"Some are Given a Chance to Climb, but They Refuse:"
The Job Ladder, Unemployment Risk, and Incomplete Markets

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Abstract

This paper introduces the idea that incomplete insurance of unemployment risk leads workers to climb the job ladder inefficiently cautiously, because they apply a distorted valuation of job safety over productivity. That is, workers prefer to stay put in safe but low productivity jobs, and reject high productivity-high risk offers. The resulting misallocation depresses aggregate productivity and provides a new efficiency enhancing role for unemployment insurance. We formalize this channel in a sequential search model. Besides standard wage (match productivity) differences, the combination of three additional features is crucial for this result: on-the-job search, separation risk heterogeneity across jobs and incomplete markets. Existing models have not explored these three features jointly. First, models that emphasize incomplete markets preclude on-the-job search (e.g., Acemoglu and Shimer, 1999; Marimon and Zilibotti, 1999); we show that adding on the job search can neutralize or even reverse their main results. Second, models with on-the-job search and risk aversion do not feature separation risk heterogeneity (e.g. Lise, 2013); we show that incomplete markets have no direct effect on job-to-job transitions with homogeneous separation risk. Third, models with on-the-job search that do feature separation risk heterogeneity (e.g., Pinheiro and Visschers, 2015; Jarosch, 2023) exclusively assume risk neutrality/complete markets; we show that such models thereby miss the key quantitative implications of the risky job ladder as well as the ensuing key labor-market inefficiency.

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1 Introduction

Chaos isn't a pit. Chaos is a ladder. Many who try to climb it fail, and never get to try again. The fall breaks them. And some are given a chance to climb but they refuse. They cling to the realm, or the gods, or love. Illusion. Only the ladder is real. The climb is all there is.
Petyr Baelish (2017, Game of Thrones, Season 3 Episode 6)

Besides allocating workers between employment and nonemployment, the labor market reallocates a comparable number of already-employed workers between different jobs and firms (Davis and Haltiwanger, 1999), and on-the-job search appears three times as effective as search while unemployed (Faberman et al., 2022). Such direct job-to-job transitions are a crucial factor in wage growth through job ladders (Topel and Ward, 1992; Karahan, Ozkan, and Song, 2022; Haltiwanger, Hyatt, and McEntarfer, 2018), and fill and 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). However, while there is ample theoretical, empirical and policy focus on inefficient job choices of the unemployed, search models are built almost universally around one assumption: conditional on having received an outside offer, employed workers always make the *efficient* choice between staying put and switching jobs.[1]

In this paper we explore the idea that workers forgo some job-to-job moves that would increase their wages but expose them to higher unemployment risk. If workers are risk averse and insurance markets are incomplete, then unemployment risk looms *inefficiently* large in this tradeoff. Workers *overvalue* job security over wages: staying put in safe but low productivity jobs while rejecting high productivity-high risk offers—they "climb to safety." At the aggregate level, their excessive caution on the job ladder reduces aggregate productivity and is a form of misallocation. All this, in turn, raises a new role for unemployment insurance, by kickstarting the job ladder. We explore these issues qualitatively and quantitatively in a search model with three key features: (i) on-the-job search, (ii) job offers with heterogeneity in productivity but also in separation (unemployment) risk, and (iii) risk aversion and incomplete markets.

The idea that risk aversion and incomplete markets may distort one of the most important economic choices individuals can make—who to work for—is intuitive. For instance, there is emerging evidence on how wealth and liquidity constraints may distort behavior of *unemployed* job seekers (e.g., Chetty, 2008; Herkenhoff, 2019; Herkenhoff et al., 2023). For employed workers, we are not aware of similar existing evidence. Hence, we present in Figure 1 Panel (a) new motivating evidence from a survey of employed workers conducted in Germany. Asked why workers prefer to stay put rather than switching to a *similar* job with a wage premium, the most popular answer is: "I have a very safe job at my current employer. If I start at a different company the risk of

[1] This consideration between two jobs conditional on an outside offer is distinct from existing analyses on whether there is an efficient amount or direction of on-the-job search (Menzio and Shi, 2011), and whether workers appropriate the social value of a given job in bargaining with associated standard search externalities (Jarosch, 2023). Another exception is presented in Flinn and Mullins (2021), where rigid-wage and flexible-wage firms compete for workers.

losing the job would be higher."[2] In our model, this consideration arises naturally when jobs carry *heterogeneous* separation risk—an intuitive property, and consistent with empirical evidence. For instance, drawing on the U.S. Survey of Consumer Expectations, Figure 1 Panel (b) displays the substantial variation in (subjective) job loss risk the same individual perceives across different jobs she holds. Consistent with risk aversion and incomplete markets, Panels (c) and (d) provide suggestive empirical evidence for the channel we advance in this paper: workers with higher willingness to take risks, also engage in more job to job transitions (blue solid circles), and there is some evidence that they hold jobs with higher unemployment risk (red hollow diamonds) (for similar evidence, see Argaw et al., 2017; van Huizen and Alessie, 2019). We pick up in Section 5 the need for further direct evidence, and devote this paper to a qualitative and quantitative theoretical exploration of this channel.

Surprisingly, the inefficiency arising from a risky job ladder appears to not have been studied in the theoretical literature either. Specifically, while there are existing models with some of the three aforementioned required features *separately*, ours is the first model to feature them *jointly*.[3]

First, our channel is distinct from the canonical way the search literature has linked incomplete markets and risk aversion with aggregate productivity. Specifically, existing research abstracts from on-the-job search and has emphasized the insufficient selectivity of *unemployed* job seekers and the resulting role for unemployment insurance to restore efficiency (e.g., Acemoglu and Shimer, 1999; Marimon and Zilibotti, 1999). In fact, we show that adding on the job search can neutralize or even reverse the main results in this literature.

Second, there exist models that combine on the job search and risk aversion (e.g. Lise, 2013; Griffy, 2021). But these papers feature *homogeneous* separation risk and hence no matter the degree of risk aversion or market completeness, workers simply take a job whenever it pays more. Choices between jobs are always efficient and unaffected by market incompleteness.[4]

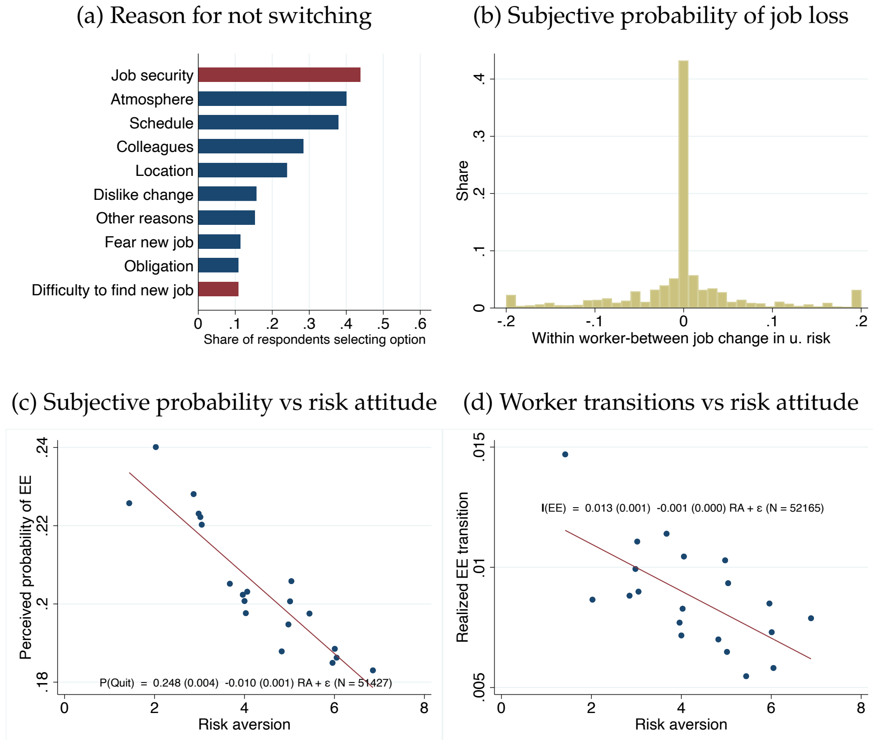
Third, models with on-the-job search that do feature separation risk heterogeneity (e.g., Pinheiro and Visschers, 2015; Jarosch, 2023) exclusively assume *risk neutrality*, equivalently, they assume *complete markets*, sidestepping the consequences of market incompleteness. We show that such models thereby miss our key results. Quantitatively, we find that the main effects of heterogeneous separation risk kicks in with risk aversion and incomplete markets: Excessive caution of

[2]Appendix Figure A.2 plots the same figure for the 2020 panel. Appendix Figures A.1 and A.3 display correlations between the probability of giving job security as a reason to not switch to a higher wage job, against proxies for the value of the current job and unemployment.

[3]A paper that features a model that comes closest to our setup is contemporaneous work by Larkin (2024), whose partial-equilibrium model links the secular decline in the US job separation rate to the increasing share of illiquid assets in household portfolios, which in turn amplifies the aggregate consumption drop in economic downturns. His model also features a two-dimensional job ladder and risk averse households under incomplete markets, but employs a richer asset structure, additionally tying cross-sectional heterogeneity in separation risk to portfolio choices. Among many differences in focus, model structure and applications, Larkin (2024) does not study the efficiency properties of job mobility and its aggregate productivity consequences, which are our main focus.

[4]Instead, Lise (2013) studies the consequences of the job ladder for savings behavior, and Griffy (2021) shows that wealthier agents search less intensively. Hubmer (2018) studies the role of the job ladder and wealth in explaining life-cycle earning dynamics. Chaumont and Shi (2022) study how wealth affects the trade off between wages and job finding rates in a directed search model.

Figure 1: Motivating evidence: considerations in job mobility, unemployment risk, and risk taking



Notes: Panel (a) plots the frequency of reasons selected for not switching employers in the 2019 German Socioeconomic Panel's custom module (for details see Jäger et al., 2024). The translation of the question is: "You told us that you think that X% of employees in Germany that are employed at a different employer, but work in the same occupation as you receive a higher wage. What are the main reasons for why you are currently (still) employed at your current employer even though other employers may offer you a higher wage?" Panels (b)-(d) use the Survey of Consumer Expectations. Panel (b) plots a histogram of job fixed effects from a regression of perceived job loss probability during the next 12 months on worker and job fixed effects (winsorization: -/+0.2). Panel (c) plots the perceived probability of voluntarily quitting from and losing one's job in the next 12 months against the respondent's willingness to take risks in daily activities (ranging from 1—not willing at all to 7—very willing) controlling for time fixed effects. Panel (d) plots realized monthly EE and EU transition indicators against risk taking, using the panel structure of the survey.

employed workers is more important than insufficient selectivity of unemployed workers in driving aggregate productivity losses from incomplete markets. The additional benefit of kickstarting the job ladder means that optimal policy prescribes raising unemployment benefits by 40%.

Qualitatively, the incomplete markets setup generates novel room for inefficient job choices *conditional* on an offer, i.e., above and beyond conventional sources we discuss in Footnote 1 above.[5] Additionally and perhaps for those reasons, none of those papers study the implications of policies such as unemployment insurance for job mobility.

We note that while our paper explicitly treats heterogeneity in match-specific separation risk,

[5]Perhaps a fourth strand of the literature on learning in the labour market (Jovanovic, 1979; Miller, 1984; McCall, 1990; Moscarini, 2005; Papageorgiou, 2013) features a notion of riskiness about match quality, but typically assumes risk neutral preferences; choices are constrained efficient subject to imperfect information.

we also experimented and obtained similar results with a model in which job switching as such boosts unemployment risk (e.g., due to loss of employment protection and seniority, or as job quality is revealed slowly on the job). By generating additional unemployment risk following an EE transition, those features would amplify the role of risk aversion and unemployment value in job mobility.

In Section 2, we review formally and in detail the existing classes of models, presenting them as stepping stones towards our model that combines all three key features. In Section 3, we integrate this building block, the worker side, into a quantitative equilibrium model. In Section 4, we calibrate the full model and assess the quantitative implications of our channel, including for optimal unemployment insurance. Section 5 concludes.

2 Partial-equilibrium model: a guided tour to our mechanism

We now present a simple model that formalizes the role of unemployment risk and risk aversion in shaping job mobility decisions, and ultimately in determining aggregate economic performance such as average wages and aggregate output. While doing so, we use intermediate model variants and relate them to the existing literature. The model in this section remains qualitative and is presented in partial equilibrium, but its mechanisms carry over to the full equilibrium model in Section 3 that we put to quantitative use in Section 4. Throughout, we highlight the productivity effects—output per capita—of UI benefits, and delay treatment of the important role of UI in providing insurance to unemployed workers by means of consumption smoothing to the quantitative model.

2.1 Baseline model: no on the job search and homogeneous job separation risk

We start with a parsimonious sequential labor search model. Workers are risk averse. There is no on the job search (OJS) and all jobs have a common separation rate into unemployment. We later relax these two assumptions to introduce the new mechanisms that are the focus of our paper.

Environment. We present the model in continuous time. Workers discount the future at rate r. Jobs arrive at an exogenous rate λ_0, offering wages drawn from a distribution with cumulative density function $F(w)$. Workers are hand-to-mouth consumers, and obtain consumption utility $u(c)$, with $c = w$ when employed in a job paying wage w and $c = b$ when unemployed and receiving unemployment insurance (UI) benefits b. We assume that the utility function is of the constant relative risk aversion (CRRA) form given by $u(c) = c^{1-\sigma}/(1-\sigma)$ with $\sigma \geq 0$. $\sigma = 0$ nests the risk-neutral case and $u(c) = \log(c)$ when $\sigma = 1$. Worker-firm matches separate at a rate δ, where the worker becomes unemployed.

Value functions. The value of unemployment is given by

$$rU = u(b) + \lambda_0 \int \max\{0, W(\widetilde{w}) - U\}\, dF(\widetilde{w}). \tag{1}$$

An unemployed job seeker consumes UI benefits, draws a wage offer $\widetilde{w}$ from $F(\widetilde{w})$ at rate λ_0, and accepts that offer if it yields a value higher than unemployment. The value of employment in a job paying wage w is given by

$$rW(w) = u(w) + \delta\left[U - W(w)\right], \tag{2}$$

where an employed worker consumes her wage w and separates into unemployment at rate δ.

Reservation wage. The reservation wage w^r renders the worker indifferent between accepting a job paying w^r and staying unemployed, satisfying the indifference condition $W(w^r) = U$, yielding:

$$\begin{aligned} u(w^r) &= u(b) + \frac{\lambda_0^*}{r+\delta}\Big(\mathbb{E}[u(w)|w > w^r] - u(w^r)\Big) && (3) \\ &\approx u(b) + \frac{\lambda_0^*}{r+\delta} \cdot \left(u(\overline{w}) - u(w^r)\right) && (4) \end{aligned}$$

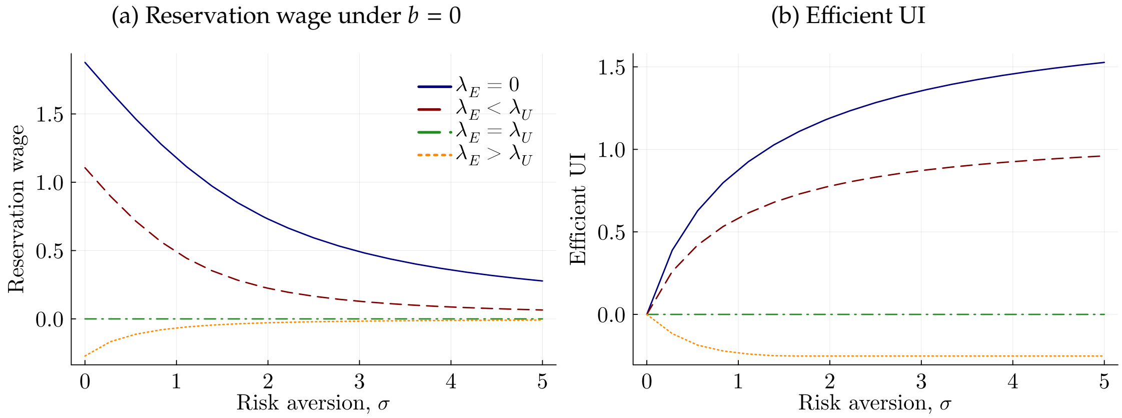
where $\lambda_0^* = \lambda_0\,(1 - F(w^r))$ is the job finding rate out of unemployment and $\overline{w} = \mathbb{E}[w|w \geq w^r]$ is the conditional mean of wages. The second line follows from approximating expected utility, which quantitatively captures essentially the full effect of risk aversion on the reservation wage, with little room for higher-order terms.[6]

Risk aversion and reservation wages. The approximation in Equation (4) makes clear that risk aversion shapes the reservation wage primarily through diminishing marginal utility of consumption by mediating the utility gap between the reservation job with wage w^r and unemployment with UI benefit b *relative* to the expected job with wage $\overline{w}$ and the reservation job with wage w^r. Since $b < w^r < \overline{w}$, a higher degree of risk aversion shrinks the gap between $u(\overline{w})$ and $u(w^r)$ by more than the gap between $u(w^r)$ and $u(b)$. Hence, to equilibrate the model, w^r must be closer to b, the higher the risk aversion.[7] *That is, risk averse workers have an inefficiently low level of selectivity,*

[6]Specifically, we take a second-order Taylor approximation of the expectational term in Equation (3) around $\overline{w}$ as in Hornstein et al. (2011) and show that the second-order (conditional variance) term is quantitatively unimportant. The full approximation is: $u(w^r) - u(b) \approx \frac{\lambda_0^*}{r+\delta} \cdot (u(\overline{w}) - u(w^r)) + \frac{\lambda_0^*}{r+\delta} \cdot 0.5u''(\overline{w})\,\mathrm{Var}(w|w > w^r)$. The second-order term captures the error arising from Jensen's inequality. In Appendix Figure A.5, we show that this error does not account for any significant portion of the effect of risk aversion (CRRA parameter σ) on the reservation wage. Concretely, we present the relationship between $w^r - b$ and σ for three models: the precise model in Equation (3), the second-order approximation just presented, and the first-order approximation in Equation (4). While the higher-order risk aversion term matters for a given σ across the models, the vast majority of the effect of σ on the reservation wage is captured by first-order effects. We acknowledge that this result may be sensitive to the underlying assumption for the wage-offer distribution.

