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Abstract

We propose and estimate a model of family job search and wealth accumulation with data from the Survey of Income and Program Participation (SIPP). This dataset reveals a very asymmetric labor market for household members who share that their job finding is stimulated by their partners' job separation. We uncover a job search-theoretic basis for this added worker effect, which occurs mainly during economic downturns, but also by increased non-employment transfers. Thus, our analysis shows that the policy goal of increasing non-employment transfers to support a worker's job search is partially offset by the spouse's cross effect of decreased non-employment and wages. The added worker effect is robust to having more children and more education in the household and does not just result as a composition of heterogeneous individuals. We also show that the interdependency between household members is understated if wealth and savings are not considered. Finally, we show that gender equality in the labor market not only improves women's labor market performance, but it also increases men's accepted wages and non-employment rates.

Keywords: job search, asset accumulation, household economics, consumption, non-employment, estimation of dynamic structural models.

JEL Classification: C33, E21, E24, J64.

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1 Introduction

Married couples are the largest group within the U.S. labor force,[1] yet most employment analyses and policy designs are undertaken under the individual-agent framework. When multiple workers within the household are considered, the economic analysis focuses on the choice of hours that they work in a frictionless labor market,[2] which is particularly enlightening for an evaluation of tax schemes and social programs. The evaluation of employment policies toward households, however, requires extending this analysis to household labor decisions in the presence of search frictions.

This paper adds to the recent literature on household job search with an analysis and estimation of the added worker effect not just as a result of economic downturns, but also of increased non-employment transfers. We propose and estimate a two-agent job search model in which an agent's reservation wages depend on common wealth and the spouse's wage. This setup is flexible enough to mimic observed employment transitions, wages, and household wealth levels. We find a search-theoretic basis for the observed added worker effect: When an agent separates from his job, the partner's reservation wage declines and his or her job finding rate increases. This result reflects the observed cyclicality of household job flows, when during economic downturns job loss for one agent is compensated by the spouse's job finding, a switch in breadwinner roles that is shown to occur mostly at low levels of wages and household wealth. We also show that the added worker effect is the result of rising individual non-employment transfers that increase workers' non-employment and wages but have the opposite effect on their spouses. An important policy implication of our analysis is thus that the desired goal of non-employment transfers is partly undone by the spouse's opposite behavior in the labor market, a result that is absent in individual job search or household labor supply frameworks.

Our approach stems from the literature on job search with wealth accumulation[3]

[1] According to the Bureau of Labor Statistics (BLS), individuals whose declared marital status is "married, spouse present" represent around 77% of the civilian labor force (BLS 2016, Table 5).

[2] This framework, basically under the collective approach (see Blundell et al. 2007), studies the division of labor and of labor income within the household. One of its main conclusions is that the spouse's wage matters for an individual's labor supply but only through its impact on the income sharing rule set within the household, that is, through an income effect. Blundell and Macurdy (1999) and Browning, Chiappori, and Weiss (2014) review the literature on family economics.

[3] Our approach grows out from Mortensen (1977) and Burdett and Mortensen (1998) and includes wealth accumulation as in Danforth (1979), Acemoglu and Shimer (1999), Costain (1999), Rendon (2006), Lentz (2009), and Lise (2013).

and from the recent research on family job search[4] related to common health-insurance (Dey and Flinn 2008), long-term welfare inequality (Flabbi and Mabli 2018), equilibrium effects (Ek and Holmlund 2010), and household members' job turnover (Guler, Guvenen, and Violante 2012). None of these studies has considered the effect of savings on family job search. Recent macroeconomic research shows that family job search can explain that participation rates are not sensitive to business cycles (Mankart and Oikonomou 2017), intrahousehold insurance (Fernández-Blanco 2017), labor supply of secondary earnings, sons and daughters (Gonçalves et al. 2018), countercyclical unemployment rates for women (Wang 2019), household inequality (Pilossoph and Wee 2019a), and the marital wage premium, i.e., higher wages for married men than bachelors (Pilossoph and Wee 2019b). Mankart and Oikonomou (2017) and Wang (2019) consider wealth within a household search model, but with a unique wage that is determined in a competitive market. We have two gender-specific wage distributions and on-the-job search, plus quits and layoffs, which are able to account closely for their empirical counterparts. We also focus on asymmetric non-employment transfer increases on family members' non-employment rates and wages.

Our model is a unitary framework in which both employed and non-employed agents are engaged in job search and their labor markets are connected by their common wealth and consumption and joint employment decisions. The underlying mechanism for the added worker effect in this framework is similar to Guler, Guvenen, and Violante's (2012) "breadwinner's cycle." However, while they remark that an employed agent's job separation results from the partner's finding a job, the added worker effect that we highlight is rather that the non-employed agent's job finding results from the employed partner separating from his or her job.

The Survey of Income Program Participation (SIPP) contains a detailed work history of individuals in the U.S. from 1996 until 2010, including their employment transitions, wages, and wealth. We find a strong labor market attachment of men and a high job turnover of women, which are not indicative of a cycle in which breadwinners' roles constantly switch. There is a noteworthy asymmetry reflected in that, in around 20% of couples, only the husband works, while in only 4.5% of couples, only the wife works. Additionally, the job finding rate for the husband is

[4]The job search literature also includes work by Gemici (2011), who proposes and estimates a model of household migration that results in family ties hindering mobility and wage growth. Though different in their purpose, the analysis of search by committee proposed by Albrecht, Anderson, and Vroman (2010) can be also considered as part of the literature on job search by more than one agent.

around 17%, with a job separation rate of around 1.1%, while the wife's job finding rate is around 3.5%, and her job separation rate is around 0.9%. On the other hand, in our data for both partners, non-employment and wages tend to increase in the spouse's wages; we do not find the "gender asymmetry" found by Lentz and Tranæs (2005), Lentz (2009), and Marcassa (2014), that the non-employment duration of the wife (and, therefore, her reservation wage) is increasing in the husband's wage, while the non-employment duration of the husband is decreasing in the wife's wage.

We estimate this model structurally by a Simulated Method of Moments (SMM) with reasonable fit to the data on wealth, wages, employment, and employment transitions. By modifying the recovered behavioral parameters, we evaluate three counterfactual scenarios, which show important household effects that would not be present in an individual-agent framework.

The first counterfactual scenario reveals that, once a household member is hit by an adverse labor market shock, the partner substantially decreases his/her non-employment rate. Stephens (2002), for example, presents evidence of this effect in the American economy, while Wang (2019) finds a similar result by linking the added worker effect to countercyclical search intensity of unemployed partners. The second counterfactual scenario is a relaxation of borrowing constraints, which implies increases in both spouses' non-employment. The third counterfactual scenario shows that the desired policy effect of non-employment transfers established by models of individual agents, increasing wages at the expense of more non-employment, is partially undone, especially at low levels of wages and household wealth.

We also show that the omission of wealth and savings in the family job search implies underestimating the interconnection between individual job search processes and misunderstanding on how married workers react to their spouses' job loss and increased non-employment transfers. We show as well that the added worker effect caused by the spouses' job loss and increased non-employment transfers is robust to having more children in the household and more educated families. Moreover, we show that this effect is not simply a compositional result of heterogeneous agents. Finally, we show that, if wives had the same labor markets as their husbands, not only would they have similar wages and non-employment rates as their husbands, but also their husbands would experience increases in their wages and non-employment rates.

Our model has the limitation, shared with all existing household job search models, that it is a unitary framework wherein the household is a planner that does not admit

any spouse's individual decision-making. In the context of labor supply models, this framework is not supported by the data. Under search frictions, a similar limitation may be present by means of the related reservation wages. Addressing this limitation requires modelling household job search in a non-unitary framework, which is beyond our current purpose.[5]

The remainder of this paper is organized as follows. In Section 2, we explain the model and its main implications; in Section 3, we describe the data and the selection criteria used to construct the sample; in Section 4, we detail the estimation method and identification; in Section 5, we present the estimation results and assess the model's fit to the data; in Section 6, we analyze counterfactual scenarios; in Section 7, we evaluate the effects of omitting wealth and savings in family job search; in Section 8, we discuss the effects of the number of children and education on family job search; in Section 9, we analyze the effects in the household of equalizing labor markets for husbands and wives; and in Section 10, we summarize our main conclusions. In the Appendix, we provide details about the numerical solution to the model.

2 Model

Consider a household of two members, husband and wife,[6] that derives utility from consumption and leisure. They maximize expected lifetime utility by choosing a common level of consumption and acceptable wage offers that determine their individual employment status as employed or non-employed. If a spouse is non-employed, the household receives transfers b_i, which are non-labor income and transfers that are not the result of any previous job search process, utility from leisure ϑ_i,[7] and a wage offer with probability λ_i from a wage offer distribution F_i, $i = 1, 2$.[8] Additionally, if both

[5] A non-unitary extension of the household search model requires an individual outside option that is a divorce threat point in household bargaining. Furthermore, in a dynamic framework, a problematic issue is the commitment for future allocations of resources, as exposed by Chiappori and Mazzocco (2017).

[6] To facilitate the exposition of the model and to further relate it to the data, we describe our two-agent job search model as consisting of husband and wife, but this framework is applicable to any household composed of two individuals.

[7] The value of leisure includes the direct enjoyment of free time as well as the enjoyment of non-market goods produced at home using this time, that is, home production. See Aguiar et al. (2012).

[8] This model can be extended to account for geographical mobility by allowing for offers from other locations, moving costs and preference for location, as in Rendon and Cuecuecha (2010), Guler et al. (2012,) and Gemici (2011).

spouses are non-employed, the household enjoys an extra utility ϑ_3, which reflects the complementarity between partners' leisure time spent together. Employed spouses can be either laid off with probability θ_i or receive a job offer with probability π_i.[9] If agents accept an offer, they work for the new employer; otherwise, they remain in their current employment status. Agents can always quit their job to become non-employed. Individual arrival and layoff rates and wage offer distributions are independent; yet, the model is able to account for correlated spouses' employment transitions and wages, because their reservation wages are interconnected.

In each period, given individuals' employment status, wages, and current common wealth A, the household decides on a level of consumption, which determines a level of wealth for the next period A'. The rate of return for saving and borrowing is the same and constant r, while the subjective discount factor is $\beta \in (0,1)$. There is no restriction for savings, but borrowing is limited by a fraction $s \in [0,1]$ of the natural borrowing limit, defined as the present value of the lowest possible secured income: $B = -s\frac{(1+r)(b_1+b_2)}{r}$. Here, s measures the tightness of borrowing constraints, and the limit case $s = 1$ occurs when there are no borrowing constraints.

