

Family Job Search and Wealth: The Added Worker Effect Revisited*

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Abstract

We develop and estimate a model of family job search and wealth accumulation. Individuals' job finding and job separations depend on their partners' job turnover and wages as well as common wealth. We fit this model to 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, particularly during economic downturns. We uncover a job search-theoretic basis for this added worker effect. We also show that this effect is robust to having more children in the household, but that this effect and the interdependency between household members is underestimated if wealth and savings are not considered. Moreover, our analysis shows that the policy goal of supporting job search by increasing unemployment transfers is partially offset by the partner's cross-effect in lower unemployment and wages.

Keywords: job search, asset accumulation, household economics, consumption, unemployment, 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 In recent years, a few studies have extended this analysis to household labor decisions in the presence of search frictions that drive job offer uncertainty and job turnover.

In this paper, we analyze two-agent job search in connection with savings decisions. We propose a model in which common wealth and an agent’s wages allow the other agent to be more selective and search longer for a job. Consequently, employment transitions and wage outcomes depend crucially on wealth and on the partner’s employment status and wages. We find a search-theoretic basis for the “added worker effect”: when an agent faces a job separation, the partner’s reservation wage declines and his or her job finding rate increases substantially. This occurs especially in economic downturns, when the job loss increases for one agent are compensated by the spouse’s increased labor market activity. These switches in breadwinner roles are more likely to occur at low levels of wages and household wealth. By the same mechanism, raising unemployment transfers increases workers’ unemployment and wages but decreases their spouses’ unemployment and wages. A policy implication of our analysis is that the desired effect of unemployment transfers is partly undone by the spouse’s behavior in the labor market, as unemployment transfers for one household member cause a reassignment of breadwinner roles inside the household.

We show the importance of wealth and savings in family job search, which has not been considered by earlier work on this type of model. If wealth is not included explicitly in a family job search model and, accordingly, is omitted in the corresponding estimation, the interconnection between individual job search processes will be underestimated. Moreover, this omission could result in neglecting the added worker effect and miscalculating the policy effect of increasing unemployment transfers.

¹According 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).

²This 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) include reviews of the literature on family economics. The labor supply approach of the household has been particularly important to understand the household reaction to tax schemes and social programs.

Our approach stems from the literature on job search with wealth accumulation³ and from the recent research on household job search. We allow for a twofold interaction whereby each household member’s reservation wage depends on the partner’s labor market status and wages as well as on wealth. Previous work on family job search⁴ has analyzed family job search related to common health insurance (Dey and Flinn 2008), long-term welfare inequality (Flabbi and Mabli 2010), 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.

In our model, both employed and unemployed agents receive job offers arriving randomly from a known wage offer distribution. Employed agents face the risk of being laid off from their current job. Labor market environments of the household members are unconnected; however, wealth and consumption are common to the household, which links the household members’ employment decisions. Thus, the employed partner’s income supports the other family member’s selectivity in accepting a job. But, at the same time, if the partner becomes unemployed, an agent cannot afford to be so selective, and he or she has to accept lower wage offers, which generates the added worker effect.

The underlying mechanism of this effect is similar to Guler, Guvenen, and Violante’s (2012) “breadwinner’s cycle” in that it relies on the dependence between household members’ reservation wages. These authors remark the employed agent’s separation from his or her job resulting from the unemployed partner finding a job. The “added worker” effect also involves a switch of breadwinner roles, but it rather remarks the unemployed agent’s job finding resulting from the employed partner separating from his or her job.

Using data from the Survey of Income Program Participation (SIPP), which contains a detailed work history of individuals in the U.S. from 1996 until 2010 including their employment transitions, wages, and wealth, we find evidence for both of these mechanisms. Yet, given the strong labor market attachment of men and the high job turnover of women, these interactions are not indicative of a cycle in which roles

³Our 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).

⁴The 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.

constantly switch. This noteworthy asymmetry is reflected in that, in around 20% of couples, the husband is employed and the wife is unemployed, while in only 4% of couples the wife is employed and the husband is unemployed. Additionally, the job finding rate for the husband is around 15% with a job separation rate of around 1%, while the wife’s job finding rate is around 4% and her job separation rate is around 1%. However, in our data for both partners, unemployment and wages tend to increase in the spouse’s wages; we do not find a “gender asymmetry”, as Lentz and Tranæs (2005), Lentz (2009), and Marcassa (2013), who find that while the unemployment duration of the wife (and, therefore, her reservation wage) is increasing in the husband’s wage, the unemployment duration of the husband is decreasing in the wife’s wage.

We estimate this model structurally by a simulated method of moments (SMM). The model fits reasonably well with the data on wealth, wages, employment, and employment transitions. With the recovered behavioral parameters, we evaluate the dynamics of employment, employment transitions, wages, and wealth accumulation under three counterfactual scenarios: i) an economic downturn for one household member, ii) a relaxation of borrowing constraints, and iii) higher unemployment transfers. We accomplish these scenarios by modifying the underlying parameters that we estimated previously: higher layoff rates, looser borrowing constraints, and higher unemployment transfers. The first regime change aims to assess the “added worker effect,” the second regime change determines the effect of borrowing constraints on the household labor allocation, and the third regime change evaluates the policy of increasing unemployment transfers.

All of these regime changes show important household effects that would not be present in an individual-agent framework. The first regime change reveals that once a household member is hit by an adverse labor market shock the partner decreases substantially his/her unemployment rate, which corroborates the “added worker effect” (Stephens 2002, for example, offers clear evidence of this effect being present in the American economy). The underlying mechanism for this effect is that once the partner separates from his or her job, the spouse’s reservation wage declines, thereby speeding up the partner’s transition from unemployment to employment. The second regime change shows that when the household faces looser borrowing constraints the wife’s unemployment increases without much effect on wages, suggesting that the household consumes more leisure of the wife. The third regime change shows that increases in unemployment transfers generate the well-known labor market effect for

the direct beneficiary, namely that unemployment rates and accepted wages increase. The effect on the partner is, however, the opposite: unemployment rates and wages decrease. Increasing unemployment transfers increases the beneficiary’s reservation wage while simultaneously decreasing the partner’s reservation wage which, again, accelerates his or her job finding. The desired policy effect of unemployment transfers established by models of individual agents, increasing wages at the expense of more unemployment, is thus partially undone when the receivers are household members who are active in the labor market, especially at low levels of wages and household wealth.

To understand the importance of wealth and savings in family job search, we fit a model that excludes wealth and savings to a restricted sample of only employment and wage data. This omission implies underestimating the coefficient of risk aversion, the only parameter that creates interdependence between individual actions within a household, and to a misunderstanding on how married workers react to their spouses’ job loss and increased unemployment transfers.

Finally, we also show that the “added worker effect” is robust to increasing the number of children in the household. If a worker experiences job loss, the spouse’s job finding increases also when more children are present in the household. However, the presence of more children weakens the negative cross-effect of increasing unemployment transfers for the wife; that is, if the husband is the receiver of increased unemployment transfers, the wife’s unemployment rate increases. The likely reason for this result is that the increase in the husband’s income while unemployed implies that the wife is spending more time with the children, which the model reflects in her higher valuation of leisure.

The remainder of the 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 on family job search; and in Section 9, 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,⁵ 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 unemployed. Labor markets for these household members are separated and independent from each other. If household members are unemployed, each of them receives transfers b_i and a wage offer with probability λ_i from a wage offer distribution F_i , $i = 1, 2$. If they are employed, they can be either laid off and become unemployed with probability θ_i or receive a job offer with probability π_i . 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 unemployed. If an agent is unemployed, the household enjoys an agent-specific utility from leisure ϑ_i , and if both are unemployed they enjoy an extra utility ϑ_3 , which reflects the complementarity between partners' leisure time spent together.

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: $B = -s \frac{1+r}{r} (b_1 + b_2)$. 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 wages of its members. The value function

⁵To facilitate the exposition of the model and 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.

when both members are unemployed is the following:

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

When the husband is employed and the wife is unemployed, the value function is:

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

A similar expression corresponds to $V(A, 0, w_2)$, the value function when the husband is unemployed and the wife is employed. And, finally, the value function when both

members are employed has the following expression:

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

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:

$$\begin{aligned}
w_1^*(A, w_2) &= \{w_1 | \max [V(A, w_1, w_2), V(A, w_1, 0)] = \max [V(A, 0, w_2), V(A, 0, 0)]\}, \\
w_2^*(A, w_1) &= \{w_2 | \max [V(A, w_1, w_2), V(A, 0, w_2)] = \max [V(A, w_1, 0), V(A, 0, 0)]\}.
\end{aligned}$$

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 unemployed, an agent's reservation wage is expressed as $w_1^*(A, 0)$ and $w_2^*(A, 0)$. We also define the following reservation wages:

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

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, above this wage set joint employment does not need to occur, being possible that only one partner is employed.

As 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 coefficient 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 $F_i(x)$: $\ln w \sim N(\mu, \sigma^2 | \underline{w}, \bar{w})$; $0 < \underline{w} < \bar{w} < \infty$, $i = 1, 2$. We allow wealth to be continuous while we discretize wages. 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 the Appendix, we provide a detailed explanation of the numerical solution to the model. For ease of understanding, however, the following discussion is based on solving the model assuming the same labor markets for both household members, same arrival rates, wage offer distributions, unemployment transfers, and zero leisure values.

