

IZA DP No. 4829

**The Effect of Job Flexibility on
Female Labor Market Outcomes:
Estimates from a Search and Bargaining Model**

Luca Flabbi
Andrea Moro

March 2010

The Effect of Job Flexibility on Female Labor Market Outcomes: Estimates from a Search and Bargaining Model

Luca Flabbi

*Georgetown University
and IZA*

Andrea Moro

Vanderbilt University

Discussion Paper No. 4829
March 2010

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

Any opinions expressed here are those of the author(s) and not those of IZA. Research published in this series may include views on policy, but the institute itself takes no institutional policy positions.

The Institute for the Study of Labor (IZA) in Bonn is a local and virtual international research center and a place of communication between science, politics and business. IZA is an independent nonprofit organization supported by Deutsche Post Foundation. The center is associated with the University of Bonn and offers a stimulating research environment through its international network, workshops and conferences, data service, project support, research visits and doctoral program. IZA engages in (i) original and internationally competitive research in all fields of labor economics, (ii) development of policy concepts, and (iii) dissemination of research results and concepts to the interested public.

IZA Discussion Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be available directly from the author.

ABSTRACT

The Effect of Job Flexibility on Female Labor Market Outcomes: Estimates from a Search and Bargaining Model*

This paper develops and estimates a search model of the labor market where jobs are characterized by wages and work-hours flexibility. Flexibility is valued by workers, and is costly to provide for employers. The model generates observed wage distributions directly related to the preference for flexibility parameters: the higher the preference for flexibility, the wider is the support of the wage distribution at flexible jobs and the larger is the discontinuity between the wage distribution at flexible and non-flexible jobs. Estimation results show that more than one third of women place positive value to flexibility, with women with a college degree valuing flexibility more than women with a high school degree. Counterfactual experiments show that flexibility has a substantial impact on the wage distribution but not on the unemployment rate. We comment on the implications of our approach for gender differentials in wages and schooling.

JEL Classification: J30, C5

Keywords: search model, work-hours flexibility, structural estimation

Corresponding author:

Luca Flabbi
Georgetown University
Department of Economics
580 ICC, 37th & O Streets, NW
Washington, DC 20057
USA
E-mail: lf74@georgetown.edu

* We would like to thank the seminar participants at the 2007 Conference on Auctions and Games (Blackburg, VA), Bocconi University (Milan, Italy), the 2009 IZA Conference on Labor Market Policy Evaluation (Washington, DC), Istituto Carlo Alberto (Turin, Italy) and two anonymous referees for many useful comments.

1 Introduction

Anecdotal and descriptive evidence suggests that work hours' flexibility, such as the possibility of working part-time or choosing when to work during the day is a job amenity particularly favored by women when interviewed about job conditions.¹ On average women spend more time in home production and child-rearing and less in the labor market.² In this paper we measure women's preference for job flexibility and its effects on labor market outcomes by estimating a search and bargaining model of the labor market. We show that preferences for flexibility have implications on labor market participation and the accepted wage distribution. We also assess the desirability and welfare implications of policies favoring job flexibility using counterfactual analysis.

Our approach is to propose and estimate a search and matching model of the labor market, which we describe in Section 3. In this model, jobs can be flexible or not. Flexible jobs are more expensive to provide.³ Workers have preferences over wages and flexibility, and meet with firms to bargain over these dimensions. Wage heterogeneity arises exogenously as a result of idiosyncratic match-specific productivity and heterogeneity in preferences for flexibility, and endogenously as a result of the bargaining process. We show that because of the search frictions, the wage differential between flexible and non-flexible jobs is not a pure compensating differential.⁴

The identification of the model parameters using standard labor market data is discussed in Section 4. The model predicts different wage distributions for flexible and non-flexible jobs. Fixing *the preference for flexibility*, the two wage distributions have non-overlapping support, and the size of the gap is measured by the monetary value of the preference for flexibility (the compensating wage differential paid to the worker that marginally rejects flexibility). The higher the preference for flexibility, the wider is the support of the wage distribution at flexible jobs and the larger is the discontinuity between the wage distribution at flexible and non-flexible jobs. This is a result of allowing workers to bargain over

¹See for example Scandura and Lankau 1997.

²For example, using recent Current Population Survey data we find that more than 20% of women with a college degree work less than 30 hours per week while only 1.6% of men in the same demographic group do so. Women also generally choose more flexible working schedule (Golden 2001). Our computations from data from the American Time Use Survey 2008 reveal that women spend approximately 60% more time in family related activity during the work day than men do.

³This cost can be justified on the grounds that flexibility makes it more difficult to coordinate workers, or may require the hiring of a higher number of workers, which implies greater search and training costs.

⁴It is a compensating differential only for the marginal worker that is indifferent between a flexible and a non-flexible job.

wages and flexibility options when meeting employers, which generates equilibrium wage schedules that are functions of the match-specific productivity, the outside option and the flexibility regime. The firms' cost of providing flexibility is also identified, because, at given preferences, a higher cost implies fewer flexible jobs in equilibrium.

We describe the data in Section 5. In the empirical implementation, we define a job as flexible when the worker provides less than 35 hours of work per week. Working hours' flexibility includes both the possibility of working less hours and the option of organizing the working hours in a flexible way at same amount of total hours worked. Some papers focus on the first type of flexibility by studying part-time work and hours-wage trade-offs⁵. Data limitations make it difficult to study the second type of flexibility. While our model and estimation method apply to a general definition of flexibility, the data we use in the empirical application are standard and force us to implement the usual definition of flexibility as a part-time job.

Section 6 describes our estimation approach. We estimate the model using a simulated method of moments to minimize a loss function that includes several moments of the wage distributions of flexible and non-flexible jobs and of unemployment durations. Our estimates, presented in Section 7, fit the data very well. Results show that flexibility is important to women. Approximately 37 percent of college-educated women have a positive preference for flexible jobs valuing them between 1 and 10 cents per hour, but only about 20 percent of them choose such jobs in equilibrium. The value of flexibility for women with at most a high school degree is estimated to be equal or lower than 2.5 cents per hour.

Estimating a structural model of the labor market on a representative sample of U.S. individuals allows us to evaluate some relevant policy interventions, which we present in Section 8. We assess what are the overall welfare effects of the simple presence of the flexibility option by comparing our estimated model with an environment where flexibility is not available. We then analyze policies that reduce the cost of providing flexibility. Taking into account equilibrium effects in these comparisons is crucial because the experiments imply that some individuals observed in flexible jobs might decide to work in non-flexible jobs if flexibility is not available, whereas some might decide to remain unemployed: the preferences and the productivities of these workers are relevant to assess the overall labor market impact of each policy. The introduction of frictions and the presence of preferences over job amenities also imply that policy intervention may be welfare improving because the compensating differentials mechanism is only partially at work.⁶

⁵See for example Altnozi and Paxson (1988) and Blank (1990).

⁶Hwang, Mortensen and Reed (1998) and Lang and Majumdar (2004) make this point explicitly.

The experiments suggest that there is a substantial impact of flexibility on the accepted wage distribution. However, the impact on overall welfare and unemployment is limited. This has an interesting policy implication. If the policy objective is to have an impact on the wage structure but not on welfare - for example because the policy maker wants to reduce the gender wage gap - then policies aimed at reducing the cost of the provision of flexibility could be particularly effective.

2 The existing literature and our contribution

There is a vast literature that estimates the marginal willingness to pay for job attributes using hedonic wage regressions.⁷ Authors have long recognized the limitation of the static labor market equilibrium that provides the foundation for this approach. One alternative approach, the use of dynamic hedonic price models (see e.g. Topel 1986), maintains the static framework assumption of a unique wage at each labor market for given observables.

However, if there are any frictions that may make the market not competitive, hedonic wage regressions produce biased estimates. The bias arises for two reasons. First, flexibility is a choice, therefore the standard selection argument applies: we may not always observe the wage that workers choosing flexible jobs would receive had they chosen a different type of job. This bias could be identified by observing the wage pattern of workers that choose different flexibility regimes over their career. This approach is problematic because there are few workers that change their flexibility regime over their life time. Moreover, it is crucial in this approach to control appropriately for job market experience, but it is difficult to do so if experience is a choice that is affected in part by preferences for flexibility. An alternative is to model the selection with appropriate exclusion restrictions, as for example in our approach.

The second reason for the bias is that in hedonic wage models the compensating differential mechanism is working perfectly so that the conditional wage differential is a direct result of preferences. Hwang, Mortensen and Reed (1998) develop a search model of the labor market showing how frictions interfering with the perfect working of a compensating differential mechanism may bias estimates from an hedonic wage model⁸. The bias may be

⁷Rosen (1974) provides one of the first and most influential treatment of the issue; See Rosen (1986) for a more recent survey.

⁸Usui (2006) is an application to hours worked that confirm their results. Lang and Majumdar 2004 obtain a similar result in a nonsequential search environment. Gronberg and Reed (1994) study the marginal willingness to pay for job attributes estimating a partial equilibrium job search model on jobs durations. Differently from us, they do not use flexibility or hours worked among the job attributes and they do not

so severe that the estimated willingness to pay for a job amenity may have the opposite sign than the true one. The intuition is as follows. In an hedonic wage model a job amenity is estimated to convey positive utility only if the conditional mean wage of individuals at job with amenity is lower than the conditional mean of individuals without the job amenity. However, in presence of on-the-job search and wage posting, firms may gain positive profit by offering both a higher wage and the job amenity because doing so will reduce workers turnover. The presence of the job amenity affects the entire wage distribution, which also depends on the value of the outside option. The observed wage distribution may then exhibit a positive correlation between wages and job amenity even if workers are willing to pay for it. In our model, we obtain a similar outcome without on-the-job search but as a result of the bargaining game: when workers and employers meet, they observe a match-specific productivity draw and then engage in bargaining over wages and job amenities. The relationship between productivity and wages depends on preferences for the job amenity in two ways: directly (the compensating differential mechanism) and indirectly through the value of the outside option (the bargaining mechanism).

Hence, despite exploiting a similar intuition as in Hwang, Mortensen and Reed (1998) for solving the hedonic models bias, our model is different with respect to the wage determination since we assume wage bargaining instead of wage posting.

The estimation of the impact of part-time or more generally of hours-wage trade-offs using hedonic wage model has been extensively studied. Moffitt (1984) is a classic example of estimating a joint wage-hours labor supply model. Altonji and Paxson (1988) focus on labor market with tied hours-wage packages concluding that workers need additional compensation to accept unattractive working hours. Blank (1990) estimates large wage penalties for working part-time using Current Population Survey data but suggests that selection into part-time is significant and that the estimates are not very robust.