The household's problem is contained in four value functions, which depend on wealth holdings, employment status, and the wages of its members. The value function when both members are non-employed is the following:

$$
\begin{aligned}
V(A,0,0) = \max_{A' \geq B} \Bigg\{ & U\left(A + b_1 + b_2 - \frac{A'}{1+r}\right) + \vartheta_1 + \vartheta_2 + \vartheta_3 \qquad (1) \\
& + \beta[\lambda_1\lambda_2 \int\int \max\left[V\left(A',x_1,x_2\right), V\left(A',x_1,0\right), V\left(A',0,x_2\right), V\left(A',0,0\right)\right] dF_2(x_2)dF_1(x_1) \\
& + \lambda_1(1-\lambda_2) \int \max[V\left(A',x_1,0\right), V\left(A',0,0\right)]dF_1(x_1) \\
& + (1-\lambda_1)\lambda_2 \int \max[V\left(A',0,x_2\right), V\left(A',0,0\right)]dF_2(x_2) \\
& + (1-\lambda_1)(1-\lambda_2) V\left(A',0,0\right)]\Bigg\}.
\end{aligned}
$$

Equation (1) shows that the family is receiving utility of consumption and of leisure, as well as the discounted value of all possible future joint employment statuses. There are similar expressions for $V(A,w_1,0)$ and $V(A,0,w_2)$, the value function when one household member is employed and the other is non-employed and for the value

[9] We tried to extend this model to allow for a costly search effort that increases arrival rates (as in Wang 2019). Since this extension did not improve model fit of the data, we kept the simple version of the model with exogeneous arrival rates. This extension is available from the authors upon request.

function when both members are employed, $V(A, w_1, w_2)$. The specific expressions for these functions are in Appendix A. A policy rule for wealth accumulation solves each of these four equations; we concisely express them by $A' = A'(A, w_1, w_2)$. Reservation wages emerge from comparing value functions for each possible employment status with each other. We define reservation wages as a function of wealth and the spouse's wage. For the husband, this reservation wage is

$$w_1^*(A, w_2) = \{w_1 | \max[V(A, w_1, w_2), V(A, w_1, 0)] = \max[V(A, 0, w_2), V(A, 0, 0)]\},$$

and there is a similar definition for the wife's reservation wage, $w_2^*(A, w_1)$. Each agent's reservation wage is defined as a function of the partner's *acceptable* wage. For any wage below the partner's reservation wage, as the partner is non-employed, an agent's reservation wage is expressed as $w_1^*(A, 0)$ and $w_2^*(A, 0)$. We also define the following reservation wage set:

$$w_1^{**}(A), w_2^{**}(A) = \{w_1, w_2 | V(A, w_1, w_2) = V(A, w_1, 0) = V(A, 0, w_2)\}.$$

This reservation wage set defines the lowest wage combination for both individuals to be employed, which we call *joint-employment reservation wage*. There is no joint employment at wage combinations in which at least one wage w_i is below its corresponding reservation wage w_i^{**}. However, joint employment does not need to occur above this wage set; it can happen that only one partner is employed.

Because this model does not admit a closed-form solution, we solve it numerically, for which we assume a specific functional form for the utility function, a constant relative risk aversion (CRRA) type, where γ is the coeffi cient of risk-aversion: $U(C) = \frac{C^{1-\gamma}-1}{1-\gamma}$ (if $\gamma \neq 1$, and $U(C) = \ln(C)$, if $\gamma = 1$). The wage offer distribution is a truncated lognormal $F_i(x)$: $\ln w \sim N(\mu, \sigma^2 | \underline{w}, \overline{w}); 0 < \underline{w} < \overline{w} < \infty,\ i = 1, 2$. Wealth is treated as a continuous variable, while wages are discretized.[10] Accordingly, we use the Euler equation and an interpolation algorithm to solve for wealth next period, and we integrate the value functions over wages by a weighted summation. The dynamic problem is solved recursively, iterating the value function until convergence is attained. In Appendix B, available online, we explain in detail the numerical solution to the model. For ease of understanding, the following discussion is based on solving

[10] The lognormal distribution is truncated because the discretization of wages for the numerical solution requires a maximum level. We also need to discard implausible very low wage offers that do not allow couples to accumulate wealth in the way that is observed in the data.

the model assuming the same labor markets for both household members, same arrival rates, wage offer distributions, non-employment transfers, and zero leisure values.

[Figure 1 here]

Figure 1 shows the two individual reservation wages as a function of the spouse's wage, where the husband is indexed by 1 and the wife by 2. An individual's reservation wage is unreactive to the spouse's wages below his or her reservation wage, and an increasing curve for the spouses's acceptable wages. The reservation wages of both spouses cross each other and divide this space into four areas, each corresponding to the four joint employment statuses. The area of joint non-employment, uu, is a rectangle, while the areas for one non-employed and one employed household member, eu and ue, the area under the curves, are convex sets. However, interestingly, the area of joint employment, ee, is a nonconvex set, which implies that, when both spouses work, there can be voluntary quits to non-employment, if one spouse receives a high wage offer. Only when both household members are employed having wages that are higher than the highest possible reservation wage $w_i^*(A, \overline{w})$, there are no voluntary job separations at a given wealth level.

These results are consistent with Guler, Guvenen, and Violante (2012) in what they have called "the breadwinner's cycle," with the following differences. In models of job search and wealth accumulation, as opposed to classic job search models, quits are possible even in individual-agent setups: Over time, once-acceptable wages are overtaken by reservation wages that increased with wealth accumulation (Rendon 2006). Thus, individuals who managed to increase their wealth position separate voluntarily from their current job to search for better jobs while non-employed. In our model, this effect is present as well but for the couple: As the household accumulates wealth, the rectangular area uu and both areas ue and eu of Figure 1 expand over the graph, implying that some wage offers and current wages are no longer acceptable. Another important difference with Guler, Guvenen, and Violante's model is that, in our framework, joint employment is not an absorbing state; agents can still be dismissed or quit to non-employment. Accordingly, quits from employment to non-employment not only switch who is the breadwinner from ue to eu or from eu to ue, but also from ee to eu and from ee to ue. In the figure, when the couple is in the area ee and the husband is employed at wage $\widehat{w}_1$, if the wife receives a high wage offer w_2, then she accepts it, and because $\widehat{w}_1 < w_1^*(A, w_2)$, he quits. Breadwinner switches can thus go on even when both household members are employed, until both wages are at least $w_i^*(A, \overline{w})$.

As we show in the next section on data, we find evidence that job finding triggers job separations and role switching within the household. However, asymmetric labor markets by gender, characterized by a strong labor market attachment for men with a high turnover for women, more than indicating a cycle of constant switching between breadwinners rather suggest episodes of role switching, mostly triggered by job separation than by job finding of one spouse. When an employed household member faces a job separation, the non-employed partner experiences a drop in his or her reservation wage and is more likely to accept wage offers. Job separations of one agent thus encourage job finding of the partner. Hence, this analysis provides a search-theoretic explanation for the added worker effect observed in the data.

[Figure 2 here]

Figure 2 shows that reservation wages are increasing in wealth, which coincides with Danforth's (1979) result for a model of an individual job searcher. In our context of household job search, the joint-employment reservation wage is also increasing in wealth, and, moreover, it converges to the reservation wage set. This implies that switching breadwinner roles within the household occurs at low levels of wealth, but it diminishes as wealth accumulation takes place, so that wage disparity within the household decreases in wealth. At low levels of wealth, and especially under tight borrowing constraints, the household smooths consumption over economic downturns by more active breadwinners' turnover, while with more wealth, the household can smooth consumption by wealth decumulation.

[Figure 3 here]

Figure 3 illustrates the joint employment effects of an asymmetric increase in non-employment transfers, as we evaluate empirically in Section 6. The husband's increased transfers, and thus reservation wage, produces a reallocation of joint employ-ment statuses in three ways. First, there is a reallocation from joint employment to the husband being non-employed and the wife being employed (ee to ue). Second, there is a household role switch from the husband being employed and the wife being non-employed to the husband being non-employed and the wife being employed (eu to ue). This mechanism occurs at low levels of acceptable wages for both household members: between wages just above the lowest possible reservation wages for both agents and the joint-employment reservation wages w^{**}. As explained, this range of wages is wider at low levels of wealth. Third, there is a reallocation from

the husband being employed and the wife being non-employed to both spouses being non-employed (eu to uu). In these three reallocations, the husband separates from his job, but the wife's employment status is unchanged in two of them, whereas in one reallocation, she transitions from non-employment to employment. Hence, an increase in the husband's non-employment transfers increases his non-employment rate, while it tends to decrease the wife's non-employment rate, particularly at low levels of acceptable wages and at low levels of wealth.

Summarizing, in this model, both common wealth and the partner's wages allow individuals to be more selective and to search longer for a suitable job. If an employed agent separates from his or her job, the non-employed partner cannot afford to be so selective and will be more likely to accept job offers and become employed. The model allows, thus, for an added worker effect. It also produces the classic effect of non-employment transfers on the receiving household member, higher non-employment, and higher wages; yet, at the same time, it produces an opposite effect on the spouse, namely, lower non-employment and lower wages.

3 Data and descriptive statistics

We are fitting our model to a sample of couples coming from SIPP. This dataset contains information on socio-demographic characteristics and labor market variables, such as income, labor force, and participation in public programs, including child care, wealth, utilization and cost of health care, disability, school enrollment, and taxes. SIPP was constructed primarily to measure the effectiveness of existing federal, state, and local programs. As it collects information on several variables at the household level, this survey is unique in allowing us to construct a household labor market history.

SIPP's design is based on a continuous series of national panels, with a sample size of approximately 36,700 interviewed households. We are using the 4-year 1996 panel, which covers the period 1996–1999, a period of relative economic stability.[11] The survey is based on monthly interviews and uses a 4-month recall period, with approximately the same number of interviews being conducted in each month of the 4-month period for each wave. Hence, we have three observations per year during the 1996–1999 span, that is, 12 waves.

[11] This time interval avoids both the recession period at the beginning of the 2000s and the boom in housing prices that dramatically changed households' saving behavior.

As we are interested only in households with two members present, we select one-family households of married couples in which both spouses are present and meet certain requirements regarding age and education. We restrict our sample to those aged between 26 and 50, who are high school graduates, not currently enrolled in school, not self-employed or ever retired, not disabled, not contingent workers, not receiving any kind of welfare benefits or social program, not owners of any kind of business, and not in the armed forces.

We categorize any individual in the sample as either employed or non-employed.[12] To determine the labor status in each of the 12 waves included in the sample, we use the monthly labor status information offered. If that information is not available, we compute monthly wages from the regular hourly wage and the number of hours they work per week. The SIPP contains information on multiple jobs held by an individual in the same period; when there is more than one job, we select the job with the most work hours.

We use the total wealth information reported by SIPP and exclude couples who lack wealth data. All wages and wealth observations are in U.S. dollars for 1982–1984. Nominal values in SIPP are deflated using the Consumer Price Index reported by the BLS.[13]

Our main sample consists only of couples who do not have children or who have only one child, which amounts to 34,326 observations of 1,082 married couples.[14] In Section 8, we consider additional samples: high school graduates with two or more children (1.088 couples, 36,963 observations), college graduates with no more than one child (1.255 couples, 38,480 observations), and college graduates with two or more children (1.172 couples, 40,244 observations). Hence, the complete set of results that we are presenting in this paper is based on a total sample of almost 4,600 couples and 150,013 observations.

