

Online Appendix to Accompany “Job Ladders and Earnings of Displaced Workers”

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A Appendix: Model with Rigid Wages

This section outlines an alternative model that features efficient rigid wages, as opposed to a surplus sharing rule, as well as the ability for workers to use their current and outside offers in bargaining over their new wage with an outside or current firm, respectively. The time-path of earnings around displacement implied by this alternative model resembles the time-path of earnings in the baseline model, and so the main text develops the surplus sharing model, which is standard in the search and matching literature.

The alternative bargaining solution results in an efficient rigid wage. I follow the approach of MacLeod and Malcomson (1993), Malcomson (1999) and more recently Yamaguchi (2010). When the worker and the firm first meet, they (Nash) bargain over an employment contract given all relevant information such as the stochastic component and the fixed component. Once they sign the contract, the firm pays a fixed flow wage w and the worker supplies a flow of labor services until a possible renegotiation or separation. At this point the two parties renegotiate the wage up/down if the worker/employer can credibly threaten to leave the employment relationship. The model therefore exhibits bargaining with nonemployed workers, bilateral bargaining with employed workers when productivity fluctuations induce wage renegotiation, and trilateral bargaining with employed workers when workers encounter outside job offers. The solution to the trilateral bargaining problem comes from Cahuc, Postel-Vinay and Robin (2006) who show that the worker’s threat point is the match value with the losing firm. The model still features privately efficient separations alongside exogenous separations.

A.1 Bellman Equations

This section details the Bellman equations characterizing the efficient rigid wage model.

A.1.1 Joint Value of a Match

Define the continuation value of employed workers and firms as $W(x, y, w)$ and $J(x, y, w)$ respectively. Let N be the continuation value of nonemployed workers. For notational convenience, define the joint value as the sum of the value of a match to the worker and the firm:

$$V(x, y) = W(x, y, w) + J(x, y, w)$$

Notice that w does not change the joint value of a match V ; it merely determines the allocation of the joint value between worker and firm. A higher w implies that the worker receives more of the match value. The joint value function satisfies:

$$\begin{aligned}
 V(x, y) = & x \cdot y + \delta(1 - p_s) \underbrace{(1 - p_E)}_{\text{No outside offer}} \int \underbrace{\max\{N, V(x', y)\}}_{\text{Match continues or terminates}} dF_x(x'|x) + \delta p_s N \\
 & + \delta(1 - p_s) \underbrace{p_E}_{\text{Outside offer}} \int \int \left[\max\{N, \underbrace{V(x', y)}_{\text{Match continues}}, \right. \\
 & \left. \underbrace{(1 - \beta) \max\{N, V(x', y)\} + \beta V(x_0, \tilde{y})}_{\text{Worker moves to poaching firm}} \right] dF_x(x'|x) dF_y(\tilde{y})
 \end{aligned} \tag{1}$$

where p_E is the probability of contacting an outside firm, δ stands for the discount factor and β represents the bargaining power of the worker. The flow payoff from the match equals $x \cdot y$, the product of the stochastic and fixed components. Every period a shock to the stochastic component arrives. In the event of no outside job offer (occurs with probability $1 - p_E$), the employment relationship either continues with joint value $V(x', y)$, or a separation occurs. In the event of separation, the worker receives continuation value N and the firm is left with nothing. Notice that the $V(x', y)$ term captures renegotiation: the employment relationship continues, but a new wage, w' , divides the surplus differently.

When a shock to the stochastic component occurs and the worker contacts an outside firm, three things can happen. First, the outside offer could be worse than the current match, and the shock makes the current match unbearable. This causes a separation, which leaves the worker with N and the firm with zero. Second, the current employment relationship

continues with $V(x', y)$. This includes the case of a newly renegotiated wage at the current firm because changing the wage contract does not change the match value. Third, the outside offer induces renegotiation and the worker leaves the current firm ($V(x_0, \tilde{y})$ exceeds $V(x', y)$). The continuation value here looks like the outcome of generalized Nash bargaining with the new employer using the value of the old relationship (or nonemployment, whichever is larger) as a threat point. This result comes from Appendix A of Cahuc, Postel-Vinay and Robin (2006).

