (hours at jobid1 $\times$ # of weeks in jobid1) + (hours at jobid2 $\times$ # of weeks in jobid2). Clearly, I could generate an average quarterly wage in the same way, however, it is not clear what to do with the discrete flextime job characteristic as I would not wish to average it across the two jobs held consecutively within the quarter. Thus, it is more consistent to treat all job characteristics similarly and assume one job's characteristics hold for the whole quarter.

When more than one job is recorded for a given quarter, either because the respondent is working two or more jobs or because within that quarter one job has ended and another has begun, I use data on the job with greater weekly hours.

Labor supply I treat labor supply data as missing if hours are missing *and* there is no information available on their work status that quarter from the weekly work history data. If their quarterly work status is not missing, respondents are not employed in a given quarter if for that quarter: (i) hours are 0; or (ii) hours are missing. To be employed (either part-time or full-time), a respondent must have reported positive usual weekly hours.

Table A.1: Variable descriptions

Variable	Description
Flextime	an indicator variable equal to 1 if the respondent answers yes to the question: Does your employer make flexible hours or work schedule available to you?
Full-time	an indicator variable equal to 1 if the respondent reports usual weekly hours of work > 30
Part-time	an indicator variable equal to 1 if the respondent reports usual weekly hours of work ≤ 30
Wage	reported hourly wage
Quarterly spousal income (reported)	the respondent's spouse or partner income reported in surveys during that marriage or cohabitation
Age at marriage or cohabitation	Age in years as at the start date of the marriage or cohabitation if earlier
Number and age of children	constructed from the date of birth (quarter,year) for the first through fourth children

Education	Highest completed education in years
Race	Either an indicator variable for white (1), non-white (0) or a discrete variable equal to 1 if white, 2 if black and 3 if Hispanic or other.
AFQT	Armed forces qualification test score in percentiles. I use the survey measure AFQT-3 which is re-normed to control for age by the NLS program staff.
Spouse's education	the highest completed education (in years) of the spouse reported in any survey year within the time range of the relationship
Industry	Industry of each job (major categories of the 3-digit 1970 Census codes)
Occupation	Occupation of each job (major categories of the 3-digit 1970 Census codes)
Maternity leave	an indicator variable equal to 1 if the respondent answers yes to the question: Does your employer make maternity leave, that will allow you to go back to your old job or one that pays the same as your old one, available to you?

B Details of the behavioral model

Flow utility is:

$$\begin{aligned} U_t^{j,m} = c_t + &\alpha_{11} c_t n_t + \alpha_{21}^{\omega} n_t + \alpha_{22} n_t^2 + \alpha_{23} \mathbf{1}(\text{Preg with Infant or Two Infants}_t) + \\ &\alpha_{12} c_t \text{PT}_t + \alpha_3^{\omega} \text{PT}_t + \alpha_{31} \text{PT}_t n_t + \alpha_{32} \text{PT}_t \mathbf{1}(\text{infant}_t) + \\ &\alpha_{13} c_t \text{FT-Flex} + \alpha_4^{\omega} \text{FT-Flex}_t + \alpha_{41} \text{FT-Flex}_t n_t + \alpha_{42} \text{FT-Flex}_t \mathbf{1}(\text{infant}_t) + \\ &\alpha_{14} c_t \text{FT}_t + \alpha_5^{\omega} \text{FT}_t + \alpha_{51} \text{FT}_t n_t + \alpha_{52} \text{FT}_t \mathbf{1}(\text{infant}_t) + \\ &\alpha_{61} d_{\text{Home16to20},t} + \alpha_{62} d_{\text{Home20to23},t} \\ &+ d_t^{j,m} \varepsilon_t^{j,m}. \end{aligned} \tag{8}$$

Utility is linear in consumption however I allow for income effects through the interaction of consumption with the number of children (α_{11}) and with each of the labor supply choice variables (α_{12},α_{13},α_{14}). α_{21}^{ω} and α_{22} capture the utility from the stock of children n_t, assumed to be quadratic. Preferences for children (in the linear term) are allowed to vary by unobserved preference type, $\omega = \{1, 2, 3\}$. $\mathbf{1}(\text{Preg with Infant or Two Infants}_t)$ is an indicator variable equal to one if she is pregnant and has an infant child in period t or if she has two infants concurrently in time t. α_{23} is expected to be negative and capture the disutility of falling pregnant while still caring for a very young child and for caring for two very young children (this is mainly used to assist in fitting the empirical pattern of birth spacing).