[Table 1 here]

Table 1 shows employment status, wages, and wealth by joint employment status.

[12] In the absence of good information on search intensity, we are not able to distinguish between being out of the labor force and unemployment, a distinction that is relevant especially for women.

[13] See Table 24 in the Historical Consumer Price Index for All Urban Consumers (CPI-U): U.S. city average, all items-Continued (1982–1984=100, unless otherwise noted).

[14] This stringent sample selection is usual in structural estimations. It is particularly similar to Dey and Flinn (2008), who also use SIPP and restrict their sample to 1,267 married couples.

It illustrates a noteworthy employment asymmetry within the household.[15] When only one spouse works, more often it is the husband. In 20.3% of the sample, the husband is employed and the wife is non-employed, compared with only around 4.6% in which the husband is non-employed and the wife is employed. However, the most frequent employment status is joint employment, which is 74.3% of the sample, while joint non-employment is very infrequent, only 0.9% of the sample. That is, in 94% of the observations, the husband is employed compared with 79% of the observations in which the wife is employed. Within the household, the husband is clearly better established as an employed worker than the wife.

For both household members, the non-employment rate is clearly much higher when the spouse works than otherwise. For the husband, the non-employment rate is around 4.1% when his wife is non-employed and increases to 5.8% when she is employed. The same happens for the wife, at much higher levels: The wife's non-employment rate is around 15.8% when her husband is non-employed and becomes 21.4% when he is employed.

On the contrary, wages are higher when the spouse is non-employed than otherwise. Husbands' monthly wages are on average \$1,738 when their wives do not work, and \$1,574 when they work. Wives' average monthly wages are \$1,107 when their husbands do not work and \$1,039 when they work.[16] That is, husbands' wages are fairly correlated with their wife's employment status, whereas wives' wages are mostly uncorrelated with their husband's employment status.

Wealth data are very noisy, but they are clearly correlated with the joint employment status. Wealth is the highest when only the husband works and the lowest when only the wife works, which suggests that wealth accumulation is mainly correlated with the husband working than with the wife working. These differences in wealth by joint employment status are suggestive of the household's attempt to maintain consumption by decumulating during non-employment and recovering wealth positions during employment spells.

[Table 2 here]

Table 2 reports non-employment rates and average wages of each household member by the spouse's wage segment and when the spouse is non-employed. Although

[15] In these tables, we also report predicted statistics, which we discuss in detail in Section 5 when we assess model fit.

[16] These descriptive statistics correspond to the within variation, yet in the estimation we use both within and between variations.

there are non-monotonicities in several segments, the general descriptive pattern is that non-employment rates and average wages are increasing in partners' wages. We do not find evidence of a "gender asymmetry" as in Lentz and Tranæs (2005), Lentz (2009), and Marcassa (2014); that is, that wife's non-employment and wages are decreasing in the husband's wage.

[Table 3 here]

Table 3 presents conditional transitions between joint employment statuses. The exit from joint non-employment depends mainly on the husband finding a job, which happens in 17.4% of the transitions compared with 3.6% for only the wife finding a job and 2.5% for both finding a job. When only one household member works, the main off-diagonal transition is to joint employment; that is, the non-employed partner finds a job while the employed partner remains employed. However, there is a large quantitative difference in these transitions: If only the wife works, the probability of transition to joint employment is around 14.1%. But if only the husband works, the probability of transition to joint employment is around 4.1%. If both work, the most likely transition is that the wife loses her job, which occurs at a rate of 1.2%.

[Table 4 here]

Table 4 shows individual employment transitions, job finding, and job separations, both total and by the spouse's employment transitions. This table illustrates how one spouse's transitions are influenced by the transition of the partner. Both the husband's and wife's job finding are the highest when the employed partner separates from her or his job. Also for both partners, job finding is next highest when the non-employed partner finds a job. More active job finding is thus strongly influenced primarily by the partner's job separations and secondarily by the partner's job finding.

Moreover, for both partners, job separations are also larger when the employed spouse experiences a job separation and next larger when the non-employed partner finds a job. This evidence supports that job separations trigger job finding, the added worker effect, and that job finding triggers job separations, as noted by Guler, Guvenen, and Violante's (2012).

SIPP identifies the employer and includes information on the reason for leaving employment, so that job-to-job transitions and quits and layoffs can be determined. The employer variable only contains 5% of missing observations for husbands and 4% for wives. However, the percentage of missing observations among job separations is

relatively high: around 55% for husbands, and 44% for wives. Accordingly, we can make a meaningful inference for job-to-job individual transitions conditional on the spouse's transitions, but not for quits in individual job separations for all spouse's transitions. Many of the relevant employment transitions are simply not computable. In the next rows of Table 4, we report job-to-job transitions that are around altogether 1.4% both for husband and wife. Employer changes are the highest when the partner finds a job or separates from his or her current job. Quits in job separations are high for both partners, around 48% for husbands and 66% for wives in total.

In sum, these data reveal a clear asymmetry between husband and wife's employment status, and support that there is an added worker effect, especially for the wife; that is, when the husband separates from his employment, it is more likely that the wife becomes employed and experiences wage increases.

4 Estimation

By SMM, we recover the parameters of the theoretical model. From the month that we first observe wealth onward, we use the policy rules that solve the dynamic programming problem and random numbers for the stochastic components (e.g., job offers, layoffs, and wage offers) to generate simulated data. Details on the simulation procedure are provided in Appendix C, available online. We compute some selected moments that are then matched to actual moments. At each iteration of the parameter computation, we construct a measure of distance between the observed and the simulated moments. This criterion function is then minimized by the parameter estimates of the theoretical model.

To make sure that the observed effects are not just the result of differences across agents, we introduce unobserved heterogeneity: in logwage offer means and individual leisure terms. We have two types of husbands, $\left(\mu_1^1, \vartheta_1^1\right)$ and $\left(\mu_2^1, \vartheta_2^1\right)$, and two types of wives, $\left(\mu_1^2, \vartheta_1^2\right)$ and $\left(\mu_2^2, \vartheta_2^2\right)$, so that altogether there are four types of couples in proportions $p_{11}, p_{12}, p_{21}, p_{22}$, with $p_{22} = 1 - p_{11} - p_{12} - p_{21}$.

We fix the discount factor β at 0.9957 and the interest rate r at 0.0041, which are the monthly values that match annual values of 0.95 and 0.05, respectively. The parameters to estimate are then $\Theta = \left\{\Theta^1, \Theta^2, \gamma, s, \vartheta^3, p_{11}, p_{12}, p_{21}\right\}$, with $\Theta^i = \{b^i, \lambda^i, \pi^i, \theta^i, \sigma^i, \mu_1^i, \mu_2^i, \vartheta_1^i, \vartheta_2^i\}, i = 1, 2$.

The moments used in this estimation are the following: joint employment status, accepted wage distributions by joint employment status, wealth holdings by joint em-

ployment status, wealth distribution, joint employment transitions (employment-non-employment, job-to-job and quits), means and standard deviations of wage variations by joint employment transitions, means and standard deviations of wealth variations by joint employment transitions, hazard rates, by joint employment transitions and wealth status, and accepted wages by duration of non-employment.

These moments, most of them reported in the previous tables, are selected to allow identification of the behavioral parameters of the model. The parameters of the standard search model Θ^i are identified from the reservation wage rule by the observed transitions, accepted wages, and wealth levels (Flinn and Heckman 1982). Fixing the interest rate r and the discount factor β enables the identification of arrival rates and layoff rates by the employment transitions; that is, job finding and job separations, as well as job-to-job transitions and available data on quits. The observed accepted wages identify the parameters of the wage offer distributions as well as the transfers while non-employed. The other parameters that are specific to a utility-maximizing job search model with wealth accumulation, γ and s, are pinned down by the observed evolution of wealth by employment status and wages. Wealth data also allow identification of the leisure values ϑ separately from non-employment transfers, which in risk-neutral job search is identical to the value of leisure. Unlike non-pecuniary leisure values, higher non-employment transfers affect directly observed wealth accumulation over employment transitions.

Parameters for the unobserved types are mainly identified by the hazard rates by employment status and wealth level, and the joint wage distributions. In a context of a job search model with wealth, wealthier people exhibit longer duration of non-employment, which is not likely to happen in the data. Unobserved heterogeneous abilities can be the underlying mechanism to reconcile model and evidence and identify ability and search frictions separately: Ability may be correlated with wealth so that higher-ability types and jobs sooner and accordingly exhibit shorter duration of non-employment. Unobserved heterogeneity in mean logwages also allow us to identify some segments of the joint wage distribution, particularly those segments in which the wife's wages are higher than the husband's, a relatively infrequent yet non-negligible event.[17]

[17] An additional source of heterogeneity is by age and by marital duration. Younger and recently married couples may face different search frictions and unobserved heterogeneity than couples who are older and have longer marriage duration. We leave this matter for future research, yet in the online Appendix D, we show that age in our sample is fairly dispersed, and thus is potentially important.

The SMM procedure is based on a weighted measure of distance between sample and simulated moments as a function of a parameter set $S(\Theta) = \Delta m' W^{-1} \Delta m$, where $\Delta m = (m_a - m_p)$ is the distance between sample and simulated moments and W is a weighting matrix. As in Dey and Flinn (2008), the matrix W is a diagonal matrix consisting of the standard deviation of each empirical moment m_a, obtained by bootstrap methods, from 10,000 random samples of the data. The estimated behavioral parameters are thus $\widehat{\Theta} = \arg\min S(\Theta)$. We minimize this function by means of the Powell algorithm, as in Press et al. (1992), who use direction set methods in their optimization algorithm.[18] Asymptotic standard errors are calculated by the gradient estimator, which requires first derivatives. We compute them numerically using a polynomial that requires five function evaluations, obtained by proportionally varying the parameter values around their estimated value. This polynomial smooths the criterion function, whose surface has discontinuous areas. The parameters' asymptotic standard errors are then the square root of the main diagonal of this matrix.

5 Results

The estimates and their corresponding asymptotic standard errors are reported in Table 5.

[Table 5 here]

These estimates reflect the gender asymmetry in labor markets in which arrival rates are much higher and layoff rates are much lower for the husband than for the wife. As we used monthly data in the estimation, the reported rates are also monthly and are in line with the employment transitions reported in Table 4. Job finding and job-to-job transitions are certainly lower than their corresponding estimated arrival rates because some job offers are not accepted. Similarly, job separations are higher than the estimated layoff rates, especially for the husband, as there is a relatively high proportion of voluntary job separations. Utility-maximizing search models have the feature of producing voluntary quits, as explained in Section 2, moreover so in this environment of household job search in which an individual's employment status is

[18] This algorithm first calculates function values for the whole parameter space and then searches for the optimal parameter direction in the next iteration for function minimization. Once a new set of parameters is obtained, the algorithm goes back to calculate a new function value, and the process is repeated until a convergence criterion is satisfied.

highly correlated with the partner's status. Accepted offers that made an individual leave non-employment may no longer be acceptable in the next periods, as household wealth accumulates and the spouse accesses better paying jobs. The annualized arrival rates while non-employed are 87.55% for the husband and 38.19% for the wife, while the annualized arrival rates when employed are 61.17% and 47.11%, respectively. The annualized layoff rate is 6.63% for the husband and 11.79% for the wife.