A.1.2 Value of Work to the Employee

The value of work satisfies the following equation:

$$\begin{aligned}
W(x, y, w) = & w + \delta(1 - p_s)(1 - p_E) \int \underbrace{\max\{N, \min\{V(x', y), W(x', y, w)\}\}}_{\substack{\text{Match continues or terminates;} \\ \text{possible wage renegotiation}}} dF_x(x'|x) + \delta p_s N \\
& + \delta(1 - p_s)p_E \int \int \left[\underbrace{\mathbb{I}\{V(x_0, \tilde{y}) > V(x', y)\}}_{\substack{\text{Worker leaves current firm}}} \max\{N, (1 - \beta) \max\{V(x', y), N\} + \beta V(x_0, \tilde{y})\} \right. \\
& \left. + \underbrace{\mathbb{I}\{V(x_0, \tilde{y}) \leq V(x', y)\}}_{\substack{\text{Worker turns down outside firm}}} \max\{N, \min\{V(x', y), W(x', y, w)\}, V(x_0, \tilde{y})\} \right] dF_x(x'|x) dF_y(\tilde{y}) \quad (2)
\end{aligned}$$

The value of work is a function of three state variables: the stochastic component x , the fixed component y , and the previous wage w . The first term on the right hand side is the flow payoff from working, which is the current wage: w . Note that I assume a linear utility function (risk-neutrality).

The second term on the right hand side corresponds to the event of no outside job offer. Since I assume the shock to the stochastic component arrives every period, I need to consider what happens when this component changes. There are several possibilities. First, if $W(x', y, w) > V(x', y) \geq N$ the relationship is still viable (there is positive surplus), but the firm can credibly threaten to leave. In this case, the wage is reduced until $W(x', y, w') = V(x', y)$, i.e., $J(x', y, w') = 0$ so that the firm is indifferent between separation and continuation. Second, if $V(x', y) \geq N > W(x', y, w)$ the relationship is still viable, but the worker can credibly threaten to leave. In this case the wage rises until the worker is indifferent between nonemployment and working at the current firm: $W(x', y, w') = N$. Third, if $V(x', y) < N$ the relationship is no longer viable. The employment partnership comes to an end. Finally, if anything else happens the employment relationship continues with continuation value $W(x', y, w)$.

The third term on the right hand side corresponds to the worker contacting an outside

firm (and a shock to the stochastic component). The worker leaves the current employment relationship only if the match value of the new match exceeds the value at the current firm. The function $\mathbb{I}\{V(x_0, \tilde{y}) > V(x', y)\}$ captures this outcome. The timing here is important: the value from the current match and the value at the poaching firm are compared *after* the shock to the stochastic component. In this case, the worker chooses between two options: nonemployment and working at the new firm. In the latter case, the worker bargains with the outside firm after renegotiating with his current firm. The worker's continuation value is "Outside Option + $\beta \times$ Match Surplus". In this case the outside option is either $V(x', y)$ or N . The latter occurs when the stochastic component induces a separation. If no separation occurs, the current firm is willing to raise the wage until it is indifferent between separation and continuation, and hence the outside option for the worker is $V(x', y)$.

The function $\mathbb{I}\{V(x_0, \tilde{y}) \leq V(x', y)\}$ captures the situation where the worker does not go to the outside firm. There are several cases here. First, if $N > V(x', y)$ the relationship is no longer viable. The employment partnership comes to an end. Second, if $V(x_0, \tilde{y}) > \max\{W(x', y, w), N\}$ the worker can use the outside offer to raise the wage at the current firm. Third, if $V(x', y) \geq N > \max\{V(x_0, \tilde{y}), W(x', y, w)\}$ the current match still has positive surplus but worker can credibly threaten to leave. The wage is bid up so that worker is indifferent between staying at current firm and flowing into nonemployment. Fourth, if $W(x', y, w) > V(x', y) \geq N$ then there is positive surplus but the firm can credibly threaten to leave. In this case, the wage is bid down so that the firm is indifferent between staying and going. The continuation value in this case is $V(x', y)$. If anything else happens, then the employment relationship continues with continuation value $W(x', y, w)$.

Given the previous definitions, the value of a filled job to the firm is simply:

$$J(x, y, w) = V(x, y) - W(x, y, w) \quad (3)$$

A.1.3 Value of Nonemployment

The value of nonemployment satisfies:

$$N = b + \delta(1 - p_N)N + \delta p_N \int \underbrace{\max\{N, N + \beta[V(x_0, \tilde{y}) - N]\}}_{\text{Match consummates or not}} dF_y(\tilde{y}) \quad (4)$$

where p_N is the probability of making a contact with a job for nonemployed workers. The first term captures the flow payoff from nonemployment: b . The second term corresponds to no outside job offer. In this case the worker simply remains nonemployed. The third term

corresponds to an outside job offer. In this case the worker chooses between working at the contacting firm and nonemployment. The payoff from working at the firm is the outside option, N , plus β times the surplus, which is $[V(x_0, \tilde{y}) - N]$. Again, this is proved formally in Cahuc, Postel-Vinay and Robin (2006). In particular, this generalized Nash outcome is the result of an infinitely repeated game where worker and firm make alternating wage offers. Note that $V(x_0, \tilde{y}) - N = W(x_0, \tilde{y}, w')$, where w' is chosen so that this is true.

