Job Mobility and Unemployment Risk *

[Preliminary and Incomplete.]

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Abstract

Job mobility entails excess unemployment risk: the monthly probability of job loss is 2.5% in a job's first few months, and then quickly stabilizes to 0.5%, a pattern we confirm in three U.S. household panels. The value of unemployment may hence affect employed workers' willingness to engage in job mobility. We confirm this effect of unemployment risk on job mobility in a custom questionnaire in the German Socio-Economic Panel, documenting that [number released in April] workers rank this risk as a key reason to avoid job-to-job mobility. We formalize this mechanism in a search model in which job offers are *lotteries*: probability weights on eventual job qualities (a generalization of the experience-goods model of jobs). Lotteries are heterogeneous in those weights. The separation-into-unemployment option limits the downside risk of accepting job lotteries, i.e. of engaging in job mobility. We also explore the implication that UI insures the downside risk of job-to-job transitions, and thereby subsidizes job mobility of employed workers, and tilts the job composition to ex-ante riskier ones.

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1 Introduction

Besides allocating workers between employment and nonemployment, the labor market reallocates a similar volume of already-employed workers between different jobs and firms (Davis and Haltiwanger (1999)). Such direct job-to-job transitions are a crucial factor in wage growth through job ladders (Topel and Ward (1992), Karahan et al. (2019), Haltiwanger et al. (2018)), and fill and in turn trigger around half of job openings (Mercan and Schoefer (2020)). This job mobility may also affect macroeconomic performance (e.g., Davis and Haltiwanger (2014) , Moscarini and Postel-Vinay (2016)).

Standard theoretical treatments of worker flows with on-the-job search, explicitly detach the nonemployment-to-employment margin from job-to-job flows (e.g., Cahuc et al. (2006), Bagger et al. (2014)).[1] Once employed, workers move up the job ladder and only occasionally fall off back into nonemployment (Jarosch (2015)).

We highlight and explore a basic mechanism by which workers' decision of switching jobs is directly sensitive to the unemployment value: job mobility exposes the worker to excess unemployment risk. We show that in the data, job loss is much more prevalent in the first months of a job, when on average 2.5% of job starters transition into unemployment. After this initial spike of unemployment risk, the separation rate quickly stabilizes at around 0.5% per month for the median-tenure worker (ca. 50 months). We demonstrate this empirical regularity in three large U.S. household panel surveys: the Survey of Income and Program Participation (SIPP), the Current Population Survey (CPS), and the Survey of Consumer Expectations (SCE). We also present survey evidence on worker beliefs, showing that subjective job loss risk spikes up after job entry, and falls with tenure.

We provide novel empirical evidence from a custom survey module in the German Socio-Economic Panel that documents that workers rank increased unemployment risk following job transitions as a key reason to avoid job mobility. [Data release scheduled for April 2020.] However, we leave for future research a dedicated empirical study that studies the causal effect of concrete shifts in the unemployment value on realized job mobility outcomes.[2]

Our paper explores the consequences unemployment risk ensuing job mobility for job-to-job transitions. We do so in an equilibrium search model featuring heterogeneity in match quality, generating a job ladder employed workers seek to climb through on-the-job search. Job transitions are risky because job offers arrive as *lotteries*: probability weights on ultimate match

[1]The nonemployment value may affect employed workers as an outside option in wage bargaining (Pissarides (2000)), although this channel is limited in the data (Jäger et al. (2018)) and modeled away in wage setting models of sequential auctions (e.g., Postel-Vinay and Robin (2002b), Cahuc et al. (2006), Bagger et al. (2014)).

[2]We are not aware of direct evidence supporting this channel. For UI as a potential specific source of variation, Jäger et al. (2019) study the effect of UI on separations into nonemployment in response to a large expansion of potential benefit duration (perhaps amounting to early retirement for older workers). Jäger et al. (2018), who focus on wage effects of UI, do not find evidence for separation effects from benefit level reforms for a broader sample of workers and reforms.

qualities, the outcome of which is realized only *after* the worker has quit her old job and has accepted the offer. Hence once in the new job, the worker chooses between unemployment and commencing employment at the particular match productivity realization. Our model therefore builds on a "jobs as experience goods" mechanism (Jovanovic (1979)).[3] Ex ante, the value of a given job offer inherits the shape of the payoff function of this lottery, except that the *separation-into-unemployment option* bounds the downside risk of the offer. Through this limited-liability mechanism, the unemployment value directly affects job mobility.

To assess the potential quantitative role of the unemployment value in shaping job mobility, we calibrate the model. Our key empirical target is the excess unemployment risk in the first year after a job transition, along with other U.S. worker flow moments. We specify our general, nonparametric job-lottery structure to mimic Bayesian learning with a normally distributed fundamental job offer and normally distributed noise, calibrating the standard deviations to existing models (Moscarini (2005); Menzio and Shi (2011)). In our model, a significant share of EU transitions arise from unsuccessful job-to-job transitions rather than exogenous separation shocks that hit all matches homogeneously.

As a concrete experiment, we explore a commonly studied shifter in unemployment value (e.g. Jäger et al. (2018), Jäger et al. (2019)): an increase in the level of unemployment insurance (UI) benefits. Substantively, this experiment also highlights a novel potential "experimentation" channel of UI, arising from the subsidy it provides for the downside risk of job mobility.

Upon impact, UI increases the value of unemployment. Workers across the board are more likely to accept (risky) job offers, leading to a burst in job mobility. The average job value increases through this reallocation channel – ultimately so much so that the high-UI steady state has job mobility below the original level. Hence, studying the transition uncovers dynamics in line with the model that would be masked in steady-state comparison of worker flows, e.g. across countries or long-run trends.

We also implement an experiment in which we shut off the option value of quitting into unemployment after job transitions, to highlight the limited-liability function of such transitions and hence the role of the unemployment risk in affecting job mobility. We find that job mobility drops considerably.

To more directly isolate the unemployment risk channel, we also compare our baseline model with a variant where jobs are perfect inspection goods (lotteries are perfectly informative of the underlying match quality) for those jobs dominated by unemployment. We surgically leave the model to feature the baseline experience goods (lotteries) for match qualities above the unemployment value with the associated job ladder. This model mechanically cuts off any prospect of the value loss from mobility-induced unemployment risk that is the focus of our

[3]A variety of mechanisms can generate the excess unemployment risk upon switching, such as seniority rules shielding higher tenured workers from layoffs, formal firing protections or firm-specific human capital built with tenure.

study.

The paper is organized as follows. Section 2 provides motivating facts on job mobility and the following excess unemployment risk. Section 3 presents our model, and Section 4 discusses the calibration strategy. Section 5 presents the quantitative analysis of the worker flows in the steady-state model. Section 6 studies the quantitative experiments. Section 7 concludes.

2 Motivating Facts: Job Mobility Entails Unemployment Risk

This section presents our key facts on unemployment risk and worker mobility using U.S. household level panel data. Our first fact is that the probability of employment-to-unemployment transitions spikes in the first year of employment. After the first year, this probability steeply falls and stabilizes at low levels. Second, this pattern still holds in new matches formed after direct job-to-job transitions. Third, these results are robust to composition adjustment and sample restrictions. This gradient is also reflected in worker beliefs.

2.1 Data and Variables

We describe our three data sources and the transition measures.

Tenure Gradients of Separations Our main outcome variable is the tenure gradient of monthly transition probabilities from one month to the next, for a given cross-section of workers sorted by beginning-of-month tenure. Specifically, in each data set, we start by assigning an individual i holding tenure τ her labor market status $s_{i,\tau} \in \{E, U, N\}$ (i.e. employed *in a different job* (a job-to-job transition), unemployed and out of the labor force). We then construct individual-level transition indicators $x^{s,s'}_{i,\tau} = \mathbb{I}(s_{i,\tau} = s \wedge s_{i,\tau+1} = s')$.

To construct tenure gradients, we take the average of these indicators at each tenure bracket, i.e. $\rho^{s,s'}_{\tau} = \mathbb{E}_{\tau}[x^{s,s'}_{i,t} | t = \tau]$, namely ρ^{EU}_{τ} and ρ^{EE}_{τ}, and ρ^{EO}_{τ}.[4] We sometimes use these monthly transition probabilities to construct annualized (cumulative) separation probabilities $\rho^{E,s_{+12}}_{\tau} = 1 - \prod_{\tau}^{\tau+12} \sum_{s'} \rho^{E,s'}_{\tau}$.

Besides these transition gradients, we will also exploit particular strengths of each given data set. Since we are particularly interested in initial excess unemployment risk following job-to-job switching, we additionally construct separation rates by origin in the SIPP: E-EU and U-EU transition probabilities $\rho^{(E)EU}_{t}$ and $\rho^{(U)EU}_{t}$. Hence here we split the sample of workers those who were nonemployed and employed before their current employment spell. In the SCE, we will study *beliefs* about future transitions i.e. $\hat{x}^{s,s'}_{i,\tau} = \mathbb{E}_{i,\tau}[x^{s,s'}_{i,\tau}]$.

[4]We therefore nest a special case of our transition gradient, namely the total separation rate by pooling *all* subsequent states, an analysis also conducted by Farber (1994), and also Nagypál (2007), Menzio et al. (2016), Jung and Kuhn (2016), among many other papers.

Sample restrictions common across all surveys are ages 20 and 65, excluding school, military or self-employment spells.

CPS We start with the broadest picture of excess unemployment risk ensuing worker mobility in the Current Population Survey (CPS). The CPS is a short rotating panel, where households are surveyed for two four-month periods with an eight month break in between.[5] Importantly, following a major redesign in 1994, the CPS asks employed workers whether they are still working for the same employer as the previous month.[6] We complement the short panel dimension by merging in the biennial CPS Tenure Supplements, which allows us to measure worker transitions by tenure on job.

SIPP We supplement our analysis of the CPS with the U.S. Survey of Income and Program Participation (SIPP). SIPP covers a representative sample of households interviewed every four months (a "wave"), where survey questions cover the previous four calendar months ("reference period"). New household cohorts enter every two to four years ("panels"), and then are tracked for (at most) four years. To track worker transitions, we construct a monthly panel using the 1996, 2001, 2004 and 2008 SIPP panels, covering years 1992 to 2013. We assign labor market status based on the last week of each month, following Nagypál (2008).[7] We identify a job-to-job transition as an event where a worker is employed in two consecutive months yet has a different employer ID than the previous month.[8] We construct tenures using the reported start and end dates for each job, and observed transitions into employment from unemployment or out of labor force. A strength of the SIPP over the CPS is that we can track households for longer, and therefore can construct separation profiles by origin of the current job, i.e. the individual's status before the current job.