Unobserved heterogeneity is contained in "high" and "low" types, represented by the values of individual mean logwages and leisure.[19] We find that heterogeneity is relevant essentially only for husbands; there is a very low proportion of the high type for wives, 1.4%, and is only matched with the high type of the husband. Individual leisure values are only positive for the wife and have relatively low values, while for the husband they are zero. The "low" type of wife is matched to the "high" type of husband for 59% of the total and to the "low" type of husband for 40% of the total. This relative large homogeneity for the wife is compensated with the large dispersion of her wage offer distribution.[20] Given these parameters, in general, the husband receives higher wage offers than the wife, but there is an important segment for which the wife receives higher wage offers. Non-employment transfers only exist for the husband, while the wife's main support when non-employed is her husband's wages. In models of individual agents, these non-employment transfers are mainly non-labor income and the partner's income. In our framework, we are accounting explicitly for both non-labor income that comes from wealth and for the partner's income, which we endogenize as accepted wages resulting from the joint job search process.[21]

Larger values of leisure for the wife than for the husband capture the household's higher incentive for the wife not to work. However, when both are non-employed, the common leisure parameter has a negative sign with a relatively high value, which reflects that there is net disutility from joint non-employment. The coefficient of constant relative risk aversion is estimated at 1.36, which is in line with previous es-

[19] Without imposing any constraint in the estimation, values of leisure turn out to be higher when the mean logwage is higher and smaller when the mean logwage is smaller.

[20] Having two types of partners, and thus four types of couples, certainly helps for the identification of the heterogeneous parameters as well as their proportions. The results of this specification, in particular that heterogeneity only matters for the husband, suggest that the estimation would not improve much from allowing for more types or in the limit assuming a continuum of types.

[21] As discussed previously, the non-employment transfers parameters are mainly identified by accepted wages and employment transitions. In further research, these results can be corroborated by incorporating data of observed income during non-employment spells of each household member.

timates of utility-maximizing job search models. The estimated borrowing constraint is very tight; essentially, the household cannot borrow.

The estimated model is able to replicate very closely the observed trends in joint and conditional individual employment transitions, wages and wealth by employment status, and wealth variations by employment transitions, as we can see in Tables 1 through 4. Certainly, in Table 1, wealth is estimated less accurately because of the very noisy wealth data. Yet, predicted average wealth is closer to actual average wealth when both partners are non-employed or both are employed.

In Table 2, the increasing trend of non-employment rates and wages by the wage segment of the spouse is well replicated by the estimated model, which conforms to both reservation wages being increased in the spouse's wage. Predicted household employment transitions, shown in Table 3, also exhibit a close proximity to their actual counterparts. Table 4 also reassures that individual employment transitions conditional on the spouse's employment transitions are fairly well replicated by the model, particularly for the most frequent spouse's employment transitions. As in the actual transitions, job finding and job separations for household members tend to be higher when their partners experience employment status changes. The model's prediction for both spouses job-to-job flows is very close to the actuals at the total level. However, conditional on the spouse's employment transitions, the model performs well only when the spouse's employment status does not change. The model underpredicts job-to-job transitions when the spouse changes his or her employment status; it also overpredicts quits.

Altogether, the model delivers a fairly good replication of the observed data, particularly for employment and wages. This good replication is extensive to several conditional moments by the spouse's employment transitions both joint and conditional, in particular, the connection between household members' job finding and job separations. The model replicates well for the large dispersion of the wealth data and their trend to depend mainly on the husband's labor market activity.

6 Downturns, credit, and non-employment income

We perform three counterfactual experiments: worsening each household member's labor markets, relaxing borrowing constraints, and increasing non-employment transfers. The first change aims to assess the effect of an asymmetric downturn on a worker's labor market outcomes and, more precisely, evaluate whether the spouse

increases his or her labor market activity once the partner becomes non-employed i.e., the added worker effect. This change is attained by increasing layoff rates by 1 percentage point. The second change consists of decreasing tightness of the borrowing constraint by 5 percentage points to evaluate the effect of access to credit on family job search. The third experiment is increasing non-employment transfers of each spouse by \$100 at a time and then increasing both transfers by \$50 at the same time, so that we can assess to what extent non-employment transfers can also generate the added worker effect. For these counterfactuals, we recompute all moments from the same starting point in time but with the new setup. We are comparing two different economies rather than comparing an economy before and after a policy change.

[Table 6 here]

In Table 6, we report the variations of several selected observables caused by these changes. The response to worsening of a spouse's labor market can be seen in the first two columns. When there is a downturn for the husband by a higher layoff rate, there is an increase of both joint non-employment and non-employment for the husband, associated with a decrease of joint employment and non-employment for the wife. This evidently translates into higher total non-employment for the husband but less evidently into a lower non-employment for the wife. There is a clear added worker effect for the wife: She becomes more active in the labor market when labor market conditions for her husband worsen. Underlying these changes in outcomes are the household members' reservation wage variations. An economic downturn increases an agent's non-employment and thereby undermines the support for the partner's reservation wage, thus becoming more likely to accept a job. On their turn, average wages of both spouses tend to decrease when their layoff rates increase. Wealth holdings increase if the husband's layoff rate increases, which indicates the predominance of the precautionary motive for savings' effect over the effect of higher non-employment for the husband, whereas wealth holdings decrease if the wife's layoff rate increases, thus suggesting that the higher non-employment effect is stronger. This added worker effect does not exist for the husband when the wife faces an economic downturn.

The second counterfactual change, increasing the debt limit, generates increases in both spouses' non-employment rates, with negligible wage effects. The increased credit limit increases the couple's wealth holdings: As more access to credit increases non-employment currently and in the future, the predominant effect is that couples prefer to be cautious and increase their wealth position.

The third counterfactual exercise is reported in the last three columns of Table 6. Increases in non-employment transfers increase non-employment and wages of the beneficiary spouse, but it has an ambiguous effect on non-employment and wages of the spouse who does not receive them. Increasing the husband's non-employment transfers has the usual effect in the labor market of the husband but the opposite effect on his wife, i.e., the cross effect is negative, and there is an added worker effect as discussed in Section 2. If the wife is the beneficiary of the increased non-employment transfers, her non-employment increases, but her husband's non-employment increases slightly. Splitting individual non-employment transfers in half and increasing both spouses' non-employment transfers implies increasing both agents' non-employment rates, but this increase is quantitatively split between the two spouses. Additionally, this change increases wealth holdings, as agents increase their permanent income.

[Table 7 here]

As these counterfactual exercises impact a heterogeneous population, it is instructive to decompose their effects for each type of couple, as shown in Table 7. The added worker effect for the wife is present in all types of couples; whereas for the husband, it is absent in any type. The effect of relaxing borrowing constraints is so small in all types that we do not report it in this table. When the husband's non-employment transfers increase, there is an increase in his non-employment but a decrease in his wife's non-employment across all types. We, thus, have an added worker effect of non-employment transfers for the wife in all types. This negative cross effect does not happen when the wife's non-employment transfers increase. When the non-employment transfers are split between husband and wife, non-employment of both partners tends to increase for all types, except for the low-low type, for which the negative cross effect predominates. In sum, this decomposition by types shows that the main total effects occur for each type of couples, so that they are not just the result of the composition of different types.

These counterfactual scenarios corroborate, thus, the existence of the added worker effect for the wife, both as a result of the husband's increased layoff rates and increased non-employment transfers.

7 No wealth and savings

To understand the importance of wealth and savings in family job search, we perform a reestimation excluding wealth and savings both in the model and in the data; that is, assuming that all household income is consumed at every period, as in Dey and Flinn (2008), Ek and Holmlund (2010), Guvenen, and Violante (2012), and Flabbi and Mabli (2018). This is the exercise performed by Blundell et al. (2016) in their analysis of female labor supply. As in excluding a relevant variable in any other estimation, this exercise implies a biased estimation of the remaining parameters.

[Table 8 here]

As shown in Table 8, the omission of savings reduces the estimated coefficient of risk aversion, which accounts for the labor market interdependence between household members. This parameter declines substantially, from 1.360 to 0.924. This result is around earlier structural estimations of this parameter in the absence of wealth data, which also find lower estimates. Dey and Flinn (2008), using full-time data, part-time data, and employer-provided health-insurance data from the 1996-1999 panel of SIPP estimate this coefficient at a low value: 0.474. Flabbi and Mabli (2018) use full-time and part-time data from the 2001-2003 panel of SIPP and estimate this coefficient at a higher value, 0.9744.

Despite the nonlinear utility function, without data on hours of work or monetary transfers, in a model without savings, it is not possible to distinguish between the value of leisure and non-employment transfers. Accordingly, we exclude the leisure parameters from the estimation that increases substantially the estimated non-employment transfers.[22] Omitting wealth also implies a reduction in the mean logwages in the main type: from a type of 6.6 for husbands and 5.5 for wives, with a proportion of 59%, to 6.1 for husbands and 4.9 for wives, with a proportion of 66%.

[22] In this model, we are abstracting from the option of workers to choose hours of work, either by receiving wage rate offers and choosing hours directly, as in labor supply models, or by receiving job offers as wage-hours package offers as in Hwang, Mortensen, and Reed (1998), Gorgens (2002), Dey and Flinn (2008), Aizawa and Fang (2013), Flabbi and Moro (2012), Meghir, Narita, and Robin (2014), Flabbi, Mabli, and Salazar (2016), Flabbi and Mabli (2018). None of these papers has attempted to separately identify pecuniary from nonpecuniary compensations during non-employment. In SIPP, there are data on unemployment insurance and other government transfers as well on the hours of work by each household member. However, as it happens in other datasets used in the estimation of structural job search models, these observed transfers are very low for the model to match observed non-employment rates and wealth accumulation. Accordingly, we leave this extension for future research.

There is a lower fraction of high mean logwages for wives, which is compensated by an increased dispersion of logwages, from 0.91 to 1.14. Other parameters of the model, such as the arrival rates, do not present large variations because they do not present heterogeneity and are well identified from the observed employment transitions.

[Table 9 here]

Table 9 presents the effects of two counterfactual changes in the constrained model. An asymmetric downturn increases non-employment and job separations and decreases wages of the affected spouse, without any added worker effect as in the unconstrained model with wealth. On the other hand, the added worker effect of non-employment transfers is present even in a household search without savings: Increasing non-employment transfers increases the beneficiary non-employment rate while decreasing his or her partner's non-employment rate.