[Figure 1 here]

Figure 1 shows the two reservation wages as a function of the spouse's wage, where the husband is indexed by 1 and the wife by 2. The wife's reservation wage is a horizontal line, when the husband's wage is below his reservation wage; then the wife's reservation wage becomes an increasing curve when the husband's reservation wage increases. Similarly, the husband's reservation wage is a vertical line for wife's wages below her reservation wage; the husband's reservation wage then becomes an increasing curve as the wife's wage increases. These crossing reservation wages divide this space into four areas, each corresponding to the four joint employment statuses. The area of joint unemployment, uu , is a rectangle, while the areas for one unemployed 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. Notice also that there is a ceiling on acceptable wages for both partners who are employed: if the wage of one partner is very high, then the other household member will not work. This shape implies that a household with both employed members

can experience voluntary quits to unemployment, if one household member receives a high wage offer. Only when both household members are employed at wages that are higher than the highest possible reservation wage $w_i^*(A, \bar{w})$, $\forall i$, there are no voluntary job separations at a given wealth level.

These results are consistent with Guler, Guvenen, and Violante (2010) 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 unemployed. In our model, this effect is present as well but at the couple level: 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 unemployment. Accordingly, quits from employment to unemployment 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 $\hat{w}_1$, if the wife receives a high wage offer w_2 , then she accepts it, and because $\hat{w}_1 < w_1^*(A, w_2)$ he quits. Breadwinner switches can thus go on even when both household members are employed, until both wages are at least $w_i^*(A, \bar{w})$, $\forall i$.

As we will see in the next section on data, we find evidence that suggests 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 point out 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 unemployed partner experiences a drop in his or her reservation wage and is more likely to accept wage offers. Job separations of one agent encourage thus job finding of the partner. Hence, this analysis provides a search-theoretic explanation for the well-known “added worker effect”.

[Figure 2 here]

Figure 2 shows that reservation wages are increasing in wealth. This result coincides with Danforth's (1979) result for a model of an individual job searcher for which employment is a terminal state. 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. Switching directly between employment statuses ue and eu , and thus between breadwinner roles, occurs mostly at low levels of wealth. As wealth accumulation takes place, there is less room for a direct rotation of breadwinners within the household. Consequently, the internal disparity of wage income within the household is decreasing in wealth.

[Figure 3 here]

Figure 3 illustrates the joint employment effect of an increase in the husband's unemployment transfers. The husband's increased reservation wage produces a reallocation of joint employment statuses in three ways. First, there is a reallocation from joint employment to the husband being unemployed and the wife being employed (ee to ue). Second, there is a household role switch from the husband being employed and the wife unemployed to the husband being unemployed to the wife being employed (eu to ue). Notice that 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_i^{**} . Notice also that, as shown in the previous figure, this range of wages is wider at low levels of wealth. Third, a reallocation from the husband being employed and the wife unemployed to both spouses being unemployed (eu to uu). In these three reallocations, the husband separates from his job, but the wife's employment status is unchanged in two, whereas in one reallocation she transitions from unemployment to employment. Hence, an increase in the husband's unemployment transfers increases his unemployment rate while it tends to decrease the wife's unemployment rate, particularly at low levels of acceptable wages and at low levels of wealth. This effect will be important when we assess the policy implications of this model in Section 6.

Summarizing, in this model both common wealth and the partner's wages allow individuals to be more selective and search longer for a suitable job. If an employed agent separates from his or her job, the unemployed 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 well-known effect of

unemployment transfers on the receiving household member, higher unemployment, and higher wages; yet at the same time it produces an opposite effect on the spouse, namely, lower unemployment and lower wages. Thus, unemployment transfers given to one household member are able to influence the household work assignment and trigger a switch in breadwinner roles.

3 Data and descriptive statistics

We are fitting our model to a sample of couples coming from SIPP. This data set 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. The survey is based on monthly interviewing 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.

As we are interested only in households with two members present, we select one-family households of married couples where 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 exclude from the sample couples who have two children or more; our sample consists only of couples that do not have children or who have only one child. These selection criteria restrict our sample to 33,305 observations on 1,069 married couples.⁶

⁶This 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.

We categorize any individual in the sample as either employed or unemployed.⁷ In order 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 hours of work.

We use total wealth information reported by SIPP and exclude couples that lack wealth data. All wages and wealth observations are in dollars of 1982–1984. Nominal values in SIPP are deflated using the Consumer Price Index reported by the BLS.⁸

[Table 1 here]

Table 1 shows employment status, wages, and wealth by the employment status of the spouse. It illustrates a noteworthy asymmetry between the employment statuses of the household members.⁹ In 20.4% of the sample, the husband is employed and the wife is unemployed, compared to only around 4.2% in which the husband is unemployed and the wife is employed. On the other hand, the most frequent employment status is that both are employed, which occurs in around 74.7% of the observations, while joint unemployment is very infrequent, with only 0.7% of the observations. That is, in 95% 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 unemployment rate is clearly much higher when the spouse is employed than when he or she is unemployed. For the husband, the unemployment rate is around 3.5% when his wife is unemployed and becomes 5.3% when she is employed. The same happens for the wife, at much higher levels: the wife’s unemployment rate is around 14.9% when her husband is unemployed and becomes 21.5% when he is employed.

⁷In 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. Like Dey and Flinn (2008), we use unemployment synonymously with nonemployment.

⁸See 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).

⁹In these tables, we also report predicted statistics, which we will discuss in detail in Section 5 when we assess model fit.

On the contrary, wages are higher when the spouse is unemployed than if he or she is employed. Husbands' monthly wages are on average \$1,776 when their wife is not working, and \$1,631 when she is working. Wives' average monthly wages are \$1,195 when their husband is not working and \$1,152 when he is working. That is, husbands' wages are fairly sensitive to their wife's employment status whereas wives' wages are pretty unreactive to their husband's employment status.

Wealth data are very noisy, yet there are some clear differences by household employment status. Wealth is the highest with joint unemployment, which suggests that higher wealth allows couples to hold on to unemployment and wait for better wage offers to arrive. When only one household member works, there is also a clear asymmetry in wealth, depending on who is working. Wealth is higher when only the husband works than when only the wife works. Moreover, when only the wife works, wealth is the lowest, whereas when only the husband works, the wealth level is only slightly lower than when both work. These associations between wealth and joint employment status suggest that wealth accumulation is mainly dependent on the husband working than on the wife working, another asymmetry within the household.

[Table 2 here]

Table 2 reports unemployment rates and average wages of each household member by the spouse's wage segment and when the spouse is unemployed. The general pattern is very clear: unemployment rates and average wages tend to be higher when the partner's wages are higher. At this level of aggregation, we do not find a "gender asymmetry" as found by Lentz and Tranæs (2005), Lentz (2009), and Marcassa (2013) that would imply that the wife's unemployment and wages are decreasing in the husband's wage. We observe, however, nonmonotonicities in several segments. It is also noteworthy that the unemployment rate when the partner is employed is higher than when the partner is unemployed, even in the lower wage segment. On their turn, average wages when the partner is unemployed are lower than when the partner is employed, except for the lowest wage segment.

[Table 3 here]

In Table 3 we report the household employment transitions as a percentage of all transitions. The main flows happen within the same joint employment status. Most

of the off-diagonal single transitions represent less than 0.2% of all transitions; none of them exceeds 1%. As these employment transitions are small, the data for wage and wealth variations occurring within these employment transitions contain very few observations.

[Table 4 here]

Table 4 presents employment transitions between joint employment statuses conditional on the current status. We see that the exit from joint unemployment depends mainly on only the husband finding a job, which happens in 18.4% of the transitions compared with 3% for only the wife finding a job and 3% for both finding a job. If one of the household members is unemployed and the other is employed, the main off-diagonal transition is to joint employment, that is, that the unemployed 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 transitioning to joint employment is around 13.1%. But if only the husband works, the probability of transitioning to joint employment is only around 4.1%. If both work, the most likely event next to staying in the current status is that the wife loses her job, which occurs in around 1.2% of the transitions.

[Table 5 here]

Table 5 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. The husband's job finding is the highest when the unemployed wife finds a job. Job finding is also high, much higher than the unconditional job finding rate, when the employed wife separates from her job. For the wife, job finding is the highest when the employed husband separates from his job and is next highest when the unemployed husband finds a job. More active job finding is thus strongly influenced by job separations and by job finding by the partner.

On the other hand, for both individuals job finding and job separations are larger when the spouse experiences an employment status change, job finding or job separation. This evidence supports that job finding is triggered by job separations, especially for wives, the "added worker effect," and that job separations are triggered by job finding as remarked 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 5 we report job-to-job transitions which are around altogether 1.5% 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 56% for husbands and 67% for wives in total. Because of the mentioned missing data problem, however, we can only compute quits in job separations when the partner remains employed, which exhibit similar values as the unconditional percentages.

This table also shows wage variations in the most frequent transition, from employment to employment, depending on the spouse’s employment transition. Wage increases for each spouse are higher if the partner finds a job. If the wife separates from his or her current job, there is a wage drop in the husband’s wage. However, if the husband separates from his job, there is an increase in the wife’s wage, which conforms to the existence of an “added worker effect” for the wife.

In this table we also show that variations in the household’s wealth caused by the spouse’s employment transitions are smaller when the husband stays employed than when the wife stays employed. These trends have to be interpreted carefully, because wealth data are only available annually, so that the reported employment transitions occur between employment statuses when wealth data are available. Yet, as we would expect, wealth accumulation accelerates mainly when an individual stays employed and the spouse finds a job.

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. 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.

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 $\Theta = \{\Theta^1, \Theta^2, \gamma, s, \vartheta^3\}$, with $\Theta^i = \{b^i, \lambda^i, \pi^i, \theta^i, \mu^i, \sigma^i, \vartheta^i\}$, $i = 1, 2$. The moments used in this estimation are the following: joint employment status, wage means and standard deviations by joint employment status, wealth holdings by joint employment status, joint employment transitions, means and standard deviations of wage variations by joint employment transitions, and means and standard deviations of wealth variations by joint employment transitions. Most of these moments are reported in Tables 1 through 6.