α_3^{ω}, α_4^{ω} and α_5^{ω} capture the disutility of part-time, full-time with flextime and full-time hours respectively. Each is permitted to vary by unobserved preference type, ω. As Hotz and Miller (1988) note the literature consistently finds the number and age structure of children to be an important factor in the hours and participation decisions of women. Thus, α_{31}, α_{41} and α_{51} allow for interactions between hours and flextime of the job and the number of children, while α_{32}, α_{42} and α_{52} capture the extra cost of work (hours and flextime) when a child is under two years of age and may require greater time investments.

α_{61} and α_{62} are incorporated to better match the high proportions of young women in non-employment when between the ages of 16 and 23 years. These parameters allow a loading on the utility of non-employment when the women are young, that is, when the probability of still being in some kind of education is high.

$d_{j,m,t}\varepsilon_t^{j,m}$ are choice-combination-j, m-specific random preference shocks.

The formal Bellman equation takes the following form:

1. If she chooses employment in the current period ($j = \text{PT}, \text{Flex}, \text{FT}$):

$$\begin{aligned} V_t^{j,m}(\Omega_t) = U_t^{j,m}(\Omega_t) + \beta \Big\{ & (1-\lambda_E)\mathbb{E}\max\{V_{t+1}^{k=j,m}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\} \\ & + \lambda_E\lambda_{\text{PT}}\Big(\pi_1\mathbb{E}\max\{V_{t+1}^{k=j,m}(\Omega_{t+1}), V_{t+1}^{k=\text{PT},m,\nu=1}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\} \\ & \quad + \cdots + \pi_5\mathbb{E}\max\{V_{t+1}^{k=j,m}(\Omega_{t+1}), V_{t+1}^{k=\text{PT},m,\nu=5}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\}\Big) \\ & + \lambda_E\lambda_{\text{Flex}}\Big(\pi_1\mathbb{E}\max\{V_{t+1}^{k=j,m}(\Omega_{t+1}), V_{t+1}^{k=\text{Flex},m,\nu=1}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\} \\ & \quad + \cdots + \pi_5\mathbb{E}\max\{V_{t+1}^{k=j,m}(\Omega_{t+1}), V_{t+1}^{k=\text{Flex},m,\nu=5}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\}\Big) \\ & + \lambda_E\lambda_{\text{FT}}\Big(\pi_1\mathbb{E}\max\{V_{t+1}^{k=j,m}(\Omega_{t+1}), V_{t+1}^{k=\text{FT},m,\nu=1}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\} \\ & \quad \cdots + \pi_5\mathbb{E}\max\{V_{t+1}^{k=j,m}(\Omega_{t+1}), V_{t+1}^{k=\text{FT},m,\nu=5}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\}\Big)\Big\} \end{aligned} \tag{9}$$

   where k indicates the hours-flex choice made in the next period.

2. If she chooses not to be employed in the current period $j = 0$:

$$\begin{aligned} V_t^{0,m}(\Omega_t) = U_t^{0,m}(\Omega_t) + \beta \Big\{ & (1-\lambda_0)\mathbb{E}\left(V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\right) \\ & + \lambda_0\lambda_{\text{PT}}\Big(\pi_1\mathbb{E}\max\{V_{t+1}^{k=\text{PT},m,\nu=1}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\} \\ & \quad + \cdots + \pi_5\mathbb{E}\max\{V_{t+1}^{k=\text{PT},m,\nu=5}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\}\Big) \\ & + \lambda_0\lambda_{\text{Flex}}\Big(\pi_1\mathbb{E}\max\{V_{t+1}^{k=\text{Flex},m,\nu=1}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\} \\ & \quad + \cdots + \pi_5\mathbb{E}\max\{V_{t+1}^{k=\text{Flex},m,\nu=5}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\}\Big) \\ & + \lambda_0\lambda_{\text{FT}}\Big(\pi_1\mathbb{E}\max\{V_{t+1}^{k=\text{FT},m,\nu=1}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\} \\ & \quad + \cdots + \pi_5\mathbb{E}\max\{V_{t+1}^{k=\text{FT},m,\nu=5}(\Omega_{t+1}), V_{t+1}^{k=0,m}(\Omega_{t+1})|\Omega_t, d_t^{j,m}=1\}\Big)\Big\} \end{aligned} \tag{10}$$