Thus, wealth data, even if they present a large dispersion, contribute to the estimation of a family job search model. Omitting wealth in an estimation of this model implies a lower estimated coefficient of risk aversion, which understates the interdependence between household members' job search and thus obscures the added worker effect.

8 Children and education

What is the effect on the family job search of having more children or more education? We can answer this question by reestimating our model using samples of similar characteristics to the one that we use in this paper, but with two or more children and with more education, such as college graduates, as we anticipated in Section 3.

[Table 10 here]

Table 10 shows descriptive statistics for these three samples. They all exhibit a clear asymmetry in labor markets for husbands and wives as in the high school group with at most one child. Essentially, more children exacerbate this asymmetry by undermining the wife's labor market activity; that is, decreasing her non-employment and wages, while increasing the husband's employment and wages. By contrast, increasing education reduces this asymmetry by deeply increasing the wife's labor market activity yet also increasing the husband's employment and wages. As it happens in our main sample, the dispersion of wealth is very high, yet we can see that

with more children, wealth is lower for high school graduates, but it is higher for college graduates.

[Table 11 here]

In Table 11, we report the estimated parameters for these three groups. For high school graduates with two or more children, the husband's labor market, contained in arrival and layoff rates, is generally better than in the main sample, whereas the wife's labor market is generally worse, which is consistent with the lower non-employment for the husband and the higher non-employment for the wife. The main difference between the two types of husbands is in leisure values, as their mean logwages are very similar. For this group, there is also little heterogeneity between types of wives, as almost all wives except a very small percentage are of the low type. The coefficient of risk aversion is higher, and the husband's non-employment transfers and his value of leisure are also higher, while the wife's value of leisure and her mean logwages are lower than the estimated parameters of the main sample. However, as in the main sample, the wife's non-employment transfers are close to zero and the tightness of the borrowing constraint is very low.

For college graduates of both groups by number of children, the largest type of couple is low-low, which amounts to around 72%. The low-high type amounts to 13% and the high-high type to 14%. College graduates in general have better labor markets than high school graduates; that is, higher wage offers, higher non-employment transfers, and better arrival and layoff rates. Notably, college graduates have more access to credit, around 19% of their natural borrowing limit. College graduates with more children tend to have a wider difference between mean logwages of husbands and wives than college graduates with at most one child. We can say thus that there is more heterogeneity in the latter than in the former. Yet, with more children, arrival rates are better for the husband than for the wife, and leisure parameters are higher for both household members.

[Table 12 here]

Table 12 presents an intrahousehold comparison of actual and predicted wages by segment, which illustrates one of the sources of unobserved heterogeneity across households. Even though wages are mostly higher for men than for women, there is an important fraction of households for which both household members are in the same wage segment and even a fair proportion of households in which women

make more than men. This latter proportion is 13% for high school graduates and 21% for college graduates with at most one child, and it declines in the number of children, which reiterates that wives are more impacted by the presence of children than their husbands. Unobserved heterogeneity is especially important to account for the segments in which women have higher wages than men.

[Table 13 here]

In Table 13, we repeat the three counterfactual exercises for all groups. The added worker effect of an economic downturn exists for both spouses in all groups, except for a downturn in the wife's labor market in the main sample. Relaxing borrowing constraints increases non-employment of both spouses for high school graduates; it also decreases husbands' non-employment and increases wives' non-employment for college graduates. This suggests that more access to credit increases reservation wages, mainly of the husbands. Increasing non-employment transfers also produces the added worker effect as a negative cross effect on the spouse. For high school graduates, this negative effect exists when the husband is the beneficiary and when the wife is the beneficiary for the sample of two or more children. For college graduates, this effect only exists when the wife is the beneficiary; that is, more transfers for wives increase husbands' employment rates.

In sum, these additional samples corroborate the added worker effect both during downturns and as a result of individual non-employment transfers and, the increased non-employment reaction to more access to credit.

9 Household gender equality

The family job search framework also allows us to evaluate different labor market outcomes if there is full gender equality in the labor market. We simulate the model when wives have the same arrival rates and wage offer parameters $(\lambda, \pi, \theta, \mu, \sigma)$ and initial employment status and wages as husbands. Results of this exercise for the four samples are shown in Table 14.

[Table 14 here]

Labor market homogenization does accomplish gender equality and increased employment, wages, and wealth in the household. For all groups, average wages of husbands and wives are practically identical, with small differences in non-employment

rates by gender. Notice that despite only labor markets for wives were improved, husbands' wages increased as well, which clearly implies that men's reservation wages increased and allowed them to access better paying jobs, yet at the expense of increased non-employment in some segments. As expected, the remaining intrahousehold differences in labor market outcomes by gender are driven by individual values of leisure and non-employment transfers.

10 Conclusions

In this paper, we have developed and estimated a model of family job search and wealth accumulation that is able to mimic observed employment transitions, wages, and wealth levels. We have documented that increasing job separations, particularly during economic downturns, triggers increased job finding by his or her partner, which constitutes the added worker effect, and underlies the countercyclical unemployment rate of married women documented by Wang (2019). We have proposed a search-theoretic mechanism for this effect: Increased job separations of one agent decreases the partner's reservation wage and thus accelerates his or her job finding.

An important policy implication of the added worker effect is that the design of non-employment transfers has to consider single and married workers differently. Besides the classical direct effect of increasing non-employment and wages, there is a negative cross effect of decreasing partners' non-employment and wages, a breadwinner role reassignment that is triggered at low levels of both wealth and wages. Hence, the effects of non-employment transfers in an individual-agent job search framework are partly undone in a two-agent job search context by the partner's behavior. The purpose that non-employment insurance supports job search and thereby improves the quality of the resulting wage match may not be accomplished efficiently for married couples. An optimal non-employment insurance has to be reassessed, departing from the individual-agent setup to consider the household as an economic decision unit.

Our results also establish that the added worker effect is understated, if wealth data are excluded in the model and the estimation. Yet, both for economic downturns and non-employment transfers, the added worker effect is robust to the presence of more children in the household and to more education, especially for the wife. We have also introduced unobserved heterogeneity and have shown that the added worker effect is not merely the result of compositional effects, it is present for each household

type. Finally, we have shown that if wives had the same arrival rates and wage offers as their husbands, not only would gender equality in the labor market be attained, but also husbands would have increased accepted wages and non-employment rates.

A limitation of our analysis is the assumption that households and their number of children are exogenous as well as the unitary family job search framework. Valuable extensions of the current framework are couple formation and dissolution, fertility decisions, and in general, a non-unitary framework that considers bargaining, cooperation, and commitment mechanism on future allocations of resources within the household.

When more data become available, another important improvement would be to distinguish between non-employment and being out of the labor force. A further and challenging extension would be an equilibrium framework that improves the assessment of regime changes by considering firms' reactions to increased reservation wages caused by increased non-employment benefits.

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Appendix A: Value functions by employment status

When the husband is employed and the wife is non-employed, the value function is

$$
\begin{aligned}
V(A,w_1,0) = \max_{A'\geq B}\Bigg\{ & U\left(A+w_1+b_2-\frac{A'}{1+r}\right)+\vartheta_2 \qquad (2)\\
& +[\beta\pi_1\lambda_2\int\int \max[V\left(A',x_1,x_2\right),V\left(A',w_1,x_2\right),V\left(A',x_1,0\right),\\
& \quad V\left(A',w_1,0\right),V\left(A',0,x_2\right),V\left(A',0,0\right)]dF_2(x_2)dF_1(x_1)\\
& +\pi_1(1-\lambda_2)\int \max\left[V\left(A',x_1,0\right),V\left(A',w_1,0\right),V\left(A',0,0\right)\right]dF_1(x_1)\\
& +(1-\pi_1-\theta_1)\lambda_2\int \max\left[V\left(A',w_1,x_2\right),V\left(A',w_1,0\right),V\left(A',0,x_2\right),V\left(A',0,0\right)\right]dF_2(x_2)\\
& +(1-\pi_1-\theta_1)(1-\lambda_2)\max\left[V\left(A',w_1,0\right),V\left(A',0,0\right)\right]\\
& +\theta_1\lambda_2\int \max\left[V\left(A',0,x_2\right),V\left(A',0,0\right)\right]dF_2(x_2)\ +\theta_1(1-\lambda_2)V\left(A',0,0\right)\Big]\Big\}.
\end{aligned}
$$

In Equation (2), the household only receives the value of leisure for the agent who does not work. A similar expression corresponds to $V(A,0,w_2)$, the value function when the husband is non-employed and the wife is employed. The value function when both members are employed is

$$
\begin{aligned}
V(A,w_1,w_2) = \max_{A'\geq B}\Bigg\{ & U\left(A+w_1+w_2-\frac{A'}{1+r}\right) \qquad (3)\\
& +[\beta\pi_1\pi_2\iint \max[V\left(A',x_1,x_2\right),V\left(A',w_1,x_2\right),V\left(A',x_1,w_2\right),V\left(A',w_1,w_2\right),\\
& \quad V\left(A',x_1,0\right),V\left(A',w_1,0\right),V\left(A',0,x_2\right),V\left(A',0,w_2\right),V\left(A',0,0\right)]dF_2\left(x_2\right)dF_1\left(x_1\right)\\
& +\pi_1(1-\pi_2-\theta_2)\int \max[V\left(A',x_1,w_2\right),V\left(A',w_1,w_2\right),\\
& \quad V\left(A',0,w_2\right),V\left(A',x_1,0\right),V\left(A',w_1,0\right),V\left(A',0,0\right)]dF_1(x_1)\\
& +\pi_1\theta_2\int \max\left[V\left(A',x_1,0\right),V\left(A',w_1,0\right),V\left(A',0,0\right)\right]dF_1(x_1)\\
& +(1-\pi_1-\theta_1)\pi_2\int \max[V\left(A',w_1,x_2\right),V\left(A',w_1,w_2\right),\\
& \quad V\left(A',w_1,0\right),V\left(A',0,x_2\right),V\left(A',0,w_2\right),V\left(A',0,0\right)]dF_2(x_2)\\
& +(1-\pi_1-\theta_1)(1-\pi_2-\theta_2)\max\left[V(A',w_1,w_2),V\left(A',w_1,0\right),V\left(A',0,w_2\right),V\left(A',0,0\right)\right]\\
& +(1-\pi_1-\theta_1)\theta_2\max\left[V\left(A',w_1,0\right),V\left(A',0,0\right)\right]\\
& +\theta_1\pi_2\int \max\left[V\left(A',0,x_2\right),V\left(A',0,w_2\right),V\left(A',0,0\right)\right]dF_2(x_2)\\
& +\theta_1(1-\pi_2-\theta_2)\max\left[V\left(A',0,w_2\right),V\left(A',0,0\right)\right]+\theta_1\theta_2V\left(A',0,0\right)]\}.
\end{aligned}
$$

Equation (3) shows that the household does not enjoy any value of leisure since both spouses are working. There is also a rich variety of employment transitions captured in the several combinations of individual job loss and job-to-job transitions.