[7]Part of the adjustment is brought about by changes in $\frac{\lambda_0^*}{r+\delta}$ and $\overline{w}$ following the reduction in w^r, which we ignore in this exposition for simplicity, but our later quantitative analyses incorporate the full effects.

Figure 2: The role of risk aversion in optimal UI



Notes: Panel (a) plots the reservation wage as a function of the risk aversion parameter σ in the CRRA utility function for four regimes of on the-job-search efficiency relative to unemployed job search efficiency when UI benefit is $b = 0$. Panel (b) plots the UI benefit level that recovers the reservation wage of the risk-neutral economy with $b = 0$ under those four regimes as a function of σ.

seeking to escape from unemployment to any job quickly, rather than holding out for better-paying jobs.

Inefficiency from risk aversion and incomplete markets. We illustrate this inefficiency quantitatively in Figure 2 Panel (a) (solid blue line, with OJS efficiency $\lambda_1 = 0$, a parameter we introduce below). The blue line plots the reservation wage on the y-axis against various degrees of risk aversion when UI is $b = 0$.[8] Linear utility ($\sigma = 0$) captures the absence of risk aversion or perfect consumption insurance/complete markets under risk aversion, and the social planner's reservation wage choice.[9] As risk aversion (σ) goes up, the reservation wage falls. This downward-sloping pattern indicates an inefficiently low job selectivity under risk aversion and market incompleteness, as in our case of hand-to-mouth consumers.

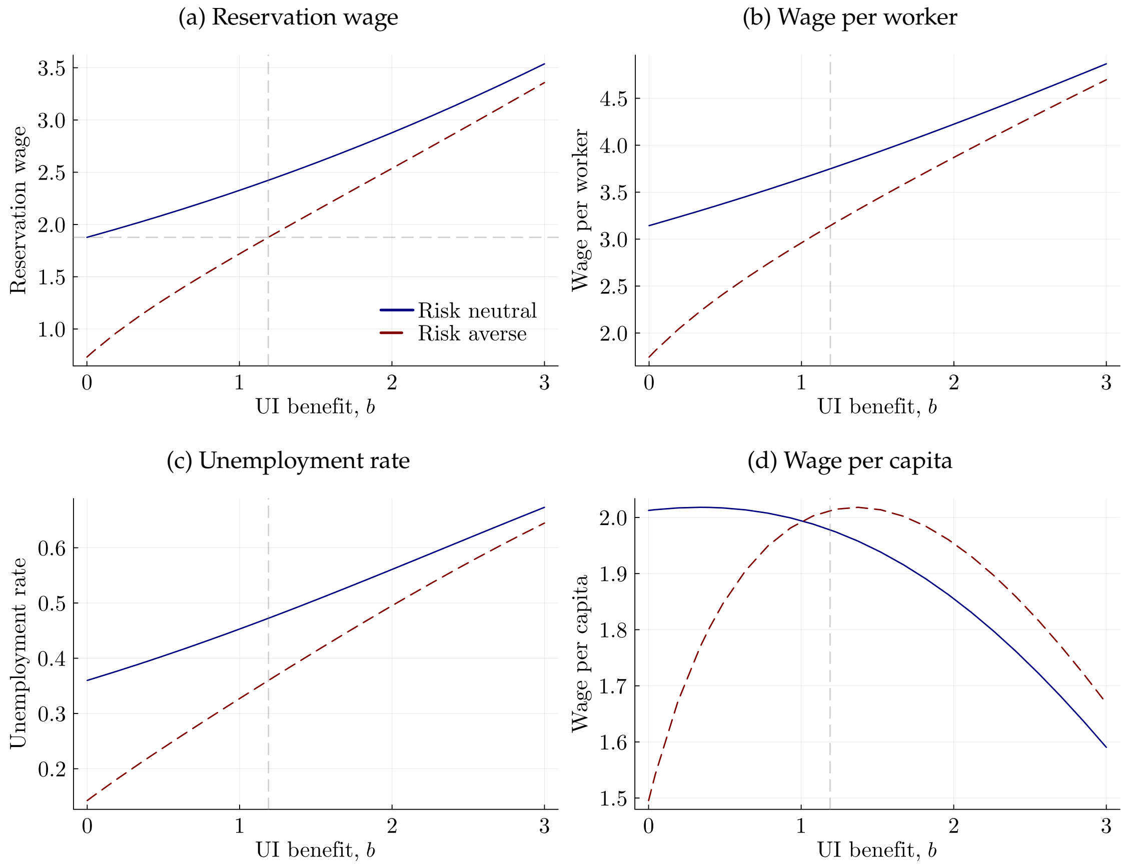
The effects of UI on the reservation wage. Equation (3) raises a feasible policy intervention: since the reservation wage w^r is increasing in b for any σ, the policy maker facing risk averse workers can implement the risk neutral—and hence efficient—allocation by choosing the b that delivers the w^r emerging under risk neutrality with $b = 0$.

We illustrate this logic in Figure 3 Panel (a), plotting the relationship between w^r and b, for two economies with risk neutral ($\sigma = 0$) and the risk averse ($\sigma > 0$) workers. For $b = 0$, w^r is too low under risk aversion, but it increases in b. The figure highlights the level of UI b^*_{RA} that

[8]To be able to set $b = 0$ as the no-UI case under risk aversion ($\sigma > 0$), we specify consumption for the unemployed and employed as $c = h + b$ and $c = h + w$, respectively, where h can be viewed as home production or simply as a preference shifter.

[9]More precisely, the reference is to the choices risk-averse individuals would make if they faced complete markets, and hence equalized marginal utilities across wage/employment states, but did not act on the resulting moral hazard (on reservation wages) and committed to the efficient strategy when buying the assets.

Figure 3: Effects of UI benefits: no on the job search and homogeneous separation risk



Notes: This figure plots outcomes against UI benefit level from the model with no on-the-job search and homogeneous job separation risk for the risk neutral (blue solid lines) and the risk-averse (red dashed lines) economies. Panel (a) plots the reservation wage, Panel (b) plots the average wage per employed worker, Panel (c) plots the unemployment rate and Panel (d) plots the wage per capita. The dashed vertical line indicates the UI level that gives the efficient level of UI in the risk averse economy, i.e., the UI level that yields the same reservation wage in the risk neutral economy with no UI.

would implement the corresponding efficient allocation, illustrated by the dotted lines. The blue solid line in Figure 2 Panel (b) traces out this relationship as a function of σ by plotting the UI benefit level that implements the reservation wage of the risk neutral economy. The higher the risk aversion parameter σ, the higher the required UI to undo the distortions of incomplete markets.

Aggregate outcomes. Figure 3 Panel (a) showed that risk aversion lowers the reservation wage relative to the risk neutral case. The three additional panels show the effects of risk aversion on aggregate outcomes. Average wages of employed workers ($\overline{w} = \frac{\int_{w^r}^{\infty} \tilde{w} dF(\tilde{w})}{1-F(w^r)}$) are lower—Panel (b)), and so is unemployment ($u = \frac{\delta}{\delta+\lambda_0^*}$—Panel (c)), as risk-averse workers exit unemployment more quickly than risk-neutral ones.

Panel (d) shows the net result of lower employment and higher wages, plotting wage per capita, $\overline{y} = u \cdot 0 + (1-u) \cdot \overline{w}$—a measure of output. For $b = 0$, $\overline{y}$ is lower in the risk-averse economy than its risk-neutral counterpart. As UI increases, wage per capita unambiguously falls under risk neutrality. This relationship is hump-shaped with risk aversion. The maximal wage per capita is attained at a positive b that in Panel (a) incentivizes the risk averse worker to search efficiently.[10] Hence, our model captures the key insight in Acemoglu and Shimer (1999).

2.2 The model with on the job search and homogeneous job separation risk

The previous model abstracted from OJS. By assumption, the model therefore precludes the interaction of unemployment risk and risk aversion in shaping job mobility decisions that our paper highlights. Before moving to the full model (with OJS and heterogeneity in job security), we now incrementally add OJS. This intermediate model variant provides a surprising result: OJS can break the previous results regarding the role of risk aversion and unemployment insurance in the productive efficiency of the economy.

Additional model features. OJS allows for drawing another wage offer during employment at rate λ_1, in which case the worker observes the new wage $\widetilde{w}$ and decides whether to switch. Such a job-to-job transition occurs whenever the value of the outside offer $W(\widetilde{w})$ exceeds the value from the current one $W(w)$. The unemployment value in Equation (1) is unchanged, but the value function for the employed worker in Equation (2) changes to:

$$rW(w) = u(w) + \lambda_1 \int_{w}^{\infty} \big(W(\widetilde{w}) - W(w)\big) dF(\widetilde{w}) + \delta\big[U - W(w)\big], \tag{5}$$

where we use the fact that $W(w)$ is increasing in w, and hence offers with $\widetilde{w} > w$ are accepted by the worker.

Reservation wage for UE switches. The reservation wage of unemployment-to-employment (UE) switches continues to be defined by $W(w^r) = U$, and results in the following expression (using integration by parts):[11]

$$u(w^r) = u(b) + (\lambda_0 - \lambda_1) \int_{w^r}^{\infty} \big(W(\widetilde{w}) - W(w^r)\big) dF(\widetilde{w}) = u(b) + (\lambda_0 - \lambda_1) \int_{w^r}^{\infty} \frac{\big(1 - F(\widetilde{w})\big) u'(\widetilde{w})}{r + \delta + \lambda_1 (1 - F(\widetilde{w}))} d\widetilde{w}. \tag{6}$$

Importantly, the relative search efficiency on- and off-the job matter for the UE reservation wage. To this end, we study four cases for the relative values of λ_1 and λ_0, by analyzing the response of the economy to shifts in UI benefit b and its sensitivity to risk aversion σ. For each case, we use

[10] Wage per capita is maximized at the UI benefit level that implements the efficient reservation wage only when the discount rate is zero, which is our calibration. Otherwise, the efficient b falls slightly short of the per-capita wage maximizing UI level due to discounting.

[11] Equation (6) is not directly comparable to its counterpart without OJS in Equation (3), which is cast in terms of expected utilities. Of course, this expression does characterize the reservation wage in the no OJS case when we set $\lambda_1 = 0$.

variants of Figure 3, relegated to Appendix Figures A.6-A.8. Our main discussion is summarized in the form of additional lines in Figure 2.

The case with $\lambda_1 = 0$ (Figure 2 blue solid lines) precisely captures the baseline model's reservation wage definition in Equation (3), whose properties we already discussed.

With "some" on the job search, $0 < \lambda_1 < \lambda_0$, the risk averse economy still exhibits too low a reservation wage, illustrated by the downward-sloping red dashed lines in Figure 2 Panel (a). But OJS attenuates the inefficiencies caused by risk aversion. Panel (b) makes this clear because the amount of unemployment insurance needed to bring about the efficient reservation wage is lower for any given risk aversion level σ. The intuition is that OJS reduces the search advantage of unemployment over employment. Hence, the inefficiency from risk aversion, which stems from exiting unemployment too quickly rather than holding out for better jobs, is weakened.

In fact, when OJS is equally effective as unemployed search ($\lambda_1 = \lambda_0$), OJS *entirely* eliminates the inefficiencies at the UE margin due to risk aversion. The green dash-dotted line in Panel (a) is flat such that for any risk aversion level σ, unemployed searchers make efficient decisions as if they were risk neutral or fully insured. Equation (6) clarifies this simple result: for $\lambda_1 = \lambda_0$, $u(w^r) = u(b)$ and therefore $w^r = b$ *irrespective of the shape of the utility function or of market completeness*. Hence, Panel (b) shows that for any σ, optimal unemployment insurance benefit level is zero. Hence, all other outcomes, too, are identical between all risk-averse economies and the risk neutral one, for a given level of b. Finally, when $\lambda_1 > \lambda_0$ (yellow dotted lines), i.e., OJS is more effective than unemployed search, risk averse searchers are too selective, and refuse to take "internships" that pay wages below b even though the associated job ladder gains would outweigh this consumption drop under complete markets. Hence, Panel (b) predicts more and more *negative* efficient UI levels, the more risk averse the workers are.

To our knowledge, the result that the inefficiencies in the spirit of Acemoglu and Shimer (1999) highlighted in Section 2.1 can be neutralized or even reversed with OJS is new. In other words, we find that the structure of the labor market can undo the allocative consequences of a financial markets inefficiency. We also reiterate that empirical evidence points to $\lambda_1 > \lambda_0$; for instance, survey evidence by Faberman et al. (2022) suggests that on-the-job search is three times as effective as search while unemployed.

Reservation wage for EE switches. While OJS has large potential implications for how risk aversion shapes UE switches, neither risk aversion nor unemployment insurance play any role in EE transitions in standard labor-market models. This is because workers simply switch whenever a job offers a higher value $W(\widetilde{w}) > W(w)$, and since $W(\widetilde{w})$ is increasing in wage $\widetilde{w}$ monotonically. The only way risk aversion or UI may shape job mobility is by changing the composition of jobs formed out of unemployment. Given first job out of unemployment, the worker's career trajectory is unaffected by her risk aversion with respect to job mobility. That is, risk aversion and UI may truncate the job ladder (unless $\lambda_1 \geq \lambda_0$), but they do not affect the workings of the job ladder itself.[12] We break this strong neutrality result below, by adding heterogeneity in unemployment risk across jobs.

2.3 Our model: risk aversion, on the job search, and heterogeneous separation risk

We now introduce our preferred model, which recognizes the fact that jobs differ not only in the wage but also in separation rate δ. That is, our model can be viewed as conducting a normative analysis in the spirit of Acemoglu and Shimer (1999)—who do not feature OJS and hence focus on the UE margin only—in the context of the two-dimensional job ladder. We show that heterogeneity in job safety breaks the neutrality of the job ladder with respect to risk aversion we have established in the previous section. Instead, risk aversion now affects the strategy and speed with which employed workers climb the job ladder, and introduces a new source of labor market inefficiency. It also raises a new role for unemployment insurance in alleviating this inefficiency.

We note the important prior work developing the two-dimensional job ladder by Pinheiro and Visschers (2015) and Jarosch (2023). Importantly, the model in Pinheiro and Visschers (2015) does not feature risk aversion or market incompleteness, and focuses on the compensating differentials mechanism (see Equation (19) below). Our paper is also related to the model in Jarosch (2023), which also features risk neutrality and among other items differs from Pinheiro and Visschers (2015) in that his model features wage bargaining rather than wage posting, an assumption we also draw on in our full model in Section 3. Jarosch (2023) provides a positive analysis of the effect of the risky job ladder on persistent earnings losses following job displacement.[13] By assuming risk neutrality/complete markets, these models miss the key quantitative implications of the risky job ladder as well as the key inefficiency it introduces, and the role of UI in alleviating this inefficiency.