These moments 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 level (Flinn and Heckman 1982). Fixing the interest rate r and the discount factor β enables 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 unemployed. 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 unemployment transfers, which in risk-neutral job search is identical to the value of leisure. Unlike nonpecuniary leisure values, higher unemployment transfers affect directly observed wealth accumulation over employment transitions.

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 resamples of the data. The estimated behavioral parameters are thus $\hat{\Theta} = \arg \min S(\Theta)$. 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.¹⁰ 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 6.¹¹

[Table 6 here]

The estimated labor market parameters reflect the asymmetry in individual labor markets. 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. The corresponding annual rates for the arrival rate while unemployed

¹⁰This 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. Underlying the computation of this optimal direction there is an implicit model of the derivative structure of the objective function. Once a new set of parameters is obtained, the algorithm goes back to calculate a new function value f_t , and the process is repeated until a convergence criterion is satisfied, namely that the percentage variation of this value falls below a certain value: $2|f_t - f_{t-1}| / (|f_t| + |f_{t-1}|) \leq 10^{-10}$.

¹¹Appendix 2 presents the results for the predicted moments, the actual values for these moments and their variance, whose inverse is the weight associated with each moment.

are 92.67% for the husband and 49.73% for the wife, and 62.56% and 38.34%, respectively, for the arrival rate when employed. The annualized layoff rate is 5.72% for the husband and 8.97% for the wife. Notice that these rates are in line with the employment transitions reported in Table 5. Job finding on average is certainly lower than the estimated arrival rate when unemployed for each spouse, as some job offers are not accepted. For the same reason, job-to-job transition rates are higher than estimated arrival rates when employed for both spouses. By contrast, job separations are higher than the estimated layoff rates, especially for the husband. This conforms to the high proportion of voluntary job separations discussed above in the descriptive section. 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 highly dependent on the partner's status. Accepted offers that made an individual leave unemployment may no longer be acceptable in the next periods, as household wealth accumulates and the spouse accesses better paid jobs.

Both the log mean and the dispersion of the husband's wage offer distribution are higher than for the wife. Accordingly, the husband receives higher wage offers than the wife. These wage offer distributions are associated with higher unemployment transfers for the husband than for the wife, which are almost zero. This means that these unemployment transfers basically only exist for the husband, while the wife's main support when unemployed is only her husband's wages. In models of individual agents these unemployment transfers are mainly non-labor income and the partner's income. In our framework, we are accounting explicitly for both nonlabor income that comes from wealth and for the partner's income, which we endogenize as accepted wages resulting from the joint job search process. Because of the design of the sample, consisting only of couples who do not participate in any government program, these unemployment transfers do not contain income that comes from unemployment insurance. Thus, these unemployment transfers may consist of extensive family transfers, such as transfers from parents to household members.¹² Notice also that these higher unemployment transfers imply a higher truncation point for the wage offer distribution of the husband, which is consistent with his higher wages, despite the higher dispersion of his wife's wage offer distribution.

The value of leisure is positive for both individuals but higher for the wife than

¹²As discussed previously, these parameters are mainly identified by accepted wages and employment transitions. In further research, these results can be corroborated by incorporating data of observed income in unemployment spells of each household member.

for the husband, which captures the household’s higher incentive for the wife not to work. However, when both are unemployed the common leisure parameter has a negative sign with a relatively high value, which implies that there is net disutility from joint unemployment.

The coefficient of constant relative risk aversion is estimated at 1.46, which is in line with previous estimates of utility-maximizing job search models. The estimated borrowing constraint is very tight; essentially the household cannot borrow.

These estimates reproduce 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 5.

The estimated model is able to replicate very closely the household employment status, individual employment status, and accepted wages by employment status of the spouse, as reported in Table 2. Wealth is, however, estimated less accurately, most likely because of the very noisy wealth data. Standard deviations of wealth by employment status are large relative to their corresponding means. The model does reproduce these large variations, but certainly with less precision in replicating average wealth. Predicted average wealth is closer to actual average wealth when both partners are unemployed or both are employed.

Table 2 shows actual and predicted individual unemployment rates and average wages by the wage segment of the spouse. Both are relatively well replicated, except for the highest wage segment. Yet, the general increasing trend of both variables is well captured by the estimated model: higher individual wages are associated with higher unemployment rates and average wages of the spouse. We find that these trends hold both for husband and wife, suggesting thus that both reservation wages are increasing in the spouse’s wage.

Predicted household employment transitions, as shown in Tables 3 and 4, also exhibit a close proximity to their actual counterparts. This replication is particularly important because many of these numerous household employment transitions have very low values. Accordingly, in the next tables, we concentrate on the wage and wealth variations for the most relevant transitions.

Table 5 presents individual employment transitions and wage and wealth variations conditional on the spouse’s employment transitions. The replication of these moments is pretty good, particularly for employment and wage variations for the most frequent spouse’s employment transitions. But, once again, the replication is less accurate for the very dispersed wealth data. It is particularly difficult to mimic

drops in wealth for the wife’s employment transitions. As in the actual transitions, in all cases unconditional variations are very close to the variations conditional on the spouse staying employed, the most frequent employment transition. An important feature of these predicted transitions is that for both household members job finding is highest when the partner faces job separations. By contrast, predicted job separations for husbands are the highest when wives find jobs, while for wives, as in the data, they are the highest when husbands separate from their jobs. As in the actual transitions, both job finding and job separations for a household member tend to be higher when their partners experience employment status changes.

Table 5 also reports job-to-job transitions as a percentage of employment to employment transitions and quits as a percentage of job separations. 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. When the spouse changes his or her employment status, the model underpredicts, except for the husband when the wife takes a job. For quits, the model replicates them accurately for the wife, but it overpredicts them for the husband. The same occurs for individual quits conditional on the available spouse’s employment transition.

In addition to assessing the fit for the moments used in the estimation, we analyze the hazard rates for the four household employment statuses. We did not include this hazard information in the estimation, yet the model also fits these data reasonably well.

[Figure 4 here]

Figure 4 shows the actual and predicted hazard rates of the four joint employment statuses. In the four graphs, the actual data fluctuate around the predicted hazard over time in months. All exhibit a peak around the fifth month of being in the current joint employment status, which the model is not reproducing. Yet the general level is correctly captured by the estimated model.

[Table 7 here]

In Table 7, we report the proportion of the last joint employment status for each hazard rate. Joint unemployment is mainly, 59%, receiving the flow from the husband

employed and the wife unemployed. The employment status of only one partner working is fed mainly by joint employment, that is, by job separations of one partner: from joint employment comes 92.8% of the flow to only the wife working and 85.8% of the flow to only the husband working. Joint employment comes mostly from only the husband being employed, 59.7%, and second from only the wife being employed, 38.7%. Joint job separations or joint job finding are very unlikely. The model is able to replicate these flows relatively closely.

[Figure 5 here]

Finally, Figure 5 reports the proportion of exits from the current joint employment status. The model also replicates these exits pretty well in levels, but it does not capture how their proportion fluctuate over time. The main destination for a joint unemployment spell is to only the husband working, followed by only the wife working. For only one partner working, the main destination is joint employment. However, the second destination differs by who the working spouse is. For only the wife working, the second destination is that only the husband works. An employment separation of the wife in this status is associated with the unemployed husband immediately finding a job, which conforms to the “added worker effect.” For only the husband working, the second destination is joint unemployment, which implies that the husband’s job separation is not associated with the wife’s immediate incorporation to work. After a spell of joint employment, the main destination is that only one agent separates from her job, mainly the wife.

The model delivers thus 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 separation. The model replicates well the large dispersion of the wealth data and their trend to depend mainly on the husband’s labor market activity.

6 Regime changes

After recovering the underlying parameters of the model and assessing their success in replicating the data, we perform three regime changes: worsening each household member’s labor markets, relaxing borrowing constraints, and increasing unemployment 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 unemployed i.e., the “added worker effect”. This change is attained by increasing layoff rates by 1 percentage point. The second change consists of increasing the debt limit by increasing the tightness of the borrowing constraint by 5 percentage points. Thereby we evaluate the effect of access to credit on family job search. The third regime change is increasing unemployment transfers of each spouse by \$100 at a time and then increasing both transfers by \$50 at the same time. We assess these changes by recomputing all moments from the same starting point in time but with the new regime. We are comparing two different economies rather than comparing an economy before and after a policy change.

[Table 8 here]

In Table 8, we report the effects of these regime changes on several selected observables. Worsening a spouse’s labor market increases his or her unemployment but decreases it for the partner. This can be seen in the first two columns for joint employment status. When there is a downturn for the husband by a higher layoff rate, there is an increase of both joint unemployment and unemployment only for the husband, associated with a decrease of joint employment and unemployment only for the wife. This evidently translates into a higher total unemployment for the husband but less evidently into a lower unemployment for the wife. We can see this effect also in job separations: higher layoff rates for an individual imply an increase in his or her job separation, but a decrease in the partner’s job separation. There is a clear “added worker effect”: an agent becomes more active in the labor market when labor market conditions worsen for the partner. Underlying these changes in outcomes are the household members’ reservation wage variations. An economic downturn increases an agent’s unemployment 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’s effect over the effect of higher unemployment for the husband, whereas wealth holdings decrease if the wife’s layoff rates increases, thus suggesting that the higher unemployment effect is stronger.

The second regime change, increasing the debt limit, increases mainly the wife unemployment rate, by increasing the employment status when only the husband

works. Wage effects are negligible, which suggests that this regime change mainly goes to consuming the wife’s leisure. This change implies less job finding for both spouses, and less job separation for the husband but more job separations for the wife. Understandably, as there is more access to credit, family wealth holdings decline.