SCE To complement our analysis using realized worker transitions, we study the tenure gradient of workers' subjective expectations about separation rates in the Survey of Consumer Expectations (SCE). The SCE is a rotating panel tracking workers up to 12 months, and available since June 2013. It covers a variety of idiosyncratic and aggregate economic outcomes, including job separations, specifically probabilities of (i) job loss and (ii) voluntary separations over the next twelve months.[9] The survey also contains standard labor force statuses, and we identify

[5]The CPS is address-based, so households that move are dropped out of the sample. The SIPP however, makes an effort to track households in case of an address change.

[6]For the first use of this question to study job to job transitions, see Fallick and Fleischman (2004).

[7]We have checked that our results are robust to a single nonemployment status.

[8]SIPP assigns a unique ID for each employer-employee pair, together with the start and possible end date of the match in each four-month reference period. In cases where a worker has multiple jobs, we define a worker's main job to be the one where she has worked the most hours. If hours worked are equal then we choose the job that was held the longest.

[9]The variables we use ask "What do you think is the percent chance that you will lose your main/current job during the next 12 months?" and "What do you think is the percent chance that you will leave your main/current

job-to-job transitions as in the CPS with a "same firm?" question. We construct tenure from the reported job start dates.

German Socio-Economic Panel We will draw on a unique custom questionnaire on job mobility integrated into the German Socio-Economic Panel to provide direct evidence on workers' ranking the excess unemployment risk upon job switches as a key reason for limited job mobility.

2.2 Results

Overall, we find that while the typical employed worker with tenure above three years is unlikely to undergo unemployment, a job-to-job transition dramatically increases this risk.

Tenure-Specific Separation Rates Figure 1 presents the EU separation rate of an employed worker by tenure on job for each of our two household surveys, the CPS and the SIPP.

In each survey, the gradients are elevated in the first months of the job, and then steeply fall to stabilize at a lower level. For example, the monthly total-separation rate is above 2% and 3% for workers in their first months on the job in the CPS and SIPP. By contrast, workers with tenure of, for instance, 24 months exhibit a separation rate of only 0.5-0.8%, i.e. less than a *quarter* of the unemployment risk faced by the newly employed in their first months.

Separation Risk by Origin: Employment vs. Unemployment New jobs can be formed out of nonemployment or as a result of job-to-job transitions. One compositional concern is that the gradient is driven by recently unemployed workers that typically shift in and out of employment, while job switchers may not actually be exposed to excess unemployment risk in the new job.

Figure 2 presents the tenure profile of separations separately by previous labor market status of the new hire $\rho_\tau^{(E)EU}$ and $\rho_\tau^{(E)EU}$. The jobs formed as result of job-to-job transitions and out of nonemployment exhibit a similar gradient: unemployment risk is concentrated in the early months of the newly formed job, and declines steeply with tenure, *even for workers engaging in direct job-to-job transitions*.

This pattern implies that job-to-job transitions pull workers out of the "safe" portion of the gradient, in which they are largely insulated from unemployment risk, back to the initial maximal unemployment risk. The change from this portion of tenure to the front of the line exceed the amplitude of the business cycle fluctuations in the EU rate.

Composition Adjustment Comparing the middle to the low tenure points in the gradient ideally captures the experiment of moving a worker from the unemployment-insulated middle of the distribution to the front of the line with high unemployment risk – i.e. would then

job voluntarily during the next 12 months?" respectively.

capture the considerations of a safely employed worker contemplating a job-to-job transition. Yet, the empirical tenure gradients are simple averages, which may in part capture selection. To evaluate these compositional effects, in Figure 3 we separately plot the EU separation rates for workers having formed the job out of long-duration jobs (at least 12 months) and for those from preceding short-term jobs. For the previously high-tenure jobs, the EU separation risk is 3% early on (although it is higher at 4% for the other workers), confirming that a job transition exposes workers to risk even if switching out of seemingly stable higher-tenure jobs.

2.3 Evidence on Worker Beliefs

Subjective Job Loss Probabilities In Figure 4, we plot the evolution of *beliefs* about separation risks over tenure, exploiting a unique question in the the SCE.[10] The graph indicates that workers early on in their job perceive their job to be risky, and that high-tenured workers similarly recognize the stability of their jobs.

Direct Evidence on Worker Beliefs of Excess Unemployment Risk Curbing Job Mobility To complete the casual narrative on the basis of worker beliefs, in Figure 5, we also present empirical evidence from a custom survey module in the German Socio-Economic Panel that documents that workers rank increased unemployment risk following job transitions as a key reason to avoid job mobility. [Data release scheduled for April 2020.]

However, we leave for future research a dedicated empirical study that studies the causal effect of concrete shifts in the unemployment value on realized job mobility outcomes.

3 A Model of Risky Job Mobility

We formalize the link between risky job mobility and unemployment value in an equilibrium search model with on-the-job search and match quality (productivity) heterogeneity. Importantly, job offers arrive as lotteries: probability distributions over possible match productivities, where the match quality is revealed only after switching jobs. Some jobs, in low-productivity realizations, carry values below unemployment, hence triggering match separation. That is, job mobility entails excess unemployment risk, in line with the evidence in Section 2. An increase in the unemployment value (e.g. due to more generous UI benefits) insures the downside risk of these job offer lotteries, and thereby encourages experimentation in the form of job switching.

2x2 Matrix of Necessary Ingredients As a bird's eye preview, we present a couple of existing models in Table 1 to clarify the two properties necessary for the unemployment risk channel in

[10] Relatedly, Hendren (2017) shows that individual workers have some information about their idiosyncratic layoff risk. We have confirmed that our expectations measure is associated with future separations.

job mobility. First, the lowest initial match quality must be worse than unemployment, for some job mobility to trigger excess unemployment risk compared to having stayed put. For example, Postel-Vinay and Robin (2002a) or Fujita and Ramey (2012) do not feature such job qualities. Second, the model needs to feature jobs as experience goods, for job switchers to accidentally land in such jobs and hence immediately or quickly separate. For example, while one setup in Menzio and Shi 2011 features this setup, the inspection goods variant in Menzio and Shi 2011 does not. Lastly, models like Moscarini (2005) and Mercan (2017) do not feature this property because they only feature two job types differentiated by the belief about it being the good type, such that the reservation job quality is such that job transitions weakly decrease unemployment risk.

3.1 Environment

Time $t \in \{1, 2, \ldots\}$ is discrete and runs forever. Firms and a unit-mass of workers (employed or unemployed) are risk neutral, live forever, and discount the future with factor $\beta \in (0, 1)$.

Match Quality and Job Lotteries Matches are heterogeneous in productivity $v_m \in \{v_1, \ldots, v_M\}$ taking on M discrete types, with $v_1 < \cdots < v_M$. Upon meeting for the first time, the worker-firm pair draws a job lottery $\vec{q}_l = \begin{pmatrix} q_{l1} \\ \vdots \\ q_{lM} \end{pmatrix}$ from L lottery types, yielding a probability distribution over potential fundamental match productivities. That is, q_{lm} denotes the probability of ending up in a match with productivity v_m under lottery $\vec{q}_l$, and thus satisfies $\sum_{m=1}^{M} q_{lm} = 1 \; \forall l \in \{1, \ldots, L\}$. The outcome of this lottery is revealed after match formation. Among the L lottery types, the probability of drawing a particular lottery $\vec{q}_l$ is given by $\Pr(\vec{q}_l)$, where $\sum_{l=1}^{L} \Pr(\vec{q}_l) = 1$.

Matching Both unemployed and employed workers look for jobs, where employed workers search with relative intensity λ. Meetings between vacant jobs and job seekers are determined randomly according to a constant returns to scale matching function $M(S, v)$, where v is the mass of vacancies posted, and aggregate search effort is $S = u + \lambda(1-\delta)(1-u)$. The contact rate for an unemployed [employed] worker is given by $f(\theta) \equiv \frac{M(S,v)}{S} = M(1, \theta) \; [\lambda f(\theta)]$, where labor market tightness is defined as $\theta \equiv v/S$. Firms contact workers at rate $q(\theta) \equiv \frac{M(S,v)}{v} = M(1/\theta, 1)$. In each period matches are exogenously destroyed with probability δ.

Timing The timing of events within period t is as follows:

1. The aggregate state of the world s_t and lottery outcomes are realized.[11] Based on the aggregate state of the world and their realized match productivities, workers decide whether to quit into unemployment or continue with their new job.

[11] Our analysis will comprise perfect foresight transition dynamics, so we do not make s_t explicit here.

2. Employed workers in a job with productivity v consume their bargained wage $w(v, s_t)$ and produce v. Unemployed workers receive unemployment benefit b.

3. Fraction δ of active jobs are exogenously destroyed. Employed workers who lose their job for exogenous reasons are not allowed to search for a job in the current period.

4. The search phase takes place. Firms post v_t vacancies, and pay a flow cost κ per vacancy. Unemployed workers u_t and $(1-\delta)(1-u_t)$ employed workers (with relative efficiency λ) engage in job search. This determines market tightness:

$$\theta_t = \frac{v_t}{u_t + \lambda(1-\delta)(1-u_t)}.$$

5. $f(\theta_t)u_t$ unemployed workers and $\lambda f(\theta_t)(1-\delta)(1-u_t)$ employed workers meet potential employers. Upon contact, a job offer lottery $\vec{q}_l$ is drawn with probability $\Pr(\vec{q}_l)$. The worker and firm decide match consummation based on the lottery's probability distribution over potential match productivities.

3.2 Value Functions

We outline the worker and firm problems recursively. We suppress the dependence of contact rates $f(\theta)$ and $q(\theta)$ on market tightness θ for notational simplicity. We drop time subscripts and use primes (′) to denote the next period. Arrows denote vectors. Value functions are cast as of subperiod 2, i.e the bargaining/production stage.

Lottery Values The value of sampling lottery l is the expected value over possible employment values accounting for the fall back option onto unemployment net of potential mobility costs, and it is defined as:

$$\Omega_l(s) = \vec{q}_l \max\{\vec{W}(v, s'), U(s')\} - \mathbb{I}(\text{EE}) \times c_l, \tag{1}$$

where $\mathbb{I}(\text{EE})$ is an indicator that takes the value one if the lottery is sampled by an employed worker and c_l is the lottery specific moving cost that we specify later. $W(v, s)$ and $U(s)$ denote values of employment with match productivity v and unemployment, respectively. We now define these values.

Workers When unemployed, the worker's value follows the Bellman equation:

$$U(s) = b + \beta\Big[(1-f)U(s') + f\sum_{l=1}^{L} \Pr(\vec{q}_l)\max\big\{U(s'), \Omega_l(s')\big\}\Big]. \tag{2}$$

The unemployed worker consumes unemployment benefit b. She contacts a vacancy with probability f, in which case she draws lottery $\vec{q}_l$, from a distribution of lotteries with probability $Pr(\vec{q}_l)$. She then decides whether to take the lottery or not. If she rejects, she stays unemployed. If she accepts, the worker observes the realized match productivity in the beginning of the following period. She can then either decide to produce in this new job, or separate into unemployment. Unemployed workers always accept all job lotteries as their current state is equal to the lowest outcome in the new job: unemployment.