Appendix B: Numerical solution of the model

Continuous and discrete variables

In the numerical solution of the model, wealth is a continuous variable, only discretized to support the computation of any value on its domain, while wages are discretized. Table B1 gives further details of this discretization.

Table B1. Discretization of Variables

	Wealth	Wages
Original Variable	A	w
Discretized Variable	$A[i]$	$w[j]$
Gridpoints	$i = 1, ..., N_A$	$j = 1, ..., N_w$
Gridpoint Location	Left	Middle
Number of Gridpoints	$N_A = 101$	$N_w = 101$
Number of Intervals	$N_A - 1$	N_w
Lower Bound	$\underline{A} = -s\frac{(1+r)(b_1+b_2)}{r}$	$\underline{w} = 700$
Upper Bound	$\overline{A} = 500\,000$	$\overline{w} = 10\,000$
Gridsize	$\Delta_A = \frac{\overline{A}-\underline{A}}{N_A-1}$	$\Delta_w = \frac{\ln \overline{w}-\ln \overline{w}}{N_w}$

The lower bound on wealth is set at a fraction of the natural borrowing limit, so that a household can borrow up to some fraction of the present discounted value of their lowest possible income. We also define $w[0] = b_1$ and $w[0] = b_2$.

Wage offer distribution

For each discretized wage, $j = 1, N_w$, and for each agent, $l = 1, 2$, we compute discrete probabilities integrating the wage interval defined by the grid:

$$g(j,l) = \frac{\Phi\left(\frac{\ln w_j + \Delta_w/2 - \mu_l}{\sigma_l}\right) - \Phi\left(\frac{\ln w_j - \Delta_w/2 - \mu_l}{\sigma_l}\right)}{\Phi\left(\frac{\ln \overline{w} - \mu_l}{\sigma_l}\right) - \Phi\left(\frac{\ln \underline{w} - \mu_l}{\sigma_l}\right)}.$$

Value function, policy rules, and expected value function

These are approximated by:

$$\begin{aligned} V(A_t, w_1, w_2) &= V[i,j,k], \\ A_{t+1}(A_t, w_1, w_2) &= A[i,j,k], \\ EV(A_{t+1}, w_1, w_2) &= EV\left[i', j, k\right]. \end{aligned}$$

Solution to the dynamic problem

The following steps are done for each i, j, and k:

1. Initialization. We initialize the value function at the deterministic value of consuming all wealth and income forever with the instantaneous value of leisure, which admits an explicit expression:

$$V[i,j,k] = c_1 \frac{\left(A[i] + \left(1 + \frac{1}{r}\right)(w[j] + w[k])\right)^{1-\gamma}}{1-\gamma} - \frac{1}{1-\gamma}\frac{1}{1-\beta} + \vartheta[j,k],$$

where $c_1 = \left(1 - \beta^{\frac{1}{\gamma}}(1+r)^{\frac{1-\gamma}{\gamma}}\right)^{-\gamma}$, and $\vartheta[j,k] = \vartheta_1 I(j=0) + \vartheta_2 I(k=0) + \vartheta_3 I(j=0) I(k=0)$.

2. Integration. For each combination i', j, k integrate over all admissible values of j and k. For instance, for $V\left[i', 0, 0\right]$, we calculate the following three summations:

$$\begin{aligned} EV_{11}\left[i', 0, 0\right] &= \sum_{j=1}^{N_w}\sum_{k=1}^{N_w} \max\left[V\left[i', j, k\right], V\left[i', j, 0\right], V\left[i', 0, k\right], V\left[i', 0, 0\right]\right] \\ &\qquad g\left(j, 1\right) g\left(k, 2\right), \\ EV_{10}\left[i', 0, 0\right] &= \sum_{j=1}^{N_w} \max\left[V\left[i', j, 0\right], V\left[i', 0, 0\right]\right] g\left(j, 1\right), \\ EV_{01}\left[i', 0, 0\right] &= \sum_{k=1}^{N_w} \max\left[V\left[i', 0, k\right], V\left[i', 0, 0\right]\right] g\left(k, 2\right). \end{aligned}$$

With them, we build the integral

$$\begin{aligned} EV\left[i', 0, 0\right] &= \lambda_1\lambda_2 EV_{11}\left[i', 0, 0\right] + \lambda_1\left(1-\lambda_2\right) EV_{10}\left[i', 0, 0\right] \\ &\quad + \left(1-\lambda_1\right)\lambda_2 EV_{01}\left[i', 0, 0\right] + \left(1-\lambda_1\right)\left(1-\lambda_2\right) V\left[i', 0, 0\right]. \end{aligned}$$

We repeat this process for the expected value functions of the other three joint employment statuses.

3. Differentiation. Compute the derivative of this object over wealth using a cubic interpolation:

$$\begin{aligned} EV_A\left[i', j, k\right] &= \frac{-EV\left[i'+2, j, k\right] + 4EV\left[i'+1, j, k\right] - 3EV\left[i', j, k\right]}{A\left[i'+2\right] - A\left[i'\right]},\ if\ i' = 1; \\ &= \frac{EV\left[i'+1, j, k\right] - EV\left[i'-1, j, k\right]}{A\left[i'+1\right] - A\left[i'-1\right]},\ if\ N_A > i' > 1; \\ &= \frac{3EV\left[i', j, k\right] - 4EV\left[i'-1, j, k\right] + EV\left[i'-2, j, k\right]}{A\left[i'\right] - A\left[i'-2\right]},\ if\ i' = N_A. \end{aligned}$$

4. Policy rule inversion. We use the endogenous gridpoints method as in Carroll (2006). For each i', j, and k, optimal consumption $C\left[i', j, k\right]$ is found:

$$C\left[i', j, k\right] = \left(\beta\left(1+r\right) EV_A\left[i', j, k\right]\right)^{-\frac{1}{\gamma}}.$$

5. Smoothing. Conditional on j, k, regress $C\left[i', j, k\right]$ on $A(i')$. Whenever there are non-monotonicities in $C\left[i', j, k\right]$ over $A(i')$, use predicted consumption instead of actual consumption:

$$\widehat{C}\left[i', j, k\right] = \widehat{b}_0 + \widehat{b}_1 A\left[i'\right] + \widehat{b}_2\left[A\left[i'\right]\right]^2.$$

6. Inverse solution. Find wealth at time t as a function of i' and j, k, denoted by $\widetilde{A}$, for each j, k:

$$\widetilde{A}\left[i', j, k\right] = \widehat{C}\left[i', j, k\right] - w\left[j\right] - w\left[k\right] - \frac{A\left[i'\right]}{1+r}.$$

7. Conditional solution. Reposition current liquid wealth $\widetilde{A}$ to find the solution.

   Interior solution. For each i locate $i\prime$ such that $\widetilde{A}\left[i', j, k\right]) < A\left[i\right] < \widetilde{A}\left[i'+1, j, k\right]$,

then compute the linear interpolations

$$\begin{aligned} A'[i,j,k] &= aA\left[(i'\right] + (1-a)\,A\left[i'+1\right], \\ EV^* &= aEV\left[i',j,k\right] + (1-a)\,EV\left[i'+1,j,k\right], \end{aligned}$$

where $a = \frac{A(i)-\widetilde{A}(i',j,k)}{\widetilde{A}(i'+,j,k)-\widetilde{A}(i',j,k)}$.

Corner solutions. If $A(i) < \widetilde{A}(1,j,k)$, then let $i^* = 1$; if $A(i) > \widetilde{A}(N_A,i,k)$, then $i^* = N_A$:

$$\begin{aligned} A'[i,j,k] &= A[i^*] \\ EV^* &= EV[i^*,j,k]. \end{aligned}$$

8. Then compute the value function using

$$\begin{aligned} C^*[i,j,k] &= A[i] + w[j] + w[k] - \frac{A'[i,j,k]}{1+r}, \\ V[i,j,k] &= U(C^*[i,j,k]) - \vartheta[j,k] + \beta EV^* + \vartheta[j,k]. \end{aligned}$$

9. Evaluate convergence. If $\|V' - V\| < \varepsilon$, stop; otherwise go back to step 2, and repeat the process.

Appendix C: Simulation procedure

We start the construction of the simulated dataset, when household wealth is first observed, for each couple and each of the four types, 11, 12, 21, and 22.

1. At period $t = 1$, we have $A = A^{obs}, w_1 = w_1^{obs}$, and $w_2 = w_2^{obs}$. As explained, we denote unemployment by $w = 0$. The household enters the next period with $A_2 = A'(A, w_1, w_2)$.

2. At period t, conditional on household's wealth, joint employment status, and individual wages, (A, w_1, w_2) job offers or job separations are realized.

   If a household member is non-employed, he or she may receive a job offer, which we determine by taking random draws from a Bernoulli distribution with parameter λ.

   If the household member is employed, we take two similar draws from Bernoulli distributions with parameters π, and θ, which respectively determine whether the employed household member received an offer or if he or she was fired.

   If there is a job offer, we determine the specific offered wage by taking draws from the lognormal distribution F.

3. Once job offers are realized, the household decides whether to accept or reject them, using the reservation wage rules $w_1^*(A, w_2), w_2^*(A, w_1), w_1^{**}(A), w_2^{**}(A)$ so that the maximum value of $V(A, w_1, w_2)$ over each available set of arguments is attained.

4. At the end of period t, there is a new joint employment status and wages w_1 and w_2, and the household enters the next period with $A_{t+1} = A'(A, w_{1t}, w_{2t})$.

5. Go back to step 2. This process is repeated until reaching the last observed period T for this household.

This process is repeated 100 times for each household of the actual dataset, so that a larger simulated dataset is built. We then compute for this simulated dataset the same moments that we calculated for the actual dataset. From these type-specific moments, using the four proportion of types of couples, $p_{11}, p_{12}, p_{21}, p_{22}$, we compute weighted simulated moments for the whole sample. Finally, we measure the distance between simulated moments and actual moments in the way that we described in Section 4.

Appendix D: Age distribution at first observation

Our setup is an infinite horizon model in which age or marriage duration are not state variables. However, the role of search frictions vs. unobserved heterogeneity in explaining the dispersion in accepted wages is different for households with heads of, say, age 35 who has been married for 1 year compared to households with heads of age 49 who have been married for 19 years.[23] The longer a couple has been making joint search decisions together, the larger a role the interdependence due to family search will have in the observed wage dispersion of such households. Unfortunately, the wave of the SIPP that we are using, 1996, does not contain information on the duration of marriage. This information was only incorporated to the data in 2014. We can, however, report the composition of households according to their age of head at the first period in which wealth is observed.