There exist very few attempts at estimating models with frictions capable of recovering preferences. Blau (1991) is one of the first contributions. He estimates a search model where utility when employed depends both on earnings and on weekly hours of work. His concern, however, is testing the reservation wage hypothesis and not estimating the marginal willingness to pay for job amenities. Bloemen (2008) estimates a search model with similar preferences. He concludes that the reservation wage significantly increases for weekly hours above 50 while decreases in the 20 to 30 hours range. Both Blau and Bloemen's contributions assume that hours worked play a role because firms post tied wage-hours offers. This approach is different from ours because we allow individuals to bargain over wages and attempt to fit the wage distribution.

flexibility. In addition, we estimate the firms' cost in providing flexibility. The focus of their policy experiments is also different because we look at the impact of flexibility on labor market outcomes while Blau tests for the reservation wage property and Bloemen for the difference between desired and actual hours of work.

Methodologically, our paper is related to papers that estimate search and matching models with bargaining, which are a tractable version of partial equilibrium job search models allowing for a wider range of equilibrium effects once major policy or structural changes are introduced.⁹ We extend the standard model in this class by including preferences for a job amenity. A similar feature was implemented by Dey and Flinn (2005) who estimated preferences for health insurance. Our model differs from theirs because the provision of the job amenity is endogenously determined and can be used strategically within the bargaining process.

3 The Model

3.1 Environment

We consider a search model in continuous time with each job characterized by (w, h) where w is wage and h is an additional amenity attached to the job. In the empirical implementation, h is a job regime related to flexibility in hours worked. Workers have different preferences with respect to h and firms pay a cost to provide it.

Workers' instantaneous utility when employed is:

$$u(w, h; \alpha) = w + \alpha h, h \in \{0, 1\}; \alpha \sim H(\alpha) \quad (1)$$

where α defines the marginal willingness to pay for flexibility, the crucial preference parameter of the model, distributed in the population according to distribution H . The specification of the utility function is very restrictive but we prefer to present the specification that we can empirically identify. More general specifications are possible, but the restriction that w and h enter additively in the utility function is difficult to remove if one needs to obtain a tractable equilibrium in a search environment.

Workers' instantaneous utility when unemployed is defined by a utility (or disutility) level $b(\alpha)$. We allow for the possibility that individuals with different taste for flexibility have

⁹See Eckstein and van den Berg (2007) for a survey. Models in this class have been estimated to study a variety of issues, such as: duration to first job and returns to schooling (Eckstein and Wolpin 1995); race discrimination (Eckstein and Wolpin 1999); the impact of mandatory minimum wage (Flinn 2006); gender discrimination (Flabbi 2009).

different preferences for being unemployed. There is no participation decision so workers can only be either employed or unemployed.

Firms' instantaneous profits from a filled job are:

$$pr(x, w, h; k) = (1 - kh)x - w, k \in [0, 1] \quad (2)$$

where x denotes the match-specific productivity and k is the firm cost of providing flexibility.¹⁰ Cost k may arise from the need to coordinate workers in the workplace, and possibly the need to hire a higher number of workers when flexibility is provided, which generates additional search and training costs. Crucially, the total cost of flexibility kx is proportional to potential productivity x : the potential loss of productivity that derives from lack of worker's coordination is higher when workers are more productive, and training costs are higher when workers have higher skills.

The timing of the game is as follows: workers meet firms following a Poisson process with exogenous instantaneous arrival rate λ .¹¹ Once workers and employers meet, they observe their types (defined by α, k) and draw the match specific productivity distributed in the population from distribution G : $x \sim G(x)$. This is an additional source of heterogeneity resulting from the match of a specific worker with a specific employer.

Matched firms and workers engage in bargaining over a job offer defined by the pair (w, h) . The timing of the game is crucial for the bargaining game and for the search process. Before an employer and a worker meet, they know their own type but not the type of who they are going to meet: this implies that they will not direct their search toward specific agents. After an employer and a worker have met, types are revealed. This avoids any problem related to the presence of asymmetric information in the bargaining game.

A match is terminated according to a Poisson process with arrival rate η . There is no on-the-job search and the instantaneous common discount rate is ρ .

¹⁰Standard equilibrium search model assume a cost (usually homogenous) of posting a vacancy and then free-entry with endogenous meeting rates (usually determined by a matching function) to close the model. However these costs are very difficult to identify using workers data, so as a first approximation we will assume firm have no cost of posting a vacancy.

¹¹Keeping the arrival rate exogenous introduce a major limitation in the policy experiments because it ignores that firms can react to the policy and post more or less vacancies. It would be useful to use an endogenous arrival rate but data limitations prevent the estimation of a credible "matching function" in our application since we are looking at specific labor markets where the scarce data on vacancy rates cannot be credibly applied.

3.2 Value functions and the Bargaining Game

This problem can be solved recursively, and the value functions can be written as follows.¹²

The value of employment for a worker matched to a firm is:

$$V_E(w, h; \alpha, k) = \frac{w + \alpha h + \eta V_U(\alpha)}{\rho + \eta} \quad (3)$$

The value of employment is the instantaneous utility flow ($w + \alpha h$) plus the value of unemployment, denoted by $V_U(\alpha)$ weighted by the probability associated to this event (η), all appropriately discounted by the instantaneous rates ρ and η .

For an unemployed worker the value is:

$$V_U(\alpha) = \frac{b(\alpha) + \lambda \int \max [V_E(w, h; \alpha, k), V_U(\alpha)] dG(x)}{\rho + \lambda} \quad (4)$$

This is the flow utility from unemployment $b(\alpha)$ plus the value of finding a match weighted by the probability associated to this event (λ), all appropriately discounted by the instantaneous rates ρ and λ . The value of finding a match involves a decision: accept the job offer or not. Notice also that this job offer involves not only a wage but the pair (w, h) . To solve this optimal decision rule we need to solve the bargaining game between the worker and the firm and then plug in the optimal wage schedule in equation (4): this is shown in detail in the next section when we characterize the equilibrium.

For the firm the value of a filled position is:

$$V_F(x, w, h; \alpha, k) = \frac{(1 - kh)x - w}{\rho + \eta} \quad (5)$$

where again equation (5) has an analogous interpretation to worker's value equations, noting that in this case the value of the alternative state, an unfilled vacancy, is zero because we assume there are no costs of posting a vacancy.

Workers and firm Nash-bargain over the surplus, using the value of unemployment and zero, respectively, as threat points. The cooperative solution is characterized by the following problem:

$$\{\tilde{w}, \tilde{h}\} = \arg \max_{w, h} S(x, w, h; \alpha, k) \quad (6)$$

where

$$\begin{aligned} S(x, w, h; \alpha, k) &\equiv [V_E(w, h; \alpha, k) - V_U(\alpha)]^\beta [V_F(x, w, h; \alpha, k)]^{(1-\beta)} \\ &= \frac{1}{\rho + \eta} [w + \alpha h - \rho V_U(\alpha)]^\beta [(1 - kh)x - w]^{(1-\beta)} \end{aligned} \quad (7)$$

¹²The complete analytical derivation is presented in Appendix A.1.

To compute this solution, we first condition on the flexibility regime and then solve for the wage schedule. When the parties agree to a flexible job, the Nash-bargaining axiomatic solution is given by:

$$\tilde{w}(x, h) = \arg \max_w S(x, w, h; \alpha, k) \quad (8)$$

$$= \beta(1 - kh)x + (1 - \beta)[\rho V_U(\alpha) - \alpha h] \quad (9)$$

This wage equation states that the wage of a realized match is an average between the value of the outside option ($\rho V_U(\alpha)$) and a portion β of the total surplus of the match $((1 - kh)x)$, minus an amount proportional to the job amenity flexibility weighted by the worker's preference for it (αh). The wage schedule, together with the previous value functions, implies that the optimal decision rule has a reservation value property. Since equation (9) shows that wages are increasing in x , equation (3) shows that the value of employment $V_E(w, h; \alpha, k)$ is increasing in wages and equation (4) shows that the value of unemployment $V_U(\alpha)$ is constant with respect to wages, then there exists a reservation value $x^*(h)$ such that the agent is indifferent between accepting the match or no:

$$V_U(\alpha) = V_E[\tilde{w}(x^*(h), h), h; \alpha, k] \quad (10)$$

This in turn implies that workers will accept matches with productivity higher than $x^*(h)$ and reject matches with productivity lower than $x^*(h)$. An analogous decision rule holds for firms and, because of Nash bargaining, there is agreement on the reservation values, i.e. the value $x^*(h)$ satisfying (10) also guarantees that $V_F[x^*(h), \tilde{w}(x^*(h), h), h; \alpha, k] = 0$. Solving for $x^*(h)$ we obtain:

$$x^*(h) = \frac{\rho V_U(\alpha) - \alpha h}{1 - kh} \quad (11)$$

Substituting in (9), the corresponding reservation wage is:

$$w^*(h) = \rho V_U(\alpha) - \alpha h \quad (12)$$

Notice that if flexibility were not available (i.e. $h = 0$) the reservation values would converge to the usual values found in the search-matching-bargaining literature:

$$w^*(0) = x^*(0) = \rho V_U(\alpha) \quad (13)$$

where the reservation wage is the discounted value of the outside option ($\rho V_U(\alpha)$). This is also the solution that we obtain in the non-flexible regime since in the non-flexible regime only the wage matters to determine the decision rule. When flexibility is present, instead, the optimal decision rule changes as a function of α and k . The worker is receiving an

amenity that she values more as α increases: equation (12) then states that the worker is willing to work at lower wages as long as flexibility is provided ($w^*(0) > w^*(1)$). At the same time equation (11) shows how on one side providing the amenity lowers the worker reservation match value but on the other the cost incurred by the firm increases it.

More specifically, the choice of the flexibility regime for the two agents is characterized by the following reservation value property. Given a match productivity value x , the worker and the firm compare the two options they have: a job with flexibility and a job without flexibility. They are indifferent when productivity is x^{**} satisfying:

$$\begin{aligned} V_E(\tilde{w}(x^{**}, 1), 1; \alpha, k) &= V_E(\tilde{w}(x^{**}, 0), 0; \alpha, k) \\ V_F(x^{**}, \tilde{w}(x^{**}, 1), 1; \alpha, k) &= V_F(x^{**}, \tilde{w}(x^{**}, 0), 0; \alpha, k) \end{aligned} \tag{14}$$

Again Nash-bargaining implies that there is an agreement between worker and firm: both agents accept a non-flexible job if the match specific productivity draw is above the threshold x^{**} . Solving equation (14) this reservation match value is given by:

$$x^{**} = \frac{\alpha}{k} \tag{15}$$

Because a higher utility from flexibility α increases the threshold x^{**} then for individuals with higher α it is optimal to accept a job with flexibility over a larger support of x . On the other hand, for a firm with a high cost of providing flexibility it will be optimal to offer job with flexibility over a smaller support of x .

Depending on parameters, it is possible that no jobs with flexibility are created. The cost of providing flexibility and the preferences for flexibility have an opposite impact on the reservation value x^{**} and this threshold represents the point in which agents switch from the flexible regime to the non-flexible. Therefore, if x^{**} is lower than $x^*(1)$ there is no region over the space of x where flexible jobs are accepted. In the next subsection, we characterize the threshold productivities in terms of the values of the fundamental parameters. This characterization will then be exploited for purpose of empirical identification.