An employed worker in a productivity-v job has value defined by:

$$
\begin{aligned}
W(v,s) =& w(v,s) + \beta\Big[\delta U(s') + (1-\delta)\Big((1-\lambda f)\max\big\{W(v,s'),U(s')\big\} \\
&+ \lambda f \sum_{l=1}^{L} \Pr(\vec{q}_l)\max\big\{\max\big\{W(v,s'),U(s')\big\},\Omega_l(s')\big\}\Big)\Big].
\end{aligned} \tag{3}
$$

She consumes bargained wage $w(v,s)$ that we discuss below. Her match is destroyed with exogenous probability δ. With probability λf, she contacts an outside firm to draw a job lottery. She evaluates the value of that offer, and decides whether to stay put or to switch jobs. If she switches, in the beginning of the subsequent period the new job's productivity is realized, and she decides between working in the new job or separating into unemployment. That is, we do not permit a "return option" to the old job, and appeal to a version of jobs as experience goods (Jovanovic (1979)).

Firms The value of posting a vacancy is given by

$$
V(s) = -\kappa + \beta\Big[q\mathbb{E}[\max\{J(v,s'),V(s')\}] + (1-q)V(s')\Big]. \tag{4}
$$

The expectation is taken with respect to the distribution of workers over employment and unemployment states, as well as the lottery realizations. The vacant firm pays a flow cost κ to maintain the job posting. It contacts a worker with probability q. If the contact results in a productive match the firm continues to the next period with some productivity v, with the complementary probability the firm continues to the next period as vacant. In what is to follow, we assume there is free entry of firms, which drives down the value of a vacancy to $V(s) = 0\ \forall s$.

The value of a filled job with productivity v to the firm is given by

$$
\begin{aligned}
J(v,s) =& v - w(v,s) + \beta(1-\delta)\Big((1-\lambda f)\mathbb{I}\big\{W(v,s') \geq U(s')\big\}J(v,s') \\
&+ \lambda f \sum_{l=1}^{L} \Pr(\vec{q}_l)\mathbb{I}\big\{\max\big\{W(v,s'),U(s')\big\} > \Omega_l(s') \wedge W(v,s') \geq U(s')\big\}J(v,s')\Big).
\end{aligned} \tag{5}
$$

The firm collects flow profit $v - w(v,s)$ from the match. If the match is not destroyed, either exogenously or endogenously through a worker quit (all of which entails zero value due to free entry), it continues with the same productivity level.

Surplus and Wage Determination We assume that the outside option of both employed and unemployed workers is unemployment. Match surplus from a job with productivity v under aggregate state s is denoted by $S(v,s)$ and defined as

$$S(v,s) \equiv J(v,s) + W(v,s) - U(s), \tag{6}$$

where we already incorporate the free-entry condition.

Wages are determined according to Nash bargaining with worker share $\phi \in [0,1]$, yielding linear surplus sharing rules:

$$W(v,s) - U(s) = \phi S(v,s) \tag{7}$$

$$J(v,s) = (1-\phi) S(v,s). \tag{8}$$

Using Bellman Equations (2), (3), (5), definition of surplus in Equation (6), and the linear sharing rules in Equations (7) and (8), we arrive at the surplus value given by the following Bellman equation.

$$\begin{aligned} S(v,s) =& v - b + \beta(1-\delta)\Big((1-\lambda f)\max\left\{S(v,s'),0\right\} \\ &+ \lambda f \sum_{l=1}^{L} \Pr(\vec{q}_l)\max\left\{\phi \max\left\{S(v,s'),0\right\}, \Phi_l(s')\right\}\Big) \\ &- \beta f \sum_{l=1}^{L} \Pr(\vec{q}_l)\max\left\{0, \Phi_l(s')\right\} \\ &+ \beta(1-\delta)(1-\phi)\lambda f \sum_{l=1}^{L} \Pr(\vec{q}_l)\mathbb{I}\left\{\max\left\{\phi S(v,s'),0\right\} > \Phi_l(s') \wedge S(v,s') \geq 0\right\} S(v,s'). \end{aligned} \tag{9}$$

We define $\Phi_l(s) \equiv \Omega_l(s) - U(s)$, and it is related to match surplus as $\Phi_l(s) = \phi \vec{q}_l \max\{\vec{S}(v,s),0\} - c_l$.

Free Entry We assume there is free entry in vacancies under random search, i.e. firms post vacancies until the vacancy value is zero, which yields the following market clearing condition:

$$
\begin{aligned}
\kappa =&\beta\Bigg[\frac{q}{u+(1-\delta)\lambda(1-u)}\Big(u\sum_{l=1}^{L}\Pr(\vec{q}_l)\underbrace{\mathbb{I}\{U(s')\leq\Omega_l(s')\}}_{\text{sample lottery}}\sum_{m=1}^{M}q_{lm}\underbrace{\mathbb{I}\{W(v_m,s')\geq U(s')\}}_{\text{keep new match}}J(v_m,s')\\
&+(1-\delta)\lambda\sum_{k=1}^{M}e(v_k)\sum_{l=1}^{L}\Pr(\vec{q}_l)\underbrace{\mathbb{I}\{\max\{W(v_k,s'),U(s')\}\leq\Omega_l(s')\}}_{\text{sample lottery}}\\
&\times\sum_{m=1}^{M}q_{lm}\underbrace{\mathbb{I}\{W(v_m,s')\geq U(s')\}}_{\text{keep new match}}J(v_m,s')\Big)\Bigg],
\end{aligned}
\tag{10}
$$

where $e(v_m)$ is the mass of productivity-v_m matches.

The laws of motion for worker distribution over unemployment and match-productivity specific employment states are presented in Appendix Section A.1.

3.3 Equilibrium

The stationary equilibrium of the model is a set of match-specific surplus values $\{S(v_m)\}_{m=1}^{M}$, and market tightness θ such that:

- $\{S(v_m)\}_{m=1}^{M}$ solves the system of equations in (9).
- Distribution of workers over employment states, $(u, \{e(v_m)\}_{m=1}^{M})$, evolves according to the laws of motion in Equations (A.1) and (A.2) induced by worker decisions, and is time-invariant.
- Market tightness θ satisfies the free-entry condition in Equation (10).

Besides solving and analyzing the steady state of our model, we also study perfect foresight transition dynamics following one-time unanticipated aggregate shocks.

4 Calibration

We set some parameters outside of the model and estimate the rest jointly. Table 2 summarizes our choice of parameters set with and without solving the model, together with their values.

Functional Forms We assume that $M(S,V)$ has the constant elasticity of substitution form proposed by Haan et al. (2000), $M(S,V) = \frac{SV}{(S^\eta + V^\eta)^{1/\eta}}$. This matching function yields contact rates (guaranteed to lie between zero and one, unlike with Cobb-Douglas) $f(\theta) = \frac{\theta}{(1+\theta^\eta)^{1/\eta}}$ and $q(\theta) = \frac{1}{(1+\theta^\eta)^{1/\eta}}$, where η is the elasticity parameter.

Job Lotteries We specify the process governing job lotteries to mimic the normal-normal structure commonly used in the Bayesian learning literature. The underlying productivity follows a normal distribution $v \sim \mathcal{N}(\mu_v, \sigma_v^2)$, which is drawn upon a firm-worker meeting. Yet, upon contact the worker and firm only observe a noisy signal of v, namely $x_\nu \sim \mathcal{N}(v, \sigma)$. Hence, signals are unconditionally distributed as $x \sim \mathcal{N}(\mu_v, \sigma_v^2 + \sigma_x^2)$. Bayesian updating yields, for a given signal x, a posterior $v_x \sim \mathcal{N}(\mu_{v_x}, \sigma_{v_x}^2)$; to operationalize this setting we discretize the normal distributions.

Calibration Strategy We set some parameters without solving the model, and jointly estimate the remaining parameters to be consistent with a number empirical labor market moments. We set a model period to one month.

Parameters Set Outside the Model The discount factor $\beta = 0.9967$ reflects a 4% annualized interest rate. We assume the firm and worker have equal bargaining share and set $\phi = 0.5$. We set the elasticity term in the matching function to $\eta = 0.5$. The exogenous separation rate $\delta = 0.005$ matches the average U.S. EU transition probability of around 0.5% after 50 months on the job. We assume that there are 200 lottery types and each lottery can place workers into one of 200 match types.

Parameters Set via Solving the Model The remaining parameters are jointly estimated and reported in Table 2. We minimize the equally weighted sum of squared percent deviations of model steady-state moments from their empirical counterparts, both reported in Table 3.

Our first empirical target is a 5% unemployment rate, intuitively, disciplining vacancy cost κ, which determines market tightness θ and hence contact rates, given surplus, matching technology and the stationary distribution of workers. Market tightness in turn determines contact rates, and hence steady state unemployment rate, $u = \frac{\rho_{eu}}{\rho_{eu}+\rho_{ue}}$, a function of inflow rate ρ_{eu} (given by exogenous separation rate δ, and endogenous separations following job mobility) and outflow rate ρ_{ue}:

$$\rho_{eu} = \delta + (1-\delta)\lambda f(\theta)\times \left\{ \sum_{m=1}^{M} \left[\sum_{l=1}^{L} Pr(\vec{q}_l)\mathbb{I}\left\{S(v_m) < \vec{q}_l \max\{S(\vec{v}'),0\}\right\} \sum_{k=1}^{M} q_{lk}\mathbb{I}\{S(v_k) < 0\}\right] \frac{e(v_m)}{1-u} \right\} \tag{11}$$

$$\rho_{ue} = f(\theta) \sum_{l=1}^{L} Pr(\vec{q}_l)\vec{q}_l \mathbb{I}\{S(\vec{v}') \geq 0\} \tag{12}$$

Second, we target the average job-to-job transition rate, around 2% per month in SIPP. Its theoretical counterpart is given by:

$$\rho_{ee} = \sum_{m=1}^{M} \frac{e(v_m)}{1-u} \times \Bigg[\underbrace{(1-\delta)\lambda f \sum_{l=1}^{L} Pr(\vec{q}_l)\mathbb{I}\left\{S(v_m) < \vec{q}_l \max\{S(\vec{v}'),0\}\right\} \sum_{k=1}^{M} q_{lk}\mathbb{I}\{S(v_k) \geq 0\}}_{\rho_{ee}(v_m)} \Bigg], \tag{13}$$

which helps discipline the relative on-the-job search efficiency λ.