A.2 Solving the Model

I derive one central functional equation in the surplus from a match, $S(x, y)$. The derivation is similar to the baseline model, and I present the equation here:

$$\begin{aligned}
S(x, y) = & x \cdot y + \delta(1 - p_s) \underbrace{(1 - p_E)}_{\text{No outside offer}} \int \max\{0, \underbrace{S(x', y)}_{\text{Match continues}}\} dF_x(x'|x) \\
& + \delta(1 - p_s)p_E \int \int \left[\max\{0, \underbrace{S(x', y)}_{\text{Match continues}}, \right. \\
& \left. \underbrace{\max\{0, S(x', y)\} + \beta[S(x_0, \tilde{y}) - \max\{0, S(x', y)\}]}_{\text{Worker moves to poaching firm}} \right] dF_x(x'|x) dF_y(\tilde{y}) \\
& - \underbrace{[b + \delta p_N \beta \int \max\{0, S(x_0, \tilde{y})\} dF_y(\tilde{y})]}_{\text{Worker's outside option}}
\end{aligned} \tag{5}$$

The first part of the right hand side is the flow payoff from a match, $x \cdot y$. The second piece captures the event of no outside job offer and the continuation value of the match. In this case, the match either comes to an end or the match continues with the new stochastic component. The third piece captures the event of the worker receiving an outside offer and potentially moving to the poaching firm. When the worker moves to the poaching firm she uses the surplus at his previous firm (or zero if his old relationship implies negative surplus at the new level of the stochastic component) as a threat point. The final piece is the outside option of an employed worker: she forgoes the value of nonemployment, b , and the possibility of finding a job at a new firm with surplus $S(x_0, \tilde{y})$ and receiving β of this surplus. Notice that equation (5) is a functional equation in only $S(x, y)$. Value function iteration yields a close approximation to this function, denoted by $\hat{S}(x, y)$.

Calibration and identification follow the baseline model and I omit them here.

B Appendix: Surplus/Wage Equation and Numerical Details

This section details the derivation of the surplus equation and the wage equation used in the main text, as well as briefly describing the numerical approach.

B.1 The Surplus Equation

Here I outline how to solve for the surplus equation. I derive one central functional equation in the surplus from a match: $S(x, y) = W(x, y) + J(x, y) - N$. First, re-arrange equation (1) from the main text slightly to yield the equivalent expression:

$$\begin{aligned}
W(x, y) &= w(x, y) + \delta(1 - p_E)(1 - p_s) \int \max\{N, W(x', y)\} dF_x(x'|x) + \delta p_s N \\
&+ \delta p_E(1 - p_s) \int \int \left[\mathbb{I}\{W(x', y) \geq W(x_0, \tilde{y})\} \max\{N, W(x', y)\} \right. \\
&\left. + \mathbb{I}\{W(x', y) < W(x_0, \tilde{y})\} \max\{N, W(x_0, \tilde{y})\} \right] dF_x(x'|x) dF_y(\tilde{y})
\end{aligned} \tag{6}$$

Now simply combine equations (6) and (3) to write:

$$\begin{aligned}
J(x, y) + W(x, y) - N &= S(x, y) \\
&= x \cdot y + \delta(1 - p_E)(1 - p_s) \int \left[\max\{0, (1 - \beta)S(x', y)\} + \max\{0, \beta S(x', y)\} \right] dF_x(x'|x) \\
&+ \delta(1 - p_E)(1 - p_s)N + \delta p_s N \\
&+ \delta p_E(1 - p_s) \int \int \left[\mathbb{I}\{S(x', y) \geq S(x_0, \tilde{y})\} \left[\max\{0, (1 - \beta)S(x', y)\} + \max\{0, \beta S(x', y)\} \right] \right. \\
&\left. + \mathbb{I}\{S(x', y) < S(x_0, \tilde{y})\} \max\{0, \beta S(x_0, \tilde{y})\} \right] dF_x(x'|x) dF_y(\tilde{y}) \\
&+ \delta p_E(1 - p_s)N - \delta(1 - p_N)N - \delta p_N \int \max\{0, \beta S(x_0, \tilde{y})\} dF_y(\tilde{y}) - \delta p_N N \\
\Rightarrow S(x, y) &= x \cdot y + \delta(1 - p_E)(1 - p_s) \int \max\{0, S(x', y)\} dF_x(x'|x) \\
&+ \delta p_E(1 - p_s) \int \int \left[\mathbb{I}\{S(x', y) \geq S(x_0, \tilde{y})\} \max\{0, S(x', y)\} \right. \\
&\left. + \mathbb{I}\{S(x', y) < S(x_0, \tilde{y})\} \max\{0, \beta S(x_0, \tilde{y})\} \right] dF_x(x'|x) dF_y(\tilde{y}) \\
&- (1 - \delta)N
\end{aligned}$$

where like terms have been combined and Nash bargaining has been used to substitute $J(x, y) = (1 - \beta)S(x, y)$ and $W(x, y) - N = \beta S(x, y)$. Using equation (2) in the main text to solve for $(1 - \delta)N$, and plugging into this equation yields the desired result.