3.3 Equilibrium

A convenient approach to characterize the optimal decision rules is to compare the values of the three reservation productivities defined in (11) and (15): $\{x^*(0), x^*(1), x^{**}\}$. Recall that $x^*(0)$ is the reservation productivity value that makes it convenient to form a job without flexibility, $x^*(1)$ is the reservation productivity to form a flexible job, and x^{**} is the reservation productivity that makes a flexible job preferable to a non-flexible job. We

will characterize now these reservation values in terms of the parameters. The following proposition holds:¹³

Proposition 1 *There exists a unique α^* such that:*

$$\begin{aligned} \alpha > \alpha^* &\iff x^*(1) < x^*(0) < x^{**} \\ \alpha = \alpha^* &\iff x^*(1) = x^*(0) = x^{**} \\ \alpha < \alpha^* &\iff x^*(1) > x^*(0) > x^{**} \end{aligned}$$

which is determined by the equation: $\alpha^* = k\rho V_U(\alpha^*)$

Note that we have characterized everything from the point of view of the worker but an analogous result exists for the firm: again the agreement between the optimal policies of the firm and the worker is guaranteed by the Nash bargaining solution.

This proposition defines two qualitatively different equilibria over two regions of the support of the distribution $H(\alpha)$.

Case 1. Consider first the case where parameters values imply $\alpha > k\rho V_U(\alpha)$ and therefore $x^*(1) < x^*(0) < x^{**}$. The optimal decision rule in this case is:

$$\begin{aligned} x < x^*(1) &\text{ reject the match} \\ x^*(1) < x < x^{**} &\text{ accept the match } \{\tilde{w}(x, 1), 1\} \\ x^{**} < x &\text{ accept the match } \{\tilde{w}(x, 0), 0\} \end{aligned}$$

This optimal behavior results from maximizing over the values of each available choice. In Figure 1 we report the value functions for given values of the parameters as a function of the match-specific productivity x : the optimal behavior will then be choosing the value function that delivers the highest value for each x . The value of being unemployed is constant with respect to x since it does not depend on wages (horizontal line). The value of being employed both at flexible and not flexible jobs is increasing in wages and therefore, by Equation (9), it is increasing in x . However, again by (9), workers in a non-flexible job receive more surplus from additional productivity than workers in a flexible job and therefore the slope of equation $V_E(\tilde{w}(x, 0), 0; \alpha, k)$ is steeper than the slope of equation $V_E(\tilde{w}(x, 1), 1; \alpha, k)$. For the same reason when the productivity is extremely low, workers at flexible jobs are better off because they receive the benefit of flexibility: therefore equation $V_E(\tilde{w}(x, 1), 1; \alpha, k)$ has an higher intercept than equation $V_E(\tilde{w}(x, 0), 0; \alpha, k)$. This configuration is common at both types of equilibria; what is changing are the intersection points.

¹³The proof is provided in appendix.

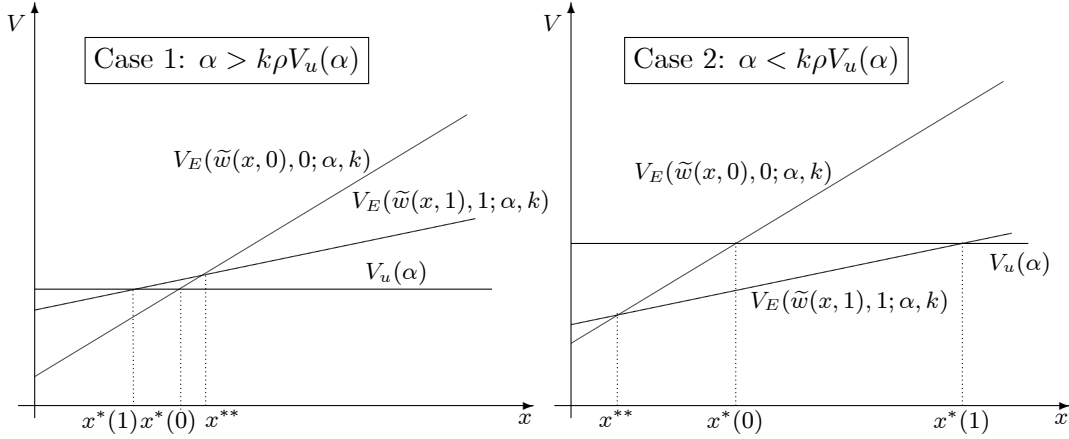


Figure 1: Different equilibrium outcomes

Case 1 is described in the left panel of Figure 1. For low values of the match-specific productivity x , agents prefer to reject the match because the value of unemployment is higher. The point of indifference for switching state is reached at $x = x^*(1)$ where both agents are indifferent between leaving the match or entering a match with a flexible regime and a wage determined by the match schedule (9). Between $x^*(1)$ and $x^*(0)$ only jobs with a flexible regime are acceptable since the value of a job without flexibility is lower than both the value of job with flexibility and unemployment. Notice then that without the availability of such job amenity all this range of values of productivity would be rejected. At $x = x^*(0)$ also non-flexible jobs start to become acceptable. However up to $x = x^{**}$ the surplus generated by a flexible job is higher than the surplus generated by a non-flexible job, as shown by equation (14). Only for values of match-specific productivity higher than x^{**} the optimal decision rule is to accept a non-flexible job with wage determined by (9). Finally, by monotonicity of the difference (14), it is guaranteed that this will remain the optimal decision rule for the rest of the support of x .

Given the optimal decision rules and conditioning on α , the value of unemployment can be rewritten as:

$$\begin{aligned} \rho V_U(\alpha) &= b(\alpha) + \lambda \int_{x^*(1)}^{x^{**}} [V_E(\tilde{w}(x, 1), 1; \alpha, k) - V_U(\alpha)] dG(x) \\ &\quad + \lambda \int_{x^{**}} [V_E(\tilde{w}(x, 0), 0; \alpha, k) - V_U(\alpha)] dG(x) \end{aligned} \quad (16)$$

that by substitution of the optimal wages schedules and value functions becomes:

$$\begin{aligned} \rho V_U(\alpha) &= b(\alpha) + \frac{\lambda\beta}{\rho + \eta} \int_{\frac{\alpha}{k}}^{\frac{\alpha}{k}} \left[x - \frac{\rho V_U(\alpha) - \alpha}{1 - k} \right] dG(x) \\ &+ \frac{\lambda\beta}{\rho + \eta} \int_{\frac{\alpha}{k}} [x - \rho V_U(\alpha)] dG(x) \end{aligned} \quad (17)$$

where notice that the value of unemployment is implicitly defined by an equation that depends only on parameters. Given that $G(x)$ is a distribution, this equation has a unique solution for $V_U(\alpha)$. Equation (17) completes the characterization of the behavior for individuals with $\alpha > k\rho V_U(\alpha)$.

Case 2. When $\alpha < k\rho V_U(\alpha)$, we have $x^{**} < x^*(0) < x^*(1)$, implying the following optimal decision rule:

$$\begin{aligned} x < x^*(0) & \text{ reject the match} \\ x^*(0) < x & \text{ accept the match } \{\tilde{w}(x, 0), 0\} \end{aligned}$$

In Case 2 the added utility of flexibility relative to the cost of providing it is not enough to generate acceptable flexible jobs: only non-flexible jobs with high enough match-specific productivity will be acceptable to both agents. Looking at the right panel of Figure 1, we see that the point of indifference between the two employment regime, x^{**} , is actually placed in a region where matches are not accepted. Only for an higher value of match-specific productivity agents prefer employment to unemployment. But this is the region above $x^*(0)$ where the optimal choice are jobs without flexibility. In conclusion, if the benefit from flexibility is too low, $\alpha < k\rho V_U(\alpha)$, workers and firm will only accept non-flexible jobs.

Given the optimal decision rules and conditioning on α , the value of unemployment can be rewritten as:

$$\rho V_U(\alpha) = b(\alpha) + \lambda \int_{\rho V_U(\alpha)} [V_E(\tilde{w}(x, 0), 0; \alpha, k) - V_U(\alpha)] dG(x) \quad (18)$$

that by substitution of the optimal wages schedules and value functions becomes:

$$\rho V_U(0) = b(\alpha) + \frac{\lambda\beta}{\rho + \eta} \int_{\rho V_U(0)} [x - \rho V_U(0)] dG(x) \quad (19)$$

This equation shows that the value of unemployment is implicitly defined by an equation that depends only on parameters but that does depend on α . To emphasize this fact, we are

denoting here the value of unemployment as a constant $\rho V_U(0)$ and not as a function of α . This result is important because allows us to partition the support of α in a region that can potentially generate acceptable flexible jobs and a region that does not. Empirically, though, it reduces identification because all the α such that $\alpha < k\rho V_U(\alpha)$ are equivalent in terms of observed behavior. In other words, all the individuals with α such that $\alpha < k\rho V_U(\alpha)$ will never accept flexible jobs and they will all share the same reservation value $x^*(0)$. Therefore we will not observe any difference in terms of durations and accepted wages distribution which are the observed variables we use to identify the parameters of the model.

The previous value functions lead to a particularly convenient definition of equilibrium:

Definition 2 *Given $\{\lambda, \eta, \rho, \beta, b(\alpha), k, G(x), H(\alpha)\}$ an equilibrium is a value $V_U(0)$ that solves equation (19) and a set of $V_U(\alpha)$ that solve equation (17) for any $\alpha > k\rho V_U(0)$ in the support of $H(\alpha)$.*

This definition states that, given the exogenous parameters of the model, we can solve for the value functions which uniquely identify the reservation values: the reservation values in turn are the only piece of information we need to identify the optimal behavior. Empirically it is also very convenient because - as we will see in more detail in the identification section - we can directly estimate the reservation values and from them recover information about the value functions and the primitive parameters.

The economic interpretation of the equilibrium is that only for relatively high productivity matches the higher wages compensates the worker for not having a flexible job. This is again a result of the bargaining process: since worker share a proportion of the rents generated by the match there will always be a value of the rent high enough that more than compensate the utility gain of working flexible.¹⁴ On the other side, if a worker has a significant utility from working flexible and the productivity is low enough, it will be optimal to give up some of the relative small share of surplus to gain the job amenity flexibility. The range of productivities on which flexible jobs are accepted is directly related to preferences since an higher α means that the distance between the two reservation values x^{**} and $x^*(1)$ is becoming larger. In the Identification section will show how a similar implication holds for wages generating a useful mapping from the data to the parameters. Looking at Figure 1, left panel there is another interesting region that is worth to analyze: the interval $[x^*(1), x^*(0)]$. This region is proportional to the region of matches that would have not

¹⁴To be precise, this is true if the sampling productivity distribution is not bounded above. If there is an upper bound to productivity and the share at this upper bound is small enough, it is possible that some high α -types will never work in a nonflexible job.

been created without the flexible job option. In a sense this is an efficiency gain of having the option to offer flexible jobs: if the flexibility option were not available, less matches would be created leaving more unfilled jobs and unemployed worker.