Third, we target moments of the tenure gradient of job-to-job transitions for jobs created as a result of direct job transitions, specifically at tenure of one, two and three years. In our model, job mobility only depends on job level v_m, which generate a v_m-specific $\rho_{ee}(v_m)$, so the model average traces the v composition by tenure:

$$\rho_{ee}^{\tau} = \sum_{m=1}^{M} \frac{e^{\tau}(v_m)}{\sum_{k=1}^{M} e^{\tau}(v_k)} \rho_{ee}(v_m) \tag{14}$$

The aggregate tenure-gradient of EE transitions therefore only reflect composition shifts in the employment stock – which are all due to heterogeneous job mobility decisions in the background of homogeneous exogenous separation rates δ and lottery offer arrival rates λf. For each tenure bin $\tau \geq 1$, we have a law of motion:

$$e^{\tau\geq 1}(v_m) = (1-\delta)\left[1 - \lambda f \sum_{l=1}^{L} Pr(\vec{q}_l)\mathbb{I}\left\{S(v_m) < \vec{q}_l \max\{S(\vec{v}'),0\}\right\}\right] e^{\tau-1}(v_m) \tag{15}$$

Since all workers face the same lottery arrival rate λf, the EE gradient will be declining due to advantageous selection: low-v jobs have lower surplus, therefore increasing the share of job offers that make the cut for a transition. In reality, other moments besides selection may contribute to this pattern, although empirical evidence suggests the wage gradient to be driven by precisely the job offer-driven selection in our model, as in the mechanism emphasized by Hagedorn and Manovskii (2013). The initial stock distribution reflects merely the composition of accepted lotteries that yield viable jobs, formed out of existing jobs:

$$e^{\tau=0}(v_m) = \sum_{k=1}^{M} e(v_k) \times \sum_{l=1}^{L} Pr(\vec{q}_l)\mathbb{I}\left\{S(v_k) < \vec{q}_l \max\{S(\vec{v}'), 0\}\right\} q_{lk}\mathbb{I}\{S(v_k) \geq 0\}(1-\delta)\lambda f \tag{16}$$

Fourth and most importantly, we target the excess unemployment risk in period 1 for jobs created as a result of direct job-to-job transitions. This moment is our key motivation. In the data, we count all separations in period 1 as sampling of job lotteries that resulted in unemployment. Strictly read, this definition seems to differ from our model setup, which for analytical tractability has unsuccessful sampling of jobs result in unemployment even before production begins, which we consider a stand-in for a richer experience good mechanism. In our model, this moment is given by:

$$\rho^{``\tau=0"}_{(E)EU} = \frac{\sum_{m=1}^{M} e(v_m) \times \sum_{l=1}^{L} Pr(\vec{q}_l)\mathbb{I}\left\{S(v_m) < \vec{q}_l \max\{S(\vec{v}'), 0\}\right\} \sum_{k=1}^{M} q_{lk}\mathbb{I}\{S(v_k) < 0\}}{\sum_{m=1}^{M} e(v_m) \times \sum_{l=1}^{L} Pr(\vec{q}_l)\mathbb{I}\left\{S(v_m) < \vec{q}_l \max\{S(\vec{v}'), 0\}\right\}} \tag{17}$$

This effect captures the riskiness of job-to-job transitions in our model, which arises as an equilibrium outcome given the job lottery offer distribution. This moment helps discipline the noise associated with lotteries, σ_x.

Finally, we target an average UI replacement rate of 40% to discipline the UI benefit level b.

5 Quantitative Analysis: Job Riskiness and Job Mobility

In this section we assess the quantitative properties of the calibrated model in steady state. Our particular focus is the novel *unemployment-risk* view of job mobility that our model formalizes.

A worker's job-to-job transition decision is driven by the expected value from taking a lottery. Here we dissect this expected lottery value and explore the implications for equilibrium job mobility its dispersion creates. Ex-ante, job lottery values are characterized by upside and downside risk, where we define downside risk of a lottery as the probability it yields match productivities over which the worker prefers unemployment. The unemployment option therefore generates limited liability in risky job transitions. For that reason, job offers – and thus job mobility decisions – are sensitive to the value of unemployment U and its determinants. In the subsequent section, we hence examine the effects of unemployment insurance as a shifter in U, on job mobility and composition.

The Expected Value of a Job Formally, the expected value of a job offer is the probability-weighted average of eventual job values $W(v)$. A lottery is characterized by a probability vector

$\vec{q}_l$, and the expected value of taking that lottery is given by

$$\Omega_l \equiv \vec{q}_l \max\{\vec{W(v)}, U\} \tag{18}$$

Downside vs. Upside Risk of Job Lotteries We decompose expected job lottery value into downside risk – low realizations of job values in which the worker prefers unemployment – and upside risk – high realizations that yield jobs better than unemployment:[12]

$$\Omega_l = \underbrace{\sum_{m \in \{m: S(v_m) < 0\}} q_{lm} U}_{\text{Downside}} + \underbrace{\sum_{m \in \{m: S(v_m) \geq 0\}} q_{lm} W(v_m)}_{\text{Upside}}, \tag{20}$$

where the first term captures the expected value of states that result in unemployment, and the second term captures the expected value of employment states following job transition. The reservation v is identified by the kink in the schedule; all job realizations below this value would, if formed, yield job values below U: $W(\bar{v}) = U$.

The quit-into-unemployment option therefore limits the downside of the job offer and hence of job mobility. The downside value of the lottery is simply U (that portion of Ω is flat in the realized v) times the cumulative probability of the downside. Downside-risk-preserving perturbations of the precise risk allocation *within* the downside leave the total job lottery value Ω_l unchanged.

We define a downside risk that we next show to sufficiently characterize the jobs with respect to the channel we explore: the probability of a lottery resulting in a match quality, which leads to a quit into unemployment. More formally, downside risk for each lottery $\vec{q}_l$ is defined as

$$r_l \equiv \sum_{m \in \{m: S(v_m) < 0\}} q_{lm} \tag{21}$$

This probability is simply the sum of probabilities in the flat part of Ω as a function of job qualities, and captures the downside of a job offer: Riskier lotteries are more likely to lead to unemployment. The complement of downside risk is upside risk $r_l^u \equiv \sum_{m \in \{m: S(v_m) \geq 0\}} q_{lm} = 1 - r_l$.

[12]Our notion of downside risk differs from an alternative useful definition that defines downside risk with respect to the *previous* job's value: Any realized job value that falls short of the worker's previous job value is therefore also downside risk. We note this alternative view to clarify that our notion of downside specifically refers to the unemployment risk:

$$\Omega_l = \boxed{\underbrace{\sum_{m \in \{m: S(v_m) < 0\}} q_{lm} U}_{\text{Unemployment Downside}}} + \underbrace{\sum_{m \in \{m: 0 \leq S(v_m) < S(v_{m_{\text{old}}})\}} q_{lm} W(v_m)}_{\text{“Regret but Stay”}} + \underbrace{\sum_{m \in \{m: 0 \leq S(v_{m_{\text{old}}}) < S(v_m)\}} q_{lm} W(v_m)}_{\text{“Happy and Stay”}} \tag{19}$$

This definition allows us to reformulate the job lottery value:

$$\Omega_l = r_l U + (1 - r_l) \sum_{m \in \{m: S(v_m) \geq 0\}} \frac{q_{lm}}{1 - r_l} W(v_m) \tag{22}$$

The upside value is the weighted sum of the upward sloping part of of Ω as a function of job qualities. Importantly, unlike in the downside, perturbations of placement probabilities q_{lm} within the upside portion of the job space do affect job lottery value Ω_l. However, we next clarify that our specification of job lotteries features a particular notion of conditional independence of the upside in the downside risk, which allows us to cleanly study the downside risk channel. Specifically, we will frequently characterize jobs solely by their downside risk and study the effect of U (e.g. through unemployment insurance) on job mobility and in particular the shift of the economy into jobs that are "risky" as precisely and succinctly captured by their downside risk r_l.[13]

Job Mobility, Downside Risk, and the Value of Unemployment Next we discuss the interaction between the value of unemployment and a job lottery's downside risk in job mobility. Job transitions occur when, conditional on a lottery, the lottery value Ω_l exceeds the worker value from the current match. This implies that for each job lottery Ω_l, there is a lottery acceptance vector with v_m-specific binary (zero or one) elements that describe whether the worker currently employed in job v_m accepts ("samples") the job lottery: $\mathbb{I}\left\{W(v_m) < \overbrace{\vec{q}_l \max\{W(\vec{v}'), U\}}^{\Omega_l}\right\}$. This directly implies that there is a reservation $\bar{v}(\Omega)$ for any job lottery value Ω, which is simply defined by $W(\bar{v}(\Omega)) = \Omega$. All jobs with $v < \bar{v}(\Omega)$ reject a lottery of value Ω; all jobs with $v \geq \bar{v}(\Omega)$ accept and sample the lottery, leaving their old job, onward into employment or into unemployment.

Job Mobility by Current Job Quality Figure 7 plots, as a function of current job's productivity v_m, the probability of departing one's current job in an attempted job-to-job transition (which

[13] We also explored *conditional independence of the upside from the downside* as a potentially desirable model property of the relationship between a lottery's downside risk r_l and two job value concepts: the total job lottery value Ω_l, and the conditional value of the upside. While the expected lottery value Ω_l is decreasing in the downside risk, the conditional upside may or may not be invariant in downside risk. If the upside is conditionally independent from the downside, the only channel by which downside risk, r_l affects a lottery's value Ω_l is by putting weight on unemployment, but not by affecting the conditional distribution of q_{lm} within the upside. Such an independence property would allow us to characterize job lotteries q_l solely by their downside risk r_l when examining the role unemployment risk plays in job mobility, rather than indirectly selecting jobs by other characteristics unrelated to the downside (i.e. the distribution of placement probabilities within the upside). This property could be achieved by drawing placement probabilities q_{lm} *independently*. In our specific calibration, we do not impose this property, after having experimented with it.

may or may not lead to a viable job):

$$\sigma(v_m) = \sum_{l=1}^{L} Pr(\vec{q}_l)\mathbb{I}\{W(v_m) < \Omega_l\} \tag{23}$$

The figure also plots $\rho_{ee}(v_m)$, i.e. the probability of a job to job transition into an ultimately viable job in which production occurs.

All lines are decreasing in v_m. The transition probabilities illustrate that higher quality jobs are more stable. The conditional average downside risk of accepted jobs shows that when workers in higher v_m do accept jobs, these jobs carry less downside risk, which is a consequence of the negative relationship between Ω_l and r_l.

Job Mobility, Job Quality and Tenure In the model, existing jobs only differ in their productivity v, which allows us to trace out binary decision rules conditional on job offers. In the data v is not measured. However, we have indirectly exploited the link between v and job mobility by estimating the free model parameters to have the model's EE–tenure gradient match the empirical one at three tenure points. We have calibrated our model to feature a realistic early vs. late in the tenure gradient EU separation rate risk.

The Job Ladder Our model features a job ladder by which workers accept outside offers that in expectation allow them to move up the job ladder as defined by job quality v. The average gain falls in v for job switchers as a function of their original v. The relationship is negative simply because well-matched workers are closer to having maxed out their match quality.