Value function iteration yields $\hat{S}(x, y)$. Once I have $\hat{S}(x, y)$ I also have \hat{N} because N can be written as a function of $S(x, y)$. With $\hat{S}(x, y)$ and \hat{N} I can simulate the economy and observe workers moving between employment and nonemployment and from job to job.

B.2 The Wage Equation

Start with equation (1) in the main text and subtract and add N under the integrals to obtain:

$$\begin{aligned} W(x, y) &= w(x, y) + \delta(1 - p_E)(1 - p_s) \int \max\{0, W(x', y) - N\} dF_x(x'|x) \\ &\quad + \delta(1 - p_E)(1 - p_s)N \\ &\quad + \delta p_E(1 - p_s) \int \int \max\{0, W(x', y) - N, W(x_0, \tilde{y}) - N\} dF_x(x'|x) dF_y(\tilde{y}) \\ &\quad + \delta p_E(1 - p_s)N + \delta p_s N \end{aligned}$$

Simplifying the terms with N , subtracting N from both sides and using the fact that the Nash bargain implies that $W(x, y) - N = \beta S(x, y)$ yields:

$$\begin{aligned} \beta S(x, y) &= w(x, y) + \delta(1 - p_E)(1 - p_s) \int \max\{0, \beta S(x', y)\} dF_x(x'|x) - (1 - \delta)N \\ &\quad + \delta p_E(1 - p_s) \int \int \max\{0, \beta S(x', y), \beta S(x_0, \tilde{y})\} dF_x(x'|x) dF_y(\tilde{y}) \\ \therefore w(x, y) &= \beta S(x, y) + [b + \delta p_N \beta \int \max\{0, S(x_0, \tilde{y})\} dF_y(\tilde{y})] \\ &\quad - \delta(1 - p_E)(1 - p_s) \beta \int \max\{0, S(x', y)\} dF_x(x'|x) \\ &\quad - \delta p_E(1 - p_s) \beta \int \int \max\{0, S(x', y), S(x_0, \tilde{y})\} dF_x(x'|x) dF_y(\tilde{y}) \end{aligned}$$

B.3 Numerical Details

I solve the model numerically using a contraction mapping in a discretized state space. I discretize the AR(1) process for the stochastic component (x) onto 29 grid points using the Rouwenhorst method. This method is most often attributed to Rouwenhorst (1995) and in a recent article, Galindev and Lkhagvasuren (2010) have shown that this discretization method

outperforms the approaches described in Tauchen (1986) and Tauchen and Hussey (1991). In particular, for persistent AR(1) processes, as turns out to be the case here, the Tauchen (1986) method requires a large number of grid points to produce close approximations, which causes increased computational time. Galindev and Lkhagvasuren (2010) show that the Rouwenhorst method provides a close approximation “robust to the number of discrete values for a wide range of the parameter space.” Finally, the process for the fixed component has 29 grid points and I also use the Rouwenhorst method for discretizing this state variable. I solve the value function on a grid, and in the simulation interpolate for points off the grid using linear interpolation. I do not allow state variables to take values above and below the respective minimum and maximum values on the grid, although in practice this does not affect the results because the probability of state variables falling outside the grid remains extremely small.

Given the optimal decisions of workers and firms, the model generates simulated data at a monthly frequency. In particular, I simulate 20,000 agents for 600 months (50 years). To remove the effects of initial conditions, I simulate the model for 2100 months and then discard the first 1500 months of the sample. This simulation provides a time-path of wages and annual earnings, as well as an employment history.

I calibrate the parameters of the model using simulated method of moments. The procedure minimizes the distance between the summary statistics of the simulated data and the summary statistics of real data. Specifically, if θ represents the vector of structural parameters, \hat{g} represents the moments of the actual data, and $g(\theta)$ represents the moments of simulated data, then the simulated minimum distance estimator is defined as:

$$\hat{\theta} = \arg \min_{\theta} \mathcal{L}(\theta) = \arg \min_{\theta} [g(\theta) - \hat{g}]' W [g(\theta) - \hat{g}] \quad (7)$$

Here $g(\theta)$ represents a nonlinear transformation of the structural parameters by the model and a transformation of the simulated data to achieve moments that match observed moments. In practice, the weighting matrix used is the diagonal of the efficient weighting matrix, which weights the moments by the inverse variance-covariance matrix. I do not use the entire efficient weighting matrix because I do not have the variability of the mean-min wage ratio estimates from HKV.¹

The optimization is implemented using a coarse grid search across the relevant state space to obtain areas where the loss function might be minimized. Once the initial points

¹Since most of the estimates for the mean-min wage ratio seem to lie in between 1.5 and 2, I use weight 0.01^2 for this moment.

are evaluated, I use MATLAB's Nelder-Mead optimization routine, *fminsearchbnd*, from each candidate solution to find the minimum objective function value in that region of the state space. The global minimum is taken as the minimum of all these local minima.