The equilibrium exists and it is unique because equations (17) and (19) admit a unique solution. The proof involve showing that both equations generate a contraction mapping: it is relatively straightforward in this case since we are integrating positive quantities on a continuous probability density function.

Different values of the preference for flexibility α imply different configurations of the equilibrium joint distribution of wages and flexibility regimes. For example, we can have three completely different flexibility regimes depending on preferences in the following way. First, if there is only one type of worker with $0 \leq \alpha < k\rho V_U(0)$, then in equilibrium we observe only non-flexible jobs. Second, if there is only one type with $k\rho V_U(\alpha) \leq \alpha$ and the $G(x)$ distribution has a finite upper-bound \bar{x} such that $\alpha > k\bar{x}$ then in equilibrium we observe only flexible jobs. Finally, if there are two types of workers, one with $0 \leq \alpha_1 < k\rho V_U(0)$ and the other with $k\rho V_U(\alpha_2) \leq \alpha_2$, then the equilibrium displays both flexible and non-flexible jobs where the proportion of the two types of jobs depends on the proportion of the two types of workers in the population.

A larger number of types, a different combination of them or a continuous distribution of them can fit other configuration of observables. In particular, as we will show in the following section, the model can fit the configuration we observe in the data, i.e. a combination of flexible and non-flexible regimes on an overlapping support of accepted wages.

4 Identification

In this section we discuss the identification of the fundamental parameters to be estimated: the bargaining power parameter β , the parameters of the distribution over the match-specific productivities $G(x)$, the match arrival rate λ and termination rate η , the discount rate ρ , the flow value during unemployment b , the cost of providing flexibility k , and the distribution over preferences for flexibility $H(\alpha)$.

We use a representative sample of the U.S. labor market containing the following variables: accepted wages, unemployment durations and an indicator of flexibility (see section 5 for details about the data construction). Thanks to the model structure, this relatively limited amount of information allows for the estimation of all the relevant parameters: if the drawback of our approach is the reliance on some functional form assumptions for identification, one advantage is the relatively mild data requirement we need for estimation.

4.1 Identification of the standard search model parameters

First, we assume *symmetric* Nash bargaining, which implies a Nash-bargaining coefficient β equal to $1/2$. This assumption is common in the literature because separate identification of the bargaining power coefficient is difficult without demand side information.¹⁵

Flinn and Heckman (1982) proved identification of a similar model without preferences for the job amenity. They show that unemployment durations identify the hazard rate out of unemployment (the arrival rate time the probability of accepting the match) and the termination rate of a job. They also show that the accepted wage distribution identify the parameters of the match distribution $G(x)$ only if an appropriate parametric assumption is made. The parametric assumption is necessary because we do not observe matches below the reservation wage. Finally, the parameters ρ and b can only be jointly identified. This is because they both enter the likelihood (i.e. they contribute to the mapping from the data to the parameters) only multiplied through the discounted value of unemployment ($\rho V_U(\alpha)$) which, however, is not a primitive parameter, but an implicit function of various parameters (see equations (17) and (19)).¹⁶ This discounted value of unemployment $\rho V_U(\alpha)$ is identified using the minimum observed wage in the sample.¹⁷

4.2 Identification of the parameters that are specific to this model

Our model contains two additional sets of parameters left to be identified and which are not commonly found in the literature: the distribution of preferences for flexibility, α and the cost of providing flexibility k .

We assume a discrete distribution $H(\alpha)$ with a finite number of values α_j , and call p_j the frequency of individuals with preference for flexibility α_j in the population. It is common in the literature to refer to the different values of α_j 's as “types” of workers. We now show how such preferences affect the wage distribution, which should provide an intuition for why these parameters are identified.

¹⁵See Flinn (2006) and Eckstein and Wolpin (1995).

¹⁶Postel-Vinay and Robin (2002) is one of the few articles providing direct estimates of the discount rate within a search framework. Their model is however not comparable to ours because the discount rate includes both “impatience” (as in our model) and risk aversion. They generate high estimates for this parameter: about 12% for the skilled group and up to 65% for some unskilled groups in some specific industries.

¹⁷To perform policy experiment we need the instantaneous value of unemployment b separate from the discount factor ρ . We follow the literature in fixing ρ , and compute b residually using Equation (17). We use for ρ a yearly discount rate of 5%. Flinn and Heckman (1982) use a value of 5% and 10% and Flinn (2006) uses 5%. We performed sensitivity analysis and found that doubling it to 10% does not make an appreciable difference on the results.

First, assume there is only one type such that all workers have the same preference for flexibility α satisfying $\alpha > k\rho V_U(\alpha)$. The support of $G(x)$ is equal to the positive real line. As shown in definition 2, the equilibrium generates a distribution of wages over both flexible and non-flexible regimes and the accepted wage distribution does not have a connected support. This is due to the fact that accepted wages are obtained from the productivity distribution by the equilibrium wage schedule (9). The lower bound of the accepted wage distribution is given by the wage of the worker that marginally accepts a flexible job, $\tilde{w}(x^*(1), 1)$; the maximum accepted wage in a flexible job is $\tilde{w}(x^{**}, 1)$. Between these two bounds the wage distribution is governed by $\tilde{w}(x, 1)$. For $x > x^{**}$, however, the wage distribution is governed by $\tilde{w}(x, 0)$ so that on the region $(\tilde{w}(x^{**}, 1), \tilde{w}(x^{**}, 0))$ the accepted wage distribution does not place any probability mass. This means there is a gap in the support of the accepted wage distribution. The three bounds (i.e. the three truncation points that correspond to the two flexibility regimes) are by definition equal to:

$$\tilde{w}(x^*(1), 1) = \rho V_U(\alpha) - \alpha \quad (20)$$

$$\tilde{w}(x^{**}, 1) = \beta(1-k)\frac{\alpha}{k} + (1-\beta)[\rho V_U(\alpha) - \alpha] \quad (21)$$

$$\tilde{w}(x^{**}, 0) = \beta\frac{\alpha}{k} + (1-\beta)\rho V_U(\alpha) \quad (22)$$

Equating the three truncation points in the support to their definition generates three equations in three unknowns. Solving we obtain the following estimators:

$$\hat{\alpha} = \tilde{w}(x^{**}, 1) - \tilde{w}(x^{**}, 0) \quad (23)$$

$$\widehat{\rho V_U(\alpha)} = \hat{\alpha} + \tilde{w}(x^*(1), 1) \quad (24)$$

$$\hat{k} = \beta\hat{\alpha} \left[\tilde{w}(x^{**}, 0) - (1-\beta)\widehat{\rho V_U(\alpha)} \right]^{-1} \quad (25)$$

where the size of the discontinuity in the wage support identifies the preference for flexibility; given a value of α , the minimum wage in the sample identifies the discounted value of unemployment; and given β , the location of the discontinuity identifies k .

While we do observe workers in both flexibility regimes in the data, we do not observe discontinuous wage supports and, moreover, we observe the wage supports of flexible and non-flexible workers overlap. Therefore, a model with only one type cannot fit the data. This shows that the wage supports over the flexibility regimes contain identifying information about which and how many types should be present in the model to match the data.

As a second step, assume there is more than one type. If this is the case, it is possible that the highest wage of a worker of one type in a flexible job is greater than the lowest wage of a worker from a different type in a non-flexible job. The size of the overlap and

the proportion of workers in flexible and non-flexible jobs in the overlap is informative about the proportion of workers that belong to each type and the value of their preference for flexibility. The presence of more types then “smooths out” the discontinuity in the accepted wage distribution. Multiple types generate a mixture of wage distributions with the same features of the wage distribution with discontinuous support described above.

The following example clarifies how the model can fit the configuration we find in the data which is characterized by the following features: (i) both flexible and non-flexible regimes are accepted; (ii) the supports of the accepted wage distributions do not exhibit discontinuities; and (iii) the accepted wage supports of flexible and non-flexible workers overlap.

EXAMPLE:

If there are three types:

$$\begin{aligned} \alpha_0 &= 0 \\ \alpha_1 &: \alpha_1 > k\rho V_U(\alpha_1) \\ \alpha_2 &> \alpha_1 : \alpha_2 > k\rho V_U(\alpha_2) \end{aligned}$$

*then, a feasible configuration of the reservation wages is:*¹⁸

$$\begin{aligned} \tilde{w}(x^*(0, \alpha_0), 0) &< \tilde{w}(x^{**}(\alpha_1), 0) < \tilde{w}(x^{**}(\alpha_2), 0) \\ \tilde{w}(x^*(1, \alpha_2), 1) &< \tilde{w}(x^*(1, \alpha_1), 1) < \tilde{w}(x^{**}(\alpha_1), 1) < \tilde{w}(x^{**}(\alpha_2), 1) \end{aligned}$$

generating three intervals in the support of the accepted wages at job with and without flexibility. The equilibrium implies that the mapping from observed wages and the probability of being of a given type (denoted by $\pi_j(w_i, h_i; \mathbf{p})$) is as follows:

¹⁸By *feasible configuration* we mean an ordering of the three reservation values that may be realized in equilibrium given a number of types. Note that the number of types does not necessarily uniquely identify a given configuration; only given a complete set of parameters we can find the unique configuration of the realized in equilibrium.

<i>Observed</i> $\{w_i, h_i\}$	$\pi_0(w_i, h_i; \mathbf{p})$	$\pi_1(w_i, h_i; \mathbf{p})$	$\pi_2(w_i, h_i; \mathbf{p})$
<i>h_i = 1 and</i>			
$\tilde{w}(x^*(1, \alpha_2), 1) \leq w_i < \tilde{w}(x^*(1, \alpha_1), 1)$	0	0	1
$\tilde{w}(x^*(1, \alpha_1), 1) \leq w_i < \tilde{w}(x^{**}(\alpha_1), 1)$	0	$\frac{p_1}{p_1+p_2}$	$\frac{p_2}{p_1+p_2}$
$\tilde{w}(x^{**}(\alpha_1), 1) \leq w_i < \tilde{w}(x^{**}(\alpha_2), 1)$	0	0	1
<i>h_i = 0 and</i>			
$\tilde{w}(x^*(0, \alpha_0), 0) \leq w_i < \tilde{w}(x^{**}(\alpha_1), 0)$	1	0	0
$\tilde{w}(x^{**}(\alpha_1), 0) \leq w_i < \tilde{w}(x^{**}(\alpha_2), 0)$	$\frac{1-p_1-p_2}{1-p_2}$	$\frac{p_1}{1-p_2}$	0
$\tilde{w}(x^{**}(\alpha_2), 0) \leq w_i$	$1 - p_1 - p_2$	p_1	p_2

In this example, in some cases the wage and flexibility regime is enough to identify the agent's type. For example, if we observe an individual employed in a flexible job with a wage higher than $\tilde{w}(x^*(1, \alpha_2), 1)$ but smaller than $\tilde{w}(x^*(1, \alpha_1), 1)$ we could conclude she belongs to the α_2 -type. The same is true for individuals working in non-flexible jobs with a wage lower than $\tilde{w}(x^{**}(\alpha_1), 0)$: they belong to the α_0 -type. For other regions in the support we cannot have this one-to-one mapping but we can still obtain some information about the probability of belonging to a certain type. For example, individuals in a flexible job with wages in the $[\tilde{w}(x^*(1, \alpha_1), 1), \tilde{w}(x^{**}(\alpha_1), 1)]$ interval will belong to the α_1 -type with probability $\frac{p_1}{p_1+p_2}$ and to the α_2 -type with probability $\frac{p_2}{p_1+p_2}$. All these reservation wage values are themselves a function of the primitive parameters we want to estimate.