Unemployment Risk while Switching Jobs Our labor market features two types of separations that throw the worker off the job ladder: first, standard exogenous separation rate δ forces even the stayers to move into unemployment. Second, job switchers may find themselves ex post in unsatisfactory matches to which they prefer unemployment, and thus quit.

The Composition of Accepted Job Lotteries From the perspective of a lottery valued at Ω, the probability of being accepted depends on fraction of jobs above the reservation value $\bar{v}(\Omega)$: $\sum_j \frac{e(v_m)}{1-u}\mathbb{I}\{W(v_m) < \Omega\}$. A given cross-section of newly formed jobs takes this lottery/$\vec{q}_l$-specific sampling probability and takes a weighted average using the McCall job lottery distribution:

$$\sum_{l=1}^{L} Pr(\vec{q}_l) \sum_{m=1}^{M} \frac{e(v_m)}{1-u}\mathbb{I}\{W(v_m) < \Omega_l\} \tag{24}$$

Since Ω_l decreases in downside r_l, jobs with high downside make up a smaller share of accepted jobs because fewer employed workers decide to sample them. We can construct the distribution of accepted lotteries by unemployment risk r_l, and calculate the share of job switches resulting from each lottery, $\frac{\sum_m e(v_m)Pr(\vec{q}_l)\mathbb{I}\left\{W(v_m)<\Omega_l\right\}}{\sum_l \sum_m e(v_m)Pr(\vec{q}_l)\mathbb{I}\left\{W(v_m)<\Omega_l\right\}}$.

6 Applications and Quantitative Experiments

In this section we undertake a number of quantitative exercises to shed further light on the role of unemployment risk in shaping employed workers' job mobility decisions, and in turn the distribution of job quality and labor market performance overall.

Figure 11 summarizes the effects of the three experiments we study. First, we increase UI benefits b, shifting the value of unemployment and hence subsidizing risky jobs and job mobility. Second, we remove the option value of quitting upon a job-to-job transition. Third, we adjust the lottery structure to render into inspection goods those jobs that turn out to be inferior to unemployment.

6.1 Experiment I: The Experimentation Channel of UI

We start by shifting the value to unemployment U. Our U shifter is the generosity of unemployment insurance as captured by UI benefit level b.

Our experiment has also substantive and empirical predictions: We trace out a mechanism through which UI promotes job-to-job transitions by lowering the downside risk of jobs, and thereby leads to more experimentation.

We compare two UI regimes: our original level of "low" UI (b_L) and a counterfactual "high" UI level (b_H). We first compare steady states, essentially comparing long-run or cross-country implications of UI generosity. Second, we study the transition between steady states. The transition dynamics are particularly interesting because they would map into potential empirical work of this testable mechanism.

Neutralizing the Change in UI Benefits We use lottery specific mobility costs, c_l, as a diagnostic tool to surgically isolate the quantitative importance of excess unemployment risk ensuing job-to-job transitions.[14]

[14] In particular, we have two experiments that entail two different cost specifications. Consider an increase in UI benefits from b to b'. In our model, as job mobility entails unemployment risk, UI acts as an insurance for job switching. To isolate the size of this particular channel from others such as the overall decline in contact rates due to the decline in market tightness or increased selectivity of workers, we introduce a cost that taxes job mobility.

Let $\text{Pr}_t(UE)$ denote the job finding probability in period t. We first define a flow cost that satisfies the following law of motion

$$c_t = 1 + (1 - \text{Pr}_{t+1}(\text{UE})) \times c_{t+1}. \tag{25}$$

The Effect on Job Offer Values Intuitively, lottery values respond differentially to changes in b, which is the channel through which we argue UI will affect job mobility of employed workers. The distribution of the value of job offers Ω_l shifts to the right when b increases, as more generous unemployment insurance benefits increase both the value of unemployment U and value of employment $W(v)$. (Due to separation risk δ any job should put some weight on U even absent risky job mobility.) This implies that lotteries across the board become more attractive with more generous UI, which insures against outcomes that lead to unemployment.

Interaction of UI with Downside Risk There is considerable *dispersion* in the change of lottery values induced by b shifts. Our model clarifies that this dispersion should be related to downside risk r_l, the lottery's probability that the worker ends up placed in a job v that generates job value lower than U. Precisely, an *increase* in UI generosity raises the value of lotteries with larger downside risk i.e. put more weight on U to begin with. To see this, recall that lottery value is $\Omega_l = \vec{q}_l \max\{\vec{W(v)}, U\}$. From this expression, one can see that an increase in b, which increases U, will increase lottery values by more the more they put weight on unemployment, i.e. r_l. To see this more clearly, consider:

$$d\Omega_l = dU \left(r_l + (1 - r_l) \sum_{m \in \{m : S(v_m) \geq 0\}} \frac{q_{lm}}{1 - r_l} \frac{dW(v_m)}{dU} \right) \tag{28}$$

Moreover, an increase in b improves lottery value by more for riskier lotteries. Therefore, b, by increasing U, subsidizes risky job offers. The differential effect of U on the job value is a key mechanism we propose and explore here. Consequently, b will affect not only the overall level of job-to-job transitions but also the composition.

The Composition of Accepted Job Offers Next, we show how UI levels, lottery risk and job-mobility are related. We again rank the lotteries according to our risk measure, r_l, under the low UI regime, b_L. We then calculate the share of job switches resulting from each lottery.

Let $\Pr_{l,t}\big((\text{E})\text{EU}|(\text{E})\text{E}\big)$ denote the conditional probability of a job-to-job transition resulting in unemployment under lottery l. We in turn define the lump sum mobility cost as

$$c_{l,t} = (b' - b) \times \Pr_{l,t}\big((\text{E})\text{EU}|(\text{E})\text{E}\big) \times c_t. \tag{26}$$

Our second approach is more general, it can potentially isolate the experimentation channel margin in response to any shock. We define the lump sump mobility cost in this case as

$$c_{l,t} = \Pr_{l,t}\big((\text{E})\text{EU}|(\text{E})\text{E}\big) \times \big(U(s_t) - U(s_0)\big). \tag{27}$$

$U(s_0)$ is the value of unemployment in the baseline economy without mobility costs and $U(s_t)$ is the unemployment value at time t following a shock with this mobility cost structure.

More formally, we calculate

$$\frac{\sum_{m=1}^{M} e(v_m) Pr(\vec{q}_l) \mathbb{I}\{S(v_m) < \vec{q}_l \max\{S(\vec{v}), 0\}\}}{\sum_{l=1}^{L}\sum_{m=1}^{M} e(v_m) Pr(\vec{q}_l) \mathbb{I}\{S(v_m) < \vec{q}_l \max\{S(\vec{v}), 0\}\}}. \tag{29}$$

To facilitate comparison between the high and low UI regimes we keep the distribution of workers over match types, $e(v_m)$, constant. This allows us to abstract away from compositional effects of b on employment.[15] Figure 8 plots this share as a function of lottery risk for b_H and b_L. Not surprisingly, both plots yield a negative slope: A larger share of job transitions are made when facing low-risk job offer lotteries. But importantly, this job-mobility risk profile exhibits a different slope for low and high UI states of the world. When UI becomes more generous, the share of job transitions shifts from low-risk lotteries to higher-unemployment-risk lotteries. In this sense, UI encourages job-mobility by insuring workers against downside risk and lets them experiment more with uncertain job prospects.

Job Mobility and UI Next we explore the differences in steady state decisions in workers' job mobility. Figure 9 plots two job mobility (sampling) rates by job quality v, separately for the two UI regime. The higher b regime increases sampling across the board, showing that b subsidizes job mobility by insuring the downside.

A second look reveals however a crucial difference in the composition of the viable firms: in fact, the vertical black dashed line denotes the marginal job that is no longer viable (has zero surplus) in the match quality ranking due to the higher benefits under the high-b regime. While indeed the medium-low job qualities to the right of this cutoff experience an increase in job mobility, the shift in UI benefits cuts of the lower tail of job qualities, in which job mobility used to be very high in the low-b regime.

This composition adjustment implies that on *average* in the new steady state there are fewer job-to-job transitions despite the subsidy. The reason is that the economy, in the new steady state, switches to better matched workers, who are the workers that are less likely to run into jobs that make it worth sampling. We document this plotting the average EE rate below when discussing transition dynamics.

Aggregate Job mobility and Selection Figure 6 plots the employment shares by v for each b regime, plotting the low b regime in a blue solid line, and the high b regime in a dashed red line. Thanks to the subsidy of unemployment, the reservation job qualities increase when b is high, leading workers to reject worse offers and giving workers opportunities to move

[15] One caveat here is that under b_H some match productivities become unviable, that is the marginal matches yield a negative surplus. These matches mechanically cause more job-mobility-decisions, therefore when we calculate this share under b_H, we use the same worker distribution as in b_L only for those matches that are feasible, we fix the worker share to zero for all negative surplus matches.

up the job ladder. Hence, comparing steady states, the high-b economy puts more weight on low-sampling types (high match qualities).

The Experiment Channel of UI The experiment also makes clear a "moral hazard" effect. Figure 8 plots the ratio of $\frac{\rho^{(E)EU}(v)}{\sigma(v)}$, i.e. the fraction of sampling decisions that ultimately lead to unemployment, and the average r_l of accepted lotteries, by v. Both are decreasing in v. However higher b raises the level of this gradient. In other words, UI encourages workers to take riskier lotteries in the hope of climbing up the job ladder. Therefore, b increases experimentation.

Transitional Dynamics: Low to High b Steady State In this section we explore the transition dynamics of the model. We do so because the experimentation subsidy channel of UI is testable in quasi-experimental empirical designs that allow the researcher to track the transition. Moreover, we have previously found that because of the equilibrium shift in job qualities, average job mobility may in fact decline despite v-specific increases in experimentation.

Figure 10 plots the transition from the low to the high UI steady state within 50 periods for the job mobility rate. The dot on the y-axis describe the initial steady state level; the solid line traces out transitional dynamics. The solution method imposes that after 50 periods the transition to the next steady state is complete.

The first transitional time series denotes EE transition rates. EE transitions spike at the onset of the reform that makes b more generous. The reason is simple: The employment distribution is still characterized by the old b regime that features lower matches than the high b would generate. Job sampling increases because job offer values have increased at the onset of the reform, and therefore workers stuck in bad matches accept a larger fraction of the job offers (i.e. the barely unviable job offer now becomes sampled), and for each given job offer, a larger fraction of workers samples the lottery. However, the EE time-series then declines and settles at a lower level than the initial steady state. The intuition is simply selection. The average v during the adjustment period gradually increases and ultimately settles in on a level that is higher than the original one. UI therefore raises the productivity level.,

Decomposition of Steady State Effects In light of various effects occurring at the same time besides the the experimentation channel at the micro level – e.g. the offer rate shifting due to labor demand, and the composition effects described above – we decompose the effects of the UI regime shift in bar charts in Figure 11, comparing steady states. We study separately percent shifts in sampling (top panel), and in successful EE transitions (bottom panel).