Table D4. Age distribution of head of household for first observation, by sample

Education:	High School		College	
Children:	0-1	2+	0-1	2+
Age				
26-30	10.81	9.83	14.82	3.16
31-35	14.05	25.28	21.91	14.33
36-40	16.82	32.44	15.94	31.83
41-45	23.11	25.37	15.78	31.23
46-50	35.21	7.08	31.55	19.45

In Table D4, we report the age distribution of the head of household when wealth is first observed for the four samples used in this paper. We can see that agents' ages are pretty dispersed, which suggests that this issue may be important, even after analyzing samples defined by education and number of children. We leave this matter for future research.

[23] We thank an anonymous referee for this suggestion.

Table 1. Employment, Wages, and Wealth by Household Employment Status
High School. 0 or 1 Child

	Spouse			
	Actual		Predicted	
Variable	Non-employed	Employed	Non-employed	Employed
Joint Employment Status				
Husband Non-employed	0.86	4.57	1.00	4.15
Employed	20.27	74.31	21.21	73.64
Non-employment Rate				
Husband	4.07	5.79	4.51	5.33
Wife	15.84	21.43	19.45	22.36
Wages				
Husband	1738	1574	1712	1557
	(1639)	(1118)	(1279)	(876)
Wife	1107	1039	1060	1070
	(941)	(776)	(710)	(698)
Wealth if Husband				
Non-employed	44251	37640	45354	53807
	(75434)	(57700)	(68060)	(64854)
Employed	59248	54664	69269	58085
	(244521)	(183644)	(95110)	(78791)

Table 2. Non-employment Rate and Average Wage by Spouse's Wage Segment
High School. 0 or 1 Child

	Non-employment Rate (%)				Average Wage ($)			
	Husband		Wife		Husband		Wife	
Spouse is	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
Non-employed	4.08	4.53	15.85	19.50	1739	1718	1106	1060
[300, 1000)	5.64	5.42	24.05	24.95	1436	1484	847	952
[1000, 1500)	6.33	5.30	20.10	21.09	1600	1563	989	990
[1500, 2500)	5.47	4.85	17.45	18.94	1901	1843	1139	1178
[2500, 3500)	5.85	6.87	25.02	22.11	2038	1665	1271	1158
[3500, 10000)	7.21	4.41	38.59	44.25	2090	1693	1270	1086

Table 3. Household Employment Transitions. (Rows Add to 100)
High School. 0 or 1 Child

	Actual				Predicted			
$t-1 \backslash\ t$	uu	ue	eu	ee	uu	ue	eu	ee
uu	76.51	3.56	17.44	2.49	81.97	3.38	14.15	0.50
ue	0.46	85.13	0.33	14.08	0.79	84.49	0.29	14.44
eu	0.59	0.10	95.17	4.13	0.72	0.05	95.66	3.57
ee	0.07	0.90	1.19	97.84	0.01	0.77	1.17	98.06

Table 4. Employment Transitions, Wage, and Wealth Variations by Spouse's Employment Transitions. High School. 0 or 1 Child

Transition		Actual					Predicted				
		Total	By Spouse's Transitions				Total	By Spouse's Transitions			
			u→u	u→e	e→u	e→e		u→ u	u→e	e→u	e→e
Employment Transitions (%)											
Husband:	u→e	15.27	18.56	41.18	41.67	14.19	14.71	14.72	12.94	26.68	14.60
	e→u	0.91	0.62	2.46	5.79	0.91	0.78	0.74	1.50	0.78	0.78
Wife:	u→e	3.67	4.44	12.50	14.89	4.16	3.18	3.97	3.09	6.65	3.58
	e→u	1.23	0.54	2.29	7.50	1.20	1.17	0.92	1.95	1.17	1.17
Job-to-Job in Employment Transitions											
Husband:	e→e	1.42	1.22	5.15	5.73	1.38	1.15	1.21	1.15	1.09	1.13
Wife:	e→e	1.44	1.11	4.88	4.72	1.40	1.36	1.45	1.39	1.60	1.35
Quits in Employment Transitions											
Husband:	e→u	48.09					73.42				
Wife:	e→u	66.12					89.90				

Table 5. Parameter Values and Asymptotic Standard Errors in Parentheses High School. 0 or 1 Child

Parameter	$\widehat{\Theta}$	Estimate			
		Husband		Wife	
Individual:					
Arrival Rate Non-employed:	λ	0.1594	(0.000996)	0.0393	(0.000274)
Arrival Rate Employed:	π	0.0758	(0.000835)	0.0517	(0.000908)
Layoff Rate:	θ	0.0057	(0.000031)	0.0104	(0.000046)
Standard Deviation of Logwages:	σ	0.5653	(0.013680)	0.9123	(0.015301)
Non-employment Transfers:	b	118.81	(3.10)	0.0165	(3.28)
Individual heterogeneous:					
Mean Logwages, Low:	μ_1	4.1553	(0.230736)	5.4987	(0.046765)
Mean Logwages, High:	μ_2	6.6076	(0.019680)	7.9038	(0.246300)
Leisure, Low:	ϑ_1	0.0000	(735.776025)	0.0101	(0.000226)
Leisure, High:	ϑ_2	0.0000	(81.059089)	0.0188	(0.011735)
Common:					
Relative Risk Aversion:	γ		1.3600	(0.002269)	
Borrowing Constraint:	s		0.0205	(0.000548)	
Leisure:	ϑ_3		-0.0190	(0.002899)	
Types' proportions:					
Low-Low:	p_{11}		0.3948	(0.006383)	
High-Low:	p_{21}		0.5905	(0.009414)	
High-High:	p_{22}		0.0140	(0.004411)	

Table 6. Variations of Employment, Wages, and Wealth of Three Counterfactuals: i. An Economic Downturn, ii. Relaxing Borrowing Constraints, and iii. Increasing Non-employment Transfers. High School. 0 or 1 Child

Variable	Economic Downturn		Increase	Non-employment Transfers		
	Husband $+\theta_1$	Wife $+\theta_2$	Debt Limit $+s$	Husband $+b_1$	Wife $+b_2$	Both $+b_1, +b_2$
Joint Employment Status (%)						
uu	1.05	0.28	-0.00	0.76	-0.04	0.28
ue	3.60	-0.33	0.01	0.42	-0.02	0.18
eu	-1.41	6.57	0.02	-0.79	0.78	0.06
ee	-3.21	-6.51	-0.00	-0.37	-0.70	-0.50
Non-employment Rate* (%)						
Husband	4.58	0.05	0.01	0.53	0.02	0.26
Wife	-0.42	6.91	0.02	-0.56	0.81	0.17
Wages* ($)						
Husband	-66	0	-1	7	-11	0
Wife	-2	-20	0	0	6	3
Wealth** ($)	85	-804	1034	978	46	498

* if the spouse is employed. ** if both are employed.

Table 7. Variations of the Non-employment Rate Under an Economic Downturn and Increasing Non-employment Transfers, by Type of Couple High School. 0 or 1 Child

Types	Spouse	Economic Downturn		Non-employment Transfers		
		Husband $+\theta_1$	Wife $+\theta_2$	Husband $+b_1$	Wife $+b_2$	Both $+b_1, +b_2$
$p_{11} = 40\%$	Husband	4.46	0.03	0.30	0.01	0.13
	Wife	-0.52	6.93	-1.25	0.80	-0.14
$p_{22} = 1\%$	Husband	4.65	0.03	0.71	0.01	0.33
	Wife	-0.13	6.95	-0.09	0.67	0.21
$p_{21} = 59\%$	Husband	4.65	0.07	0.68	0.03	0.34
	Wife	-0.36	6.90	-0.11	0.82	0.38
All	Husband	4.58	0.05	0.53	0.02	0.26
	Wife	-0.42	6.91	-0.56	0.81	0.17

Table 8. Parameter Values and Standard Errors in Parentheses. No Wealth
High School. 0 or 1 Child

Parameter	$\widehat{\Theta}$	Estimate			
		Husband		Wife	
Individual:					
Arrival Rate Non-employed:	λ	0.1116	(0.000404)	0.0452	(0.000189)
Arrival Rate Employed:	π	0.0807	(0.000477)	0.0319	(0.000260)
Layoff Rate:	θ	0.0057	(0.000031)	0.0104	(0.000044)
S.D. of Logwages:	σ	0.5653	(0.006930)	1.1412	(0.053780)
Non-employment Transfers:	b	127.58	(5.88)	159.38	(4.45)
Individual heterogeneous:					
Mean Logwages, Low:	μ_1	6.0973	(0.009371)	4.8968	(0.163914)
Mean Logwages, High:	μ_2	6.8898	(0.014129)	5.2017	(0.142827)
Common:					
Relative Risk Aversion:	γ		0.9240	(0.094522)	
Types' proportions:					
Low-Low:	p_{11}		0.6645	(0.333731)	
Low-High:	p_{12}		0.0920	(0.333779)	
High-High:	p_{22}		0.2435	(0.001880)	

Table 9. Variations of Employment, and Wages of Two Counterfactuals:
i. An Economic Downturn, and ii. Increasing Non-employment Transfers.
No Wealth. High School. 0 or 1 Child

Variable	Economic Downturn		Non-employment Transfers		
	Husband $+\theta_1$	Wife $+\theta_2$	Husband $+b_1$	Wife $+b_2$	Both $+b_1, +b_2$
Joint Employment Status (%)					
uu	1.02	0.37	0.53	0.46	0.42
ue	4.31	-0.37	2.03	-0.44	1.58
eu	-1.01	6.32	-0.52	6.10	-0.41
ee	-4.30	-6.30	-2.02	-6.10	-1.57
Non-employment Rate* (%)					
Husband	5.37	0.00	2.53	-0.11	1.96
Wife	0.04	6.68	-0.02	6.46	-0.02
Wages* ($)					
Husband	-64	0	37	4	29
Wife	0	-20	0	67	0

* if the spouse is employed. ** if both are employed.