Note that α is not identified for all types such that $\alpha < k\rho V_U(0)$. The reason is that in this case all accepted jobs are non-flexible and flexibility has no impact on these types of workers. We will denote the α such that this is the case with α_0 and we are forced to normalize its value. In the estimation we obtain values of α that are quite low (between 0.1 and 0.01) and we know that α_0 must be smaller than the smallest estimated α . We therefore normalize α_0 to zero, which has a negligible impact on the results. The same can be said of ignoring the possibility of more than one type in the $\alpha < k\rho V_U(0)$ region: since the α -values in this regions are so compressed, even if more types were allowed they would be very similar because the types are fully described by their α 's.

5 Data

For identification purposes, we need a data set reporting at least accepted wages, unemployment duration, a flexibility regime indicator and some additional controls to insure a degree of homogeneity to the estimation sample.

Finding a good flexibility indicator is a difficult task: ideally we would like to have a

Females	College	High School
N. flexible	264	240
N. non-flexible	1058	854
Average wage, flexible	22.5 (14.2)	10.3 (4.3)
Average wage, non-flexible	23.4 (10.3)	13.9 (5.9)
Wage range, flexible	2.4-70	2.13-26.7
Wage range, non-flexible	7-57.7	3.65-38.5
Avg. hours worked, flexible	21.3 (7.7)	23.4 (7.6)
Avg. hours worked, non-flexible	42.7 (6.4)	40.5 (3.8)
N. unemployed	34	72
Avg. unemployment duration	4.4 (5.2)	4.6 (5.9)

Table 1: Descriptive statistics (standard deviations in parenthesis)

variable indicating if the worker can freely choose how to allocate her working hours. In principle this type of information is observable (for example, some labor contracts have a *flexitime* option allowing workers to enter and exit the job at her chosen time, or allowing workers to bundle extra working hours to gain some days off). However, there is lack of an homogenous definition across firms and industries of these types of contract. Moreover, we prefer to provide estimates based on a representative sample of the population than on specific firms or occupations. For this reason we use a very limited but at least transparent and comparable definition of flexibility that allows us to use a standard and representative sample of the U.S. labor market. The definition of flexibility we use is based on hours worked under the assumption that working fewer hours per week is a way to obtain the type of flexibility we are interested in. For comparability across workers with different flexibility choices, wages are measured in dollars per hour.

The data is extracted from the *Annual Social and Economic Supplement* (ASES or March supplement) of the Current Population Survey (CPS) for the year 2005. We consider only women that declare themselves as white, in the age range 30-55 years old, and that belong to two educational levels: high school completed (high school sample) and at least college completed (college sample). To avoid outliers and top-coding issues we trim hourly earnings excluding the top and the bottom 1% of the raw data.

The variables that we extract are: on-going unemployment durations observed for individuals currently unemployed (t_i); accepted wages observed for individuals currently employed (w_i) and the flexibility regime (h_i) where the worker is assumed to be in a flexible job if working less than 35 hours per week. We obtain a sample whose descriptive sta-

tistics are presented in Table 1. Accepted earnings are measured in dollars per hour and unemployment durations in months.

6 Estimation

The minimum observed wage is a strongly consistent estimator of the reservation wage¹⁹. In our model we can exploit this property of observed minimum wages both at flexible and at non-flexible jobs because they refer to the reservation wage of two different types of individuals: the lowest accepted wage at non-flexible jobs is a strongly consistent estimator for the reservation wage of workers' type such that $\alpha < k\rho V_U(\alpha)$ while the lowest accepted wage at flexible jobs is a strongly consistent estimator for the reservation wage of workers' type such that $\alpha > k\rho V_U(\alpha)$.

Therefore, the first step of our estimation procedure uses equation (12) to obtain the following strongly consistent estimators:

$$\begin{aligned}\widehat{\rho V_U(0)} &= \min_i \{w_i : h_i = 0\} \\ \widehat{\rho V_U(\alpha_j)} - \alpha_j &= \min_i \{w_i : h_i = 1\}\end{aligned}\tag{26}$$

The remaining parameters are estimated in a second step using a Simulated Method of Moments (SMM) procedure. The moments we match are the means and standard deviations of wages at flexible and non-flexible jobs over various percentile ranges defined on accepted wages at non-flexible jobs.²⁰ To these moments we add the mean and standard deviations of unemployment durations and the fraction of workers that are employed in flexible jobs over the same percentile ranges. A complete list of the simulated moments is in Appendix A.3. Matching wage moments and the proportions of flexible and non-flexible jobs over the same wage supports should capture the “smoothed out” discontinuities with the overlapping distributions of wages in flexible and non-flexible jobs generated by a model with multiple types as illustrated in the identification section.

We assume $G(x)$ is lognormal with parameters (μ, σ) .²¹ Given parameter vector $\theta \equiv$

¹⁹See Flinn and Heckman (1982)

²⁰In principle, one could attempt a maximum likelihood approach. This is difficult in our model because each type α such that $\alpha > k\rho V_U(\alpha)$ defines a parameter-dependent support over flexible and non-flexible jobs and the first step allows the estimation of only one such type α . The support of the variables over which the likelihood is defined depends on parameters and therefore a standard regularity condition is violated.

²¹This is the most commonly assumed distribution in this literature because it satisfies conditions for the identification of its parameters and it provides a good fit for observed wages distributions.

$\{\mu, \sigma, \lambda, \eta, k, \boldsymbol{\alpha}, \mathbf{p}, \rho V_U(\alpha_{-j})\}$, in the second step the estimator is:

$$\begin{aligned} \hat{\theta} &= \arg \min_{\theta} \Psi(\theta, \mathbf{t}, \mathbf{w}, \mathbf{h})' W \Psi(\theta, \mathbf{t}, \mathbf{w}, \mathbf{h}) \\ &\text{such that } \Psi(\theta, \mathbf{t}, \mathbf{w}, \mathbf{h}) = \left[\Gamma_R \left(\theta | \widehat{\rho V_U(0)}; \widehat{\rho V_U(\alpha_j)} - \alpha_j \right) - \gamma_N(\mathbf{t}, \mathbf{w}, \mathbf{h}) \right] \end{aligned} \quad (27)$$

where γ_N is the vector of the sample moments obtained by our sample of dimension N while $\Gamma_R \left(\theta | \widehat{\rho V_U(0)}; \widehat{\rho V_U(\alpha_j)} - \alpha_j \right)$ is the vector of the corresponding moments obtained from a simulated sample of size R. Bold types represent vectors of variables: for example \mathbf{t} is the vector of the unemployment durations t_i . The weighting matrix W is a diagonal matrix with elements equal to the inverse of the bootstrapped variances of the sample moments.

To perform policy analysis, we fix the discount rate ρ to 0.05 and recover $\mathbf{b}(\alpha)$ using the equilibrium equations (17) and (19) (see footnote 17).

7 Results

The model is estimated separately for women with a high school degree, and women with at least a college degree. Estimated parameters are reported in Table 2. The specification includes three types and it is very similar to the Example presented in the Section 4. The type that only accepts non-flexible jobs has value α_0 normalized to zero. Three types is the minimum number of types generating both flexible and non flexible jobs that overlaps over their wage support and that guarantees smoothness of the accepted earnings distribution.²²

The parameter estimates fit the data very well (see the table in the Appendix A.3). Observe first that arrival rates, termination rates, and the two parameters of the lognormal distribution of match-specific productivity are comparable to the results obtained in the literature.²³ The arrival rates imply that agents receive an offer, which they may accept or reject, about every 4 months on average. The sampling productivity distribution parameters (μ, σ) imply that the average productivity for college graduates is almost 40 dollars per hour while the average productivity for high school graduates is about 23 dollars per hour. The

²²We estimated the model with four types but the estimates did not generate a significant improvement of the model fit: the additional type estimate of α converges in value to the α of one of the existing type and its proportion in the population is estimated to be negligible.

²³See for example Flabbi (2009) and Bowlus (1997) who estimated comparable search models on samples of women. Flabbi used CPS 1995 data on white college graduates finding a very similar arrival rate and slightly lower average productivity in the presence of employers' discrimination. Bowlus used a NLSY 1979 sample of college and high school women finding a slightly lower hazard rate from unemployment in the presence of a non-participation state.

Parameter	College	High School
μ	3.5343 (0.0069)	3.0107 (0.0192)
σ	0.5378 (0.0043)	0.4841 (0.0188)
η	0.0057 (0.0000)	0.0136 (0.0000)
λ	0.2288 (0.0023)	0.2196 (0.0014)
α_1	0.1035 (0.0488)	0.0100 (0.0030)
p_1	0.1256 (0.0073)	0.2084 (0.0221)
α_2	0.0100 (0.0000)	0.0255 (0.0002)
p_2	0.2437 (0.0075)	0.1641 (0.0415)
k	0.0004 (0.00003)	0.0006 (0.00002)
$\rho V_U(0)$	7.0000 (0.0000)	3.6500 (0.0000)
$\rho V_U(\alpha_1)$	15.3092 (4.3083)	3.9059 (2.7685)
$\rho V_U(\alpha_2)$	2.4100 (0.0000)	2.1555 (0.0002)
Loss function	46.561	3.671
N	1,356	1,166

Table 2: Estimation results (bootstrapped standard errors from 30 samples in parenthesis)

reservation wage values are to be interpreted as measured in dollars per hour, and they appear to be within a reasonable range.

The flexibility-related parameters are more difficult to compare to previous literature, but their values look plausible: about 37% of college educated women are willing to pay between 1 and 10 cents per hour to work in flexible jobs. Firms' cost of providing flexibility is 0.04% of the hourly potential productivity. A similar proportion of women with high school education value flexibility but they are willing to pay a lower dollar amount (between 1 and 2.5 cents per hour) while firms face a higher cost of providing it, about 0.06% of the hourly potential productivity.

We have a very limited model of the firms side of the market so it is difficult to find an explanation about why firms employing low skilled workers may have higher cost of flexibility. A lower cost might seem intuitive on this group since their lower skills makes them easier to substitute. However, we can think at least one explanation consistent with our results: secretarial or manual jobs are often performed in teams and require a higher need for coordinating work-hours among workers than professional jobs.