First, the "Decision: Micro" blue bar denotes effects that would arise if job quality composition were held constant. We find a large, nearly 20% increase in sampling. However, we also find a decline in successful transitions into viable jobs as the workers are, ex post, more selective (bottom panel).

Second, the "+Decision: Macro" (red bar) adds the equilibrium labor demand effects arising from firms' lowering vacancy posting in light of the standard wage pressure channel in the model, such that the arrival rate falls and lowers sampling and successful switches.

Third, the "+composition" channel (yellow bar) further adds into these effects.

6.2 Experiment II: Removing the Quit Option After EE

We also study the effect of removing the quit-after-EE option, thereby having the workers act as if the choice between unemployment and the job after switching is not feasible (and neutralizing this channel through subsidies).

The middle bar charts in Figure 11 clarify that sampling as well as successful EE transitions decline markedly, consistent with the unemployment risk as a limited-liability channel in fact, on its own, encourages experimentation.

Intuitions and Implementation Note that in the standard setup we explore, we have a job transition if $W(v) < q_l \max\{W(v'), U\}$. We now remove the option to quit into unemployment by counterfactually having the worker decide on switching following an ad-hoc rule

$$W(v) < q_l W(v'). \tag{30}$$

Ex post, worker flows are rational (i.e. workers do quit into unemployment), but ex ante, EE decisions are made following the ad-hoc rule.

The predictions for job mobility is a decline in EE because of the removal of the limited-liability channel, and in particular U-risk-heavy lotteries will become less valuable (lower Ω) (o n top of the labor demand and compositional effects).

6.3 Experiment III: Return Option i.e. Changing "Below the Bar" Job Offers into Inspection Goods

Lastly, we isolate the role of the nonemployment risk channel by keeping the lottery structure fixed as jobs are experience goods, but permitting workers to treat as inspection goods the jobs that would turn out to be of quality below the unemployment reservation cutoff.

Equivalently, this experiment essentially introduces a "return option" (in essence a worker-sided "recall option" mirroring the employer one in Fujita and Moscarini (2017)).

The three rightmost columns in Figure 11 clarify that such a regime shift would lead to a sizable increase in sampling, albeit largely driven by labor demand/macro equilibrium channels, as well as the composition channel. We see a notable increase in successful EE transitions.

Intuitions and Implementation Recall that the average job mobility is given by

$$\sum_{v}(1-\delta)\lambda f(\theta)\sum_{l=1}^{L}\Pr(q_l)\mathbb{I}\left\{q_l\max\{W(v'),U\}>W(v)\right\}e(v)/\sum_{v'}e(v')$$

Moreover, the individual's decision to switch jobs can be separated into considerations that affect the "upside" and "downside" sub-lotteries around reservation job quality $W(\widetilde{v}) = U$, where the upside can be defined as

$$q_{lm}^{U} = \begin{cases} 0 & \text{if} \quad v_m < \widetilde{v} \\ \frac{q_{lm}}{\sum_{v_m \geq \widetilde{v}} q_{lm}} & \text{if} \quad v_m \geq \widetilde{v} \end{cases} \tag{31}$$

and the downside can be defined as:

$$q_{lm}^{D} = \begin{cases} \frac{q_{lm}}{\sum_{v_m < \widetilde{v}} q_{lm}} & \text{if} \quad v_m < \widetilde{v} \\ 0 & \text{if} \quad v_m \geq \widetilde{v} \end{cases} \tag{32}$$

Therefore, the worker switches (accept lottery l) if $q_l \max\{W(v'), U\} > W(v)$.

Here, we now permit the worker to avoid downside by observing lottery q_l's type = $T_l \in \{U, D\}$ *before* switching jobs – such that jobs are "partial inspection" goods, such that workers draw "downside" or "upside" lottery $T_l \in \{U, D\}$:

$$\tilde{q}_l = \begin{cases} {q_l}^D & \text{with} \quad \Pr(q_l) \times \sum_{v_m < \widetilde{v}} q_{lm} \\ {q_l}^U & \text{with} \quad \Pr(q_l) \times \sum_{v_m \geq \widetilde{v}} q_{lm} \end{cases} \tag{33}$$

Here, workers observe lottery type $T_l \in \{U, D\}$, decide whether to switch jobs. Since ${q_l}^D \max\{W(v'), U\} > W(v)$, they never accept downside lotteries. Since ${q_l}^U \max\{W(v'), U\} > W(v)$, they sometimes accept the upside lotteries.

The predictions of this model are that U-risk-heavy lotteries are never accepted, so we remove the excess unemployment risk entirely. This should lead to a decline in sampling and job mobility. However, now low-U-risk lotteries become more valuable, leading to an increase in sampling probabilties. Hence, we have an overall ambiguous effect on total sampling on net. (The equilibrium channel of labor demand would lead to an increase in arrival rates, and we again obtain considerable composition effects as well.

7 Conclusion

We have proposed and analyzed a model of *risky job-to-job transitions*. Employed workers receive noisy offers in the form of "job lotteries", which place them into a variety of match qualities – some of which are worse than unemployment. The resulting excess unemployment risk after job mobility is a robust empirical fact. The typical employed job seeker of tenure above two years is largely isolated from unemployment risk, facing a monthly risk of only 0.5%. By contrast, the recently employed worker that transitioned from another job faces an excess 2.5% probability of unemployment in the first months, five times the value that employed worker would have had had she stayed in her old job.

We argue that this consideration should pose a friction to job mobility in real-world labor markets. Moreover, our model implies that the downside risk is the more severe, the lower the value of the unemployment state. This insight suggests natural implications that we find empirically reasonable: Recessions are times when the value of unemployment decreases; they are also times when job-to-job transitions collapse.

A particularly interesting implication we highlight is that policies typically thought to only affect the unemployment job seekers' incentives directly, such as unemployment insurance, subsidize job mobility by employed workers.

We close by reflecting on an implicit yet crucial assumption of our model as well as real-world labor markets: the absence of a return option into one's old job after disappointing realizations of the job lottery. Our sampling mechanism is a short hand for e.g. jobs as experience goods that require workers to actually leave one's old job and start production in the new job. We have taken this realistic fact for granted and naturally presented the job switcher with a choice between unemployment and formation of the match with the realized job quality. However, it is not obvious whether this feature should be thought of as a friction or a technological feature of labor markets. In our model, the job seeker returns to unemployment yet would have preferred to return to the old job (which yielded a higher value than unemployment by revealed preference). Standard search and matching frictions are not a plausible foundation for this inability to return to a previous employer in a job that yielded positive surplus; moreover in the data, recalls after temporary employment are frequent (Fujita and Moscarini (2017)), suggesting that those return transitions should be possible in principle.

In a counterfactual economy with return options, the worker would never forgo opportunities to move up the job ladder; she would in fact accept and sample all jobs that have positive probability over better jobs. (A transaction cost of job switching would attenuate this extreme implication.) Perhaps the absence of such a "return option" (in essence a worker-sided "recall option" mirroring the employer one in Fujita and Moscarini (2017)) captures a friction (arising from strategic, behavioral or cultural causes). If so, then the amount of job mobility is not efficient (or constrained efficient, taking the matching frictions as given). Future extensions may explore the welfare properties of the model from this perspective.

We have also not modeled incomplete markets and curvature in the workers' consumption utility function. Extendeding our model with such features would permit one to study the welfare properties of policies such as UI, in which UI may subsidize otherwise inefficiently low job mobility.

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8 Tables

Table 1: 2x2 Matrix of Models that Feature EE Mobility and Excess Unemployment Risk

	Lowest initial match quality worse than unemployment? No	Yes
Inspection	~~Postel-Vinay and Robin (2002)~~ ~~Fujita and Ramey (2012)~~	~~Menzio and Shi (2011.a)~~
Experience		Mercan and Schoefer (2020) Menzio and Shi (2011.b) ~~Moscarini (2005)~~, ~~Mercan (2017)~~

Table 2: Model Parameters

Parameter	Description	Value	Source/Target
		A. PREDETERMINED	
β	Discount factor	0.9967	4% annual interest rate
ϕ	Worker bargaining share	0.5	Equal worker and firm share
η	Elasticity of matching function	0.5	–
δ	Exogenous separation rate	0.005	EU rate for $\tau \geq 50$ months
$\overline{v}$	Mean match productivity	1	Normalization
M	Number of match productivities	200	–
L	Number of lotteries	200	–
		B. ESTIMATED	
κ	Vacancy creation cost	0.0969	Unemployment rate
λ	On-the-job search intensity	1.5724	E-E rate
σ_v	Std. of productivity distribution	3.9579	Share of E-E with wage loss
σ_x	Std. of noise	3.0025	Unemployment risk for $\tau \leq 6$ after EE
b	Unemployment benefit level	2.9078	Average UI replacement rate

Notes: Summary table of model parameters and values.

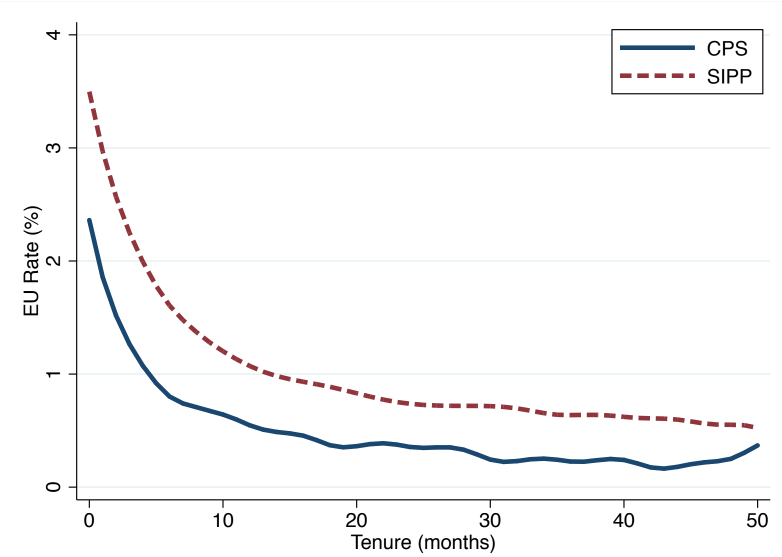
Table 3: Targets and Model Fit

Moment	Target	Model
Unemployment rate	5%	4.9%
E-E rate	2.5%	2.45%
Share of E-E with wage loss	33%	32.9%
Unemployment risk for $\tau \leq 6$ after EE	2.5%	2.48%
Average UI replacement rate	40%	40.5%

Notes: Target moments and model fit in the baseline calibration.