Note that in all cases her fertility choice m is such that she may:

1. try to conceive or not if she did not conceive in the previous period. Note that I have shut off (through the evolution of the state space) any conception that occurs within 3 quarters of the prior conception as during this time she is pregnant. If she tries to conceive, with probability π_{age} she will fall pregnant and a child will be born three quarters later.

2. not try to conceive if she did conceive in the prior period.

B.1 Approximation of the terminal value

To approximate the terminal value I first assume we can capture maximum potential earnings from employment in a non-flexible full-time job with maximum job match quality in all quarters into the future through to retirement. In each period $\tau = T + s$ where $s = 1, \ldots, 80$ (for ages 40 years to 60 years in quarters) these maximum potential earnings are a function of age, education, AFQT and years of experience as follows:

$$\ln w_\tau = \ln w_{T+s} = \mu_0 + \theta_1 \text{Age at marriage} + \theta_2 \text{educ} + \theta_3 \text{AFQT} + 4\phi_1 + \phi_2 X^y_{T+s} + \phi_4 + \nu_5 \tag{11}$$

where $4\phi_1$ enters as an intercept shift for working in all quarters of the most recent year (the maximum possible) and ϕ_4 enters as an intercept shift for working in a full-time non-flexible job. Then, taking these assumed maximum potential earnings and associated expected husband earnings, I can form an expression for future potential consumption, V_2:

$$\begin{aligned} V_2 &= \sum_\tau \beta^\tau c_\tau \\ &= \sum_\tau \beta^\tau \left(500 e^{\mu_0 + \theta_1 \text{Age at marriage} + \theta_2 \text{educ} + \theta_3 \text{AFQT} + \phi_2 X^y_T} e^{4\phi_1 + \phi_2 X^y_s + \phi_4 + \nu_5} + Y^H_\tau \right) \end{aligned} \tag{12}$$

This expression makes it clear that the accumulated experience through to age 40 will be the endogenous variable that will generate variation in the continuation value. The coefficients in the expression for V_2 are those used in the wage and husband income functions throughout the model. That is, there are no new coefficients to estimate to form V_2.

Then, I assume the continuation value at T is:

$$V(\Omega_T) = \xi \Omega^1_T + V_2 \tag{13}$$

where Ω^1_T is a subset of the state variables at T that did not enter the calculation of V_2. These will be $\{j_{T-1}, X^q_T, \text{kid}^1\text{age}_T, \text{kid}^2\text{age}_T, \text{kid}^3\text{age}_T, \text{kid}^4\text{age}_T\}$. Notice that the form of $V(\Omega_T)$ mimics a simplified version of the utility function. Consumption (here V_2) enters with separability from the other arguments of utility, while Ω^1_T captures the effects of children and their ages, as well as the impact of the most recent work choices through j_{T-1} and X^q_T.[29] There is a vector of coefficients, ξ, to estimate the effect of these state variables at age 40.

B.2 Evolution of the state vector

The pre-determined components of the state vector evolve as detailed in the following table:

Table B.1: Descriptions of state vector and its evolution

Variable	Description

[29] I use dummies in j_{T-1}, treat X^q_T as a continuous variable (it takes values 0,1,2,3,4) and dummies in the age of the four children (infants or aged over 2 years).