C Appendix: Benchmarking the PSID Worker Flows

This section shows that the average worker flow probabilities from the PSID that are used to calibrate the model are broadly consistent with results from other data sets. Moreover, the PSID data is consistent with life-cycle separation rates, and E-U probabilities by tenure.

Table 1 lines up the PSID worker flows data with similar data from the CPS and SIPP. The PSID monthly strings are broadly consistent with other data sets. In particular, the E-E probability in the PSID is around 1.8 percent, whereas in the SIPP and CPS it ranges from 1.9 to 2.6 percent. The average U-E probability in the PSID is in the middle of the estimates from the other two datasets. Finally, the layoff rate into unemployment in the PSID is consistent with the SIPP and CPS, and the layoff rate ending in nonparticipation is lower in the PSID.

I also present E-U probabilities by tenure and age and show that they are consistent with similar analyses using the SIPP. Figure 1 shows the average separation probability into unemployment by age in the PSID data. The average E-U probability is around 2.5 percent for 18 year old men, 1.5 percent for 25 year old men, and then falls significantly over the life-cycle to around 0.3 percent at age 65. Figure 2 in Menzio, Telyukova and Visschers (2015) shows a very similar pattern in the SIPP.

Figure 2 presents the results of E-U probabilities for different months of tenure. At low levels of tenure the E-U probability is around two percent and falls steadily over the next five years to around 0.3 percent. Figure 9 in Menzio, Telyukova and Visschers (2015) shows a similar pattern in the SIPP, although for low levels of tenure, the SIPP data suggest slightly higher average E-U probabilities.

Figure 3 in the main text shows the average E-E probabilities by tenure. A similar figure can be found in Menzio, Telyukova and Visschers (2015) (Figure 10). The two profiles are generally the same, showing a four percent E-E probability for workers with one month of tenure and a reduction in E-E probabilities with increased tenure. The SIPP data, however, shows slightly higher E-E probabilities for workers with more than two years of tenure, as the PSID profile continues to decline after this tenure level, whereas the SIPP profile plateaus.