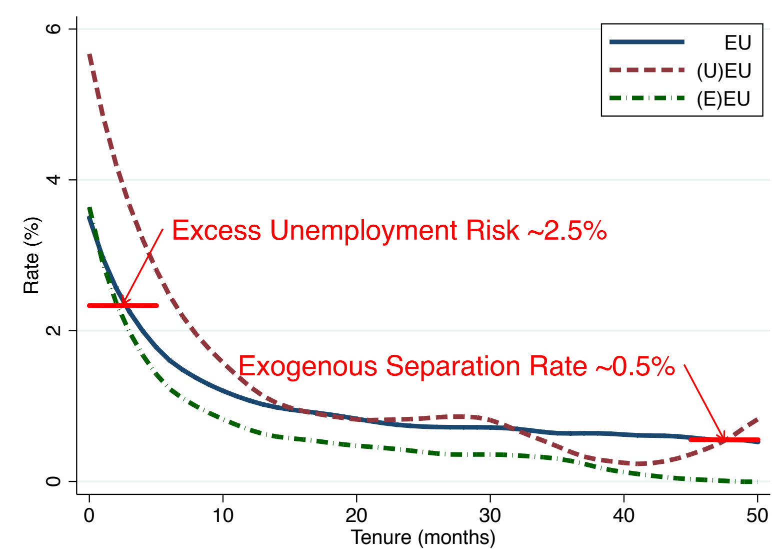
9 Figures

Figure 1: EU Separations by Tenure



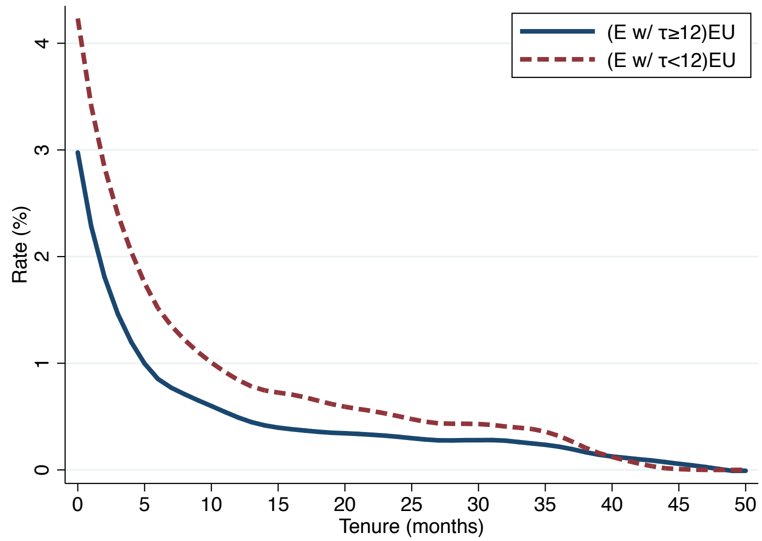
Notes: Separation rate as a function of worker tenure. Sources: Current Population Survey (CPS) and Survey of Income and Program Participation (SIPP).

Figure 2: EU Separations by Type of Previous Transition into Current Job



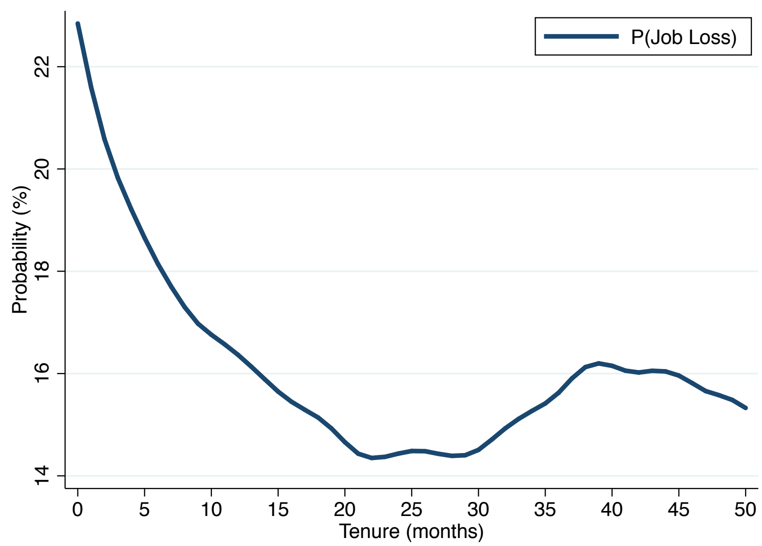
Notes: Separation rate as a function of worker tenure, separately by origin of job. The red lines denote model targets from this empirical distribution. Source: and Survey of Income and Program Participation (SIPP).

Figure 3: EU Transition By Tenure in Preceding Job



Notes: Separation rate as a function of worker tenure out of jobs formed after EE tansitions, separately by tenure (below and 12 or more months) in previous job. The red lines denote model targets from this empirical distribution. Source: and Survey of Income and Program Participation (SIPP).

Figure 4: Separation Beliefs and Events



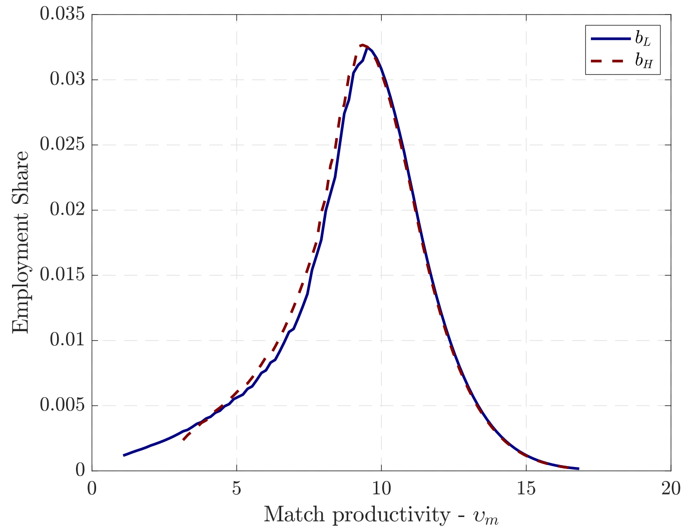
Notes: Panel (a) Self-reported job loss probability within the next 12 months. Panel (b) Realized monthly job separation rates. Panel (a) Density of the employment-tenure distribution. Panel (d) Subjective beliefs about job loss conditioning on the origin of the current employment spell. Source: Federal Reserve Bank of New York Survey of Consumer Expectations.

Figure 5: Direct Survey Evidence: The Role of Nonemployment Risk in Preventing Job-to-Job Mobility

[Bar Chart: coming in April 2020 upon data release of custom GSOEP questionnaire]

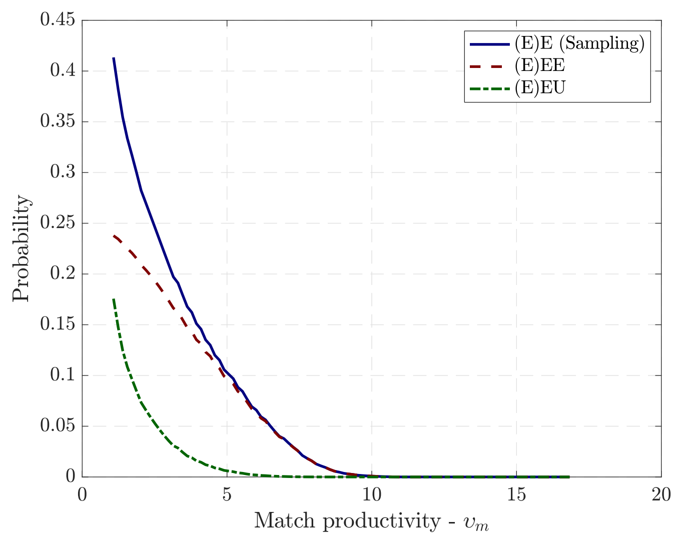
Notes: Reasons discouraging job-to-job mobility as stated by survey respondents, including the excess unemployment risk following the job switch. Source: Custom questionnaire in German Socioeconomic Panel (GSOEP).

Figure 6: Steady State Worker Distribution over Match Qualities



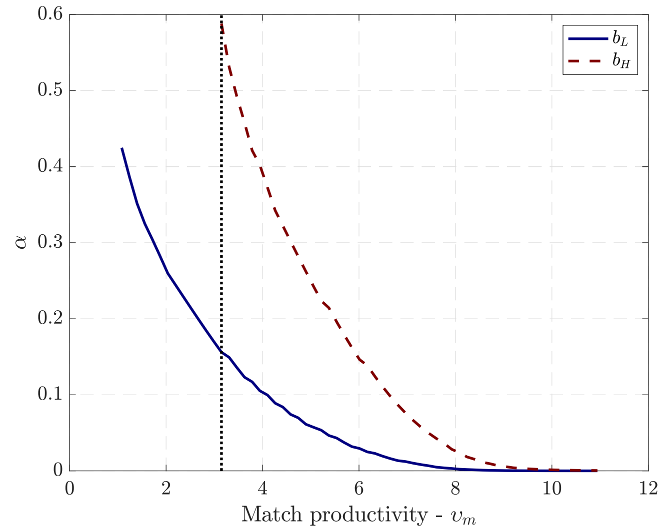
Notes: The Figure plots the match quality distribution in steady state.

Figure 7: Job Mobility and Match Quality



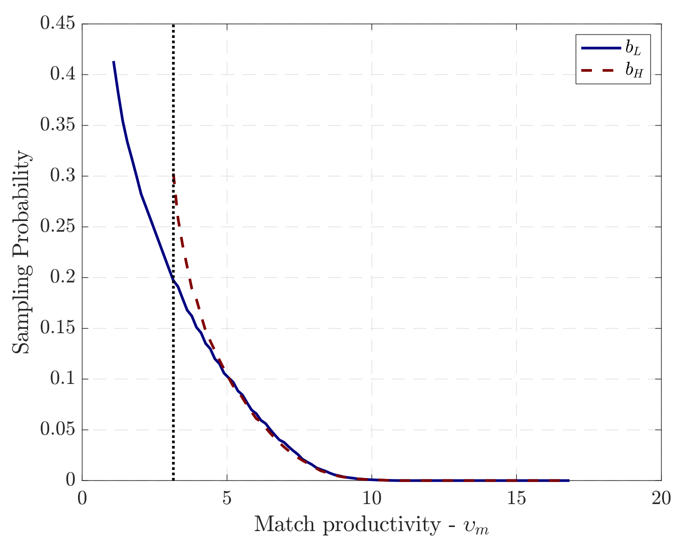
Notes: The Figure plots the relationship between job mobility (share of workers sampling a job offer (E)E, decomposed into successful ones (E)EE and those resulting in unemployment (E)EU), as a function of match quality in steady state.