The third regime change is reported in the last three columns of Table 8. Increases in unemployment transfers increase unemployment and wages of the beneficiary spouse but decreases unemployment and wages of the spouse that does not receive them. That is, increasing unemployment transfers has the usual effect in the labor market of an individual but the opposite effect on his or her partner (i.e., its cross-effect is negative). This conforms to the mechanism explained in Section 2. In terms of transitions, this regime change reduces job finding of the recipient agent. It increases the husband’s job finding for increases in the wife’s unemployment transfers, but it decreases in relatively small amounts the wife’s job finding for increases in the husband’s unemployment transfers. Splitting individual unemployment transfers in half and increasing both spouses’ unemployment transfers implies increasing both agents’ unemployment rates, but this increase is quantitatively split between the two spouses. Additionally, this regime change decreases wealth holdings, as it implies a relaxation of borrowing constraints that depend on unemployment transfers.

These regime changes corroborate, thus, that i) the increased job finding of a worker as a response to the spouse’s increased job separation (i.e., the “added worker effect”), ii) more access to credit results essentially in more consumption of the wife’s leisure, and iii) increasing a worker’s unemployment transfers lowers the spouse’s unemployment rate.

7 Family job search without wealth and savings

How important are wealth and savings to understand family job search? To answer this question, we reestimate our model 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), Flabbi and Mabli (2010), Ek and Holmlund (2010), and Guler, Guvenen, and Violante (2012). This is the exercise performed by Blundell et al. (2016) in their analysis of female labor supply. The results of this estimation are presented in Table 9.

[Table 9 here]

This exercise has a similar effect as excluding a relevant variable in any other estimation: it implies a biased estimation of the remaining parameters. In our model, 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 1.463 to 0.864. 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 (2010) use full-time and part-time data from the 2001-2003 panel of SIPP and estimate this coefficient at a higher value, 0.9744.

This omission also blurs the identification of the leisure parameters, as it is not possible to distinguish between monetary flows and nonpecuniary incentives to stay unemployed. Despite the nonlinear utility function, without using indicators of hours of work there is no possible distinction between the value of leisure and unemployment monetary transfers in a model without savings. Accordingly, we exclude the leisure parameters from the estimation with the consequence that the estimated unemployment transfers increase substantially. However, other parameters of the model (e.g., wage offer distributions and the arrival rates) do not present large variations, as they are well identified from the observed employment transitions and wages.

[Table 10 here]

Table 10 shows the main predicted statistics for employment status and wages. This constrained model exhibits a similar fit of employment status statistics but a less accurate account of conditional wages, especially for wives, which present less dependence on the husband's employment status than in the unconstrained model and in the data. This may happen because, unlike in the unconstrained estimated model where wives practically do not receive unemployment transfers, in the constrained model wives receive higher unemployment transfers, which results in less dependency on their husbands' wages.

[Table 11 here]

Table 11 presents the effects of regime changes in the constrained model. Certainly, there are no effects of wealth accumulation and access to credit on labor market

outcomes. Yet, it is possible to assess the effect of an economic downturn and of increasing unemployment transfers. A downturn increases unemployment and job separations and decreases wages of the affected spouse, without any “added worker effect” as in the unconstrained model with wealth in which job separations of the spouse decline. On its turn, increasing the husband’s unemployment transfers has important employment effects, decreasing the husband’s job finding and increasing his unemployment rate while increasing the wife’s job finding and decreasing her unemployment rate. That is, this cross-effect is present even in this context, when the husband is the beneficiary. This effect, however does not hold for the wife, for whom employment and wage effects are very small. Consequently, omitting wealth and savings conducts to underestimating the “added worker effect” and the opposite effect of increasing unemployment transfers for individual household

Thus, wealth data, even if they present a large dispersion, contribute to a correct estimation of the labor market parameters of a family job search model. Omitting wealth in an estimation implies that the estimated coefficient of risk aversion will be biased downward, which will understate the interdependence between household members’ job search. Moreover, wealth data enable the identification of leisure parameters, whose omission implies an upward bias in the estimated unemployment transfers, which will distort the assessment of unemployment policies by neglecting the “added worker effect” and weakening the negative cross-effect of increasing unemployment transfers.

8 Family job search with more children

What is the effect on family job search of having more children? We can answer this question by reestimating our model using a sample of similar characteristics to the one we use in this paper, but with two or more children. This sample contains 35,997 observations on 1,077 married couples.

[Table 12 here]

Table 12 provides the main actual and predicted statistics of this sample. Very clearly, unemployment rates are higher and wages and wealth levels are generally lower than in the sample with at most one child. But most importantly, differences in unemployment rates and wages by the spouse’s employment status are much less

pronounced than in the sample with one child or none. This suggests that the presence of more children erodes the interdependency of the individual job search processes within the household. And, as it happens in our main sample, the dispersion of wealth is very high.

[Table 13 here]

In Table 13 we report the estimated parameters that generate the predicted statistics of Table 12. Compared to the estimated parameters for the sample of no more than one child, in this sample the coefficient of risk aversion is lower, the husband's unemployment transfers are higher, his value of leisure is similar, the wife's value of leisure is higher, and the negative common value of leisure is much higher in absolute value. Her unemployment transfers are close to zero, as in the case with no more than 1 child. This corresponds to the reduced influence of the spouse's employment status as already mentioned. The tightness of the borrowing constraint increases to 3.6%. The logwage offer distribution exhibits higher means and standard deviations for both spouses; however, arrival rates for the wife are worse than in the previous sample: both arrival rates, when unemployed and employed, are lower while the layoff rate is higher. For the husband, the arrival rate is lower when unemployed but higher when employed, while his layoff rate is lower. That is, the husband's labor market is generally better than in the previous sample, but his higher unemployment transfers suggest that he is also more selective in accepting wage offers. For the wife, both the labor market, worse than in the previous sample, and her higher value of leisure explain her higher unemployment rates.

[Table 14 here]

In Table 14, we repeat the three regime changes for the sample of two or more children. Increasing layoff rates has a somewhat weaker effect on increasing unemployment of a worker but a higher effect on reducing the partner's unemployment than in the previous sample if the downturn affects the wife. This is suggestive that the "added worker effect" for the wife's downturn increases with the number of children. Job separation of one partner has to be compensated by job finding of the partner. Relaxing borrowing constraints produces a relatively small increase in unemployment of both spouses with no effect on wages, which, again, suggests an

increase in consumption of leisure. Unlike the baseline model, with more children, and some more estimated access to credit, there is a more balanced consumption of leisure between spouses. More access to credit allows the couple to consume more leisure, possibly spending more time with their children. The third regime change, increasing unemployment transfers, has a higher effect on increasing unemployment rates of the beneficiary spouse, however, with a clear asymmetry. If the husband is the beneficiary, both unemployment rates increase, but if the wife is the beneficiary, her unemployment rates increase and the husband's declines slightly. Splitting the increase of these transfers in half between spouses implies increases in unemployment rates for both, a higher impact than the increase in the sample with at most one child. This regime change implies that the opposite reaction of the spouse to increasing unemployment transfers in the couple with two or more children only exist if the wife is the beneficiary. If the husband receives the increased unemployment transfers, the wife will also increase her unemployment rate, most likely to spend time with the children, captured in her higher value of leisure. This regime change also implies increased wealth holdings, which suggests that the wage and employment effects of increased unemployment transfers dominates over their effect on relaxing borrowing constraints.

This analysis shows that with more children in the household the “added worker effect” is still present and is stronger if the wife’s labor market faces an economic downturn. On the other hand, with more children the opposite cross-effect of increased unemployment transfers on individual unemployment is more asymmetric within the household. As the wife has a higher value of leisure, reflective of her taking care of the children, increased husband’s unemployment transfers act as a disincentive for her to seek employment. However, the opposite cross-effect still exists for the husband: if the wife is the individual beneficiary of increased unemployment transfers, the husband’s job finding increases slightly, which reverses the usually desired effect of this policy.

9 Conclusions

In this paper, we have developed and estimated a model of family job search and wealth accumulation. Earlier research on family job search did not consider households’ savings decisions. We have shown that omitting wealth and savings from an analysis implies an underestimation of the household risk aversion, hence understating the interdependence between household members’ employment transitions and

wages.

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.” We have proposed a search-theoretic mechanism for this effect: increased job separations of one agent undermines the unemployed partner’s job selectivity and thus decreases the partner’s reservation wage. Consequently, the partner is more likely to accept job offers and thus accelerates his or her transition from unemployment to employment.

A policy implication of this analysis is that increasing unemployment transfers has the classical effect of increasing unemployment and wages but at the same time it implies a negative cross-effect, for it decreases his or her partner’s unemployment and wages. We show that at low levels of both wealth and wages increased unemployment transfers for one spouse are able to trigger a breadwinner role reassignment. Thereby, effects of unemployment transfers that are valid in an individual-agent job search framework are partly undone by the partner’s behavior in a two-agent job search context. Given that the desired effect of unemployment insurance is to support job search and thereby improve the quality of the resulting wage match for the whole labor force, this purpose may not be accomplished efficiently for married couples. An optimal unemployment 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 both the “added worker effect” and the negative cross-effect of unemployment transfers diminish strongly and thus would be overlooked if wealth data are excluded in the model and the estimation.

We also have shown that the “added worker effect” is robust to the presence of more children in the household. Moreover, increasing the number of children implies a positive effect of the husband’s unemployment transfers on the wife’s unemployment rate. However, the presence of more children in the household does not change that increasing the wife’s unemployment transfers decreases the husband’s unemployment rate.