Additional model features. The addition of heterogeneity in job safety now means that workers draw job offers (w, δ) from a joint cumulative distribution function $F(w, \delta)$. For reference, we define job acceptance sets as wage-separation rate combinations $(\widetilde{w}, \widetilde{\delta})$ that a worker accepts for two cases: the UE margin, i.e., a currently unemployed job seeker presented with a job offer, and for the job-to-job mobility margin, i.e., a currently employed worker considering an outside offer:

$$A^U = \left\{(\widetilde{w}, \widetilde{\delta}) \in \mathbb{R}^2 : W(\widetilde{w}, \widetilde{\delta}) \geq U\right\} \tag{7}$$

$$A(w, \delta) = \left\{(\widetilde{w}, \widetilde{\delta}) \in \mathbb{R}^2 : W(\widetilde{w}, \widetilde{\delta}) \geq W(w, \delta)\right\}. \tag{8}$$

[12]We emphasize again that the expositional treatment in this section is partial equilibrium. Our full quantitative analysis features free-entry, allowing for changes in the model environment to affect worker contact rates λ_0 and λ_1.

[13]For risk neutrality, the framework we develop in this section directly nests the *socially efficient* case of Jarosch (2023). In Jarosch's partial equilibrium model risk-neutral workers search for jobs out of unemployment and on the job. Wages are fixed, which can only be renegotiated when either party has a credible threat to abandon the match. In this framework, he shows that the decentralized equilibrium is efficient if and only if workers have full bargaining power. Thus, in what follows, we assume that wages are equal to match productivity, $w = z$. Hence, wages are a direct measure of output, and the version of the model under risk-neutral preferences is socially efficient.

Using the definition of these sets, the value of unemployment can be written as:

$$rU = u(b) + \lambda_0 \int \max\left\{0, W(\widetilde{w}, \widetilde{\delta}) - U\right\} dF(\widetilde{w}, \widetilde{\delta}) \tag{9}$$

$$= u(b) + \lambda_0 \int_{A^U} \left(W(\widetilde{w}, \widetilde{\delta}) - U\right) dF(\widetilde{w}, \widetilde{\delta}). \tag{10}$$

Similarly, the employment value in a job with wage w and separation rate δ is given by:

$$rW(w, \delta) = u(w) + \lambda_1 \int \max\left\{0, W(\widetilde{w}, \widetilde{\delta}) - W(w, \delta)\right\} dF(\widetilde{w}, \widetilde{\delta}) + \delta\left[U - W(w, \delta)\right] \tag{11}$$

$$= u(w) + \lambda_1 \int_{A(w,\delta)} \left(W(\widetilde{w}, \widetilde{\delta}) - W(w, \delta)\right) dF(\widetilde{w}, \widetilde{\delta}) + \delta\left[U - W(w, \delta)\right]. \tag{12}$$

UE transitions: no selectivity regarding job security. We first show that despite having rich implications for job-to-job flows, heterogeneity in job security preserves the properties of the one-dimensional reservation wage as the full description of the search policy for unemployed workers. Conversely, unemployed workers—no matter their risk aversion or the UI level—do not exert any selectivity along job security in their acceptance decisions.[14] Hence, compositional implications from selectivity regarding job security exclusively emanate from job-to-job transitions, with no role for the UE margin.

To show this result, we start by defining the set of *reservation jobs* R^U for unemployment as

$$R^U = \left\{(\widetilde{w}, \widetilde{\delta}) \in \mathbb{R}^2 : W(\widetilde{w}, \widetilde{\delta}) = U\right\}. \tag{13}$$

Evaluating Equation (12) at these reservation jobs reveals that their value is independent of the offers' riskiness δ:

$$rW\left((w, \delta) \in R^U\right) = u(w) + \lambda_1 \int_{A^U} \left(W(\widetilde{w}, \widetilde{\delta}) - U\right) dF(\widetilde{w}, \widetilde{\delta}). \tag{14}$$

Moreover, using Equations (9) and (14), we can pin down a standard one-dimensional reservation wage w^r characterizing the unemployed worker's behavior that is independent of δ:[15]

$$u(w^r) = u(b) + (\lambda_0 - \lambda_1) \int_{A^U} \left(W(\widetilde{w}, \widetilde{\delta}) - U\right) dF(\widetilde{w}, \widetilde{\delta}). \tag{15}$$

Hence, the distribution of offers accepted out of unemployment is truncated below by a reservation wage that is independent of the individual riskiness of the jobs taken.

As a special case, whenever $\lambda_1 = \lambda_0$, it again holds that $w^r = b$, even in an environment with

[14] This generalizes the neutrality result in Pinheiro and Visschers (2015) whose model does not feature risk aversion. Similarly, in the model of Jarosch (2023) with *neutral* workers (and no consideration of different UI benefit levels or OJS efficiency regimes), a similar neutrality is pointed out in Footnote 15. This is analogous to the result we highlight, albeit not precise due to the discrete-time nature of that model.

[15] Hence, R^U and A^U could alternatively be defined in a one-dimensional way along wages only.

job security heterogeneity and risk aversion. This case further neutralizes any effects of job values on reservation wages. We exploit this convenient result below to surgically isolate the role of the risky job ladder in aggregate outcomes.

Job-to-job transitions. By contrast, unemployment risk and risk aversion matter separately and interactively for job-to-job transitions. To see this, we define the gains from moving from job (w,δ) to $(\widetilde{w},\widetilde{\delta})$ using Equation (11):

$$\begin{aligned} rW(\widetilde{w},\widetilde{\delta}) - rW(w,\delta) =& u(\widetilde{w}) + \lambda_1 \int_{A(\widetilde{w},\widetilde{\delta})} \left(W(\widehat{w},\widehat{\delta}) - W(\widetilde{w},\widetilde{\delta})\right) dF(\widehat{w},\widehat{\delta}) + \widetilde{\delta}\left[U - W(\widetilde{w},\widetilde{\delta})\right] \\ & - u(w) - \lambda_1 \int_{A(w,\delta)} \left(W(\widehat{w},\widehat{\delta}) - W(w,\delta)\right) dF(\widehat{w},\widehat{\delta}) - \delta\left[U - W(w,\delta)\right]. \end{aligned} \tag{16}$$

Considering situations where $W(\widetilde{w},\widetilde{\delta}) \geq W(w,\delta)$, which implies $A(\widetilde{w},\widetilde{\delta}) \subseteq A(w,\delta)$, we simplify this equation to:

$$\left(r + \delta + \lambda_1\left(1 - F\left(A(\widetilde{w},\widetilde{\delta})\right)\right)\right) \cdot \left(W(\widetilde{w},\widetilde{\delta}) - W(w,\delta)\right) = u(\widetilde{w}) - u(w) - \left(\widetilde{\delta} - \delta\right)\left(W(\widetilde{w},\widetilde{\delta}) - U\right) - \epsilon, \tag{17}$$

where $\epsilon = \lambda_1 \int_{A(w,\delta)\setminus A(\widetilde{w},\widetilde{\delta})} \left(W(\widehat{w},\widehat{\delta}) - W(w,\delta)\right) dF(\widehat{w},\widehat{\delta})$.[16] Hence, unlike for UE transitions, separation risk looms saliently in the job mobility decision. The worker incorporates in her decision both the utility gain from higher wages, $u(\widetilde{w}) - u(w)$, as well as the separation risk difference, $\widetilde{\delta} - \delta$, mediated by a pricing factor we discuss below.

These intuitions are crystallized using indifference curves for separation risk vs. wages, i.e., a set of reservation jobs $R(w,\delta)$ given a current job (w,δ):

$$R(w,\delta) = \left\{(\widetilde{w},\widetilde{\delta}) \in \mathbb{R}^2 : W(\widetilde{w},\widetilde{\delta}) = W(w,\delta)\right\}. \tag{18}$$

For all reservation jobs of any given job, $\epsilon = 0$ holds precisely in Equation (17), yielding the following expression:[17]

$$u(\widetilde{w}) - u(w) = \left(\widetilde{\delta} - \delta\right) \cdot \left[W(\widetilde{w},\widetilde{\delta}) - U\right] = \left(\widetilde{\delta} - \delta\right) \cdot \left[W(w,\delta) - U\right], \tag{19}$$

where the second equality follows from realizing $W(w,\delta) = W(\widetilde{w},\widetilde{\delta})$ along an indifference curve.

Equation (19) has three intuitive features. First, the left-hand side defines the wage premium a job needs to offer to induce the worker to switch—in utility terms, and hence it is shaped by risk

[16] This term captures the forgone value of switching out of the original job to interim jobs inferior to the offer received, captured by the set $A(w,\delta) \setminus A(\widetilde{w},\widetilde{\delta})$. This integral is always weakly dominated by the first two terms in Equation (17), when $W(\widetilde{w},\widetilde{\delta}) \geq W(w,\delta)$.

[17] To see this, note that when two jobs offer the same utility, $W(\widetilde{w},\widetilde{\delta}) = W(w,\delta)$, their acceptance sets are identical, i.e., $A(\widetilde{w},\widetilde{\delta}) = A(w,\delta)$. This in turn implies $A(w,\delta) \setminus A(\widetilde{w},\widetilde{\delta}) = \emptyset$, yielding $\epsilon = \int_{\emptyset} \left(W(\widehat{w},\widehat{\delta}) - W(w,\delta)\right) dF(\widehat{w},\widehat{\delta}) = 0$.

aversion. Second, the right hand side features the difference in the separation rates, $\widetilde{\delta} - \delta$. Under homogeneous δ, as in the standard model, this term is always zero, and hence workers simply climb up the job ladder whenever the new job offers a higher wage—*irrespective of risk aversion and the level of UI*. Third, this difference is multiplied by the "price" of unemployment risk, $W(w, \delta) - U$. The higher this gap is, the larger the additional unemployment risk looms. For instance, for the reservation job out of unemployment, this price is zero as $W(w, \delta) = U$.

Our Equation (19) therefore extends prior work by Pinheiro and Visschers (2015) to a setting with risk aversion. In fact, the equation is exactly analogous to Equation (3) in Pinheiro and Visschers (2015), whose model features risk neutrality, and who do not present indifference curves. Jarosch (2023) does not feature an analog of Equation (19) but does present indifference curves in his Figure 1. To reiterate, neither paper features risk aversion and the resulting inefficiences from incomplete markets.

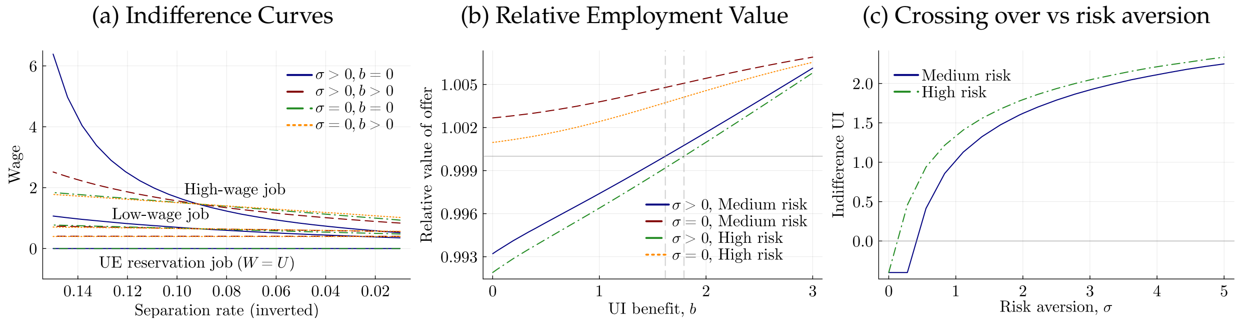
Indifference curves. We now illustrate how risk aversion and UI shape job mobility through the three terms in Equation (19)—which traces out indifference curves, i.e., the combinations job security $\widetilde{\delta}$ and wage $\widetilde{w}$ an outside offer provides that leaves the worker indifferent between staying in her current job (w, δ) and accepting the offer. Since $W(w, \delta) - U$ is independent of $(\widetilde{w}, \widetilde{\delta})$ and taken as given, Equation (19) yields an analytical expression for $\widetilde{w}$ as a function of the separation risk differential and the original wage.[18] We plot the resulting indifference curves in Figure 4 for two jobs, and two values for the UI level b (0 and 0.4). We further study these cases under linear utility ($\sigma = 0$), and risk aversion ($\sigma > 0$). To highlight the neutrality of the reservation wage out of unemployment with respect to job risk, the figure includes the indifference curves for unemployment as well.

The irrelevance of separation risk for UE transitions. The first insight is that the indifference curves for jobs out of unemployment are flat—irrespective of risk aversion. The worker accepts all jobs that pay a wage above the reservation wage, regardless of job security and risk aversion. Different levels of b shift the reservation wage, but do not affect the trade-off between job security and wages, i.e., the slope of the indifference curve, consistent with Equations (19) and Equation (15).

The role of risk aversion in job mobility. The second insight emerges from studying indifference curves relevant for EE transitions. We focus on a high-wage job, and turn attention to a low-wage job at the end of this section. Here, risk aversion steepens the indifference curves. This result stems from a combination of two margins. First, σ lowers the utility gain from higher wages—a result analogous to the UE margin discussed in Section 2.1. Second, this property additionally widens the gap between the value of a job and unemployment—hence amplifying the price of risk. The

[18]For CRRA utility, the indifference curve is given by $\widetilde{w} = (1-\sigma)^{\frac{1}{1-\sigma}} \left(\frac{w^{1-\sigma}}{1-\sigma} + (\widetilde{\delta} - \delta) \cdot [W(w, \delta) - U] \right)^{\frac{1}{1-\sigma}}$. It is immediately clear then that the indifference curves are linear under risk-neutrality.

Figure 4: The case with OJS and separation heterogeneity



Notes: Panel (a) plots indifference curves for an unemployed worker, a worker in a low-wage job and a worker in a higher-wage job (with the same separation risk) for risk-averse and risk-neutral economies vs no-UI and a positive level of UI. The UE reservation job lines are identical across the σ values for each b value. Panel (b) plots the value of a job relative to an underlying low wage-low risk job as a function of UI benefits for two jobs (high wage-high risk and high wage-medium risk) and two risk aversion regimes. Panel (c) plots the level of UI that renders a worker indifferent between the underlying low wage-low risk job and those two jobs with different wage and risk profiles.

risk neutral economy exhibits a low slope of wages against separation rates, indicating that the worker is willing to give up a lot of job security to move up the wage dimension of the job ladder. By contrast, the risk averse economy features a much steeper indifference curve, as workers fear unemployment and need a higher wage premium to accept a given increase in unemployment risk. The shape of the indifference curve is also no longer linear, as described above, with σ determining its curvature and hence the trade-off between job security and wages.

Jobs beneath the risk averse line and above the risk neutral line—concentrated in the high separation risk and high wage area—are those jobs that the risk averse consumer passes on, in favor of staying in the relatively stable but low-wage job. Hence, risk aversion and incomplete markets inhibit the formation of high-wage, high-risk jobs. By contrast, a risk neutral calibration (see, e.g., Jarosch, 2023) may quantitatively miss this role of job security.

Heterogeneity across the job ladder. We additionally plot the indifference curves for a lower wage job with the same job separation rate. Comparing the two jobs, the curves are steeper for the high-wage job. This is intuitive: the price of risk is larger for the high wage job because $W - U$ is higher—so that a given increase in separation risk looms larger. This implies that separation risk and the amplification from risk aversion bites more for the jobs at the top of the wage distribution.

In fact, when we replicate our motivating evidence in Figure 1 from 2019 for 2020 in Appendix Figure A.2 that includes the COVID recession, we find a substantially higher fraction of individuals voicing job security as a reason for staying put. Moreover, splitting up the survey by proxies for $W - U$, we find a positive correlation between these proxies and the probability of selecting this reason, both in 2019 and 2020. Appendix Figures A.1 and A.3 report those suggestive results.