Figure 8: The Unemployment Risk of Accepted Job Offers Against Original Match Quality



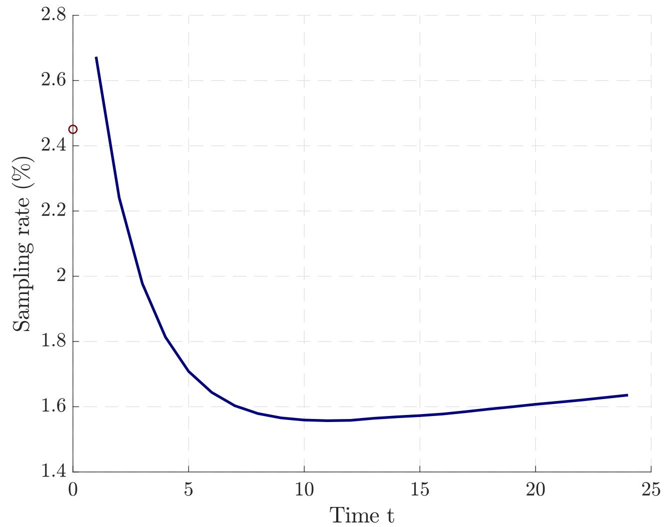
Notes: The Figure plots the relationship of the average share of accepted job offers that resulting in unemployment (E)EU), as a function of match quality. It does so separately for a low unemployment insurance benefit regime (blue solid line) and for a high unemployment insurance benefit regime (red dashed line). The vertical black dashed line denotes the marginal job that is no longer viable (has zero surplus) in the match quality ranking due to the higher benefits.

Figure 9: Job Mobility and Match Quality, By UI Benefit Generosity



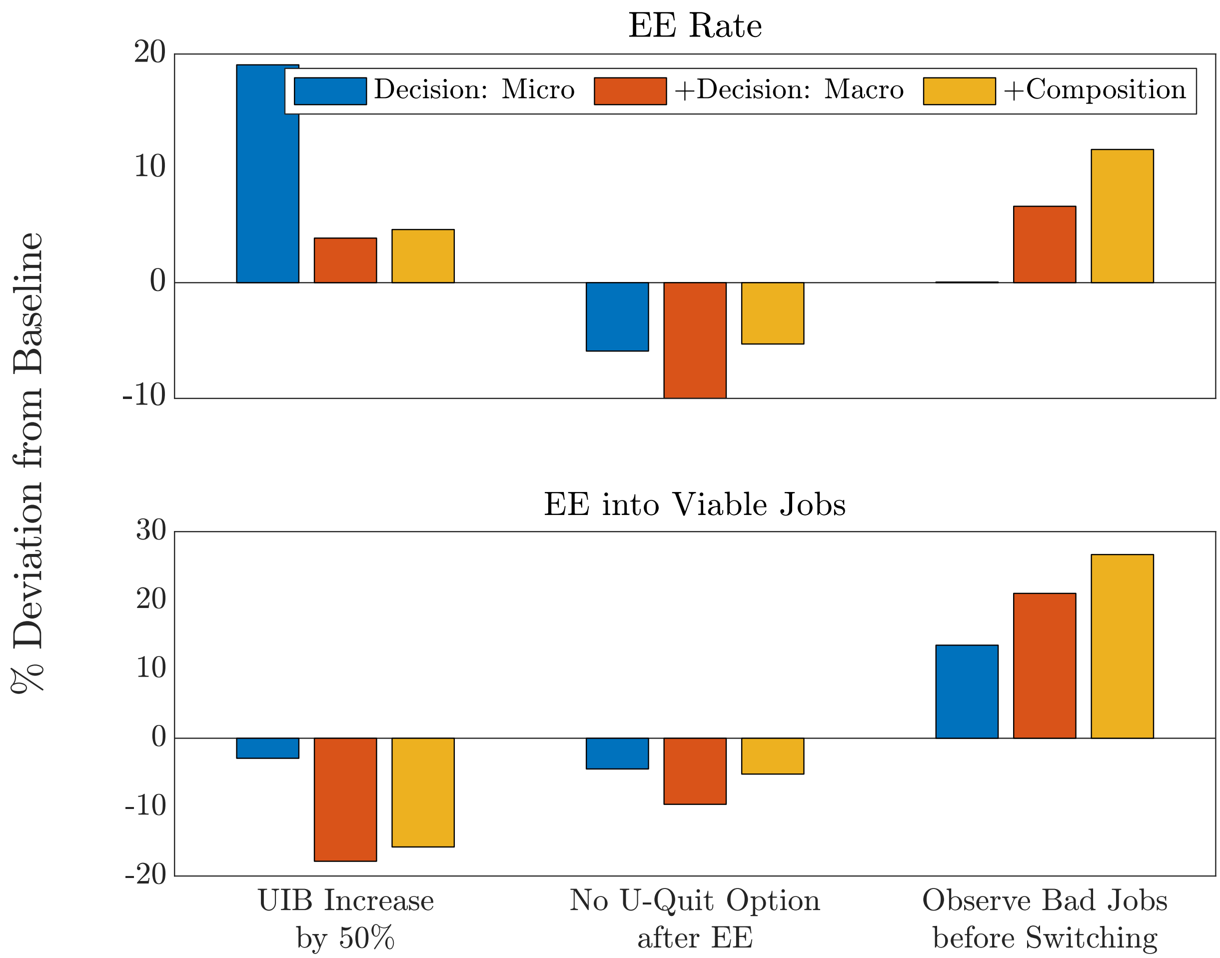
Notes: The Figure plots the relationship between job mobility (share of workers sampling a job offer (E)E), as a function of match quality. It does so separately for a low unemployment insurance benefit regime (blue solid line) and for a high unemployment insurance benefit regime (red dashed line). The vertical black dashed line denotes the marginal job that is no longer viable (has zero surplus) in the match quality ranking due to the higher benefits.

Figure 10: Transition Path of Job-to-Job Transition Probabilities



Notes: The figure plots the time series of the transition between a low and high unemployment insurance regime of the unemployment rate. The rate shoots up initially from the old steady state (denoted by the hollow red circle), and then gradually declines below the previous level, largely due to labor demand and compositional effects as illustrated in the decomposition presented in Figure 11.

Figure 11: Decomposition: Always-Viable Jobs Only



Notes: The bar chart decomposed the difference in EE mobility between the two steady states, with low and high UI benefits, into the worker-level micro decisions, the decisions at the aggregate level such as labor demand, and a compositional channel of job qualities. It does so for three experiments described in the main text: increasing UIBs, removing the quit option after job switches, and giving workers the opportunity to see the quality of bad jobs (those offering values below the value of uenmployment) before switching.

A Appendix: Model

In this section we elaborate on some of the derivations omitted in the main text and provide computational details.

A.1 Worker Flows

In this section, we describe the equations that characterize the steady state worker distribution induced by worker and firm problems. We note that in steady state the worker distribution over the state space is time-invariant, and thus inflows and outflows are equalized for each employment state.

Unemployment rate satisfies the following law of motion.

$$
\begin{aligned}
u' = \; & \overbrace{\delta(1-u)}^{\text{exogenous quit}} \\
& + \Bigg[\overbrace{(1-f)}^{\text{no contact}} + f \sum_{l=1}^{L} \Pr(\vec{q}_l) \overbrace{\mathbb{I}\{0 > \Phi_l(s')\}}^{\text{do not sample}} + f \sum_{l=1}^{L} \Pr(\vec{q}_l) \underbrace{\mathbb{I}\{0 \le \Phi_l(s')\}}_{\text{sample}} \sum_{m=1}^{M} q_{lm} \underbrace{\mathbb{I}\{S(v_m, s') < 0\}}_{\text{reject new match}} \Bigg] u \\
& + (1-\delta)\lambda f \sum_{k=1}^{M} e(v_k) \sum_{l=1}^{L} \Pr(\vec{q}_l) \overbrace{\mathbb{I}\{ \max\{\phi S(v_k, s'), 0\} \le \Phi_l(s')\}}^{\text{sample}} \sum_{m=1}^{M} q_{lm} \overbrace{\mathbb{I}\{S(v_m, s') < 0\}}^{\text{reject new match}} \\
& + (1-\delta)\lambda f \sum_{k=1}^{M} e(v_k) \sum_{l=1}^{L} \Pr(\vec{q}_l) \overbrace{\mathbb{I}\{ \max\{\phi S(v_k, s'), 0\} > \Phi_l(s')\}}^{\text{do not sample}} \overbrace{\mathbb{I}\{S(v_k, s') < 0\}}^{\text{endogenous quit}} \\
& + (1-\delta)(1-\lambda f) \sum_{m=1}^{M} e(v_m) \underbrace{\mathbb{I}\{S(v_m, s') < 0\}}_{\text{endogenous quit}}
\end{aligned} \tag{A.1}
$$

The first term captures exogenous separations into unemployment. The second line captures unemployed workers, who do not contact a firm, contact a firm but turn down the job offer lottery or take on the offer but the match realization next periods turns out to be too low to continue the employment relationship. The third line captures employed workers, who receive an offer and consummate the match, but end up in a very low quality match so they decide to quit. The fourth line captures employed workers who receive an offer, reject it, and quit endogenously into unemployment. Final line captures workers who do not receive an offer that quit endogenously.

The mass of employed workers with productivity v_m follows the law of motion:

$$
\begin{aligned}
e(v_m)' =&(1-\delta)\Bigg[\overbrace{(1-\lambda f)}^{\text{no contact}}\mathbb{I}\big\{S(v_m,s')\geq 0\big\}e(v_m) \\
&+\lambda f\sum_{l=1}^{L}\Pr(\vec{q}_l)\overbrace{\mathbb{I}\big\{\max\big\{\phi S(v_m,s'),0\big\}>\Phi_l(s')\big\}}^{\text{do not sample}}\mathbb{I}\big\{S(v_m,s')\geq 0\big\}e(v_m) \\
&+\lambda f\sum_{k=1}^{M}e(v_k)\sum_{l=1}^{L}\Pr(\vec{q}_l)\underbrace{\mathbb{I}\big\{\max\big\{\phi S(v_k,s'),0\big\}\leq\Phi_l\big\}}_{\text{sample}}q_{lm}\overbrace{\mathbb{I}\{S(v_m,s')\geq 0\}}^{\text{accept new match}}\Bigg] \\
&+f\sum_{l=1}^{L}\Pr(\vec{q}_l)\underbrace{\mathbb{I}\big\{0\leq\Phi_l(s')\big\}}_{\text{sample}}q_{lm}\underbrace{\mathbb{I}\big\{S(v_m,s')\geq 0\big\}}_{\text{accept new match}}u
\end{aligned}
\tag{A.2}
$$

The first two lines capture employed workers in type-v_m jobs, who do note receive offers or those that turn down their offers. The third line captures employed workers flowing into type-v_m matches. The last line captures workers flowing in from unemployment.