In the present paper, we have centered our attention on employment transitions and wage variations. We have made the case that wealth data are important even if the purpose of the analysis is restricted to these labor market features. However, the inclusion of wealth data opens the doors to analyzing other important issues, such as consumption smoothing in the presence of uncertain household incomes and limited access to credit. Our model also has implications for these issues. In our model,

a household combines wealth holdings and individuals' job acceptance decisions to maintain a stable level of consumption over time. We have left the detailed analysis of these issues for future research.

A limitation of our analysis is the assumption that existing observed couples and their number of children are exogenous. A valuable extension of the current framework would be to analyze how our results change when couple formation and dissolution as well as fertility decisions are allowed. This extension would also imply departing from the unitary job search model to allow for a collective framework that considers bargaining and cooperation within the household.

When more data become available, another important improvement would be to distinguish between unemployment 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 unemployment benefits.

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Appendix: 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 A1 gives further details of this discretization.

Table A1. Discretization of Variables

	Wealth	Wages
Original Variable	A	w
Discretized Variable	$A[i]$	$w[j]$
Gridpoints	$i = 1, \dots, N_A$	$j = 1, \dots, N_w$
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	$\bar{A} = 500\,000$	$\bar{w} = 10\,000$
Gridsize	$\Delta_A = \frac{\bar{A}-\underline{A}}{N_A-1}$	$\Delta_w = \frac{\ln \bar{w} - \ln \underline{w}}{N_w}$

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:

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

Value function, policy rules, and expected value function

These are approximated by:

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

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:

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

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 $V[i', 0, 0]$ we calculate the following three summations:

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

With them we build the integral

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

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

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

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

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

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

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

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

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

$$\tilde{A}[i', j, k] = \hat{C}[i', j, k] - w[j] - w[k] - \frac{A[i']}{1 + r}.$$

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

Interior solution. For each i locate i' such that $\tilde{A}[i', j, k] < A[i] < \tilde{A}[i' + 1, j, k]$, then compute the linear interpolations

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

where $a = \frac{A(i) - \tilde{A}(i', j, k)}{\tilde{A}(i' + 1, j, k) - \tilde{A}(i', j, k)}$.

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

Table 1. Employment, Wages, and Wealth by Household Employment Status

Variable	Spouse			
	Actual		Predicted	
	Unemployed	Employed	Unemployed	Employed
Joint Employment Status				
Husband				
Unemployed	0.73	4.17	0.72	4.03
Employed	20.44	74.66	20.26	74.99
Unemployment Rate				
Husband	3.46	5.29	3.43	5.09
Wife	14.95	21.49	15.17	21.27
Wages				
Husband	1776	1631	1908	1554
	(1291)	(916)	(1312)	(740)
Wife	1195	1152	1229	1133
	(793)	(621)	(696)	(544)
Wealth if Husband				
Unemployed	52036	37567	51580	81537
	(81831)	(61071)	(76561)	(97380)
Employed	45410	48108	85408	52764
	(75396)	(65633)	(110016)	(56506)

Table 2. Unemployment Rate and Average Wage by Spouse's Wage Segment

Spouse is	Unemployment Rate (%)				Average Wage (\$)			
	Husband		Wife		Husband		Wife	
	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
Unemployed	3.46	3.43	14.95	15.17	1777	1909	1196	1230
Wage segments								
[700, 1475)	5.28	4.87	22.54	19.44	1544	1490	1037	1030
[1475, 2250)	5.08	5.35	17.34	18.55	1906	1891	1209	1230
[2250, 3025)	5.84	6.60	19.67	22.85	2103	1889	1338	1365
[3025, 3800)	4.98	7.79	29.42	30.31	1970	1568	1494	1199
[3800, 10000)	8.18	16.99	42.09	60.61	2237	1879	1326	1191

Table 3. Household Employment Transitions, as a Percentage of All Transitions

t	Actual				Total	t	Predicted				Total
	uu	ue	eu	ee			uu	ue	eu	ee	
$t - 1$						$t - 1$					
uu	0.55	0.02	0.13	0.02	0.72	uu	0.56	0.03	0.12	0.01	0.72
ue	0.02	3.58	0.01	0.54	4.16	ue	0.03	3.40	0.03	0.58	4.02
eu	0.10	0.02	19.43	0.84	20.39	eu	0.13	0.03	19.23	0.84	20.23
ee	0.05	0.56	0.88	73.24	74.73	ee	0.01	0.55	0.89	73.58	75.03
Total	0.72	4.18	20.45	74.64	100.00	Total	0.72	4.01	20.26	75.01	100.00

Table 4. Household Employment Transitions, Conditional on Current Household Employment Status

t	Actual				Total	$t - 1$	Predicted				Total
	uu	ue	eu	ee			uu	ue	eu	ee	
$t - 1$						$t - 1$					
uu	75.54	3.00	18.45	3.00	100.00	uu	77.52	4.80	16.66	1.02	100.00
ue	0.45	86.19	0.30	13.06	100.00	ue	0.63	84.40	0.68	14.29	100.00
eu	0.50	0.11	95.28	4.11	100.00	eu	0.65	0.14	95.06	4.15	100.00
ee	0.07	0.75	1.18	98.00	100.00	ee	0.01	0.73	1.18	98.08	100.00

Table 5. Employment Transitions, Wage, and Wealth Variations by Spouse's Employment Transitions (standard deviations in smaller fonts)

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	14.56	19.63	50.00	40.00	13.16	15.38	17.69	17.57	51.73	14.48		
e→u	0.77	0.52	2.53	5.65	0.76	0.75	0.67	3.24	0.83	0.74		
Wife: u→e	3.68	3.83	14.00	17.50	4.13	3.75	5.96	5.20	18.45	4.19		
e→u	1.22	0.52	2.23	8.63	1.19	1.20	0.74	4.52	1.33	1.19		
Job-to-job												
Husband: e→e	1.48	1.23	27.27	6.27	0.08	1.37	1.32	30.20	1.06	0.01		
Wife: e→e	1.45	1.06	4.79	5.26	1.42	1.44	1.34	1.53	1.58	1.44		
Quits												
Husband: e→u	56.07				54.32	65.08					66.45	
Wife: e→u	66.86				65.22	65.95					66.09	
Wage variations in e→e (\$)												
Husband	1	0	53	-23	1	2	2	2	1	2		
	123	563	522	532	505	6	29	30	25	30		
Wife	0	-1	46	46	1	0	1	1	2	1		
	475	377	626	301	379	28	21	21	24	22		
Wealth variations in e→e (\$)												
Husband	987	623	1062	-593	520	740	855	696	2095	1362		
	1187	5739	1521	3622	8635	661	3228	3258	3056	2914		
Wife	438	-90	4533		520	1318	436	527	1726	1362		
	8120	5444	7611		8635	2748	3103	3037	2966	2914		

Table 6. Parameter Values and Asymptotic Standard Errors in parentheses

Parameter	$\widehat{\Theta}$	Estimate			
		Husband		Wife	
Individual:					
Arrival Rate Unemployed:	λ	0.1957	(0.000243)	0.0557	(0.000426)
Arrival Rate Employed:	π	0.0786	(0.000671)	0.0395	(0.000944)
Layoff Rate:	θ	0.0049	(0.000043)	0.0078	(0.000094)
Mean Logwages:	μ	4.7683	(0.348517)	4.5744	(0.475992)
Standard Deviation of Logwages:	σ	0.8561	(0.063987)	0.7837	(0.079070)
Unemployment Transfers:	b	199.9086	(2.333507)	0.3562	(0.850501)
Leisure:	ϑ	0.0080	(0.000119)	0.0109	(0.000172)
Common:					
Relative Risk Aversion:	γ		1.4634	(0.001180)	
Borrowing Constraint:	s		0.0016	(0.000168)	
Leisure:	ϑ_3		-0.0349	(0.000975)	

Table 7. Previous Employment Status by Employment Status Spell in Percentage (each column adds up to 100%)

Previous Employment Status	Employment Status Spell							
	Actual				Predicted			
	uu	ue	eu	ee	uu	ue	eu	ee
uu		3.61	12.99	1.55		5.67	11.64	0.52
ue	10.71		1.21	38.72	15.55		2.63	40.44
eu	58.93	3.61		59.73	79.92	4.59		59.04
ee	30.36	92.78	85.80		4.52	89.74	85.73	

Table 8. Effects on Employment and Employment Transitions of Three Regime Changes:
i. An Economic Downturn, ii. Relaxing Borrowing Constraints , and
iii. Increasing Unemployment Transfers

Variable	Economic Downturn		Increase Debt Limit $+s$	Unemployment Transfers		
	Husband	Wife		Husband	Wife	Both
	$+\theta_1$	$+\theta_2$		$+b_1$	$+b_2$	$+b_1, +b_2$
Joint Employment Status (%)						
uu	0.71	0.19	-0.07	0.75	-0.19	0.32
ue	3.48	-0.68	-0.06	1.29	-0.11	0.51
eu	-2.32	6.02	1.07	-0.85	1.42	0.19
ee	-1.84	-5.52	-0.91	-1.17	-1.10	-0.99
Unemployment Rate* (%)						
Husband	4.21	-0.50	-0.02	1.62	-0.06	0.68
Wife	-1.58	6.18	1.09	-0.45	1.42	0.38
Employment Transitions (%)						
Husband u $\rightarrow$ e	0.28	1.16	-0.09	-2.23	0.21	-0.86
e $\rightarrow$ u	1.02	-0.05	-0.03	0.27	-0.05	0.12
Wife u $\rightarrow$ e	-0.10	0.40	-0.14	-0.06	-0.22	-0.13
e $\rightarrow$ u	-0.12	1.03	0.10	-0.00	0.11	0.05
Wages* (\$)						
Husband	-31	-5	-9	16	-13	0
Wife	-6	-12	0	0	3	1
Wealth** (\$)	1014	-601	-3015	-294	-1330	-767