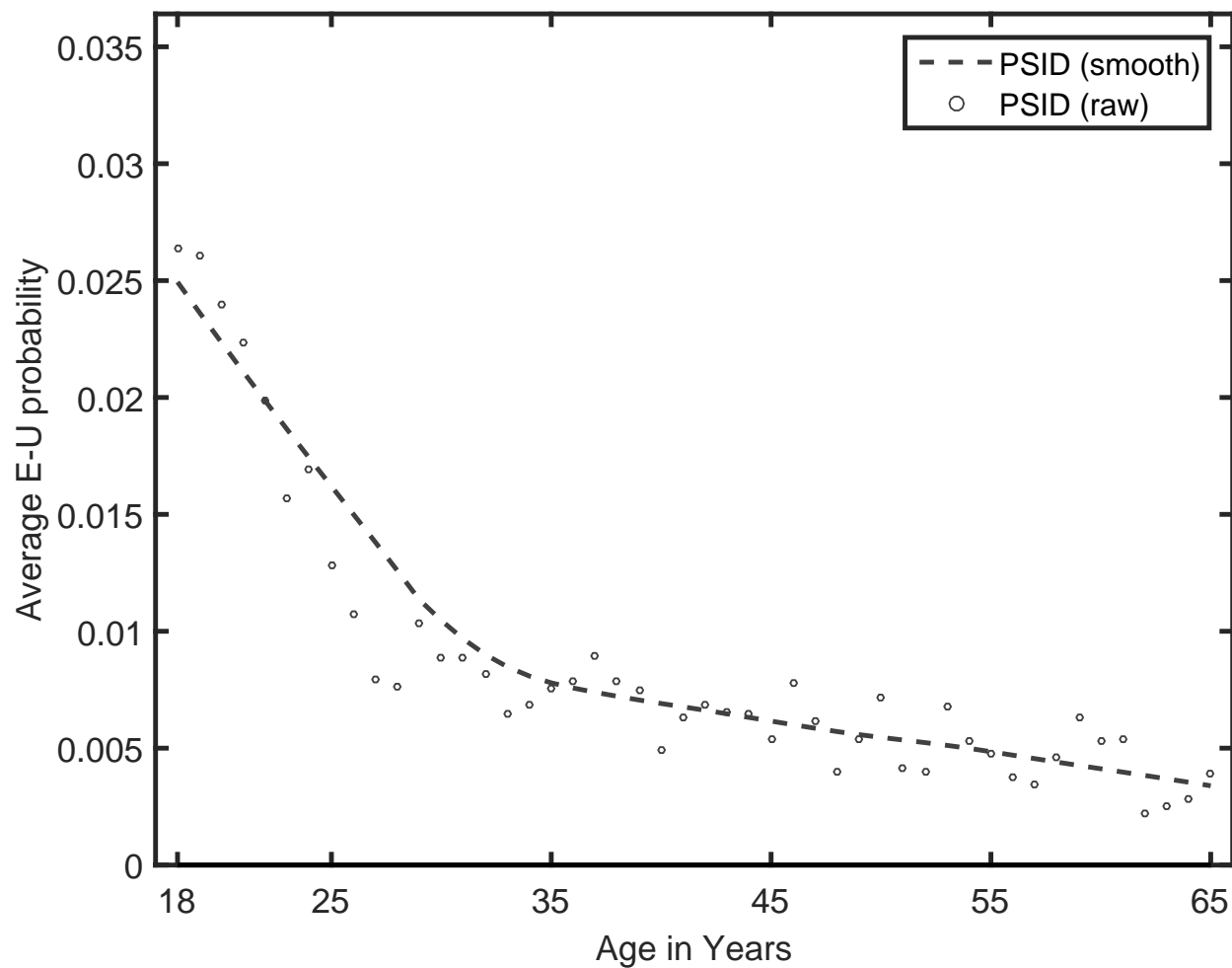


Figure 1: Average E-U Probability by Age in the PSID

Note: The empirical EU-age profile using the PSID. This includes the raw data and the (smoothed) average E-U probability at each age in the PSID. Smoothing is performed using locally weighted (LOWESS) regressions scatter-plot smoothing (with bandwidth set to 0.8).