The role of UI in job mobility. The figure further shows the workings of UI in boosting job mobility by plotting the same indifference curves for a positive UI level b. This higher UI compresses the gap between the value of the job and unemployment, i.e., it lowers the above-discussed price of separation risk. It does so particularly in the risk averse economy, as indicated by flattening indifference curves. The area between the no-UI and UI lines are those jobs that the risk averse worker is now willing to accept out of her original job. The indifference curves moving closer to their risk-neutral counterparts indicate an improvement in the productive efficiency of the economy, clarifying how UI offsets some of this new source of inefficiency.

This result shows that introducing heterogeneity in job safety breaks the neutrality of UI in shaping job-to-job transitions. Importantly, the figure also makes clear that risk aversion is needed for this effect to be quantitatively important. Moreover, risk aversion (and incomplete markets) imply that the no-UI benchmark features inefficiently low willingness to accept risky jobs, a novel mechanism.

Efficiency considerations and UI. We present two additional figures to spotlight the interaction of risk aversion and UI in job mobility explicitly—following our account of the basic logic of Acemoglu and Shimer (1999) at the UE margin in Section 2.1, but now applying it to the EE margin. Figure 4 Panel (b) plots the value of a high-risk, high-wage offer relative to a low-risk, low-wage job, against UI benefit b, for risk neutral and risk averse workers. At $b = 0$, the risk neutral economy favors the high-wage, high-risk job—but the risk averse setting leads workers to stay put in the safe job when faced with this offer. However, as b goes up, the risk averse economy increases the relative valuation of the risky job—and finally meets and crosses the indifference condition, a relative value of one. We denote this cutoff UI by b^* that renders the risk averse worker indifferent to making the switch—analogously to our reservation wage exercise in Figure 2 Panel (a) in Section 2.1. For this specific current job-outside offer pair, b^* hence restores the efficient (risk neutral) job mobility choice. Yet, the higher the risk aversion, the farther away the flipping point of relative job values, and hence the higher the required UI level. Figure 4 Panel (c) illustrates this point by plotting—for the same pair—efficient b^* against risk aversion σ—analogously to Figure 2 Panel (b) in Section 2.1.

A crucial difference between the EE and the UE margins discussed in Section 2.1 in the spirit of Acemoglu and Shimer (1999) is that each pairing of jobs and offers requires its own UI level to restore efficiency. To see this, we plot in Figure 4 Panels (b) and (c) one more job offer with an even higher separation risk. The tipping point for the riskier job is at an even higher UI level—making it clear that no single UI level can restore efficiency in the economy with OJS and heterogeneous job safety. That is UI, in the form of a flat payment is too coarse a tool—a single instrument—to affect multiple margins. A richer tool set such UI benefits designed as replacement rates that depend on past jobs or a severance pay as a fraction of current wages might improve efficiency even further. Nevertheless, the effects and issues we have highlighted here have, to the best of our knowledge, not been been treated in a dedicated study so far.

Aggregate outcomes: separations and unemployment. We close our analysis by plotting aggregate outcomes against UI level in our general model, with and without risk aversion in Figure 5. Figure 6 elaborates on specific mechanisms.

Figure 5 Panel (a) plots the average wage of UE hires, which is identical for both the risk neutral and risk averse economy.[19] Hence, the job finding rate is the same across the economies, for given b.

In Panel (b), we plot the average separation rate of jobs accepted by UE hires, which is constant at a common level for both the risk averse and risk neutral economies.[20] Hence, as reservation wages and separation risks are identical between the risk averse and risk neutral economies for hires out of unemployment, the only margin by which the unemployment rate may differ is the average separation risk of employed workers between the two economies. Any such shift must arise from EE transitions on the job ladder rather than the UE margin: whether workers decide, once in a job, to conduct EE transitions into riskier or less risky jobs.

Indeed, in Panel (b), when plotting additionally the average separation risk of the destination job following an EE transition, we find that workers switch to safer jobs in the risk averse economy. This echoes the analytical results above, that once on the job ladder, risk averse workers seek job safety.

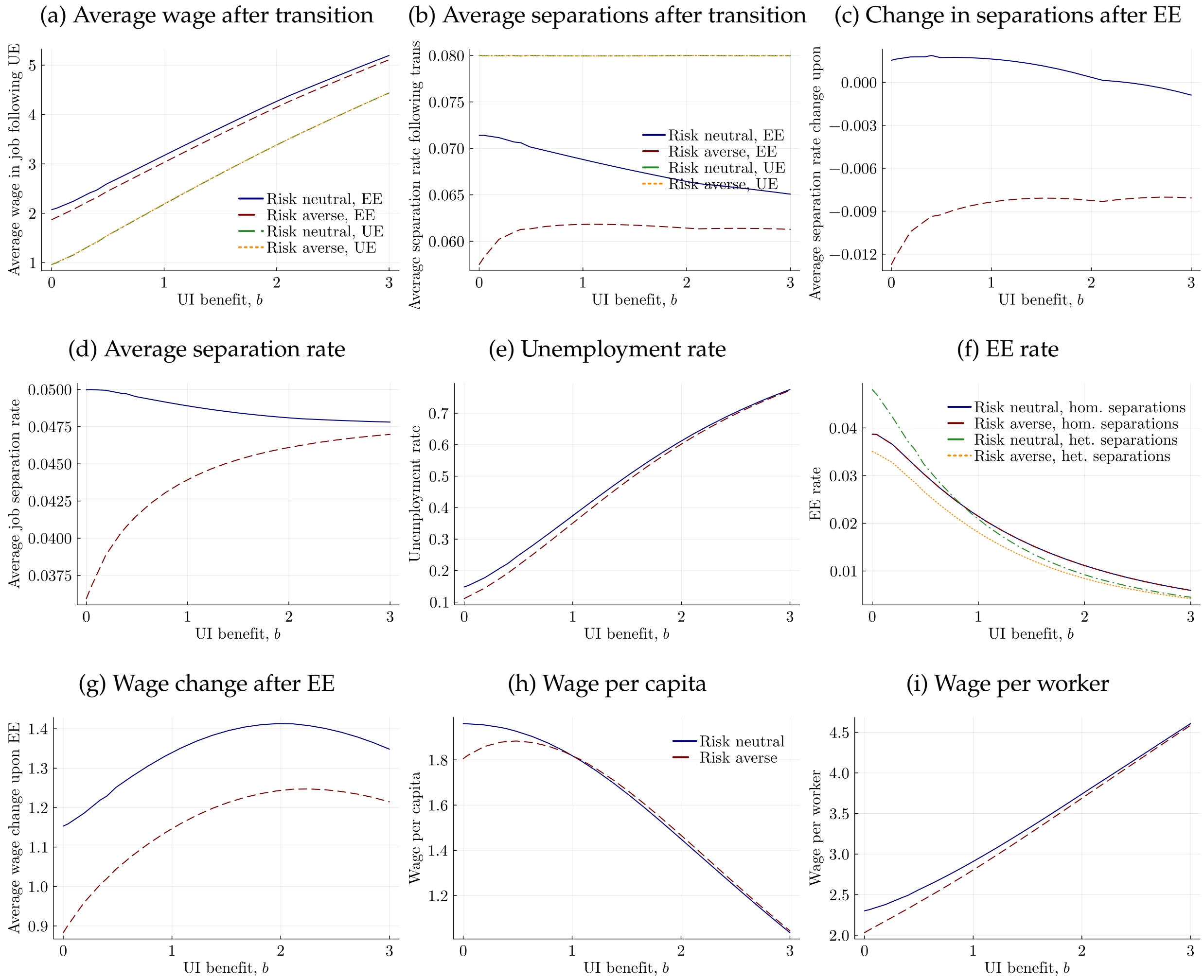
Panel (c) further illustrates this mechanism by plotting the average *change* in the separation rate during EE transitions, which is much more negative (i.e., a gain in job security) under risk aversion. By contrast, on average, workers in the risk neutral economy—for all UI levels but the highest—have increases in separation risk.

In Panel (d), we plot the average separation risk of employed workers. It is much lower for the risk averse economy—because employed workers climb the job ladder to seek job stability, a consequence of Panel (b).

[19] In fact, this result would hold no matter the marginal distribution of δ, as the UE reservation job is only defined by the reservation wage (and as we set a calibration of $\lambda_1 = \lambda_0$, which further shuts off any downstream consequences of the offer distribution on w^r).

[20] First, this is because in general, no matter the risk aversion or the relative effectiveness of OJS vs. unemployed search, unemployed job seekers disregard separation risk in their acceptance strategy, so that the realized UE transitions' separation risk distribution is simply the marginal distribution truncated along the wage dimension by the reservation wage. Second, while generally the expected value of acceptable jobs drops and hence risk aversion does enter the unemployed reservation wage, we have chosen a specific calibration, $\lambda_1 = \lambda_0$, that shuts off this effect, such that the reservation wage is simply $w^r = b$ irrespective of risk aversion, so that both lines are identical. Third, the profile is flat because we assumed that separation risk and wage draws are independent (so that the marginal distribution of unemployment risk is independent of different truncation points along the wage dimension).

Figure 5: Effects of UI benefits: on the job search with $\lambda_1 = \lambda_0$ and heterogeneous separation risk



Notes: This figure plots outcomes from the model with heterogeneous job separation risk where on and off the job search are equally efficient. Unless otherwise indicated, the blue solid lines are for the risk-neutral economy and the red dashed lines are for the risk-averse economy.

As a result of an identical UE transition rate and a lower separation risk on average, unemployment is lower in the risk averse economy than with risk neutrality (or complete markets), shown in Panel (e).

Aggregate outcomes: EE transitions and wages. Having emphasized the neutrality of risk aversion on the UE margin (for our calibration of $\lambda_1 = \lambda_0$) and clarified its effects on job safety and unemployment, we now turn to our main focus: the effects on wages (more broadly standing in for productivity in our partial equilibrium model).

To this end, we plot the EE transition rate in Panel (f), where we also include results from the homogeneous-δ model, to illustrate quantitatively that without separation risk heterogeneity, the job ladder decisions are not affected by UI directly—only indirectly so, by truncating the job ladder through a higher UE reservation wage and the associated compositional effects.

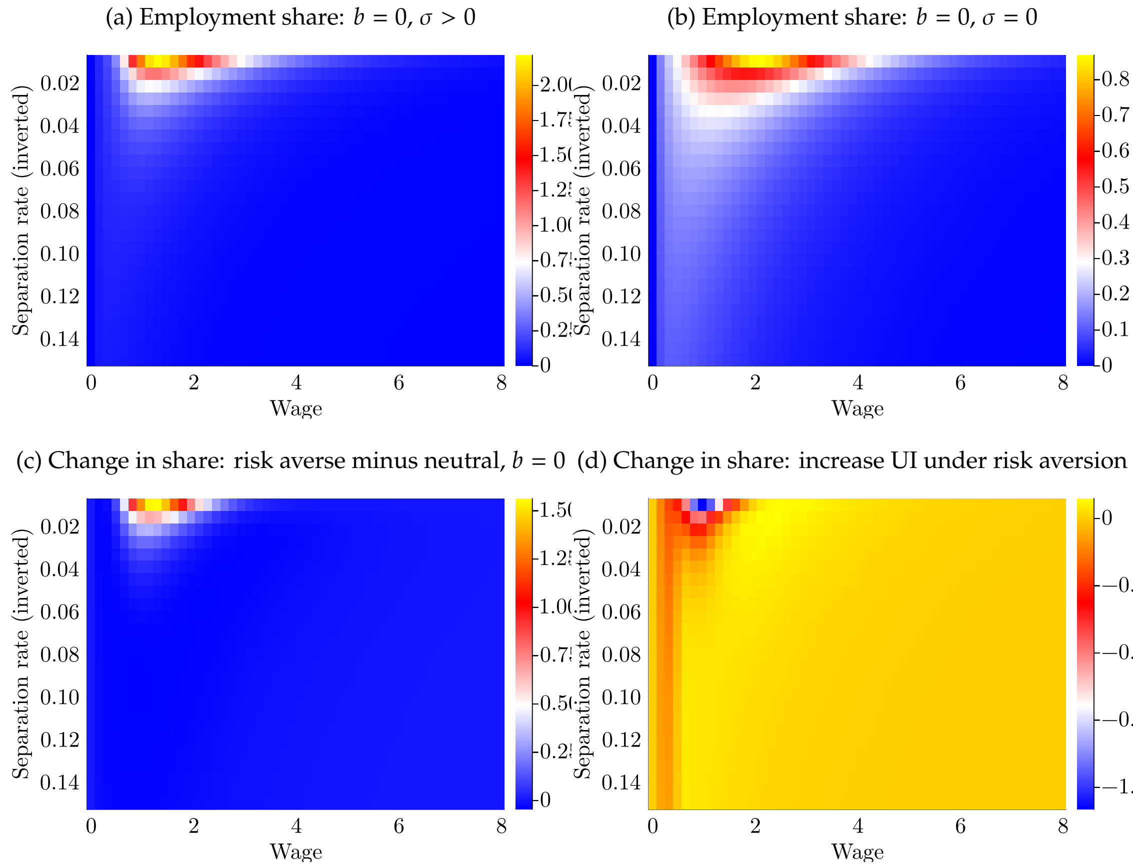
Comparing the risk neutral and risk averse economies with heterogeneous separation risk clarifies that without UI, EE transitions are substantially depressed in the risk averse economy. But conditional on a position in the job ladder, the speed with which workers climb it is unaffected by UI. Moreover, the risk averse economy prioritizes gains in job security over wage gains in EE transitions. That is, the EE transitions that are realized are skewed towards improving job security (Panel (c)) over wages. This can be seen in Panel (a), where we additionally plot the average destination wage after an EE transition, and particularly in Panel (g), where we plot the *change* in the wage for the average EE transition. Hence, these results complement the trade-off featured in the indifference curves in Figure 4 and in Equation (19), for aggregate equilibrium outcomes.

Our key quantitative result is presented in Panel (h): first, under risk aversion and separation risk heterogeneity, wages per capita are lower than in the risk neutral (complete markets) economy without UI. Second, UI affects aggregate productivity in a hump-shaped way as in the baseline economy similar to the Acemoglu and Shimer (1999) setting. This pattern contrasts starkly with the model with OJS but without separation risk heterogeneity, where this relationship is strictly negative (and moreover, for $\lambda_1 = \lambda_0$, worked solely through the truncation of the job ladder through the UE reservation wage). Moreover, this hump-shaped pattern is absent under risk neutrality with heterogeneous job safety, and hence would be masked in the model of Jarosch (2023) as revealed by the risk-neutral line in Panel (h). We reiterate that the source of this inefficiency is solely due inefficient EE decisions, as the UE decision is (due to $\lambda_1 = \lambda_0$) efficient, fully mirroring the decision under risk neutrality. As in the model without OJS, the average wage per capita is the product of the unemployment rate (Panel (e) and the average wage per employed worker (Panel (i)).

To dissect the underlying mechanisms, we present additional results in Figure 6. First, we plot the two-dimensional equilibrium distribution of jobs $G(w, \delta)$ in the form of a heat map in Panel (a) and Panel (b), separately for the risk averse and risk neutral economies under $b = 0$. Panel (c) plots the change in the job distribution as we move from risk neutrality to risk aversion. It makes clear that risk aversion leads to an excessive concentration of workers in stable jobs, in which workers stay put—and an associated missing mass of risky jobs. In Panel (d), we plot the difference in densities brought about by introducing UI into the risk averse economy. The jobs that grow in their share are risky, implying that UI can push the risk averse economy closer to the risk neutral, i.e., efficient and complete markets benchmark.