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

Table 9. Parameter Values and Asymptotic Standard Errors in parentheses
Family Job Search Without Wealth

Parameter	$\hat{\Theta}$	Estimate			
		Husband		Wife	
Individual:					
Arrival Rate Unemployed:	λ	0.1513	(0.000419)	0.0430	(0.000376)
Arrival Rate Employed:	π	0.0404	(0.000247)	0.0350	(0.001700)
Layoff Rate:	θ	0.0048	(0.000037)	0.0116	(0.000071)
Mean Logwages:	μ	4.9375	(0.026197)	4.6180	(0.799486)
Standard Deviation of Logwages:	σ	1.2434	(0.008567)	0.8754	(0.146610)
Unemployment Transfers:	b	181.3233	(2.085872)	57.3620	(178.687075)
Common:					
Relative Risk Aversion:	γ		0.8636	(0.002344)	

Table 10. Predicted Employment and Wages by Household Employment Status
Family Job Search Without Wealth

Variable	Spouse	
	Unemployed	Employed
Joint Employment Status		
Husband		
Unemployed	0.69	4.14
Employed	20.35	74.82
Unemployment Rate		
Husband	3.28	5.24
Wife	14.31	21.39
Wages		
Husband	1785 (1116)	1734 (881)
Wife	1246 (575)	1136 (546)

Table 11. Effects on Employment and Employment Transitions of Three Regime Changes:
i. An Economic Downturn, and ii. Increasing Unemployment Transfers
Family Job Search Without Wealth

Variable	Economic Downturn		Unemployment Transfers		
	Husband	Wife	Husband	Wife	Both
	+ θ_1	+ θ_2	+ b_1	+ b_2	+ $b_1, +b_2$
Joint Employment Status (%)					
uu	0.90	0.29	1.22	0.01	0.97
ue	2.91	-0.17	2.67	0.07	2.00
eu	-0.89	6.21	-1.21	0.00	-0.96
ee	-2.90	-6.31	-2.66	-0.06	-1.99
Unemployment Rate* (%)					
Husband	3.68	0.23	3.39	0.08	2.53
Wife	-0.08	6.56	-0.42	0.02	-0.36
Employment Transitions (%)					
Husband: u→e	0.47	0.01	-1.85	-0.04	-1.00
e→u	0.91	0.03	0.59	0.02	0.49
Wife: u→e	-0.27	0.19	-0.20	-0.00	-0.15
e→u	0.00	1.01	0.00	0.00	0.00
Wages* (\$)					
Husband	-47	0	70	1	53
Wife	0	-11	9	0	7

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

Table 12. Employment, Wages and Wealth by Household Employment Status
Two or More Children

Variable	Spouse			
	Actual		Predicted	
	Unemployed	Employed	Unemployed	Employed
Joint Employment Status (%)				
Husband				
Unemployed	1.32	2.88	1.54	2.92
Employed	31.67	64.13	30.53	65.02
Unemployment Rate (%)				
Husband	4.00	4.30	4.79	4.29
Wife	31.42	33.05	34.50	31.95
Wages (\$)				
Husband	1775	1601	1789	1561
	(1286)	(873)	(1108)	(685)
Wife	1148	1074	1127	1113
	(627)	(673)	(564)	(567)
Wealth if Husband (\$)				
Unemployed	30346	27424	28767	59135
	(80297)	(59420)	(57730)	(71570)
Employed	37590	41722	58761	48874
	(64672)	(57025)	(83568)	(53590)

Table 13. Parameter Values and Asymptotic Standard Errors in parentheses
Two or More Children

Parameter	$\hat{\Theta}$	Estimate			
		Husband		Wife	
Individual:					
Arrival Rate Unemployed	λ	0.1807	(0.000511)	0.0417	(0.000178)
Arrival Rate Employed	π	0.0824	(0.000473)	0.0301	(0.000183)
Layoff Rate	θ	0.0039	(0.000044)	0.0152	(0.000038)
Mean Logwages	μ	5.1109	(0.019106)	4.9615	(0.422367)
Standard Deviation of Logwages	σ	0.8805	(0.002294)	0.9741	(0.092458)
Unemployment Transfers	b	314.8272	(2.433237)	0.0390	(0.001217)
Leisure	ϑ	0.0080	(0.000052)	0.0145	(0.000101)
Common:					
Relative Risk Aversion	γ		1.3983	(0.001154)	
Borrowing Constraint	s		0.0362	(0.000974)	
Leisure	ϑ_3		-0.0659	(0.000621)	

Table 14. Effects on Employment and Employment Transitions of Three Regime Changes:
i. An Economic Downturn, ii. Relaxing Borrowing Constraints , and
iii. Increasing Unemployment Transfers. Two or More Children

Variable	Economic Downturn		Increase Debt Limit $+s$	Unemployment Transfers		
	Husband	Wife		Husband	Wife	Both
	$+\theta_1$	$+\theta_2$		$+b_1$	$+b_2$	$+b_1, +b_2$
Joint Employment Status (%)						
uu	1.29	-0.30	-0.03	0.83	-0.66	0.36
ue	2.91	-0.73	0.22	2.27	-0.04	1.14
eu	-2.42	5.91	0.25	-0.87	1.43	-0.05
ee	-1.76	-4.86	-0.43	-2.21	-0.72	-1.43
Unemployment Rate* (%)						
Husband	4.14	-0.78	0.34	3.33	-0.01	1.70
Wife	-1.18	5.78	0.32	0.13	1.26	0.45
Employment Transitions (%)						
Husband: u $\rightarrow$ e	0.05	1.04	-0.38	-2.86	0.45	-1.41
e $\rightarrow$ u	1.01	-0.18	0.02	0.43	-0.13	0.22
Wife: u $\rightarrow$ e	-0.05	0.09	-0.05	-0.14	-0.14	-0.11
e $\rightarrow$ u	-0.12	1.02	0.02	-0.00	0.09	0.03
Wages* (\$)						
Husband	-42	-10	0	41	-5	18
Wife	-6	-7	0	2	3	2
Wealth** (\$)	1494	-318	43	2756	993	1745

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

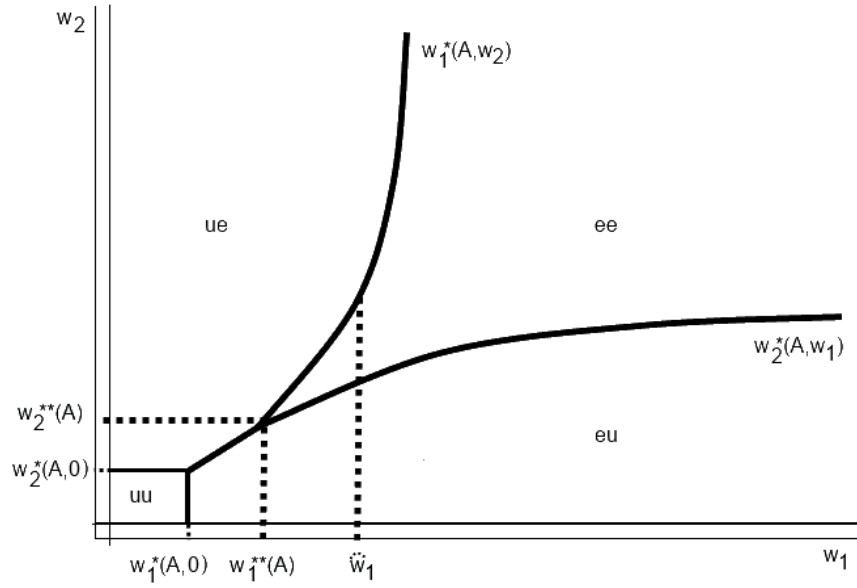


Figure 1. Joint employment status by wages of husband and wife, conditional on wealth level A

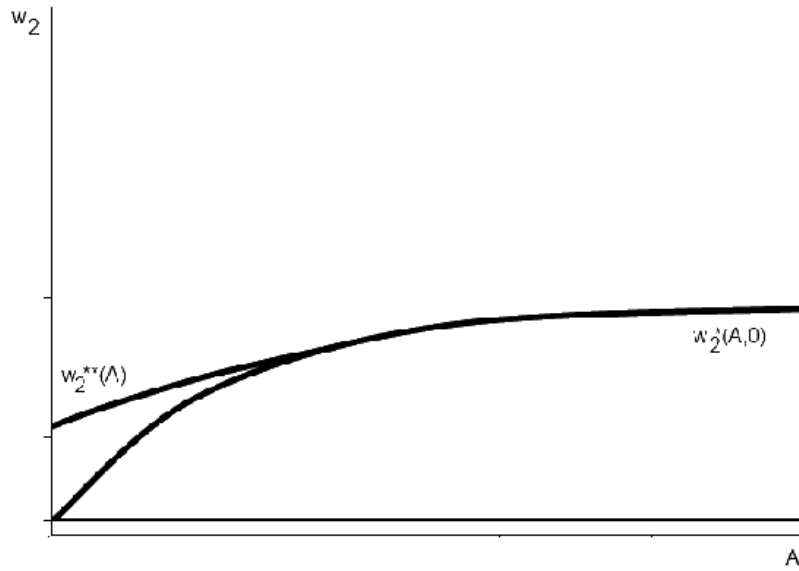


Figure 2. Reservation wages of the wife when the husband is unemployed as a function of wealth