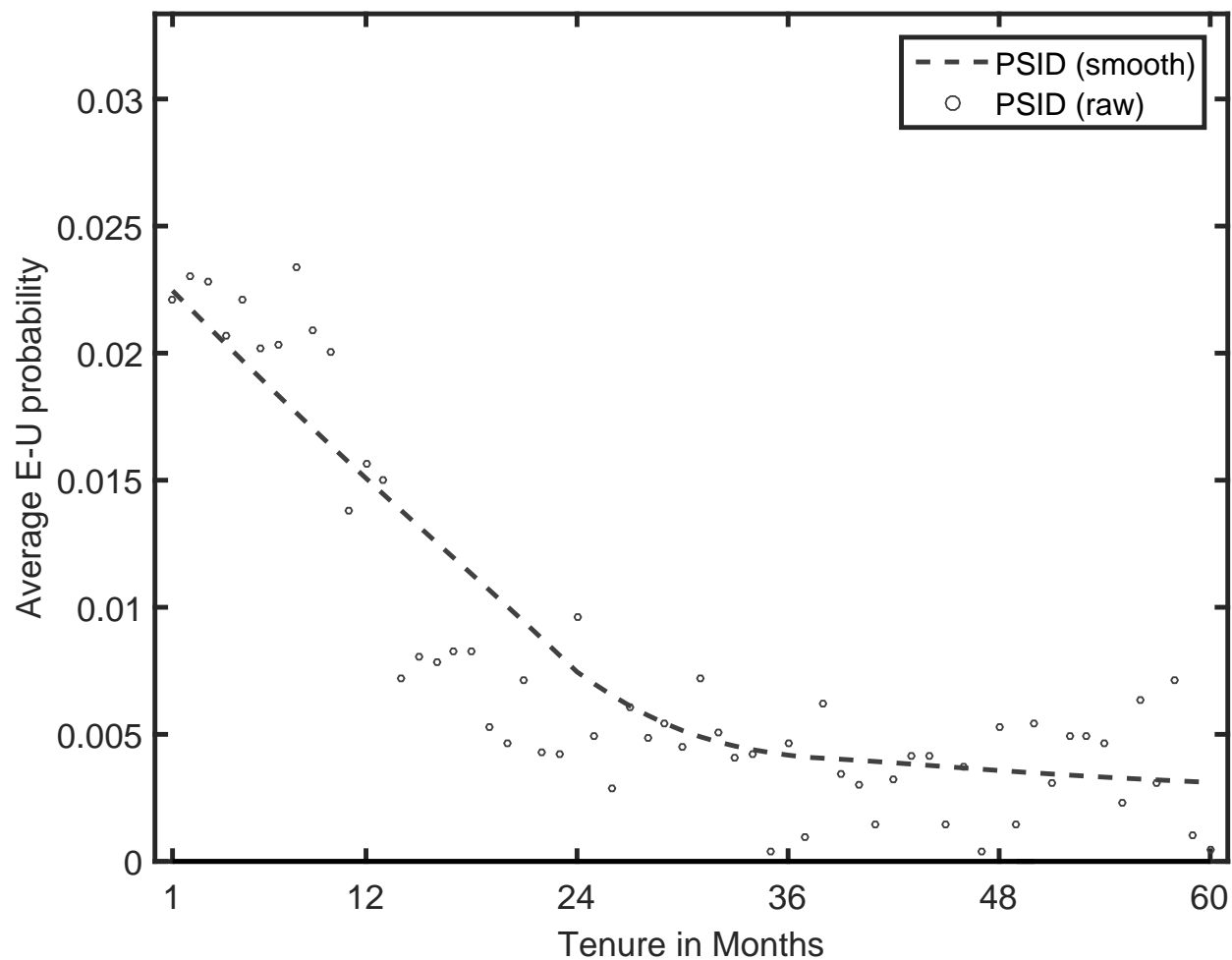


Figure 2: Average E-U Probabilities by Tenure in the PSID

Note: The empirical EU-tenure profile using the PSID. This includes the raw data and the (smoothed) average E-U probability for each month of tenure in the PSID. Smoothing is performed using locally weighted (LOWESS) regressions scatter-plot smoothing (with bandwidth set to 0.8).

Table 1: Comparing Worker Flows

Flow	PSID	SIPP	CPS
E-U	0.8	0.5-0.9	0.9-2
E-N	0.5	1.4	1.5
U-E	22	21-26	20-30
N-E	3.1	N/A	2.5
E-E	1.8	1.9-2.2	2.5-2.6

Note: The PSID worker flows are broadly consistent with SIPP and CPS counterparts. All values are in percent. As an example, 1.8 percent for E-E means that, as a fraction of those employed in month $t - 1$, 1.8 percent of individuals switched employers between months $t - 1$ and t . The CPS values are taken from Nagypal (2008), Elsbj, Hobijn and Sahin (2013) and Fallick and Fleischman (2004), and the SIPP values are taken from Nagypal (2008) and Menzio, Telyukova and Visschers (2015). In this table only, ‘N’ stands for not in labor force.

D Appendix: Identifying the Persistence of the Stochastic Component

In the main text, I claim that the persistence of the stochastic component, ρ_x , is identified by the slope of the EN-tenure profile for E-E and N-E jobs. In this appendix I perform a robustness exercise to validate this claim. In particular, I take the baseline model and fix the value of ρ_x to different values (0.25, 0.5, and 0.95) and re-calibrate the model for each value of ρ_x using the same calibration procedure as in the main text. For each of these calibrations I compute the (smoothed) average E-N probabilities for 1 through 60 months of tenure for both E-E and N-E jobs. Figure 3 shows the results of this exercise. As value of ρ_x varies, the EN-tenure profiles show considerable movement: as the persistence parameter ρ_x rises, the EN-tenure profiles become steeper, especially for low levels of tenure, although the pattern changes for very high levels of persistence. The relationship between ρ_x and the slope of the EN-tenure profile is particularly pronounced for E-E jobs.

Intuitively, the separation probabilities for individuals in low-tenure jobs are driven by downward movements in the stochastic component, x . As the persistence in this process rises, these downward movements have greater force because they persist for longer. For a given volatility, σ_{ϵ_x} , this has the effect of raising the job destruction probability for low-tenure jobs. Separations in higher-tenure jobs are driven chiefly by exogenous separation shocks, so the effect described above diminishes with tenure, thus increasing the steepness of the profile.

The figure shows that this effect is nonmonotonic: for high levels of persistence, the average E-N probability for individuals with low levels of tenure in E-E jobs actually begins to fall. This can be explained as follows. For high persistence values movements in the stochastic component affect even higher-tenure jobs. As an example, Figure 3 shows that for $\rho_x = 0.95$ the average E-N probabilities for individuals in E-E jobs with more than two years of tenure exceed the baseline calibration.² In order to match the average E-N probability, a key targeted moment, the calibration with $\rho_x = 0.95$ flattens out the EN-tenure profile for E-E jobs by bringing down significantly the volatility of the stochastic component, σ_{ϵ_x} . This, in turn, reduces the average E-N probability of those in low-tenure E-E jobs significantly. Although reducing σ_{ϵ_x} ensures that the average E-N probability is matched, it compromises on the average E-N probability for low-tenure E-E jobs. The baseline calibration ends up picking out a value of persistence for the stochastic component that best delivers the observed EN-tenure profiles.