We also clarify a source of amplification brought about by the mechanism. The excess safety in the risk averse economy arises both from risky offers not being particularly attractive, but also because safe jobs—which risk averse individuals flock to—last longer. This second channel leads the distribution to shift towards stable, long-lived jobs for two reasons: these jobs do not end exogenously (through δ shocks) nor do the workers leave them voluntarily (through job-to-job transitions). We illustrate this mechanism in Figure 7, where we plot EE transition rates, the change

Figure 6: Heat maps of job distribution: OJS with $\lambda_1 = \lambda_0$ and heterogeneous separation risk



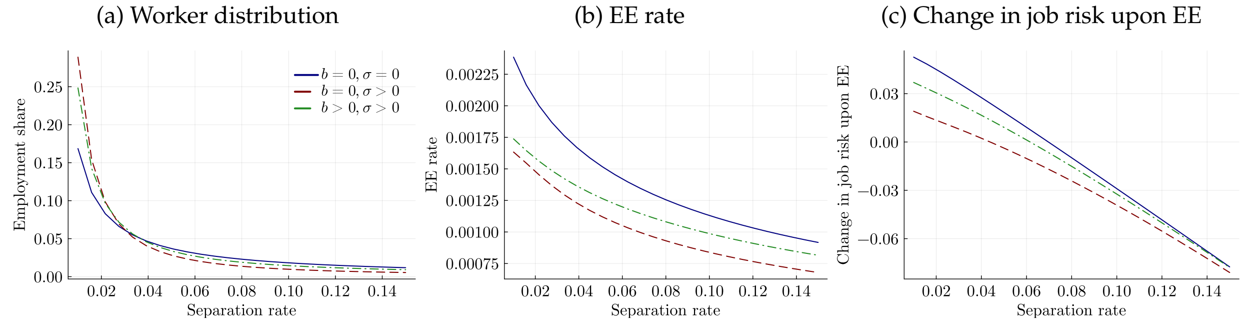
Notes: Panel (a) plots a heat map of the stationary employment share distribution in the risk-averse economy with no UI. Panel (b) does the same for the risk-neutral economy. Panel (c) plots the change in equilibrium employment shares moving from the risk neutral to the risk averse economy under no UI. Panel (d) plots the change in employment shares moving from no UI to a positive level of UI under the risk averse economy.

in δ upon an EE transitions, and the marginal distribution of workers across jobs by separation risk δ, for different levels of σ and b. Higher UI b moves the risk averse economy closer to the efficient one also from this perspective.

2.4 Alternative channels: job transitions as such may be risky

Our modeling approach linking EE decisions with the value of unemployment works through permanent differences in match-specific unemployment risk. Several additional channels would add to this channel. For instance, some workers or firms may have permanent unemployment risk differences. But most importantly, an important class of mechanisms would model the EE decision *as such* increasing risk. For instance, learning about match quality (Jovanovic, 1979; Miller, 1984; McCall, 1990; Moscarini, 2005; Papageorgiou, 2013) features a notion of riskiness about match quality, that is heightened in new jobs. That literature typically assumes risk neutral preferences.

Figure 7: The effect of UI and risk aversion on job safety



Notes: Panel (a) plots employment shares against their unemployment risk, Panel (b) plots the EE rate out of jobs against their unemployment risk and Panel (c) plots the average change in job riskiness following an EE transition out of jobs against their unemployment risk. Each panel plots these for economies with no UI and risk neutrality (blue solid line), no UI and risk aversion (red dashed line) and positive UI and risk aversion (green dash-dotted line). To partially control for compositional differences, the figures condition on jobs with wages larger than $b > 0$ (the reservation wage out of unemployment in the economy with positive UI) across the three economies. All model variants maintain $\lambda_1 = \lambda_0$.

Specific human capital at the current job or firm would boost surplus and hence lower separation risk. Lastly, employment protection legislation often features tenure-specific firing costs such as last in, first out rules or mandatory advance notice rules that are step functions of tenure. By generating additional risk in a given EE transition, those features would amplify the role of risk aversion and unemployment value in shaping job mobility.

Our model assumes heterogeneity in match-specific separation risk. In previous versions of the paper, we have experimented and obtained similar results with a model in which job mobility as such boosts unemployment risk (e.g., due to loss of employment protection and seniority, or as job quality is revealed slowly on the job). Specifically, we generated an EU separation risk relevant to EE decisions on the basis of two features: the above initial heterogeneity in job security, and an evolution of this risk over the course of the match (modelled as a probability the job transitions from the match's initial risk level into a lower value). We found overall similar results. Since empirically separating these two sources of risk relevant to EE decisions proved challenging (e.g., we found that a downward-sloping EU risk gradient in tenure was possible to generate through compositional changes alone as in Section 4 below —see Jarosch (2023) for a related discussion), we instead opt to obtain our channel through permanent separation risk differences across matches.

3 Equilibrium model

In this section, we generalize the model in Section 2 by endogenizing worker-firm contact rates. Now matches draw a productivity (rather than workers sampling wages directly) and separation rate, and wages are determined via bargaining between the worker and firm. We use this model to quantitatively investigate the effects of risk aversion, tax-financed unemployment benefits and excess unemployment risk on productivity and job mobility in Section 4.

3.1 Environment

Time is continuous and indexed by $t \in [0, \infty)$. There are three types of agents: workers, entrepreneurs and the government. There is a unit mass of hand-to-mouth workers whose preferences over the flow of consumption c_t are described by a utility function $u(c_t)$, $u'(c_t) > 0$, $u''(c_t) \leq 0$ and a discount rate r. Risk-neutral entrepreneurs post an endogenous measure of vacancies for single-worker firms at a flow cost of κ per vacancy and discount future at rate r as well. There is free entry in vacancy posting. A firm-worker match produces the single good used for consumption by workers and entrepreneurs and wasteful government spending G. The government also pays out unemployment benefits b and imposes taxes characterized by a linear tax rate τ. As we work towards defining a steady state equilibrium in this section, we drop the time subscript henceforth.

Production and match termination. Single-worker firms produce output using labor only. Workers supply one unit of labor inelastically when hired. Each worker-firm match has an exogenous productivity z, with $\bar{z} \geq z \geq 0$, which is constant over the life of the match unless it drops to zero, which triggers an exogenous separation. We denote the rate of arrival of exogenous separations by δ. On top of these exogenous separations, the worker and the firm can instantaneously and unilaterally terminate the match if desired. In the baseline version of the model, we allow matches to be heterogeneous with respect to δ. We will contrast this *heterogeneous separation risk* formulation with a model where δ is identical across all matches, the *homogeneous separation risk* model. When a worker and firm meet, they draw a pair (z, δ) from CDF $\Gamma(z, \delta)$. These are observed before both parties decide whether to accept the match or reject it without recall.

Search. Workers and vacancies meet randomly in the frictional labor market. Workers can be either employed or unemployed, and there is on-the-job search. Matches start work instantly, and (since time is continuous) there is no risk of exogenous match termination before a job starts. Let u denote the mass of unemployed agents, and $n = 1 - u$ be the mass of the employed. Let $g(z, \delta)$ denote the mass of workers employed at state (z, δ), so that $n = \int \int g(z, \delta) dz d\delta$. We assume that the efficiency of search out of unemployment s_u is normalized to 1, and we set s_e to be the (relative) search efficiency out of employment. Then, the aggregate search effort is $S = u + s_e(1-u)$. Given a mass of vacancies V and aggregate search effort, the rate of matches m per unit of time is governed by a matching function $m = M(V, S)$ which satisfies standard assumptions.

We define the labor market tightness $\theta = V/S$ so that workers meet a vacancy at rate $\lambda(\theta) = m/S$ per unit of search effort. Vacancies meet workers at rate $q(\theta) = m/V$. The type of worker a vacancy meets depends endogenously on unemployment and the distribution of employed workers, $g(z, \delta)$.

Value functions. We now specify the value functions of the unemployed, U, the employed, $W(z, \delta)$, and the filled vacancy, $J(z, \delta)$, taking as given UI benefits b and wages $w(z, \delta)$. The unemployment value solves the following Hamilton-Jacobi-Bellman (HJB) equation:

$$rU = u(b) + \lambda(\theta)\mathbb{E}_{\widetilde{z},\widetilde{\delta}}\left[\max\left\{W(\widetilde{z},\widetilde{\delta}) - U, 0\right\}\right]. \tag{20}$$

The last term represents the value of finding a match which the unemployed worker would accept. They meet a vacancy at rate $\lambda(\theta)$. Then, the match-specific productivity and separation risk, $\widetilde{z}$ and $\widetilde{\delta}$, are drawn. The worker then accepts the match if it delivers a value of employment, $W(\widetilde{z},\widetilde{\delta})$, greater than the value of remaining unemployed. As a tie-breaking assumption, we assume that agents only accept new jobs if they are strictly preferred to their current state. Implicit in this notation is that a firm will never choose not to accept a match that a worker would accept. This result follows from the structure of our model, as we discuss further below. The value of employment in a match with current state (z,δ) is:

$$rW(z,\delta) \;=\; u\left((1-\tau)w(z,\delta)\right) + s_e\lambda(\theta)\mathbb{E}_{\widetilde{z},\widetilde{\delta}}\left[\max\left\{W(\widetilde{z},\widetilde{\delta}) - W(z,\delta), 0\right\}\right] + \delta\left(U - W(z,\delta)\right). \tag{21}$$

Note, we suppress the option to quit in to unemployment for notational convenience.[21] The term following s_e corresponds to on the job search, where a worker will only move to a job offering a strictly higher value than their current one. The last term captures the risk of unemployment.

Given the value function $W(z,\delta)$, we denote by $\mu^e(z,\delta)$ the probability of a worker with current job characteristics (z,δ) accepting a new job, and hence quitting from their current one:

$$\mu^e(z,\delta) = \int \mathbf{1}\left\{W(\widetilde{z},\widetilde{\delta}) > W(z,\delta)\right\} d\Gamma(\widetilde{z},\widetilde{\delta}). \tag{22}$$

Then, the value of a filled vacancy to the firm satisfies the following equation:

$$\left[r + s_e\lambda(\theta)\mu^e(z,\delta) + \delta\right] J(z,\delta) = z - w(z,\delta). \tag{23}$$

The firm keeps the residual productivity after paying wages, and this is discounted by a factor that accounts for firm time preference and the likelihood of the match terminating either exogenously, or because of the worker leaving to another job.

Wage determination. To focus our analysis on worker flows, we assume a tractable bargaining protocol. First, renegotiation is continuous to overcome potential problems with bargaining and on-the-job search yielding a non-convex bargaining set, as discussed by Shimer (2006). Second, we assume the threat to terminate the match when no agreement has been reached is not credible, as long as there is a positive surplus to be shared, as argued by Hall and Milgrom (2008). Hence, bargaining happens over the flow surplus—as in Elsby and Gottfries (2021). The outside offers are non-verifiable and the firm does not respond to them. The employer's threat is to delay bargaining, and the employee's threat is to delay production for Δt instant. The latter can be thought of as going

[21]Thus, Equation (21) is implicitly written for (z,δ) such that $W(z,\delta) \geq U$. The option to quit is fully accounted for in our numerical experiments.

on strike as opposed to terminating the match in case of disagreement. Nothing is produced when the employee's threat is realized, and the worker incurs a wage penalty for the period of the strike. The employee obtains a payment $\chi(1-\tau)w_{-1}$ from the trade union with w_{-1} standing for the wage before going on strike and $\chi < 1$ captures the statutory decrease in pay due to striking.[22] Therefore, the firm surplus is $(z-w)-0 = z-w$ while the worker surplus is $u((1-\tau)w) - u(\chi(1-\tau)w_{-1})$. The wage w then maximises the Nash product, with worker bargaining power ψ:

$$\max_{w} \psi \log\left(u((1-\tau)w) - u(\chi(1-\tau)w_{-1})\right) + (1-\psi)\log\left(z-w\right). \tag{24}$$

The first order condition for this problem, which implicitly defines the wage w, reads:

$$\frac{\psi(1-\tau)u'((1-\tau)w)}{u((1-\tau)w) - u(\chi(1-\tau)w_{-1})} = \frac{1-\psi}{z-w}. \tag{25}$$

Wages are independent of separation risk δ and solely depend on contemporaneous variables.[23]

3.2 Equilibrium

We specify the free-entry condition for vacancy posting and the government budget constraint to close the model. To this end, let $\mathbf{1}^u(\widetilde{z},\widetilde{\delta})$ be an indicator function equal to one if a match with state $\left(\widetilde{z},\widetilde{\delta}\right)$ is accepted by an unemployed worker:

$$\mathbf{1}^u(\widetilde{z},\widetilde{\delta}) = \begin{cases} 1 \text{ if } W\left(\widetilde{z},\widetilde{\delta}\right) > U, \\ 0 \text{ otherwise.} \end{cases} \tag{26}$$

Analogously let $\mathbf{1}^e(\widetilde{z},\widetilde{\delta}|z,\delta)$ capture the decision of workers currently employed in a match with state (z,δ) whether to accept a job offer $\left(\widetilde{z},\widetilde{\delta}\right)$ or not:

$$\mathbf{1}^e(\widetilde{z},\widetilde{\delta}|z,\delta) = \begin{cases} 1 \text{ if } W\left(\widetilde{z},\widetilde{\delta}\right) > W\left(z,\delta\right), \\ 0 \text{ otherwise.} \end{cases} \tag{27}$$

Given these acceptance rules, let $\alpha_u = u/(u + s_e(1-u))$ be the likelihood of a vacancy meeting an unemployed worker under random matching. Then, free entry in vacancy posting requires:

$$\kappa = q(\theta)\mathbb{E}_{\widetilde{z},\widetilde{\delta}}\left[\left(\alpha_u \mathbf{1}^u(\widetilde{z},\widetilde{\delta}) + (1-\alpha_u)\zeta(\widetilde{z},\widetilde{\delta})\right) J(\widetilde{z},\widetilde{\delta})\right], \tag{28}$$

where $\zeta(\widetilde{z},\widetilde{\delta}) = \int \mathbf{1}^e(\widetilde{z},\widetilde{\delta}|z,\delta)g(z,\delta)dzd\delta/n$ is the fraction of employed workers who would accept a job offer with characteristics $(\widetilde{z},\widetilde{\delta})$, and $q(\theta)$ is the rate at which a vacancy meets a worker.

[22] This assumption addresses the implausible feature of the wage setting process that the currently bargained over wage affects the outside option. In equilibrium we set $w_{-1} = w$, but the choice of w does not affect $u(\chi(1-\tau)w_{-1})$.

[23] As we show in Lemma 1 in Appendix C.1, this wage-setting protocol yields wages equivalent to piece rates under CRRA preferences, which we employ in the next section.

Finally, we assume that the government runs a balanced budget so that the tax revenues exactly cover the government spending, G, and spending on unemployment benefits:

$$bu + G = \tau \int w(z,\delta) g(z,\delta) d\delta dz. \tag{29}$$

Definition 1 (Steady-state equilibrium)**.** *A steady-state equilibrium is a collection of value functions* $U, W(z,\delta), J(z,\delta)$*, job acceptance indicators* $\mathbf{1}^u(\widetilde{z},\widetilde{\delta}), \mathbf{1}^e(\widetilde{z},\widetilde{\delta}|z,\delta)$*, probability of a worker with* (z,δ) *accepting a new job* $\mu^e(z,\delta)$*, wage function* $w(z,\delta)$*, composition of the labor force* $u, g(z,\delta)$ *and labor market tightness* θ *such that, given the exogenous parameters of the model:*

- *given* θ *and* $w(z,\delta)$*,* U *and* $W(z,\delta)$ *solve* (20) *and* (21)*,*
- $W(z,\delta)$ *and* U *yield* $\mu^e(z,\delta), \mathbf{1}^u(\widetilde{z},\widetilde{\delta})$ *and* $\mathbf{1}^e(\widetilde{z},\widetilde{\delta}|z,\delta)$ *as per* (22), (26) *and* (27)*,*
- *given* θ*,* $w(z,\delta)$ *and* $\mu^e(z,\delta)$*, firm value function* $J(z,\delta)$ *solves* (23)*,*
- *labor market tightness* θ *solves the free-entry condition* (28) *given job offer acceptance rules* $\mathbf{1}^u(\widetilde{z},\widetilde{\delta})$ *and* $\mathbf{1}^e(\widetilde{z},\widetilde{\delta}|z,\delta)$*, composition of the labour force* $u, g(z,\delta)$ *and firm value function* $J(z,\delta)$*,*
- *composition of the labor force described by* u *and* $g(z,\delta)$ *is the unique invariant distribution of the Markov chain over* (z,δ) *and unemployment implied by acceptance rules* $\mathbf{1}^u(\widetilde{z},\widetilde{\delta})$*,* $\mathbf{1}^e(\widetilde{z},\widetilde{\delta}|z,\delta)$*, distribution of job offers* $\Gamma(z,\delta)$ *and the job offer arrival rate* $\lambda(\theta)$ *per unit of search effort.*
- *the government adjusts either taxes or spending in order to balance its budget constraint,* (29).

4 Quantitative analysis

In this section, we show that heterogeneity in exogenous separation risk matters quantitatively for job mobility and productivity, both in the steady state and over the business cycle. To this end, we start by calibrating our quantitative model, and contrast it with a model where all jobs have the same unemployment risk. Steady-state analysis and results from model experiments follow.