$j_{t-1} = \{0, \mathrm{PT}, \mathrm{Flex}, \mathrm{FT}\}$	Last quarter's labor supply choice. It takes the value 0 if she was not employed.
$\nu_{t-1} = \{0, 1, \ldots, 5\}$	Discrete indicator of the quality of the match of the job held last period. Zero is used if she was not employed last period.
$X_t^Y = \{0, 1, \ldots, 23\}$	Experience in years up to, but not including, the most recent 4 quarters. It increases by one unit discretely whenever 4 quarters of full-time equivalent experience are accumulated.
$X_t^q = \{0, 1, \ldots, 4\}$	Number of quarters of participation in the most recent year. To increment the two experience state variables I also track the following four state variables in the program: $Z_t, h_{t-2}, h_{t-3}, h_{t-4}$.
$h_{t-2}, h_{t-3}, h_{t-4} = \{0, 1, 2\}$	Each indicates the hours worked in the quarters 2, 3 or 4 quarters prior to t respectively. Each takes the value 0 if she was not employed in that quarter, the value 1 if she worked part-time hours and 2 if she worked full-time hours. These along with j_{t-1} are used to calculate X_t^q and to increment Z_t.
$Z_t = \{0, \frac{1}{2}, 1, ..., \frac{7}{2}, 4\}$	A counter of quarters of experience in the most recent year with the 1/2 units used to capture the half-pace increment to experience from part-time hours experience (that is, Z_t grows by 1 if $h_{t-4} = 2$ indicating that a quarter of full-time work experience was accumulated, or by 1/2 if $h_{t-4} = 1$ indicating that a quarter of part-time work experience was accumulated in the year prior to the most recent year). Z_t is used to determine when to increment X_t^Y.
$\mathrm{kid}^1\mathrm{age}_t$, $\mathrm{kid}^2\mathrm{age}_t$, $\mathrm{kid}^3\mathrm{age}_t$, $\mathrm{kid}^4\mathrm{age}_t$	Each gives the age of each child in quarters from $\{-3, \ldots, 9\}$. At the beginning of any period, if $\mathrm{kid}^x\mathrm{age}_t = -3$ then child x has not yet been conceived. If it is equal to -2 the child was conceived in $t-1$ and if equal to 0 the child is born in t. For values between 0 and 8, the child is an infant and once the child turns 2 years of age, I only need to know that a child exists so I stop following the age of the child. Thus if $\mathrm{kid}^1\mathrm{age}_t = \mathrm{kid}^2\mathrm{age}_t = \mathrm{kid}^3\mathrm{age}_t = \mathrm{kid}^4\mathrm{age}_t = 9$, the woman has 4 children all over the age of 2.

C Details of estimation

I estimate the model using simulated method of moments (SMM). The criterion function is:

$$\theta_{SMM} = \arg\min_{\theta}(Q(\theta) - q_s)' W^{-1}(Q(\theta) - q_s) \tag{14}$$

where q_s and $Q(\theta)$ are vectors of S sample and simulated moments, respectively. W is the weighting matrix and is a diagonal matrix in which the diagonal elements are bootstrapped sample variances of the S sample moments thereby placing a greater importance on matching the sample moments with the lowest variance.[30] I use the Nelder Mead Simplex algorithm to search for the parameter estimates. Analytical standard errors for the estimates are formed using numerical gradient methods.

With the chosen weighting matrix, I have fourth moments in the weighting matrix. **?** show that small-sample bias can result from correlations between sampling errors in these covariance moments and sampling errors in the weighting matrix. Within my set of moments, only a subset (139 of the 815 moments) are standard deviations. On the one hand, a majority of these are standard deviations of wages, which are assumed to have a log-normal distribution. **?** show that the log-normal generates some of the worst bias among the distributions they consider even when close to 1000 observations are used to compute the moment. However, in a large majority of these wage moments I use upwards of 2000 panel observations to construct the moment.

While simulated maximum likelihood would be a more efficient estimator, I have a large number of missing state variables (the flexible-non-flexible distinction in full-time hours is not available in the data prior to 1989). The classification error methodology of **?** is available but they caution against using that method to overcome missing state variables when also modeling a long model horizon such as in this model which has a horizon of up to 76 quarters.