The difference between the parameter estimates on high school and college graduates suggests that women might choose schooling in part to accommodate a preference for job

flexibility. Schooling is costly but may provide access to jobs where the relative cost of flexibility is lower. This might provide a partial explanation to the puzzle of why women have lower wages than men, but acquire more schooling.²⁴

To further clarify the role of flexibility on labor market outcomes we turn to the computation of counterfactual experiments.

8 Policy Experiments

We present three types of experiments. For each experiment we compute the new equilibrium and use it to generate a sample of wages and unemployment durations which we compare to a sample derived from the parameter estimates reported in Table 2 from Section 7 (the benchmark model). In each experiment we generate a sample of 100,000 observations and compute various statistics.

To emphasize changes with respect to the benchmark model we will present results as ratio with respect to it. To provide a point of reference, Table 3 presents the values of the corresponding statistics in the benchmark case. The first row presents the discounted value of unemployment $\rho V_U(\alpha)$: this can be interpreted as a measure of welfare because $V_U(\alpha)$ is the value of participating in the labor market for a potential worker of type α . Second, we present statistics about workers in flexible and non-flexible jobs: the average and standard deviation of the accepted wages, the employment rate and the hazard rate out of unemployment. Third, we present statistics for unemployed workers: the average unemployment duration and the unemployment rate. Finally, we show firm profits.

8.1 Counterfactual 1: no flexibility

To understand the impact of flexibility, we ask how much the labor market outcomes of women would change if flexibility were not available. To answer this question, the first policy experiments imposes that all jobs must be non-flexible. The equilibrium in this environment is characterized by only one reservation value for each type

$$x^*(0, \alpha_j) = \rho V_U(\alpha_j) \quad (28)$$

which is computed by solving the fixed point equation:

$$\rho V_U(\alpha_j) = u(\alpha_j) + \frac{\lambda\beta}{\rho + \eta} \int_{\rho V_U(\alpha_j)} [x - \rho V_U(\alpha_j)] dG(x|\mu, \sigma) \quad (29)$$

²⁴The main explanations proposed so far have focused on the positive returns in the marriage market (Chiappori, Iyigun and Weiss 2006 and Ge 2008).

	College				High School			
	α_0	α_1	α_2	All	α_0	α_1	α_2	All
$\rho V_U(\alpha)$	7.000	15.309	2.410	6.925	3.650	3.906	2.156	3.458
Workers in non-flex jobs								
Mean wage	23.335	172.338	25.433	23.803	13.242	16.008	27.685	13.932
St. dev. wages	11.367	29.763	10.998	11.462	5.833	5.499	6.273	6.097
Empl. rate	0.976	0.000	0.683	0.782	0.942	0.624	0.061	0.731
Hazard rate to E	0.228	0.000	0.160	0.183	0.220	0.145	0.014	0.170
Workers in flexible jobs								
Mean wage	.	28.392	10.730	21.880	.	8.118	11.448	10.401
St. dev. wages	.	11.246	2.279	12.424	.	1.412	4.190	3.880
Empl. rate	.	0.974	0.293	0.194	.	0.318	0.881	0.211
Hazard rate to E	.	0.214	0.069	0.044	.	0.074	0.205	0.049
Unemployed workers								
Avg. unempl. dur.	4.378	4.677	4.371	4.414	4.556	4.556	4.555	4.556
Unempl. rate	0.024	0.026	0.024	0.024	0.058	0.058	0.058	0.058
Firms' average profits								
Non-flex Jobs	16.335	157.028	23.023	17.778	9.592	12.102	25.530	10.257
Flex Jobs	.	13.187	8.330	11.395	.	4.222	9.318	7.716

Table 3: Benchmark Model

The implied hazard rate out of unemployment in equilibrium is:

$$r(h = 0; \alpha_j) = \lambda \tilde{G}[\rho V_U(\alpha_j) | \mu, \sigma] \quad (30)$$

In this environment fewer matches are formed. When flexibility is present, a larger range of productivities is associated with acceptable jobs. Looking at the left panel in Figure 1, the range between $x^*(1)$ and $x^*(0)$ defines productivities where only jobs with a flexible regime are accepted: if we remove this option a portion of jobs in this range will remain unfilled. The other non ambiguous implication of the policy is that agents valuing flexibility have a lower value of participating in the labor market because a job amenity that they value is not available. We can measure it by comparing the present discounted value of unemployment $V_U(\alpha_j)$ with or without the policy.

Both of these impacts are very modest: Table 4 shows that the unemployment rate is only 0.05 per cent higher for the college type with the highest value of flexibility (α_1 in the college sample) while the difference for the other types is negligible; the decrease in $V_U(\alpha_j)$

	College				High School			
	α_0	α_1	α_2	All	α_0	α_1	α_2	All
$\rho V_U(\alpha)$	100.00	99.58	99.92	99.88	100.00	99.96	99.33	99.92
Workers in non-flex jobs								
Mean wage	100.00	16.43	82.39	98.22	100.00	83.79	44.99	94.38
St. dev. wages	100.00	38.05	104.54	101.10	100.00	107.16	93.07	96.03
Empl. rate	100.00	1412452.60	142.92	124.78	100.00	150.98	1554.81	128.85
Hazard rate to E	100.00	1411683.60	142.92	123.80	100.00	150.98	1554.81	128.86
Unemployed workers								
Avg. unempl. dur.	100.00	100.06	100.00	100.01	100.00	100.00	100.00	100.00
Unempl. rate	100.00	100.05	100.00	100.01	100.00	100.00	100.00	100.00
Firms' profits								
Avg. profit	100.00	8.32	80.55	92.60	100.00	78.58	40.40	94.50
Tot. profit	100.00	9258.14	115.10	115.54	100.00	118.60	622.49	121.76

Table 4: No flexibility (benchmark model=100)

is present for all the types that value flexibility but the amount is still modest (between 0.04 and 0.42 per cent).

The implications for the distribution of accepted wages are ambiguous for two reasons. First, the wages of agents with positive α change in two opposite directions: the lack of flexibility has a positive effect on wages up but the outside option, $V_U(\alpha_j)$, decreases, with a negative effect on wages. Second, the composition of the productivity distribution of the realized non-flexible jobs is different: the realized non-flexible jobs are on average less productive than the realized non-flexible jobs in the pre-policy regime. However, they are still on average more productive than the flexible jobs in the pre-policy regime. The results, reported in Table 4, show large changes.

The average wages for types that value flexibility is reduced considerably: ranging from 16.4% of the average wage in the benchmark model for the α_1 -type in the college sample to 83.8% for the α_1 -type in the high school sample. This is because workers accepting flexible jobs in the benchmark model have lower productivities (given α) than workers accepting non-flexible job. When the option of accepting flexible jobs is taken away, some of these workers accept non-flexible jobs, thus lowering the conditional mean wage. Accordingly, the reservation value for accepting a non-flexible job in the counterfactual is the new discounted value of unemployment $\rho V_U(\alpha_j)$ instead of the ratio α_j/k as in the benchmark model.

This also implies an increase of the hazard rate from unemployment to non-flexible jobs.²⁵ However, the overall hazard rate out of unemployment for the α_1 and α_2 types does not increase because these workers do not have the option of transiting to flexible jobs.

The impact on profits on types with a high value of flexibility is large due to composition effects. For example, the average profit firms make on the α_1 -type in the college sample is a small fraction of the pre-policy profit but this is because more α_1 -types work in flexible jobs generating a large increase in total profits.

To summarize, the impact of the presence of flexibility is large on some labor market outcomes (wages and hazard rates, redistribution of employment from flexible to non-flexible jobs) but small in other dimensions (unemployment). The large effect on wages may have interesting implications for gender wage differentials.²⁶

8.2 Counterfactual 2: reduction to the cost of flexibility at zero cost to workers

The second and third experiments consider policies that ease the provision of flexible jobs by reducing their cost. This cost reduction may be due to spillovers from technological changes and therefore have no direct cost. Alternatively, it may result from an explicit public policy financed by taxation. In this subsection we consider a reduction of k to one half of its estimated value arising from technological progress that bears no cost to workers.

In this case, the α_0 -type is unaffected while the α_1 and α_2 types are affected because their labor market outcomes and endogenous reservation values depend on the cost of providing flexibility. We compute the equilibrium using equation (17). The hazard rates for α_1 and α_2 are:

$$r(h = 1; \alpha_j) = \lambda \left[G\left(\frac{\alpha_j}{k} | \mu, \sigma\right) - G\left(\frac{\rho V_U(\alpha_j) - \alpha_j}{1 - k} | \mu, \sigma\right) \right] \quad (31)$$

$$r(h = 0; \alpha_j) = \lambda \tilde{G}\left(\frac{\alpha_j}{k} | \mu, \sigma\right) \quad (32)$$

We expect an increase in welfare for workers' types that value flexibility and a larger range of productivities associated with flexible jobs. Results, reported in Table 5, show that both these effects are very small: there are negligible effects on unemployment and between 0.01 and 0.13 percentage points on workers welfare.

²⁵The increase for the α_1 -type in the college sample is huge. This result is because the reservation wage for accepting a non-flexible job for this type of worker in the benchmark model is very high and generates an extremely low hazard rate.

²⁶A complete argument requires estimating men's preferences for flexibility, but unfortunately we do not have enough variation in men's flexibility in the data to estimate the model on a sample of men.

	College				High School			
	α_0	α_1	α_2	All	α_0	α_1	α_2	All
$\rho V_U(\alpha)$	100.00	100.01	100.13	100.01	100.00	100.08	100.06	100.03
Workers employed in non-flexible jobs								
Mean wage	100.00	179.00	148.01	102.97	100.00	149.12	182.18	98.94
St. dev. wages	100.00	118.70	99.37	108.81	100.00	101.19	164.19	103.64
Empl. rate	100.00	0.24	31.73	85.47	100.00	23.47	2.46	85.06
Hazard rate to E	100.00	0.24	31.73	85.45	100.00	23.47	2.46	85.06
Workers in flexible jobs								
Mean wage	.	99.68	150.94	96.05	.	140.68	108.00	114.17
St. dev. wages	.	99.31	237.94	81.47	.	235.57	133.11	117.96
Empl. rate	.	100.01	259.07	158.63	.	250.14	106.70	151.77
Hazard rate to E	.	100.01	259.07	161.10	.	250.14	106.70	151.76
Unemployed workers								
Avg. unemp dur	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Unempl. rate	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Firms profits								
Avg (non flex)	100.00	186.70	153.02	100.52	100.00	164.95	189.11	98.69
Total (non flex)	100.00	169.73	48.63	85.93	100.00	38.80	6.40	83.96
Avg. (flex)	.	99.29	165.58	118.59	.	178.14	109.81	114.42
Total (flex)	.	99.30	428.62	188.06	.	445.21	117.17	173.60

Table 5: Half flexibility cost at zero cost to workers (benchmark model = 100)

However, as in previous counterfactual experiment, the impact on wages and on the transfer of employment from non-flexible to flexible jobs is large. Workers of type α_2 with college education have an employment rate in non-flexible jobs that is 30% of the estimated level; employment in flexible jobs increases more than 200%. Wages increase approximately 50% for this type. Note that due to the equilibrium effects there is a big impact not only on flexible jobs, but also on the realized accepted wage distribution of non-flexible jobs.