4.1 Calibration

The parameters of the model are calibrated to a monthly frequency. We fix some parameters exogenously and jointly estimate the rest. We estimate these parameters using a calibration routine, which exactly matches a set of moments, with each parameter adjusted to hit one moment exactly. The parameters, which we discuss below, are summarized in Table 1. The model matches the targeted moments well, reported in Table 2.[24]

[24]We also present the performance of the auxiliary model with homogeneous unemployment risk towards the end of this section.

Table 1: Calibrated Model Parameters

Parameter	Description	Value	Source/Target
	Pre-determined		
r	Discounting	0.0043	Risk-free interest rate of 5%
σ	Risk aversion	3	See text
τ	Linear tax rate	0.2	Personal income tax rate
η	Matching elasticity	1.27	den Haan and Ramey (2000)
ψ	Nash-product weight	0.5	Symmetric bargaining
χ	Penalty for going on strike	0.707	Labour share of 2/3
	Estimated		
b	Unemployment benefit	0.267	Net replacement rate
s_e	Search efficiency on the job	0.390	Average EE rate
$\underline{\delta}$	Lowest unemployment risk	0.010	Average EU rate
$\overline{\delta}$	Highest unemployment risk	0.250	EU rate in first month
a_δ	Initial δ distribution	0.864	EU rate in 12th month
μ_z	Mean of marginal density of $\widetilde{z}$	-0.035	Average $\widetilde{z}$ normalised to 1
σ_z	Std. dev. of marginal density of $\widetilde{z}$	0.265	Mean-Min ratio
κ	Vacancy posting cost	1.797	Unemployment rate

Pre-set parameters. We assume a CRRA utility function, $u(c) = c^{1-\sigma}/(1-\sigma)$ and set the risk aversion parameter to $\sigma = 3$. While higher than 2, often considered conventional (Hornstein et al., 2011), this is in the midpoint of values considered by Aiyagari (1994) in theoretical work and well within the range of empirical estimates.[25]

We set $r = 0.0043$ to generate a 5% annual risk-free interest rate. We choose the matching function $M(S, V) = SV/[S^\eta + V^\eta]^{\frac{1}{\eta}}$, implying worker a contact rate $\lambda(\theta) = 1/\left[1 + \frac{1}{\theta^\eta}\right]^{\frac{1}{\eta}}$ and a firm contact rate $q(\theta) = 1/[1 + \theta^\eta]^{\frac{1}{\eta}}$. We set the matching function elasticity to $\eta = 1.3$, as estimated in den Haan et al. (2000). We assume a symmetric bargaining problem and set the worker's share at $\psi = 0.5$. We choose χ, the wage penalty for going on strike, to match a labor share of 2/3, giving $a/(1-\psi+a) = 0.66$ in Appendix Equation (A.1). This yields $\chi = 0.71$. We set the linear tax rate to $\tau = 0.2$, close to the average personal income tax rate in the data.

Estimated parameters. We reduce our degrees of freedom by assuming that the job productivity and z and its EU risk δ are uncorrelated. This splits the distribution $\Gamma(z, \delta)$ into two independent distributions $\Gamma^D(\delta)$ and $\Gamma^Z(z)$, respectively.

A crucial part of our estimation is disciplining the amount of heterogeneity in EU risk, since this is a novel feature of our model. To do so, we target the EU-tenure hazards in the data, which measure the EU risk in the next month for employed workers at each level of tenure in their current job. We construct these hazards using data from the Survey of Income and Program Participation

[25]See Elminejad et al. (2022) for a recent meta-analysis. They report estimated and calibrated values of relative risk aversion, which very often lie between 0 and 10.

Table 2: Model Fit

Moment	Target	Our model	Homogeneous δ model
Net replacement rate $b/\mathbb{E}(w)$	0.400	0.400	0.398
Unemployment rate	0.065	0.065	0.066
EE rate	0.015	0.015	0.015
EU rate	0.020	0.020	0.020
First-month EU rate / 5-year EU rate	5.400	5.443	1
12-month EU rate / 5-year EU rate	2.800	2.772	1
Average $\tilde{z}$	1	1	1
Mean-Min wage ratio	1.480	1.472	1.427

Notes: Calibration targets and the values in the two model calibrations. Parameters are adjusted until the errors between model and targeted data moments are all less than 1%.

(SIPP), with details given in the appendix and plotted in Appendix Figure A.4 Panel (a). EU hazards decline with tenure, which our model explains as a composition effect as riskier jobs end sooner either due to their inherently higher EU risk or due to workers quitting these jobs.

We specify $\Gamma^D(\delta)$ as a simple distribution characterised by a single parameter a_δ. The probability of a match drawing EU risk δ_j is assumed to be $\pi_j = b_\delta(j)^{a_\delta}$, where b_δ is a constant chosen so that the probabilities sum to one.[26] We choose an equally spaced grid for the exogenous separation rates δ_j, $j = 1, ..., J$ and set $J = 20$. We choose the lower bound $\underline{\delta} = \delta_1$ to match the overall EU rate from the data. We choose the upper bound $\bar{\delta}$ to match the EU rate in the first month of a job which is 5.4 times higher than the EU rate five years into a job, similarly to our data. Finally, we choose a_δ to match the EU rate in the 12th month of a job which is 2.8 times higher than the EU rate five years into a job, similarly to our data.

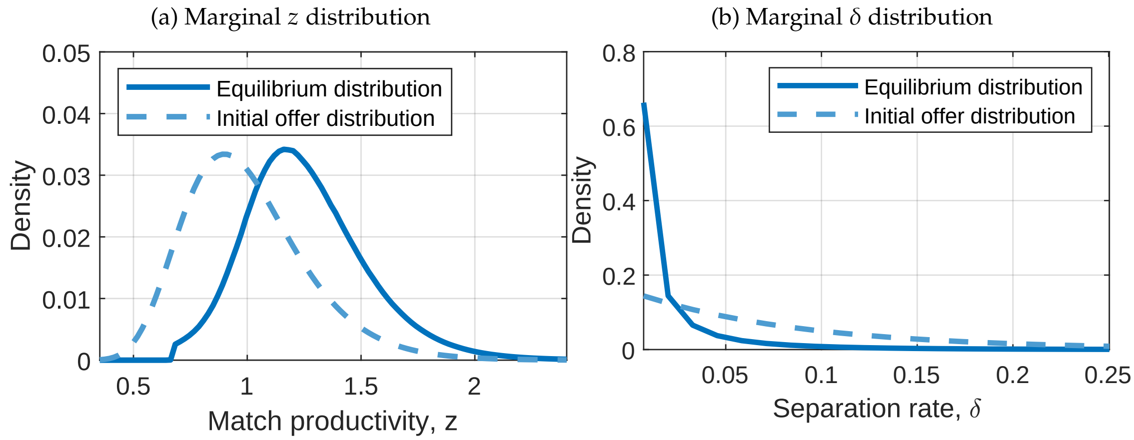
We assume that the distribution of productivity offers, $\Gamma^Z(z)$, is a log-normal with mean μ_z and standard deviation σ_z, discretized with $I = 100$ nodes.[27] We choose μ_z to normalize the expected value of z for an offer to 1. Parameter σ_z controls the dispersion of *offered* wages, which we choose to match the high Mean-Min wage ratio found in the data. This is the ratio of the mean wage in the economy to the minimum wage in the economy, and we target a ratio of 1.48, as estimated by Tjaden and Wellschmied (2012). As external validation, we compute the variance of equilibrium log wages in our model, which is 4.0%, similar to 3.1% in the data (Tjaden and Wellschmied, 2012).

We target the offer arrival rate for workers per unit of search efficiency, $\lambda(\theta)$, to match an unemployment rate of $u = 0.065$. This implies values of θ and $q(\theta)$ from our assumed matching function. This θ is achieved by choosing the vacancy posting cost, κ, such that the net value of posting a vacancy is zero in the steady state. We set the search efficiency of employed workers s_e

[26] This gives a simple way to control the probability distribution, with $a_\delta = 1$ giving a discrete uniform distribution, and $a_\delta > 1$ and $a_\delta < 1$ giving distributions with higher or lower probabilities of drawing high initial separation rates respectively.

[27] Specifically, an equi-spaced grid between $z_1 = \underline{z} = 0.01$ and $z_{100} = \bar{z}$, where $\bar{z}$ is the 99.5th percentile of the CDF.

Figure 8: Steady state: Marginal productivity and separation risk distributions



Notes: These panels plot the marginal distributions in steady state, i.e., the integration of the joint distribution $g(z, \delta)$ over each of its two dimensions alongside the offer distribution for each job characteristic.

to match an EE transition rate of 1.5% per month, in line with our data from the SIPP. The value of unemployment benefits b is set to reproduce an average replacement rate of 40% of the mean wage. The amount of wasteful government spending, G, is chosen to balance the government's budget in the steady state, given its tax receipts and spending on unemployment insurance.

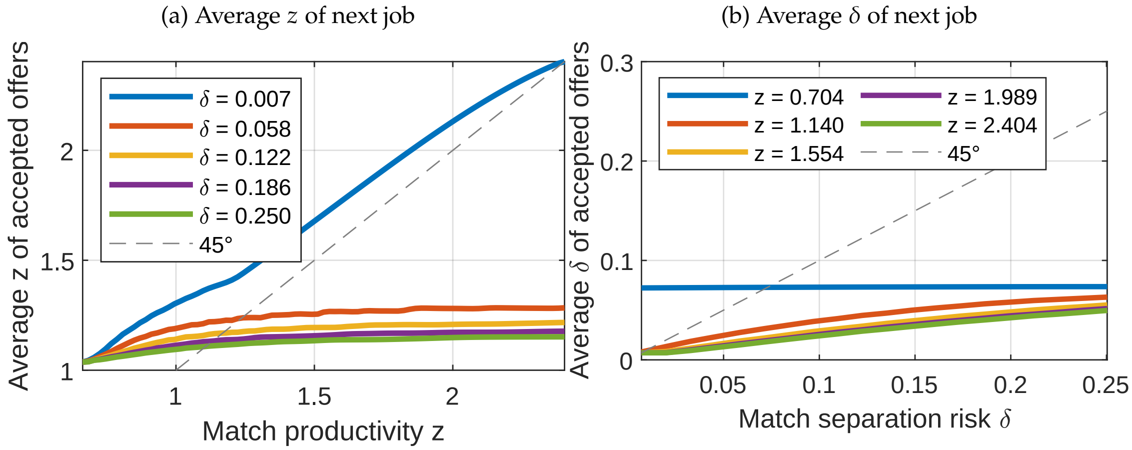
Comparison model: homogeneous δ. In order to illustrate the novel features of our model, we also solve a simpler model for comparison. This model keeps the same structure but assumes that all jobs have the same separation risk, δ, at all times. We calibrate this model to match the same moments as the full model, with two exceptions. First, we do not target the EU-tenure profile, since the parameters used in the full model to target them have been removed and by construction this model features a flat profile. We choose the single value of δ to match the overall EU rate in the data. Second, we hold the variance of productivities, σ_z, at the value estimated in our full model rather than recalibrating it to hit the Mean-Min wage ratio. This is because the homogeneous δ model struggles to hit the Mean-Min ratio, as pointed out by Hornstein et al. (2011).

4.2 Steady-state analysis

Distributions and policy functions. The worker side of the full model closely resembles the simple model in Section 2. Workers climb the job ladder both for better wages (productivity) and job safety.[28] Their choices shape the equilibrium distribution of workers across jobs. We plot this distribution, $g(z, \rho)$, in Figure 8. Panel (a) plots the equilibrium marginal distribution of employed workers over job productivity and the offer distribution for comparison. The former is shifted to the right due to two forces. First, unemployed workers do not accept job offers that

[28]We present the job acceptance policy functions of employed workers in Figure A.13 in Appendix C.2.

Figure 9: Productivity and safety ladders: Properties of EE moves



Notes: These panels represent the job ladders by productivity and size respectively. Specifically, the left panel plots the average productivity of the job offers an employed worker would accept, as a function of their current productivity and risk. The right panel does the same for the average risk of the job offers an employed worker would accept.

yield a lower value than unemployment, with the lowest productivity job they would accept being around $z = 0.6$. Second, employed workers move up the productivity ladder by quitting to, on average, increasingly higher productivity jobs.

Panel (b) plots the marginal distribution of employed workers over the separation rate of their job, as well as the offer distribution for comparison. The difference between the equilibrium and offered distributions is striking, with most workers (over 60%) in jobs with the lowest risk, while the offer distribution is skewed towards higher initial risk. This difference arises from two sources. First, workers leave higher-risk jobs faster. Second, safer jobs survive longer. These forces result in an average worker being in a job with much lower risk than the average job offer.

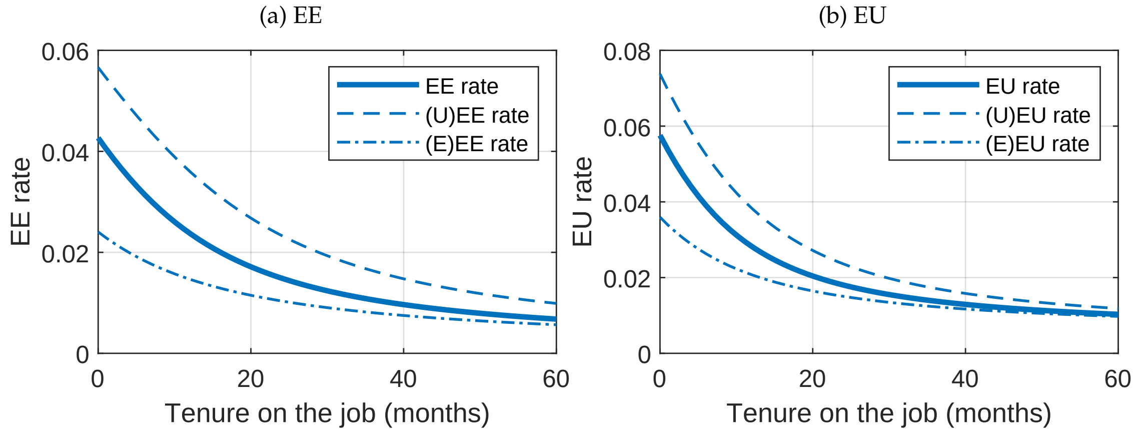
Despite productivity and job safety in the wage offer distribution being independent, equilibrium outcomes are correlated through workers' choices. We illustrate their properties in Figure 9. In Panel (a), we plot the average productivity of new jobs that employed workers would willingly move to as a function of their current job productivity. The 45 degree line separates job moves with wage increases from those with wage cuts.[29] While workers on average increase their wage following a job change, in equilibrium 19.2% of EE moves feature a wage cut, moving to a job with lower separation risk in return. This trade-off is absent in the homogeneous risk model in which all EE moves come with a wage increase.[30]

Panel (b) plots the average δ of job offers accepted by the EU risk of current job for different productivity levels. The points that lie below the 45-degree line indicate job changes which imply

[29] This comes from wages being a linear function of productivity.

[30] In the data, 34% of EE moves feature a wage cut (Tjaden and Wellschmied, 2012) which standard models rationalize by introducing a so-called *godfather shock* or other features. EE moves to increase job safety could therefore account for perhaps a large share of the EE moves with wage cuts empirically.

Figure 10: EU and EE Flows as a Function of Job Tenure and Origin



EE and EU tenure hazards in the model. These are computed in the ergodic distribution by explicitly solving for the tenure distribution on a grid and exactly averaging over the separation rates and EE rates. Rates prefixed with (U) and (E) denote rates for workers who started their current job from either unemployment or an another job switch respectively.

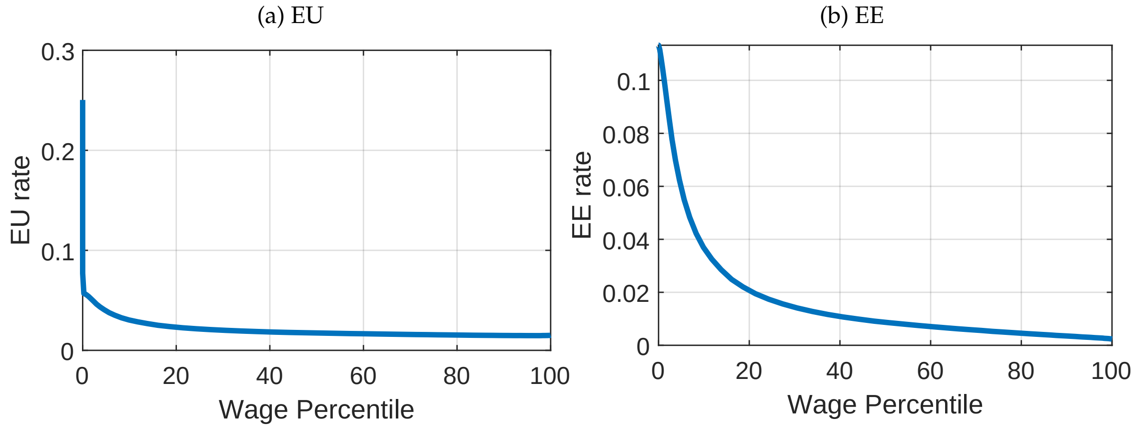
a decrease in separation risk. At low productivity levels, workers care less about unemployment risk. However, the higher the current job productivity, the stronger the flight-to-safety motive.