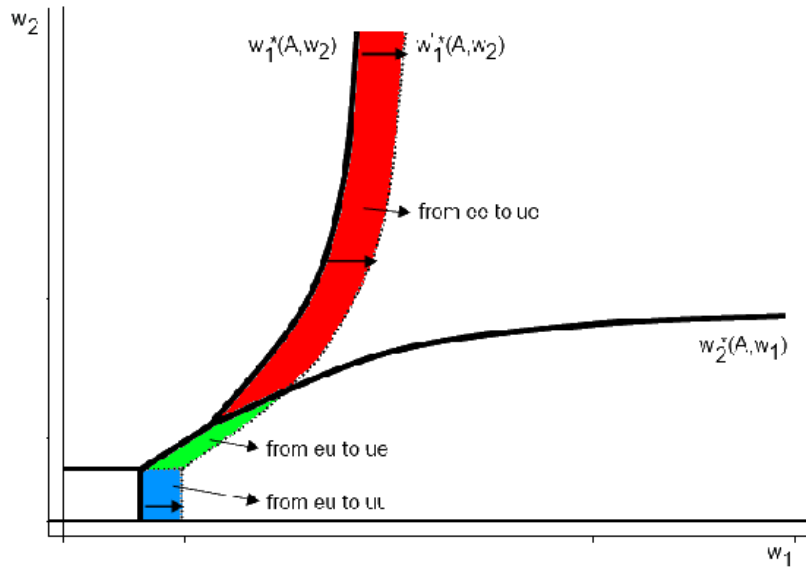


Figure 3. Change in joint employment status from increasing husband's unemployment transfers b_1

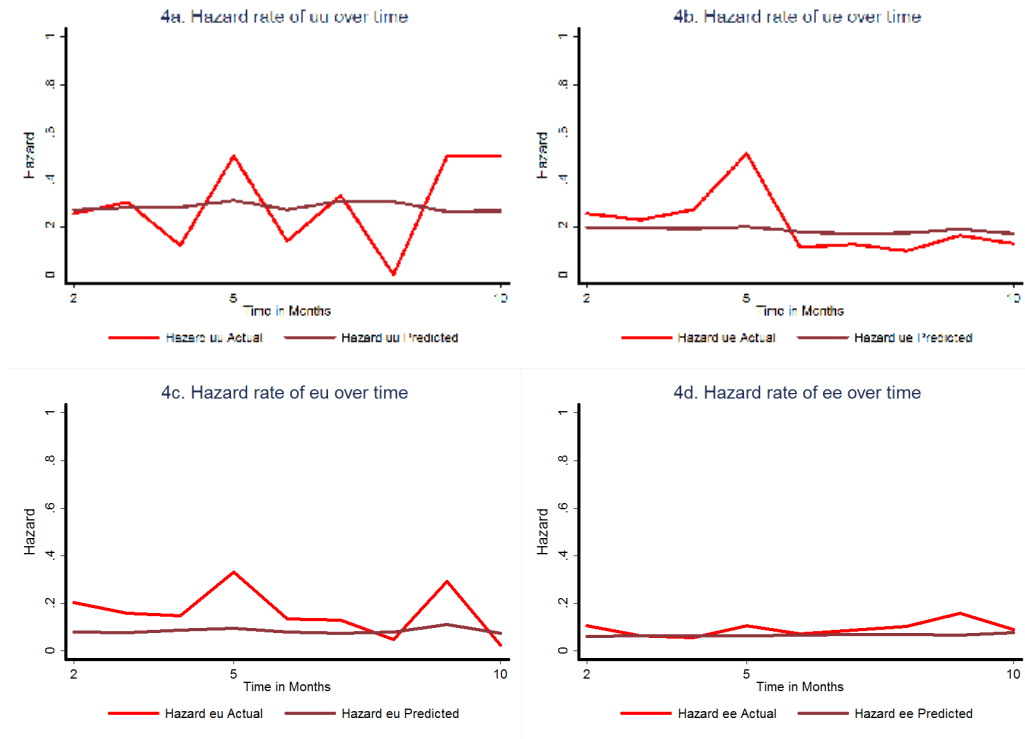


Figure 4. Hazard rate by joint employment status

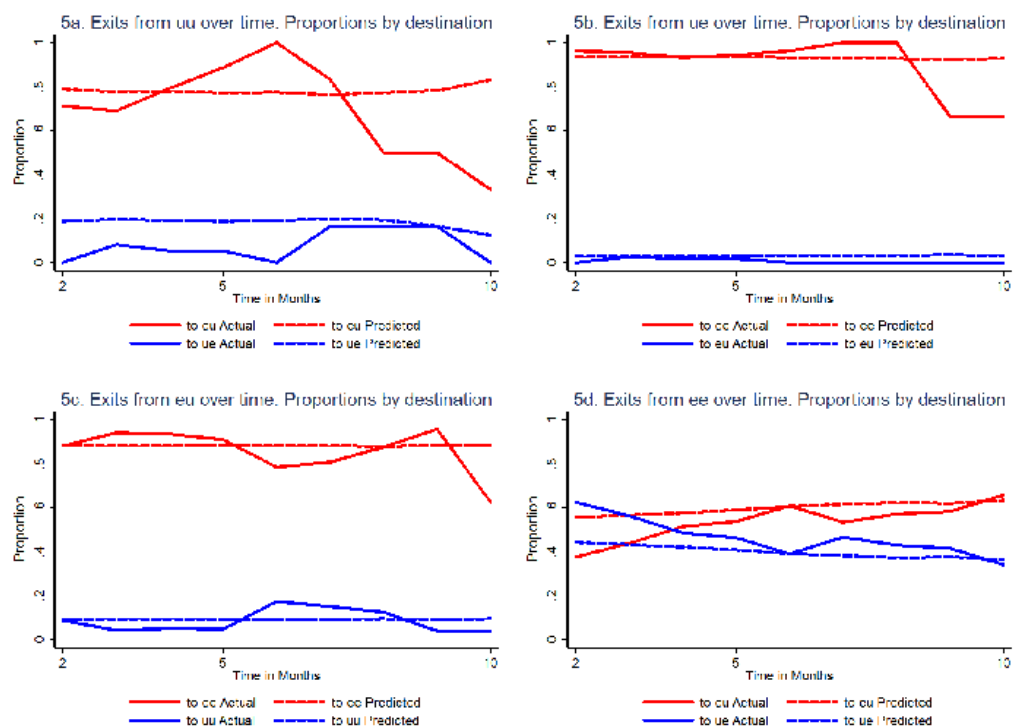


Figure 5. Proportion of transitions from a given joint employment status

Appendix 2: Actual and Predicted Moments

Table A2. Actual and Predicted Moments
Moment Weight: Variance inverse

Moment Name	Predicted	Actual	Variance
1. Employment Status UU	.0072006958	.0073262273	.0000003828
2. Employment Status EU	.2026053490	.2043837262	.0000305850
3. Employment Status UE	.0402587519	.0416754241	.0000051982
4. Employment Status EE	.7499352033	.7466146224	.0000329900
5. Wage husband. Empl.Stat EU	1908	1776	1280
6. SD Wage husband. Empl.Stat EU	1312	1291	2500
7. Wage husband. Empl.Stat EE	1554	1631	171
8. SD Wage husband. Empl.Stat EE	740	916	449
9. Wage wife. Empl.Stat UE	1229	1195	1073
10. SD Wage wife. Empl.Stat UE	696	793	11980
11. Wage wife. Empl.Stat EE	1133	1152	73
12. SD Wage wife. Empl.Stat EE	544	621	256
13. Wealth. Empl.Stat UU	51580	52036	103710737
14. SD Wealth Empl.Stat UU	76561	81831	269091092
15. Wealth Empl.Stat EU	85408	45410	4478814
16. SD Wealth Empl.Stat EU	110016	75396	15971816
17. Wealth Empl.Stat UE	81537	37567	8428833
18. SD Wealth Empl.Stat UE	97380	61071	35391719
19. Wealth Empl.Stat EE	52764	48108	1012097
20. SD Wealth Empl.Stat EE	56506	65633	3894516
21. Empl.Trans. UU→UU cell	.0055992885	.0054597345	.0000002761
22. Empl.Trans. UU→UE cell	.0003466205	.0002171485	.0000000013
23. Empl.Trans. UU brack EU cell	.0012035939	.0013339124	.0000000124
24. Empl.Trans. UU→EE cell	.0000738849	.0002171485	.0000000014
25. Empl.Trans. UE→UU cell	.0002540363	.0001861273	.0000000011
26. Empl.Trans. UE→UE cell	.0339628751	.0358295074	.0000048048
27. Empl.Trans. UE→EU cell	.0002722795	.0001240849	.0000000009
28. Empl.Trans. UE→EE cell	.0057520752	.0054287132	.0000000582
29. Empl.Trans. EU→UU cell	.0013052996	.0010237002	.0000000102
30. Empl.Trans. EU→UE cell	.0002809450	.0002171485	.0000000015
31. Empl.Trans. EU→EU cell	.1922908875	.1942548703	.0000303933
32. Empl.Trans. EU→EE cell	.0083982487	.0083757290	.0000000772
33. Empl.Trans. EE→UU cell	.0000738849	.0005273607	.0000000043
34. Empl.Trans. EE→UE cell	.0054875490	.0055838193	.0000000620
35. Empl.Trans. EE→EU cell	.0088652741	.0088100261	.0000000768
36. Empl.Trans. EE→EE cell	.7358332573	.7324109691	.0000340408
37. Empl.Trans. UU→UU row	.7751610052	.7553648069	.0002235719
38. Empl.Trans. UU→UE row	.0479858568	.0300429185	.0000231736
39. Empl.Trans. UU→EU row	.1666245738	.1845493562	.0001579712
40. Empl.Trans. UU→EE row	.0102285642	.0300429185	.0000321250

Table A2. Actual and Predicted Moments - continued
Moment Weight: Bootstrap Variance