This has an impact on profits. Again focusing on α_2 -type workers with college education we observe that average profits in non-flexible jobs increase because only relative more productive matches are realized without flexibility; however, there are fewer matches without flexibility leading to a decrease of total profits in this regime. Total profits for flexible jobs are increase, by more than 400%, because more jobs are filled in this regime compared to the benchmark environment. Average profits also increase: the lower cost of

providing flexibility compensates the relatively worst matches that are realized.

To summarize, as in Counterfactual 1 realized wage distributions are very sensitive to the cost of flexibility, while employment and welfare are almost unaffected.

8.3 Counterfactual 3: reduction to the cost of flexibility financed by lump-sum tax

In the third experiment we consider a reduction in the cost of flexibility financed by a lump-sum tax on all workers. In this case all types of workers are affected. Wages and profits now result from bargaining over the following surplus:

$$S(x, w, h; \alpha, k) = \frac{1}{\rho + \eta} [w - t + \alpha h - \rho V_U(\alpha)]^\beta [(1 - k'h)x - w]^{(1-\beta)} \quad (33)$$

leading to the following wage schedule:

$$\tilde{w}(x, h) = \beta (1 - k'h)x + (1 - \beta) [\rho V_U(\alpha) + t - \alpha h] \quad (34)$$

The value of unemployment equations used to compute the reservation values are, for α_0 :

$$\rho V_U(\alpha_0) = b(\alpha_0) + \frac{\lambda\beta}{\rho + \eta} \int_{\rho V_U(\alpha_0) + t}^{\infty} [x - \rho V_U(\alpha_0) - t] dG(x|\mu, \sigma) \quad (35)$$

and, for α_1, α_2 :

$$\begin{aligned} \rho V_U(\alpha_j) &= b(\alpha_j) + \frac{\lambda\beta}{\rho + \eta} \int_{\frac{\rho V_U(\alpha_j) + t - \alpha_j}{1-k}}^{\frac{\alpha_j}{k}} \left[x - \frac{\rho V_U(\alpha_j) + t - \alpha_j}{1-k} \right] dG(x|\mu, \sigma) \\ &\quad + \frac{\lambda\beta}{\rho + \eta} \int_{\frac{\alpha_j}{k}}^{\infty} [x - \rho V_U(\alpha_j) + t] dG(x|\mu, \sigma) \end{aligned} \quad (36)$$

For types α_1 and α_2 , only the hazard rate from unemployment to flexible jobs is affected and it is equal to:

$$r(h = 1; \alpha_j) = \lambda \left[G\left(\frac{\alpha_j}{k} | \mu, \sigma\right) - G\left(\frac{\rho V_U(\alpha_j) + t - \alpha_j}{1-k} | \mu, \sigma\right) \right] \quad (37)$$

For type α_0 the new hazard rate to non-flexible jobs reflects the new reservation value:

$$r(h = 0; \alpha_j) = \lambda \tilde{G}[\rho V_U(\alpha_0) + t | \mu, \sigma] \quad (38)$$

Finally, to complete the characterization we compute the endogenous value of the tax t used to finance flexibility. This depends on the realized equilibrium distribution of accepted

wages and on how they are distributed over flexible and non-flexible jobs. We use the expression for the endogenous steady state unemployment rate:

$$\begin{aligned} u(\alpha_0) &= \frac{\eta}{r(h=0, \alpha_0) + \eta} \\ u(\alpha_j) &= \frac{\eta}{[r(h=0, \alpha_j) + r(h=1, \alpha_j)] + \eta}; \alpha_j = \alpha_1, \alpha_2 \end{aligned} \quad (39)$$

Then compute that the total expense (TE) as the cost times the measure of employed in flexible jobs:

$$TE = (k - k') [(1 - u(\alpha_1)) p_1 + (1 - u(\alpha_2)) p_2] \quad (40)$$

while the total tax TT is paid by all employed workers

$$TT = t [(1 - u(\alpha_0)) p_0 + (1 - u(\alpha_1)) p_1 + (1 - u(\alpha_2)) p_2] \quad (41)$$

therefore: $t = \frac{TE}{TT}$ which is an implicit function of t since the equilibrium unemployment rate also depends on t .

The main difference in this experiment is that the types that do not value flexibility are affected. We expect their welfare to decrease, since they pay a tax for something that does not benefit them. However, because of bargaining, they share some of this cost with firms.

The results of this experiment are reported in Table 6. The impact on types α_1 and α_2 is very similar to the one in the second experiment: the tax generates an extremely modest change in labor market outcomes with respect to the second experiment because the cost of flexibility is very low and therefore the tax required to finance it is very low. This is also the reason why the impact on the α_0 -type is almost insignificant. However, differently from the second experiment, there is no Pareto improvement because type α_0 workers pay taxes without receiving any benefit. To see if their welfare loss is compensated by welfare gains on the other two types we can use the overall value of unemployment $V_U(\alpha)$ which increases by 0.01% on the college sample and by 0.03% on the high school sample.²⁷

To summarize, as in the previous case, wages and employment distributions across regimes are the variables most affected, while unemployment and overall welfare are not sensitive to these policies.

As a general conclusion to the policy exercises we emphasize that despite the small magnitude of the change in policies we are proposing, there is a large effect on wages. If a policy objective is to impact the wage structure, then policies aimed at reducing the cost of providing flexibility could be particularly effective. We conjecture that these policies could also significantly reduce the gender wage gap.

²⁷Given the rounding in reporting the results the α_0 type seems in both cases unaffected. It actually is affected but the loss is in the order of the .0001% and it does not show up in the reported rounded value.

	College				High School			
	α_0	α_1	α_2	All	α_0	α_1	α_2	All
$\rho V_U(\alpha)$	100.00	100.01	100.13	100.01	100.00	100.08	100.06	100.03
Workers in non-flexible jobs								
Mean wage	99.72	179.00	148.01	102.72	100.02	148.56	181.01	98.93
St. dev. wages	100.91	118.70	99.37	109.62	100.83	102.69	143.28	104.25
Empl. rate	100.00	0.24	31.73	85.47	100.00	23.47	2.46	85.06
Hazard rate to E	100.00	0.24	31.73	85.45	100.00	23.47	2.46	85.06
Workers in flexible jobs								
Mean wage	.	99.68	150.95	96.05	.	140.53	108.09	114.17
St. dev. wages	.	99.31	237.94	81.47	.	234.98	134.74	118.95
Empl. rate	.	100.01	259.07	158.63	.	250.14	106.70	151.77
Hazard rate to E	.	100.01	259.07	161.10	.	250.14	106.70	151.76
Unemployed workers								
Avg. unemp dur	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Unempl. rate	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Firms' profits								
Avg. (non-flex)	99.60	186.70	153.02	100.19	100.03	164.20	187.84	98.67
Total (non-flex)	99.60	169.73	48.63	85.64	100.03	38.62	6.36	83.94
Avg. (flex)	.	99.29	165.58	118.59	.	177.86	109.93	114.41
Total (flex)	.	99.30	428.62	188.06	.	444.51	117.30	173.58

Table 6: Half flexibility cost financed by lump-sum tax (benchmark model = 100)

9 Conclusion

Studying the impact of work flexibility on women's labor market outcome is complicated by the difficulty of finding a convincing proxy for flexibility and by the bias arising in the standard settings. In this paper, we propose a contribution to a solution to the second problem by estimating a dynamic search model of the labor market where workers and firms bargain over wages and the provision of flexibility. We maintain the narrow definition of flexibility most frequently found in the literature - flexibility as the availability of part-time work - and show that women value this amenity significantly.

In our estimates we also find that college graduates and high school graduates value flexibility differently. College graduates place higher value to having a flexible jobs. Moreover,

we find that jobs requiring a college education can provide flexibility at lower cost. Because women might choose schooling also to accommodate their preference for job flexibility, we speculate this might explain observed differences in schooling achievements between men and women.

The counterfactual experiments reveal that the impact of flexibility is quite substantial on some labor market outcomes (wages and hazard rates, the distribution of employment between flexible and non-flexible jobs) but not on others (unemployment). For example, without flexibility, the average wage of workers types that value flexibility would be up to 74% lower while the unemployment rate would be at most 0.06% higher than in the benchmark environment with flexibility. We infer that policy reducing the cost of flexibility provision could be very effective to change the realized wage distribution at little cost in terms of employment.

Our approach presents four main limitations. First, in the empirical application of our model we define flexible jobs using part-time jobs. A more appropriate definition should also capture the option of organizing work time in a flexible way.

Second, we estimate the model by schooling groups and we find significant differences between them but we did not integrate a schooling decision in the model and in the estimation procedure. We think devoting future work to fill this gap is particularly promising to test our conjecture that expectations on future job amenities, such as flexibility, are important components of the schooling choices of women.

Third, the employers side in our model is very stylized. In particular we assume a homogenous cost of providing flexibility. Estimating heterogeneous costs and correlations between costs and industries could help explain why we observe different preference across different skill levels and could deepen our understanding of the feedback of the labor market on schooling choice. Just as we find that different levels of schooling are correlated with preferences for flexibility, we could find that different types of schooling at same level (for example college majors) are correlated with preferences for flexibility because they increase the likelihood of working in jobs and industries that provide flexibility at low cost.

Fourth, we have found a strong impact of flexibility on wages and a significant correlation between preference for flexibility and level of schooling. There is a large literature on gender differentials on both variables which is currently facing a puzzle: recent U.S. workers data shows women earning lower wages, despite having a positive schooling differential with respect to men. Our results show that differences in preference and cost for flexibility have large impact on wages. Therefore, a higher preference for flexibility for women with respect to men could potentially explain a large portion of the gender wage differential. Moreover,

if we can conclude that women choose college at least in part to obtain flexibility in their future jobs, we could also explain part of the gender college differential.

The lack of males working in flexible jobs in our data prevented us to provide estimates for men. We hope that a more complete data set providing a better definition of flexibility (and possibly more detailed schooling and firms information) will also generate enough data variation to estimate the model on a sample of men.

References

- [1] Altonji J. and C. Paxson (1988) "Labor Supply Preferences, Hours Constraints, and Hours-Wage Trade-offs", *Journal of Labor Economics*, 6(2): 254-276.
- [2] Becker, G. (1967) *Human Capital and the Personal Distribution of Income*, Ann Arbor MI: University of Michigan Press.
- [3] Blank, R. (1990) "Are Part-Time Jobs Bad Jobs?", in G. Burtless (ed.) *A Future of Lousy Jobs? The Changing Structure of U.S. Wages*. Washington, D.C.: Brooking Institution.
- [4] Blau, D. (1991) " Search for Nonwage Job Characteristics: a Test for Reservation Wage Hypothesis", *Journal of Labor Economics*, 9(2): 186-205.
- [5] Bloemen, H. (2008), "Job Search, Hours Restrictions, and Desired Hours of Work", *Journal of Labor Economics*, 26(1): 137-179.
- [6] Bowlus, A. (1997), "A Search Interpretation of Male-Female Wage Differentials", *Journal of Labor Economics*, 15(4), pg. 625-657.
- [7] Burdett, K. and D. Mortensen (1998), "Wage Differentials, Employer Size, and Unemployment", *International Economic Review*, 39(2), 257-273.
- [8] Chiappori, P-A., M. Iyigun and Y. Weiss (2006), "Investment in Schooling and the Marriage Market", *IZA Discussion Paper* 2454
- [9] Dey, M. and C. Flinn (2005), "An Equilibrium Model of Health Insurance Provision and Wage Determination", *Econometrica*, 73: 571-627.
- [10] Eckstein, Z. and G. van den Berg (2007), "Empirical labor search: A survey", *Journal of Econometrics*, 136: 531-564.