Untargeted model predictions. We conclude the discussion of the steady state by showing the model matches the relationship between EE and EU rates with tenure and wages. The model successfully replicates the differences in how the EE and EU rates depend on tenure conditional on the job originating from either an EE or UE transition.

In Figure 10 Panel (a) we plot the EE rate of workers by their job tenure and origin. We additionally construct EE-tenure hazards for all jobs which started from unemployment, (U)EE, and all jobs which started from an EE move, (E)EE. As in the data, shown in Appendix Figure A.4, the (E)EE rate is below the (U)EE rate. This reflects selection into more productive and safer jobs once workers secure their first job after unemployment. Crucially, the flight to safety is further confirmed by a similar pattern for the EU rates in Panel (b): jobs which start from unemployment face an endogenously higher EU rate at all levels of tenure, shown as the (U)EU line. This is because unemployed workers are happy to accept jobs of all risk levels, while employed workers become increasingly picky about risk, as shown by the lower (E)EU hazard. We note that the model that abstracts from δ heterogeneity cannot replicate the downward-sloping EU-tenure profile, which is flat.

In Figure 11 Panel (a) we plot the EU rate of workers by their current wage. As in the data, this is downward-sloping and serves as external validation. Since we assumed that initial job risk and productivity are uncorrelated, the negative correlation between wage and EU risk is entirely endogenous and occurs due to a selection effect is at play because workers in low-wage jobs care

Figure 11: EU and EE flows as a function of current wage



Notes: These panels plot the average EU and EE rates of workers by wage percentile in the model. These are computed explicitly by averaging the separation and EE policies by current wage in the ergodic distribution.

less about unemployment risk, as shown in Figure 9 Panel (b). Higher-wage workers, however, care more about risk. These workers thus only accept job-to-job moves with low risk and stay in their current job longer. As separation risk is an endogenous choice in our model, higher-wage workers select safer jobs.

In Panel (b) we plot the EE-wage hazard, which is also downward sloping, as in the data. This is a standard property of job ladder models since workers higher up the job ladder have fewer job offers left to accept and so have lower EE rates and, hence, stay in their jobs longer. EE rates are also higher for workers who moved to their current job from unemployment since these jobs will tend to be lower down the job ladder on average.

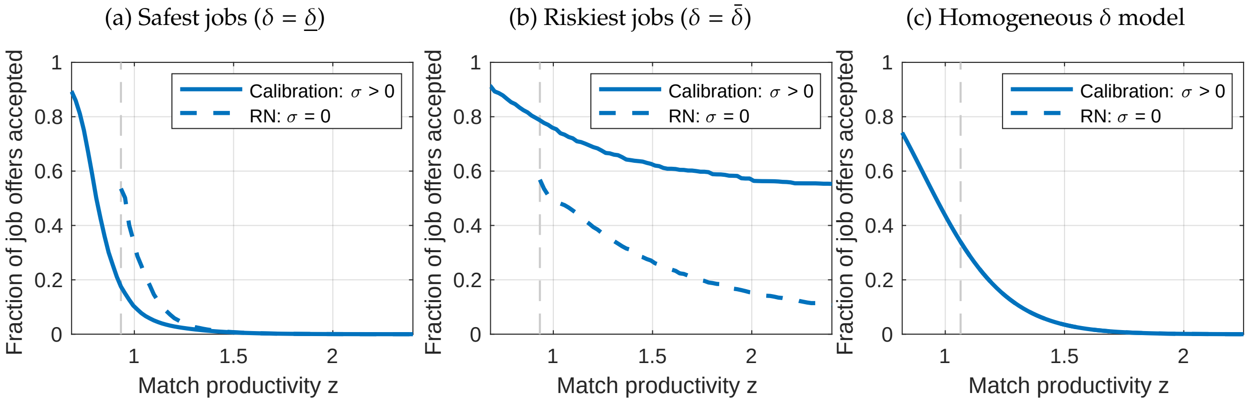
4.3 Job safety heterogeneity and costs of imperfect insurance

In this section, we demonstrate the importance of the interplay between heterogeneity in job safety at the match level with the missing insurance market against labor income risk. We do this by setting up a counterfactual economy where workers can fully insure away their consumption risk.

More formally, we consider a hypothetical first-best scenario free from any private information considerations. We assume that workers sign a contract with a risk-neutral insurer that dictates the worker's job acceptance policies. In return for receiving all the worker's wage and benefit income, the insurer then gives the worker a constant consumption stream. As a result, the insurer chooses the optimal policy that maximizes the discounted sum of expected income, exactly as risk-neutral workers would do.[31]

[31]Thus, while EU risk is still factored in the appraisal of arriving job offers, the precautionary motive in job search evaporates.

Figure 12: Perfect consumption insurance counterfactual: Job acceptance policies



Notes: Each panel plots a representation of the employed worker EE job acceptance policy: the fraction of job offers they would accept, as a function of current job productivity. Solid lines are for the calibrated model, and the dashed line for the counterfactual experiments with perfect insurance. Panels (a) and (b) are from the full model, for the safest and riskiest jobs respectively, and Panel (c) is from the homogeneous risk model.

Fixed wages. The solution to the wage bargaining problem in Equation (A.1) depends on how workers value consumption on the margin. We abstract from any wage effects of consumption insurance and assume that the wage rule $w(z)$ remains the same as in the baseline calibration. This has the advantage of letting us study purely how the missing insurance market affects workers' job search behavior for a given set of wage offers.

Partial equilibrium: EE effects. As our first step, we hold the arrival rate of job offers, $\lambda(\theta)$, and tax rate fixed at their calibrated values and compute the new job acceptance policy functions under perfect insurance. We plot the results in Figure 12. Panels (a) and (b) plot the fraction of job offers accepted by employed workers in the safest and riskiest jobs respectively.[32] The solid line is the calibrated model with risk aversion, and the dashed line is the counterfactual model with risk neutrality arising from perfect insurance. Insuring away risk makes workers in safe jobs make more EE moves, while it makes workers in risky jobs make fewer EE moves.

Intuitively, workers in safe jobs accept more jobs under full insurance because making EE moves increases their risk, as new jobs have a higher risk on average. Insuring away this risk makes them more willing to move. For workers in risky jobs, offering them consumption insurance instead makes them accept fewer job offers because they used to take some low wage but safe job offers to reduce their risk. Since most workers are in safe jobs in equilibrium, the effect in Panel (a) dominates in the aggregate.

These effects are entirely driven by EU risk heterogeneity and its interactions with the job ladder. To see this, in Panel (c) we plot the same figure for the homogeneous risk model. Insuring away consumption risk has no effect on the fraction of EE moves accepted at a given match productivity.

[32] For the calibrated model, these repeat the highest and lowest lines from Figure A.13 Panel (b).

Table 3: Equilibrium effects of perfect consumption insurance

	Y/n	u rate	EE-rate	UE-rate	$\lambda(\theta)$
Full model					
Calibration	1.256	0.065	0.015	0.290	0.317
Perfect insurance	1.340	0.141	0.012	0.194	0.295
% difference	6.69%	117.10%	-18.54%	-33.34%	-7.12%
Homogeneous δ model					
	Y/n	u rate	EE-rate	UE-rate	$\lambda(\theta)$
Calibration	1.246	0.066	0.015	0.288	0.367
Perfect insurance	1.326	0.176	0.007	0.139	0.267
% difference	6.43%	168.14%	-54.97%	-51.85%	-27.22%

Notes: The table compares the equilibrium of the calibrated model (top row of each panel) to the counterfactual where risk is perfectly insured (second row). This is a general equilibrium experiment where market tightness is allowed to adjust. The top panel is for the full model, and the bottom panel is for the homogeneous EU risk model.

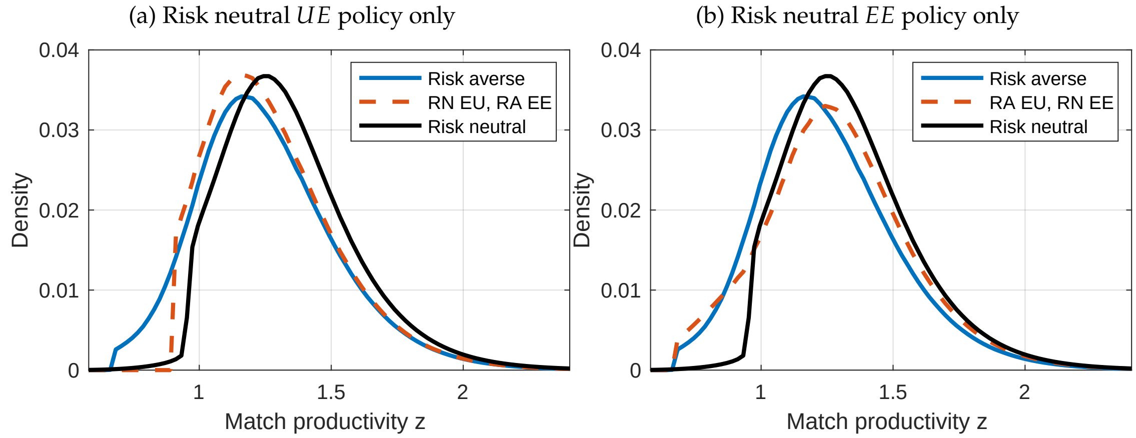
Partial equilibrium: selection effects at UE margin. In both the full and homogeneous risk economies, insuring consumption risk raises the reservation productivity to prompt a UE move. This is shown by the dashed grey vertical lines, which mark the lowest productivity accepted under perfect insurance while the lowest productivity accepted out of unemployment in the risk-averse economy is the left limit of the x axis.

General equilibrium: the importance of EU risk heterogeneity. The changes in EE and EU behavior add up to create the aggregate effect that imperfect insurance has on the economy. This is a novel feature of our model since in the homogeneous EU risk model, consumption risk only affects search by the unemployed and not job-to-job transitions. We compare the effects of offering insurance in the two models in Table 3. We explicitly consider the feedback of search decisions on vacancy posting and allow market tightness θ to adjust to restore the free entry condition.

Qualitatively, the effects of providing perfect consumption insurance are similar in both models. Labor productivity increases, but the unemployment rate goes up, too, and this is driven by a lower UE rate. The firm entry drops, and so does the EE rate. However, there are significant quantitative differences. First, while the increase in productivity is similar, the unemployment rate increases much more in the homogeneous δ model. Second, the EE rate effectively plummets in this model while it only moderately decreases in the full model. Firm entry decreases much more strongly in the model without EU risk heterogeneity.

In the full model, the rise in productivity comes from unemployed workers demanding higher productivity jobs, and employed workers in safe jobs accepting more productivity-enhancing EE moves. In partial equilibrium, this would be reflected in the higher EE and lower UE rates in the

Figure 13: Perfect consumption insurance: Productivity distribution



Notes: Figures compare the ergodic distribution over match productivities in the calibrated model (blue lines) to the risk neutral model (black lines) while keeping labor market tightness constant. In Panel (a) the dashed line gives the hybrid policy function with risk neutral UE policies but the original risk averse EE policies, and vice versa for Panel (b). See text for further details.

full insurance equilibrium, with the latter driving the rise in unemployment. This logic carries over to the full equilibrium version. However, in this exercise, the EE rate falls on net due to two offsetting forces: while EE acceptance probabilities increase, the arrival rate of job offers declines because of the decrease in labor market tightness.

The negative effect on the EE rate in the auxiliary model stems from a compositional effect on the UE margin and a decline in labor market tightness and, hence, the job offer arrival rate. On the UE margin, unemployed workers now reject some low-productivity offers that they used to accept without insurance. This increased selectivity leads firms to cut vacancy posting, which lowers market tightness, hence the nearly 27% fall in the job arrival rate. This mechanism also pulls down the EE rate even if employed workers' EE decisions aren't directly affected by risk and insurance. Second, the higher selectivity at the UE margin leads to a positive compositional effect among the employed, who now reject more offers on average.

The lower UE rate underlies the second main difference: unemployment rises nearly twice as much in response to the offered insurance than in our full model. This difference is driven mainly by the fact that the job offer arrival rate only falls by 7% in our model, not 27%, which affects unemployment. This happens because offering insurance encourages employed workers to accept more job offers, making it easier for firms to hire. This offsets the increased difficulty in hiring unemployed workers, protecting the value of vacancies, and stopping the offer arrival rate $\lambda(\theta)$ from falling precipitously when insurance is introduced.

Decomposing productivity gains of insurance: the EE and UE margins. Imperfect insurance hurts aggregate productivity by reducing the rate at which employed workers make EE moves up the productivity ladder. To illustrate this, we decompose the productivity gain from adding complete insurance to the model into the part due to EE moves and the part due to UE moves. To isolate the mechanism, we do this in the partial equilibrium experiment where we hold market tightness constant, and compare the equilibria with and without perfect insurance. We construct counterfactual hybrid policy functions that take the EE policy function from the equilibrium without insurance but the UE policy function from the equilibrium with perfect insurance, and vice versa. We then simulate the model with these hybrid policy functions and compute the aggregate distribution and, hence, the implied aggregate productivity.

We plot these counterfactual distributions in Figure 13. Each panel shows the equilibrium productivity distribution for the risk averse and full insurance equilibria, as well as from one of the hybrid policy functions. Comparing the two plots we see that EE and UE behaviour are responsible for two very different channels of productivity losses from risk. In Panel (a), we see that insuring only the UE decision causes the production distribution to be more truncated at the bottom because now unemployed workers become pickier in their choices, demanding higher minimum productivity. In Panel (b), we see that insuring only the EE decision does not lead to this truncation, but instead shifts the middle and top of the productivity distribution to the right. This is because insuring risk leads employed workers to accept more job-to-job moves, moving them up the productivity ladder and hence pushing workers towards the top of the productivity distribution.

The combination of these two effects leads to the overall difference between the risk neutral and risk averse distributions, with productivity gains due to both. Productivity is 6.69% higher in the risk neutral economy than the risk averse economy, which gives an estimate of the total productivity losses from incomplete insurance of risk. Productivity is 2.0% higher if we just consider the risk neutral UE policies, and 2.65% higher if we just consider the risk neutral EE policies.

This exercise clarifies that the nexus of incomplete insurance and EE mobility that our paper studies has quantitatively similar—in this case even larger—effects on aggregate productivity as the standard channel that works through UE behavior that the literature has focused on.