Moment Name			Predicted	Actual	Variance
41.	Empl.Trans.	UE→UU row	.0063128308	.0044776119	.0000006880
42.	Empl.Trans.	UE→UE row	.8439812768	.8619402985	.0000531437
43.	Empl.Trans.	UE→EU row	.0067661759	.0029850746	.0000005276
44.	Empl.Trans.	UE→EE row	.1429397164	.1305970149	.0000488969
45.	Empl.Trans.	EU→UU row	.0064530821	.0050213025	.0000002466
46.	Empl.Trans.	EU→UE row	.0013889233	.0010651248	.0000000379
47.	Empl.Trans.	EU→EU row	.9506391077	.9528301887	.0000031063
48.	Empl.Trans.	EU→EE row	.0415188869	.0410833841	.0000026391
49.	Empl.Trans.	EE→UU row	.0000984790	.0007056577	.0000000077
50.	Empl.Trans.	EE→UE row	.0073141968	.0074716699	.0000001148
51.	Empl.Trans.	EE→EU row	.0118162697	.0117886348	.0000001538
52.	Empl.Trans.	EE→EE row	.9807710545	.9800340376	.0000002821
53.	Empl.Trans.	Husband U→E	.1538372842	.1455816910	.0000447446
54.	Empl.Trans.	Husband U→E, Wife U→U	.1769241083	.1963470320	.0001845401
55.	Empl.Trans.	Husband U→E, Wife U→E	.1757049892	.5000000000	.0040086697
56.	Empl.Trans.	Husband U→E, Wife E→U	.5173310225	.4000000000	.0064907676
57.	Empl.Trans.	Husband U→E, Wife E→E	.1448340013	.1315789474	.0000500795
58.	Empl.Trans.	Husband E→U	.0075038460	.0077291850	.0000000897
59.	Empl.Trans.	Husband E→U, Wife U→U	.0067423830	.0052422558	.0000002698
60.	Empl.Trans.	Husband E→U, Wife U→E	.0323699422	.0252707581	.0000202734
61.	Empl.Trans.	Husband E→U, Wife E→U	.0082653061	.0564784053	.0000460005
62.	Empl.Trans.	Husband E→U, Wife E→E	.0074023945	.0075662043	.0000001178
63.	Empl.Trans.	Wife U→E	.0375219561	.0367795753	.0000018300
64.	Empl.Trans.	Wife U→E, Husband U→U	.8471267581	.8532574320	.0001591014
65.	Empl.Trans.	Wife U→E, Husband U→E	.0578364870	.1400000000	.0005185628
66.	Empl.Trans.	Wife U→E, Husband E→U	.0418470517	.0413349663	.0000026800
67.	Empl.Trans.	Wife U→E, Husband E→E	.0119740165	.0122291691	.0000001526
68.	Empl.Trans.	Wife E→U	.1528732419	.1467425680	.0001591014
69.	Empl.Trans.	Wife E→U, Husband U→U	.0451964570	.0223463687	.0000300509
70.	Empl.Trans.	Wife E→U, Husband U→E	.0119045140	.0118858291	.0000001564
71.	ΔW Husband	UU→EU	921	1193	1691
72.	ΔW Husband	UU→EE	925	919	3271
73.	ΔW Husband	UE→EU	1012	959	7884
74.	ΔW Husband	UE→EE	943	1044	351
75.	ΔW Husband	EU→UU	-1551	-1193	2731
76.	ΔW Husband	EU→UE	-982	-1413	17470
77.	ΔW Husband	EU→EU	2	0	2
78.	ΔW Husband	EU→EE	2	53	218
79.	ΔW Husband	EE→UU	-1035	-1260	6251
80.	ΔW Husband	EE→UE	-1280	-1226	1259

Table A2. Actual and Predicted Moments - continued
Moment Weight: Bootstrap Variance

Moment Name		Predicted	Actual	Variance
81.	ΔW Husband $EE \rightarrow EU$	1	-23	246
82.	ΔW Husband $EE \rightarrow EE$	2	1	0
83.	SD ΔW Husband $UU \rightarrow EU$	195	535	2025
84.	SD ΔW Husband $UU \rightarrow EE$	210	285	3249
85.	SD ΔW Husband $UE \rightarrow EU$	209	241	3580
86.	SD ΔW Husband $UE \rightarrow EE$	201	498	476
87.	SD ΔW Husband $EU \rightarrow UU$	1211	590	2439
88.	SD ΔW Husband $EU \rightarrow UE$	776	632	6578
89.	SD ΔW Husband $EU \rightarrow EU$	29	563	339
90.	SD ΔW Husband $EU \rightarrow EE$	30	522	900
91.	SD ΔW Husband $EE \rightarrow UU$	601	660	11721
92.	SD ΔW Husband $EE \rightarrow UE$	709	896	9032
93.	SD ΔW Husband $EE \rightarrow EU$	25	532	602
94.	SD ΔW Husband $EE \rightarrow EE$	30	505	81
95.	ΔW Wife $UU \rightarrow UE$	849	878	3491
96.	ΔW Wife $UU \rightarrow EE$	835	717	16
97.	ΔW Wife $EU \rightarrow UE$	869	1252	35496
98.	ΔW Wife $EU \rightarrow EE$	859	821	69
99.	ΔW Wife $UE \rightarrow UU$	-1289	-885	3415
100.	ΔW Wife $UE \rightarrow UE$	1	-1	5
101.	ΔW Wife $UE \rightarrow EE$	1	46	550
102.	ΔW Wife $EE \rightarrow UU$	-1118	-888	1984
103.	ΔW Wife $EE \rightarrow EU$	2	46	97
104.	ΔW Wife $EE \rightarrow UE$	-1052	-930	190
105.	ΔW Wife $EE \rightarrow EE$	1	1	0
106.	SD ΔW Wife $UU \rightarrow UE$	137	312	7605
107.	SD ΔW Wife $UU \rightarrow EE$	144	20	63
108.	SD ΔW Wife $EU \rightarrow UE$	144	894	72954
109.	SD ΔW Wife $EU \rightarrow EE$	141	283	300
110.	SD ΔW Wife $UE \rightarrow UU$	729	266	5089
111.	SD ΔW Wife $UE \rightarrow UE$	21	377	1193
112.	SD ΔW Wife $UE \rightarrow EE$	21	626	13716
113.	SD ΔW Wife $EE \rightarrow UU$	459	336	4507
114.	SD ΔW Wife $EE \rightarrow EU$	24	301	701
115.	SD ΔW Wife $EE \rightarrow UE$	488	476	831
116.	SD ΔW Wife $EE \rightarrow EE$	22	379	118
117.	ΔA $EU \rightarrow EU$	855	623	16
118.	SD ΔA $EU \rightarrow EU$	1362	520	16
119.	ΔA $EE \rightarrow EE$	3228	5739	15673
120.	SD ΔA $EE \rightarrow EE$	2914	8635	35140

Table A2. Actual and Predicted Moments - continued
Moment Weight: Bootstrap Variance

Moment Name		Predicted	Actual	Variance
121.	% Quits in Husband $E \rightarrow U$	.6507784584	.5607476636	.0005900592
122.	% Quits in Husband $E \rightarrow U$, Wife $E \rightarrow E$	.6644780585	.5432098765	.0007359894
123.	% Quits in Wife $E \rightarrow U$	.6595355112	.6685714286	.0003271391
124.	% Quits in Wife $E \rightarrow U$, Husband $E \rightarrow U$	.6608704599	.6521739130	.0003646851
125.	% Job-to-job in Husband $E \rightarrow E$	.0137447976	.0147844367	.0000001530
126.	% Job-to-job in Husband $E \rightarrow E$, Wife $U \rightarrow U$	.0131896959	.0123076923	.0000006731
127.	% Job-to-job in Husband $E \rightarrow E$, Wife $U \rightarrow E$	.3019984794	.2727272727	.0004317432
128.	% Job-to-job in Husband $E \rightarrow E$, Wife $E \rightarrow U$	.0105977981	.0627306273	.0000518097
129.	% Job-to-job in Husband $E \rightarrow E$, Wife $E \rightarrow E$	.0001276816	.0007511488	.0000000078
130.	% Job-to-job in Wife $E \rightarrow E$	.0143836580	.0145394465	.0000001725
131.	% Job-to-job in Wife $E \rightarrow E$, Husband $U \rightarrow U$	.0134421959	.0106007067	.0000024475
132.	% Job-to-job in Wife $E \rightarrow E$, Husband $U \rightarrow E$	.0153028861	.0479041916	.0000662232
133.	% Job-to-job in Wife $E \rightarrow E$, Husband $E \rightarrow U$	.0157912234	.0526315789	.0000601530
134.	% Job-to-job in Wife $E \rightarrow E$, Husband $E \rightarrow E$	.0144094291	.0142040457	.0000001764
135.	Husband $U \rightarrow E$, cond. on Wife $E \rightarrow E$. Same job	.1446003377	.1243158718	.0000486740
136.	Husband $U \rightarrow E$, cond. on Wife $E \rightarrow E$. Job-to-job	.1616415410	.4000000000	.0038297975
137.	Husband $E \rightarrow U$, cond. on Wife $E \rightarrow E$. Same job	.0073920930	.0071748085	.0000001168
138.	Husband $E \rightarrow U$, cond. on Wife $E \rightarrow E$. Job-to-job	.0081064937	.0271084337	.0000156080
139.	Wife $U \rightarrow E$, cond. on Husband $E \rightarrow E$. Same job	.0417938153	.0413140866	.0000029000
140.	Wife $U \rightarrow E$, cond. on Husband $E \rightarrow E$. Job-to-job	.0458133150	.1724137931	.0004219404
141.	Wife $E \rightarrow U$, cond. on Husband $E \rightarrow E$. Same job	.0119441324	.0112583662	.0000001599
142.	Wife $E \rightarrow U$, cond. on Husband $E \rightarrow E$. Job-to-job	.0090897057	.0497076023	.0000318657