- [11] Eckstein, Z. and K. Wolpin (1995), "Duration to First Job and the Return to Schooling: Estimates from a Search-Matching Model", *The Review of Economic Studies*, 62(2): 263-286.
- [12] Eckstein, Z. and K. Wolpin (1999), "Estimating the Effect of Racial Discrimination on First Job Wage Offers", *The Review of Economics and Statistics*, 81(3): 384-392.
- [13] Flabbi, L. (2009), "Gender Discrimination Estimation in a Search Model with Matching and Bargaining", forthcoming *International Economic Review*.
- [14] Flinn, C. (2006), "Minimum Wage Effects on Labor Market Outcomes under Search, Bargaining and Endogenous Contact Rates", *Econometrica*, 73: 1013-1062.
- [15] Flinn, C. and J. Heckman (1982), "New Methods in Analyzing Structural Models of Labor Market Dynamics", *Journal of Econometrics*, 18: 115-168.
- [16] Ge, S. (2008) "Women's College Decisions: How Much Does Marriage Matter?", mimeo, Virginia Tech.
- [17] Golden, L. (2001) "Flexible Work Schedules: What are we trading off to get them?", *Monthly Labor Review*, March.
- [18] Gronberg, T. and R. Reed (1988) "Estimating Workers' Marginal Willingness to Pay for Job Attributes using Duration Data", *Journal of Human Resources*, 29: 911-931.
- [19] Hwang, H., D. Mortensen and R. Reed (1998) "Hedonic Wages and Labor Market Search", *Journal of Labor Economics*, 16(4): 815-847.
- [20] Lang K. and S. Majumdar (2004) "The Pricing of Job Characteristics When Markets Do Not Clear: Theory and Policy Implications", *International Economic Review*, 45(4): 1111-1128.
- [21] Moffitt, R. "The Estimation of a Joint Wage-Hours Labor Supply Model", *Journal of Labor Economics*, 2(4): 550-566.
- [22] Rosen, S. (1974) "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition", *Journal of Political Economy*, 82: 34-55.
- [23] Postel-Vinay, F. and J-M Robin, "Equilibrium Wage Dispersion with Worker and Employer Heterogeneity", *Econometrica*, 70(6), (2002) 2295-2350.

- [24] Rosen, S. (1986) "The Theory of Equalizing Differences" in: *Handbook of Labor Economics*, V. 1 (O. Ashenfelter and R. Layard, eds.), Amsterdam: North-Holland.
- [25] Scandura, T. and M. Lankau (1997) "Relationship of gender, family responsibility and flexible work hours to organizational commitment and job satisfaction", *Journal of Organizational Behavior*, 18: 377-391.
- [26] Topel, R. (1986) "Local Labor Markets", *Journal of Political Economy*, 94: S111-S143.
- [27] Usui, E. (2006) "Gender Occupational Segregation in an Equilibrium Search Model", mimeo, Wayne State University.

A Appendix

A.1 Derivation of Value Functions

The value of employment at wage w and flexibility regime h for an agent with preference α working at a firm with flexibility cost k is given by the following discrete time approximation:

$$V_E(w, h; \alpha, k) = (w + \alpha h) \Delta t + \rho(\Delta t)[(1 - \eta\Delta t)V_E(w, h; \alpha, k) + \eta\Delta t V_U(\alpha) + o(\Delta t)] \quad (42)$$

where Δt denotes a time span. This expression states that the value of employment is given by the utility received in the entire period plus the discounted expected value of remaining at the job or of falling in the unemployment state. Other possible events are happening with a negligible probability $o(\Delta t)$. Assuming $\rho(\Delta t) = (1 + \rho\Delta t)^{-1}$, rearranging terms and dividing both sides by Δt , we obtain:

$$\begin{aligned} \frac{(1 + \rho\Delta t)}{\Delta t} V_E(w, h; \alpha, k) = \\ (w + \alpha h) \Delta t \frac{(1 + \rho\Delta t)}{\Delta t} + \frac{(1 - \eta\Delta t)}{\Delta t} V_E(w, h; \alpha, k) + \frac{\eta\Delta t}{\Delta t} V_U(\alpha) + \frac{o(\Delta t)}{\Delta t} \end{aligned} \quad (43)$$

Since the Poisson process assumption implies that $\lim_{\Delta t \rightarrow 0} \frac{o(\Delta t)}{\Delta t} = 0$, when $\Delta t \rightarrow 0$ the previous expression converges to:

$$\rho V_E(w, h; \alpha, k) = w + \alpha h - \eta V_E(w, h; \alpha, k) + \eta V_U(\alpha) \quad (44)$$

After collecting terms, this equation is equivalent to (3).

The value of unemployment for an agent with preference α is given by the following discrete time approximation:

$$V_U(\alpha) = b(\alpha)\Delta t + \rho(\Delta t) \left\{ (1 - \lambda\Delta t)V_U(\alpha) + \lambda\Delta t \int \max[V_E(w, h; \alpha, k), V_U(\alpha)] dG(x) + o(\Delta t) \right\} \quad (45)$$

This expression states that the value of unemployment is given by the total (dis)utility from unemployment over the period, equal to $b(\alpha)\Delta t$, and by the fact that after a period Δt two main events may happen: not meeting any firm and remain unemployed or meeting a firm, extract a match-specific productivity value x and decide if accept the job offer or not. We can proceed as with the derivation of V_E , obtaining:

$$\begin{aligned} \frac{(1 + \rho\Delta t)}{\Delta t} V_U(\alpha) = \\ b(\alpha)\Delta t \frac{(1 + \rho\Delta t)}{\Delta t} + \frac{(1 - \lambda\Delta t)}{\Delta t} V_U(\alpha) + \frac{\lambda\Delta t}{\Delta t} \int \max[V_E(w, h; \alpha, k), V_U(\alpha)] dG(x) + \frac{o(\Delta t)}{\Delta t} \end{aligned} \quad (46)$$

Takin the limit to continuous time this expression becomes:

$$\rho V_U(\alpha) = b(\alpha) - \lambda V_U(\alpha) + \lambda \int \max[V_E(w, h; \alpha, k), V_U(\alpha)] dG(x) \quad (47)$$

leading to equation (4) when we collect terms.

Finally, the value of a filled job for a firm with technology k paying a wage w , offering a flexibility regime h to an agent with preference α is:

$$V_F(pr, h; \alpha, k) = [(1 - kh)x - w] \Delta t + \rho(\Delta t)[(1 - \eta\Delta t)0 + \eta\Delta t V_F(pr, h; \alpha, k) + o(\Delta t)] \quad (48)$$

Notice that the dependence on the worker's preference is through the wage schedule, which depends on α after the bargaining game is solved. Applying the assumption on the discount function $\rho(\Delta t)$ and rearranging we get:

$$\frac{(1 + \rho\Delta t)}{\Delta t} V_F(pr, h; \alpha, k) = [(1 - kh)x - w] \frac{(1 + \rho\Delta t)}{\Delta t} + \frac{\eta\Delta t}{\Delta t} V_F(pr, h; \alpha, k) + \frac{o(\Delta t)}{\Delta t} \quad (49)$$

and taking limits to continuous time:

$$\rho V_F(pr, h; \alpha, k) = [(1 - kh)x - w] + \eta V_F(pr, h; \alpha, k) \quad (50)$$

leading to equation (5) when we collect terms.

A.2 Proof of Proposition 1

Proof. By definition of the reservation values:

$$x^{**} \leq x^*(0) \iff \frac{\alpha}{k} \leq \rho V_U(\alpha) \iff \alpha \leq k\rho V_U(\alpha)$$

Also by definition of the reservation values we obtain:

$$x^*(0) \leq x^*(1) \iff \rho V_U(\alpha) \leq \frac{\rho V_U(\alpha) - \alpha}{1 - k} \iff \alpha \leq k\rho V_U(\alpha)$$

proving the claim. ■

A.3 Matched Moments

The following table illustrates the moments in the data and simulated moments at the estimated parameter values. The moments that are being matched are: mean and standard deviation of wages of workers in non-flexible jobs, the fraction of workers in flexible jobs, mean and standard deviation of wages of workers in flexible jobs. Quintiles are defined using percentiles 0, 20, 40, 60, 80, and 100 of the non-flexible workers' wage distribution.

Sample	Non-flexible jobs				Flexible jobs					
	Mean wages		St. dev. wages		Prop. workers		Mean wages*		St. dev. wages*	
	Estim.	Data	Estim.	Data	Estim.	Data	Estim.	Data	Estim.	Data
All College	23.715	23.410	11.302	10.360	0.191	0.200	21.836	22.490	12.784	14.152
Quintile 1	12.297	12.032	1.976	2.273	0.311	0.311	3.495	3.447	2.491	2.470
Quintile 2	16.858	17.085	1.124	1.106	0.118	0.122	2.020	2.131	1.798	1.911
Quintile 3	21.141	21.134	1.270	1.352	0.128	0.071	2.701	1.528	2.374	1.469
Quintile 4	26.587	26.574	1.857	2.080	0.163	0.190	4.368	5.037	3.683	4.144
Quintile 5	39.222	39.910	7.783	8.196	0.197	0.195	7.819	8.021	6.483	6.714
All High Sc.	13.933	13.879	6.097	5.923	0.218	0.219	10.512	10.294	3.918	4.279
Quintile 1	7.321	7.532	1.179	1.253	0.379	0.369	2.744	2.765	1.768	1.798
Quintile 2	10.301	10.091	0.718	0.731	0.276	0.277	2.757	2.769	2.008	2.026
Quintile 3	12.718	12.735	0.736	0.770	0.145	0.144	1.846	1.843	1.590	1.609
Quintile 4	15.640	15.559	1.004	1.139	0.146	0.144	2.273	2.223	1.956	1.945
Quintile 5	22.452	22.392	3.974	4.137	0.089	0.084	1.760	1.780	1.622	1.703

*Because some quintiles may not display any worker in flexible jobs for some parameter values and because identification relies on the fractions of flexible and non-flexible job workers with overlapping wage support, means and standard deviations of wages in flexible jobs were multiplied by the corresponding fraction of workers in flexible job (except for the row displaying moments for all workers).