Table 10. Employment, Wages, and Wealth by Household Employment Status. Actual

Sample		High School		College			
	Children	2 or more		0 or 1		2 or more	
Variable	Spouse	Non-E	Emp	Non-E	Emp	Non-E	Emp
Joint Employment Status							
Husband	Non-employed	1.52	3.28	0.61	2.66	0.55	1.93
	Employed	31.70	63.50	17.02	79.71	31.54	65.98
Non-employment Rate							
Husband		4.56	4.91	3.48	3.22	1.71	2.84
Wife		31.58	33.30	18.76	17.60	22.19	32.34
Wages							
Husband		1749	1535	3554	2470	3723	2881
		(1839)	(1055)	(3834)	(2190)	(3487)	(2848)
Wife		1012	916	1645	1651	1909	1451
		(695)	(907)	(1180)	(1331)	(1579)	(1481)
Wealth if Husband							
Non-employed		34079	27542	96251	53861	55251	114711
		(92946)	(58402)	(86826)	(73112)	(81465)	(218981)
Employed		38001	42304	159466	103391	160141	120416
		(68945)	(70329)	(382556)	(189525)	(277900)	(210548)

Table 11. Parameter Values and Asymptotic Standard Errors in Parentheses

Parameter	$\widehat{\Theta}$	High School		College			
Children		2 or more		0 or 1		2 or more	
		Est.	S.E.	Est.	S.E.	Est.	S.E.
Husband:							
Arrival Rate Non-E:	λ	0.1964	(0.000427)	0.1598	(0.000981)	0.1684	(0.000932)
Arrival Rate E:	π	0.0968	(0.000424)	0.1029	(0.000961)	0.1174	(0.001297)
Layoff Rate:	θ	0.0050	(0.000044)	0.0032	(0.000020)	0.0024	(0.000017)
S.D. of Logwages:	σ	0.4274	(0.002931)	0.8293	(0.007423)	0.7945	(0.017344)
Non-E Income:	b	127.09	(0.66)	413.16	(0.925286)	477.89	(1.239324)
Mean Logwages, Low:	μ_1	6.0869	(0.004560)	6.1512	(0.016759)	5.9201	(0.039305)
Mean Logwages, High:	μ_2	6.0880	(0.040083)	7.6189	(0.046489)	8.0519	(0.023882)
Leisure, Low:	ϑ_1	0.0002	(0.000009)	0.0114	(0.000233)	0.0117	(0.000511)
Leisure, High:	ϑ_2	0.0039	(0.000251)	0.0269	(0.000729)	0.0273	(0.001727)
Wife							
Arrival Rate Non-E:	λ	0.0395	(0.000150)	0.0545	(0.000337)	0.0362	(0.000256)
Arrival Rate E:	π	0.0508	(0.000485)	0.0506	(0.000458)	0.0469	(0.000945)
Layoff Rate:	θ	0.0124	(0.000069)	0.0097	(0.000042)	0.0094	(0.000062)
S.D. of Logwages:	σ	0.9527	(0.007963)	0.9104	(0.024246)	0.4455	(0.013912)
Non-E Income:	b	0.01	(0.00)	100.11	(0.232403)	89.83	(0.214334)
Mean Logwages, Low:	μ_1	5.4678	(0.022529)	5.6433	(0.053321)	4.7568	(0.147875)
Mean Logwages, High:	μ_2	7.7302	(0.539973)	7.1412	(0.029986)	7.1912	(0.019105)
Leisure, Low:	ϑ_1	0.0059	(0.000048)	0.0159	(0.051790)	0.0161	(0.000207)
Leisure, High:	ϑ_2	0.0828	(0.054676)	0.0338	(0.000584)	0.0341	(0.000544)
Common:							
Relative Risk Aversion:	γ	1.4945	(0.001343)	1.3390	(0.003408)	1.3307	(0.001869)
Borrowing Constraint:	s	0.0219	(0.000163)	0.1902	(0.000342)	0.1904	(0.000441)
Leisure:	ϑ_3	-0.0247	(0.000367)	-1.5621	(0.028294)	-1.3942	(0.019822)
Proportions of Types:							
Low-Low :	p_{11}	0.8140	(0.025808)	0.7184	(0.022421)	0.7287	(0.009206)
Low-High:	p_{12}			0.1272	(0.013513)	0.1240	(0.007752)
High-Low:	p_{21}	0.1836	(0.025028)				
High-High:	p_{22}	0.0024	(0.003358)	0.1481	(0.010396)	0.1412	(0.002777)

Table 12. Wage Segment Comparison Between Partners, by Sample

Education:	High School				College			
Children:	0-1		2+		0-1		2+	
Comparison	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
Same for both	34.68	32.04	31.37	36.00	26.68	24.39	21.59	20.19
Husband is higher	52.16	53.33	56.68	49.49	51.53	53.91	61.56	66.57
Wife is higher	13.15	14.63	11.93	14.51	21.39	21.63	15.67	13.10

Table 13. Variations of Individual Non-employment Rates, If the Spouse Is Employed for Three Counterfactuals: i. An Economic Downturn, ii. Relaxing Borrowing Constraints, and iii. Increasing Non-employment Transfers. All Samples

Sample			Economic Downturn		Increase	Non-employment Transfers		
			Husband	Wife	Debt Limit	Husband	Wife	Both
Education	Children	Spouse	$+\theta_1$	$+\theta_2$	$+s$	$+b_1$	$+b_2$	$+b_1, +b_2$
High School	0-1	Husband	4.58	0.05	0.01	0.53	0.02	0.26
		Wife	-0.42	6.91	0.02	-0.56	0.81	0.17
High School	2+	Husband	3.53	-0.17	0.09	1.96	-0.04	1.25
		Wife	-1.33	5.94	0.12	-0.01	1.72	0.95
College	0-1	Husband	4.54	-0.58	-0.12	0.26	-0.11	0.07
		Wife	-2.22	6.50	0.11	0.15	0.71	0.43
College	2+	Husband	4.57	-0.50	-0.05	0.27	-0.00	0.14
		Wife	-4.76	7.24	0.17	0.13	2.67	1.19

Table 14. Employment, Wages, and Wealth When Women Have Men's Labor Markets ($\lambda, \pi, \theta, \mu, \sigma$). All Samples

Education	High School				College			
Children	0-1		2+		0-1		2+	
Labor Markets	Base	Same	Base	Same	Base	Same	Base	Same
Joint Employment Status (%)								
uu	1.00	1.23	1.40	0.71	0.44	0.61	0.46	0.36
ue	4.15	3.82	3.00	4.23	2.52	5.77	1.60	6.00
eu	21.21	5.00	30.79	4.58	17.23	5.04	31.52	4.46
ee	73.64	89.95	64.81	90.50	79.81	88.60	66.42	89.19
Non-employment Rate* (%)								
Husband	5.33	4.07	4.42	4.47	3.07	6.12	2.35	6.31
Wife	22.36	5.27	32.21	4.82	17.76	5.38	32.18	4.76
Wages* ($)								
Husband	1557	1603	1404	1496	2522	2738	2938	3335
Wife	1070	1612	938	1504	1720	2732	1412	3316
Wealth** ($)	58085	68091	47834	62201	115558	130148	123700	154904

* if the spouse is employed. ** if both are employed.

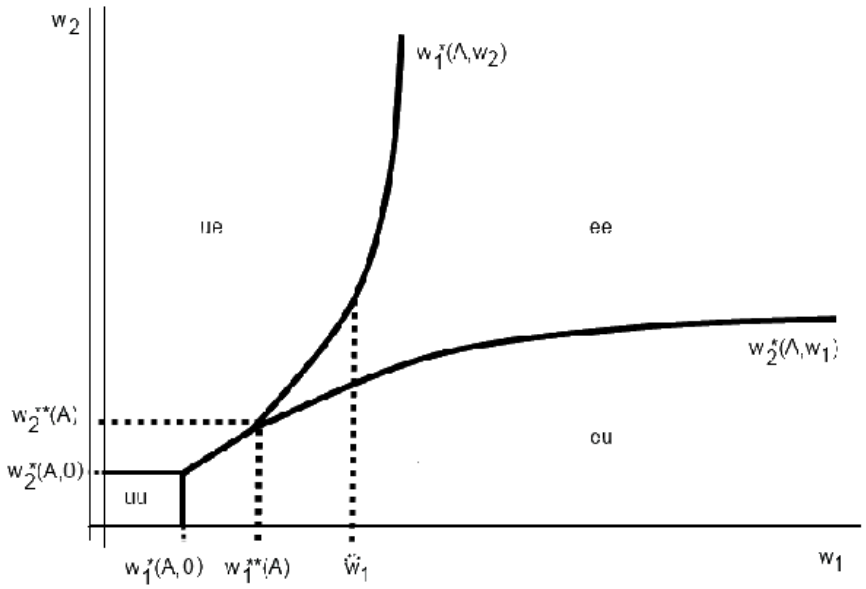

Figure 1. Joint employment status by wages of husband and wife, conditional on wealth level A

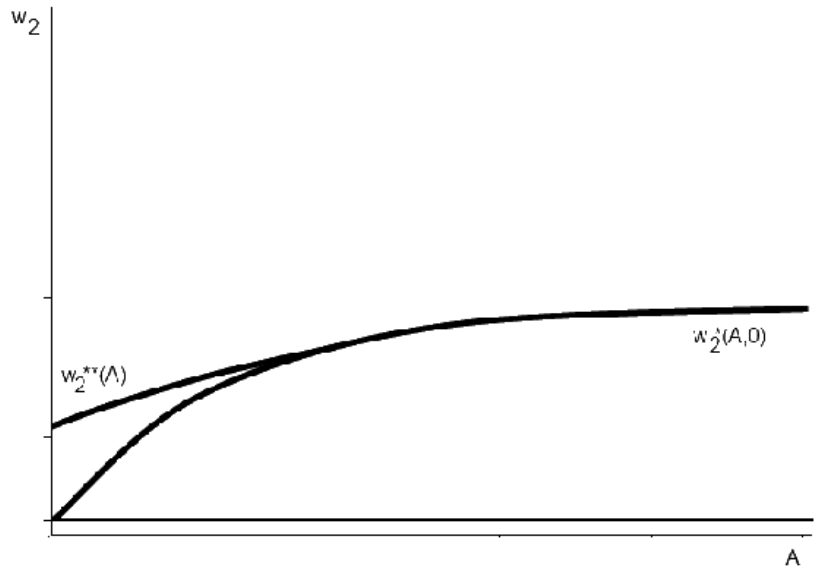

Figure 2. Reservation wages of the wife when the husband is non-employed as a function of wealth

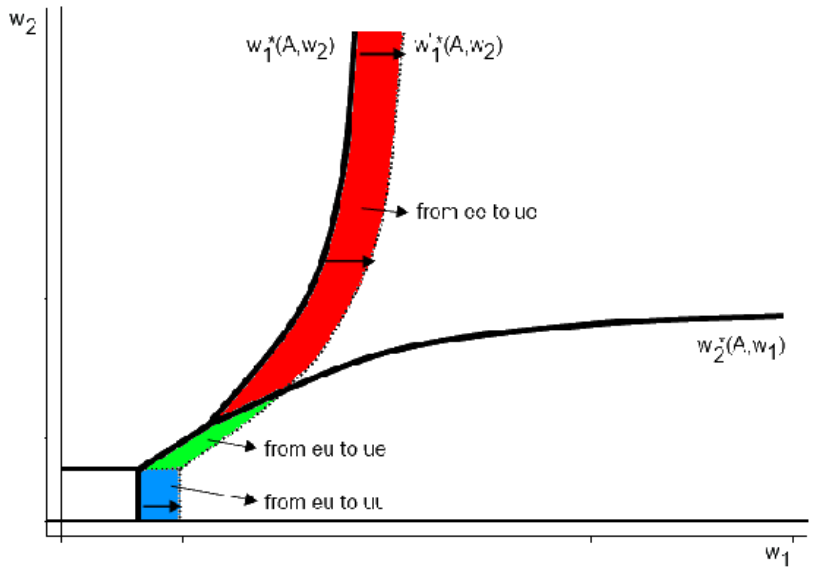

Figure 3. Change in joint employment status from increasing husband's non-employment transfers b_1