C.1 Standard errors

Analytical standard errors for the estimates are formed using numerical gradient methods. This relies on a relatively smooth moment condition in the neighborhood of θ_{SMM}. However, I am reasonably confident that I can use this method given the relatively smooth shape of the moment condition observed when checking for local identification. Let $g(\theta) = (Q(\theta) - q_s)$, then we can rewrite Equation 14 as

$$\theta_{SMM} = \arg\min_{\theta} g(\theta)' W^{-1} g(\theta). \tag{15}$$

Then the covariance matrix is

$$\Sigma_{SMM} = (G'W^{-1}G)^{-1} G'W^{-1}SW^{-1}G(G'W^{-1}G)^{-1}$$

where

$$G = \frac{1}{N}\sum_{i=1}^{N} \frac{\partial g(\theta)}{\partial \theta}$$

can be estimated using numerical gradient methods and

$$S = \frac{1}{N}\sum_{i=1}^{N} g(\theta) g(\theta)'.$$

[30] I use 1000 bootstrap iterations.

D Listing and description of moments

Table D.1: Listing and description of moments

Description	Conditioning	Count
Work choices and dynamics of labor supply		
Proportions in:		
PT, FT, FF, NF	Age*	16
PT, FT, FF, NF	Age & Husband income†	72
PT, FT, FF, NF	Age & Education‡	30
PT, FT, FF, NF	Age & AFQT#	32
PT, FT, FF, NF	Age & Number of kids	64
PT, FT, FF, NF	Age & Infant dummy	32
Across all years in sample, quarterly transitions from and to:		
Home, PT, FT	Age	28
Across years 1989-2000 incl., quarterly transitions from and to:		
Home, PT, FF, NF	Age	32
Across all years in sample, average durations in:		
Home, PT, FT	AFQT	6
Home, PT, FT	Education	6
Home, PT, FT	age at marriage (or cohabitation)[a]	12
Across years 1989-2000 incl., average durations in:		
FF, NF	AFQT	4
FF, NF	Education	4
FF, NF	age at marriage (or cohabitation)	8
Fertility		
Proportions with:		
0,1,2,3 children	Age	22
0,1,2,3 children	Age & Husband income	25
Pregnant	Age[b]	8
Pregnant while youngest is an infant	Age	6
Pregnant	Age & parity	18
Mean and standard deviations of:		
Age at births	birth order & AFQT	16
Age at births	birth order & Education	16
Age at births	birth order & age at marriage (or cohabitation)	28
Experience		
Mean and standard deviation of:		
Experience (years, up to $t-4$)	Age	12
Experience (years, up to $t-4$)	Age & Age at marriage	42

Participation over the most recent 4 quarters	Age	12
Wages		
Mean and standard deviation of:		
Log wages	Age	16
Log wages	Age & PT,FT	24
Log wages	Age & FF,NF	16
Positive quarterly changes in log wages	Age	12
Positive quarterly changes in log wages	Age & conditional on changing jobs, hours or flex	12
Positive quarterly changes in log wages	Age & conditional on changing jobs	12
Negative quarterly changes in log wages	Age	12
Negative quarterly changes in log wages	Age & conditional on changing jobs, hours or flex	12
Negative quarterly changes in log wages	Age & conditional on changing job	12
Mean of:		
Log wages	Age & Educ	11
Log wages	Age & AFQT	12
Log wages	Experience (years, up to $t-4$)	16
Log wages	Participation over the most recent year	5
Proportion of changes in log wages that are positive when there is a change in:		
Hours, flex or employer	Age	6
Employer	Age	6
Mean and standard deviation of:		
Husband's income	Age	16

Notes to the table of moments:

* Age is grouped into the following 6 bands $[16,22],(22,26],(26,29],(29,32],(32,36],(36,40]$, and for the moments on FF and NF (1989-2004) ages 22-29 years are grouped together to avoid low cell counts. In addition, as cell size allowed, the number of age bands was increased or decreased.

† Husband income is grouped into the following bands $[0,2500),[2500,5000),[5000,7500),[7500,10000),[10000,15000),[15000,\max]$

‡ Years of education is grouped into 2 bands - less than a 4 year college degree, 4 year college degree or more.

The AFQT scores are separated in to 2 groups, above or below the sample median.

[a] Age at marriage or cohabitation is grouped into the following quartiles $[16,19.5],[19.75,22.5],[22.75,26.75],[27,38]$.