²All the calibrations have a similar exogenous probability of separation, p_s , of around 0.4 percent.

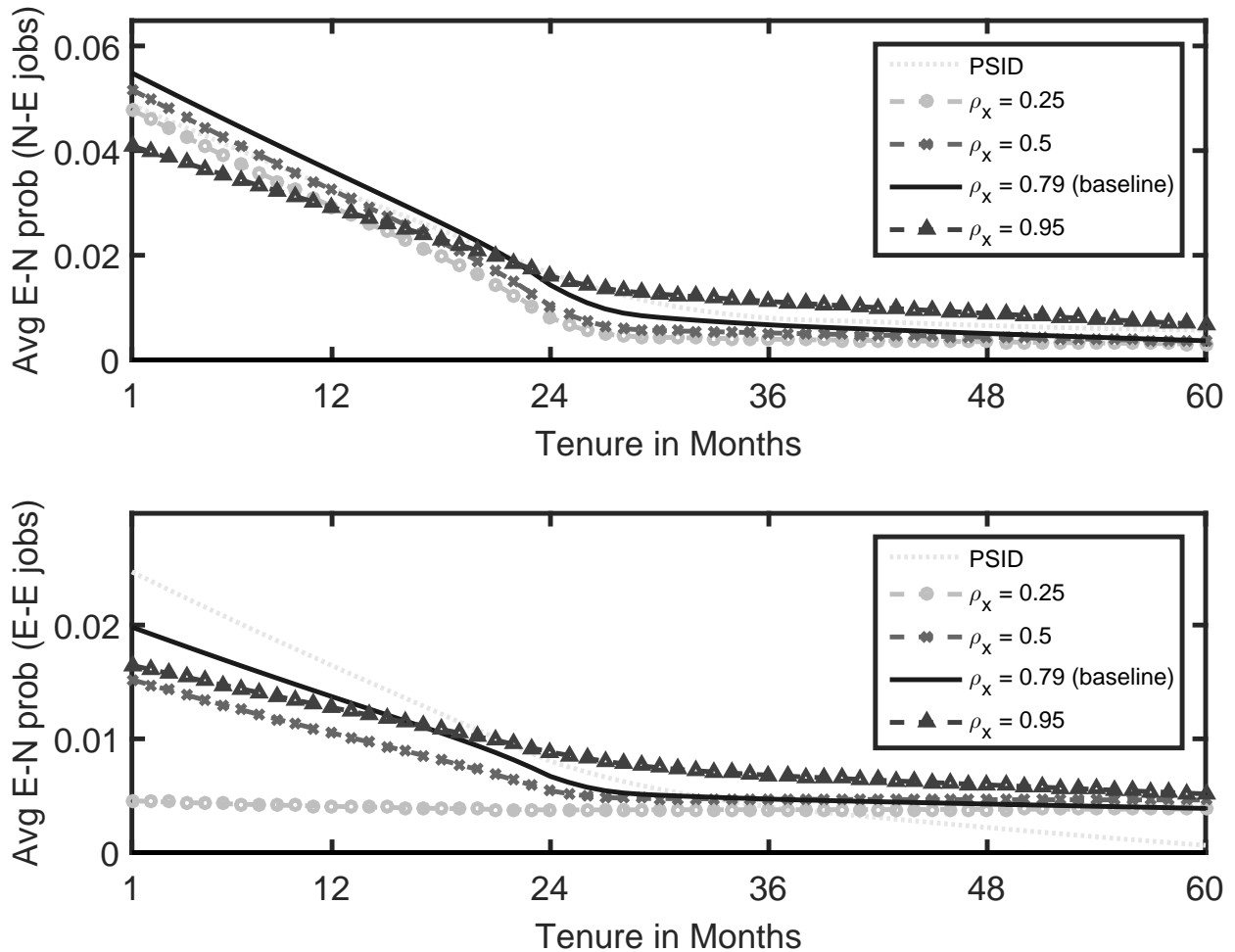


Figure 3: Average E-N Probabilities by Tenure (N-E and E-E Jobs) for Different ρ_x Values

Note: The slope of the separation profile for E-E jobs provides identification for the persistence of the stochastic component, ρ_x : as the persistence changes, the EN-tenure profiles move considerably, especially for E-E jobs. This figure shows the resulting average E-N probabilities by tenure for N-E and E-E jobs for the model with different values of ρ_x where, for each value, the model has been re-calibrated to hit all the baseline moments. Smoothing is performed using locally weighted (LOWESS) regressions scatter-plot smoothing (with bandwidth set to 0.8).

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