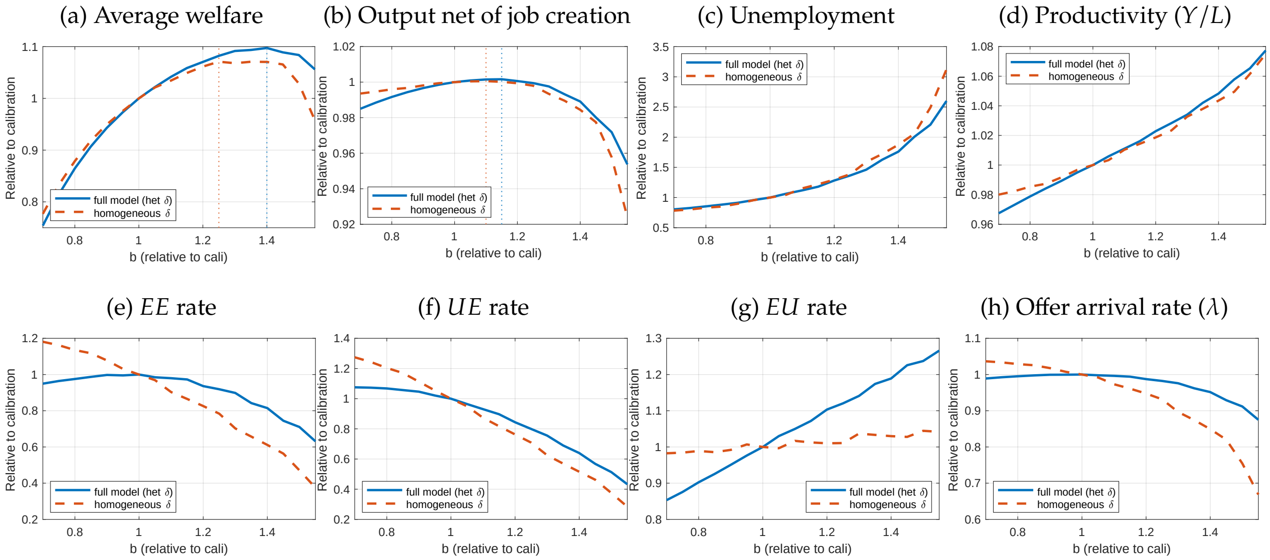
4.4 EU risk heterogeneity and tax-financed changes in unemployment insurance

Our second experiment is to vary the level of UI benefits b, and calculate the optimal level UI in our model versus the auxiliary model without EU risk heterogeneity. We do this by varying b over a wide range from its calibrated value, and recomputing the new steady state equilibrium, as well as the average level of welfare of workers in the economy.[33] We adjust labor taxes, τ, to pay for the change in government spending so that the program is balanced fiscally, with the burden of the program falling directly on employed workers.

It turns out that EU risk heterogeneity significantly changes how UI benefits affect the aggregate economy and, hence, the optimal level of benefits. This is shown in Figure 14, where we vary the

[33] We complement this exercise by studying the dynamic effects of permanent changes in unemployment insurance over the transition path in Appendix Figure A.14.

Figure 14: Effect of varying UI benefits: Full model vs. standard model



Notes: This figure plots results from a counterfactual experiment where unemployment benefits, b, are changed to a new value, and we compare the new steady state to the original steady state. The blue line plots results for our full model, and the dashed red line the homogeneous risk model. Each panel plots a different variable, and all lines are deviations from the original steady state. Raising b too far leads to an equilibrium with positive employment ceasing to exist, and we plot the lines up to the maximum value with a valid equilibrium. The dotted vertical lines in Panel (a) (Panel (b)) denote the welfare (net output) maximising level of benefits in each model.

level of benefits and plot various aggregates. In Panel (a), we plot welfare relative to the calibrated steady states with a 40% replacement rate. We see that raising benefits from this level raises welfare in both models, suggesting that the current level of benefits is too low (at least accounting for the channels considered here). At some point, raising benefits further decreases welfare, and the vertical dotted lines mark the optimal level in each model. We find that raising benefits by 40% from their current level is optimal in our full model while raising benefits by only 25% is optimal in the auxiliary model. Thus, our first finding is that EU risk heterogeneity calls for a more generous UI than in the homogeneous δ model.

To understand why, we investigate the mechanisms by studying each panel. In general, raising benefits is beneficial because workers are risk averse and unable to self-insure against risk, even if it does create other distortions in the economy. In particular, one clear cost of raising benefits is that it increases unemployment (panel c) by both making the unemployed less likely to accept job offers and discouraging firms from posting vacancies.

While the increase in the unemployment rate in response to increases in b is similar in both models, important differences emerge in how labor market flows respond to UI. These differences suggest a new reason for why raising benefits may be less costly. We tend to think of benefits as making it harder for firms to hire, but the opposite can be true in our model. Intuitively, when benefits rise, employed workers fear less the rise in unemployment risk that comes with making an

EE move, and so accept more job offers. This makes it *easier* for firms to hire since their vacancies are now more likely to be accepted by employed workers who previously turned down new job offers. This counterbalances the increased difficulty in hiring unemployed workers that firms face when benefits rise. We can see this in our full model, where raising benefits might cause the EE rate to fall (panel e) less than the UE rate (panel f). How this affects firms depends on which of the two effects dominates. It turns out that for modest increases in UI, the extra ease of hiring employed workers roughly cancels out the increased difficulty of hiring unemployed workers. Therefore, when benefits rise, the offer arrival rate in Panel (h) falls only modestly in our model. These patterns starkly contrast to the auxiliary model, where the EE rate, the UE rate, and the offer arrival rate strongly decrease in b.

The increased willingness of employed workers to accept more EU risk following an EE move leads to a strong increase in the EU rate. While the above-mentioned effects exert downward pressure on unemployment (at least for sufficiently low values of b), the overall change in the composition of jobs towards *more* EU risk almost fully offsets them. Hence, the unemployment rate in our model responds only slightly less to increases in UI benefits than in the auxiliary model.

Raising the level of benefits increases the level of productivity (panel d) more in our model than the homogeneous risk model. This is the efficiency channel (Acemoglu and Shimer, 1999) which we discussed extensively in Section 2. Focusing on this channel alone, to maximise net resources (output net of recruitment costs, panel b) it is optimal to increase b by approximately 15% relative to its calibrated value. The remaining 25 p.p. increase which maximizes welfare corresponds to further gains from increasing insurance.

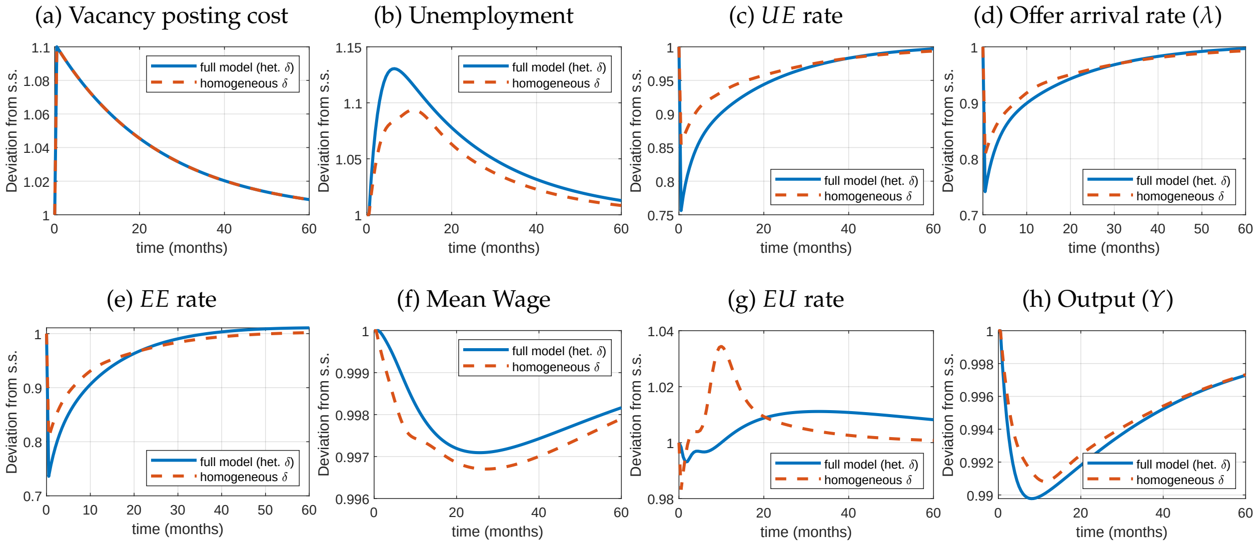
4.5 EU risk heterogeneity and the business cycle

Our final experiment investigates how heterogeneous job safety affects the economy's response to temporary — i.e., business cycle — shocks. We provide a transition experiment meant to address how an increase in job creation cost affects the economy. Specifically, we temporarily raise vacancy posting costs, κ, via an unanticipated and persistent shock.[34]

We present the results in Figure 15, for both our model (solid blue) and the model with homogeneous risk (dashed red). The shock is the same in both models, as shown in Panel (a). Studying the remaining panels yields, most importantly, that the response of unemployment to κ is much stronger in our model than in the auxiliary one. The reason behind these facts is revealed by the joint analysis of panels (c), (d), and (e). The rise in vacancy costs triggers a decline in the offer arrival rate and hence an initial increase in unemployment. In our model, this increase is amplified as unemployment fears start to slow down the job ladder. Specifically, as the UE rate falls, the cost of being unemployed becomes higher as workers anticipate that they will be unemployed for longer if they lose their job. Since climbing the job ladder is risky, this increased cost of unemployment causes employed workers to become pickier, and reject more job offers in

[34]In Appendix C.2 we provide similar evidence for a negative shock to aggregate productivity and to search efficiency out of unemployment s_u.

Figure 15: Impulse response to job creation shock: Full model vs. auxiliary model



Notes: The figure plots results from a transition experiment where vacancy posting cost, κ, temporarily increases. The blue line plots the results for our full model with heterogeneous separation risks, and the dashed red line is a simpler model where all jobs have the same separation risk. Each panel plots a different variable, and all lines are deviations from the original steady state.

favour of staying in their current, potentially safer, job.

This effect is then further amplified because it reduces vacancy creation, resulting in a larger fall in the offer arrival rate in our model than our comparison model. This is because as the job ladder slows down it becomes harder for firms to hire, making vacancy posting even more costly, and hence raising unemployment even more.

Overall, our novelty in this experiment is to provide a new "worker side" explanation for why the job ladder slows down in recessions. It is well known that it does, see Carrillo-Tudela et al. (2022) for a recent example, but typically the driving force is assumed to come from the firm side: Firms hire less in recessions and hence pull fewer workers into EE moves. This treats workers quite passively, and our model highlights that if heterogeneous unemployment risk is taken into account, the job ladder collapse might be amplified by workers deciding that the middle of a recession is not a sensible time to take the risk of changing jobs. This then amplifies recessions by making it harder for firms to hire, offsetting the equilibrating effect of increased unemployment on market tightness.

5 Conclusion

This paper has shown that incomplete insurance of unemployment risk leads workers to climb the job ladder inefficiently slowly, because they apply a distorted valuation of job safety over productivity. That is, workers prefer to stay put in safe but low productivity jobs, and reject high productivity-high risk offers. The resulting misallocation curbs aggregate productivity and provides a new role for unemployment insurance. We formalize this channel in a sequential search model. Besides standard wage (match productivity) differences, the combination of three additional features is crucial in our channel: on-the-job search, separation risk heterogeneity across jobs and incomplete markets.

Existing models have not explored these features jointly and hence missed our channel. First, models that emphasize incomplete markets preclude on-the-job search (e.g., Acemoglu and Shimer, 1999; Marimon and Zilibotti, 1999); we show that adding on the job search can neutralize or even reverse their main results.

Second, models with on the job search and risk aversion do not feature separation risk heterogeneity (e.g. Lise, 2013); we show that incomplete markets have no direct effect on job-to-job transition decisions with homogeneous separation risk.

Third, models with on-the-job search that do feature separation risk heterogeneity (e.g., Pinheiro and Visschers, 2015; Jarosch, 2023) exclusively assume risk neutrality/complete markets; we show that such models thereby miss the key quantitative implications of the risky job ladder and the ensuing key labor market inefficiency.

Besides presenting a new labor market inefficiency and showing its aggregate productivity effects, several additional implications arise in our model. Most importantly, unemployment insurance plays an additional role: it speeds up the job ladder and subsidizes risky rungs by cushioning the fall off the job ladder into unemployment. Hence, the efficient level of UI is higher. Moreover, the model also implies, for instance, that workers are reluctant to switch jobs when labor markets are depressed, which slows down the job ladder and amplifies the rise in unemployment by making it harder for firms to hire.

We close by cautioning that our study remains theoretical. We are not aware of direct empirical evidence that definitively establishes the role of risk aversion and incomplete markets in shaping employed workers' search behavior and job mobility decisions. However, the idea that risk aversion and incomplete markets may distort the most important economic choices individuals can make—job choices—is intuitive. E.g., there is emerging evidence on how wealth and liquidity constraints may distort the behavior of *unemployed* job seekers. For employed workers, we are not aware of similar existing evidence but in the introduction present suggestive survey evidence on workers' own account of their job mobility considerations. Our paper leaves for future research to present direct empirical evidence on this open and important question.

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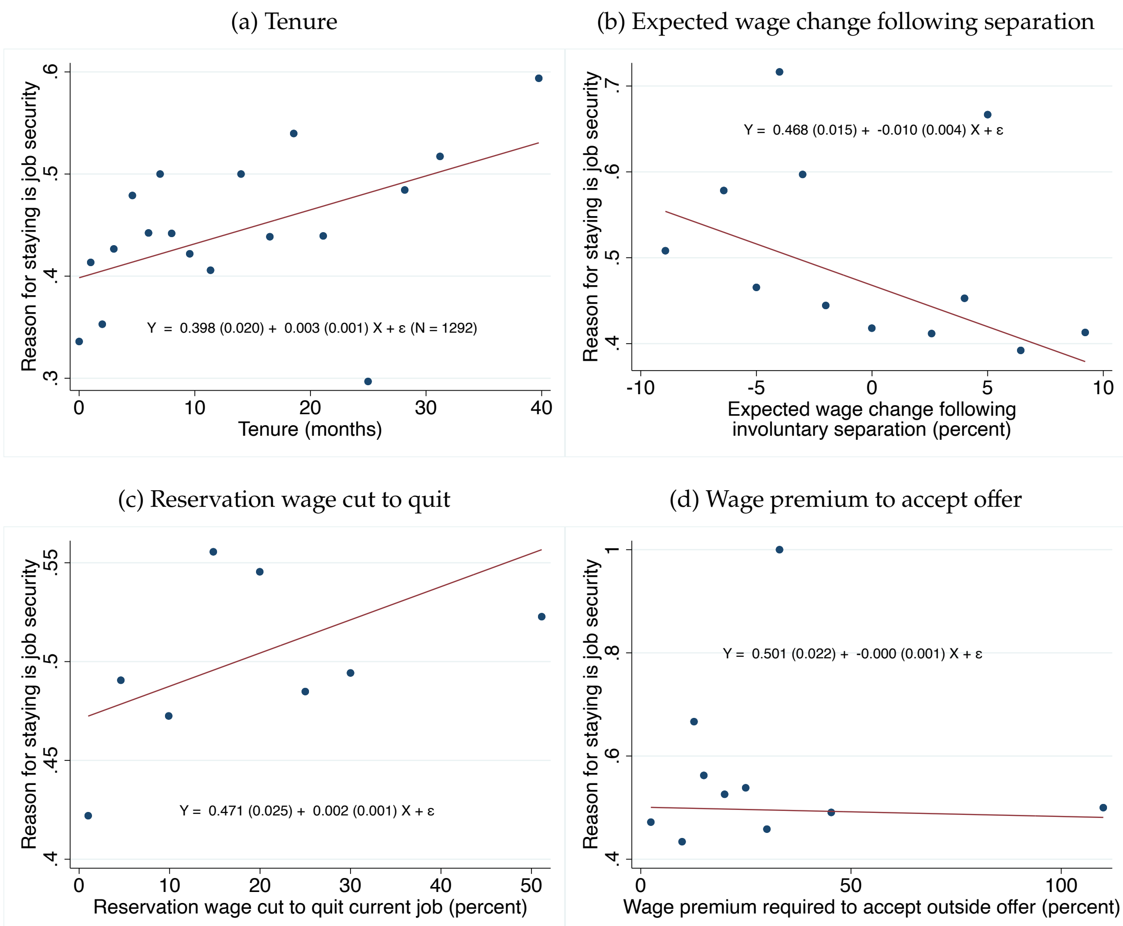
Appendix of:

“Some are Given a Chance to Climb, but They Refuse:” Job Mobility, Unemployment Risk, and Incomplete Markets

By Alex Clymo, Piotr Denderski, Yusuf Mercan and Benjamin Schoefer

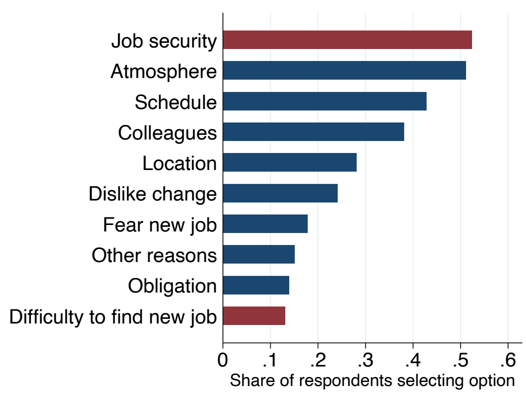
A Empirical appendix

Figure A.1: Correlations: probability of giving job security as a reason to not switch to job with higher wage, against proxies for the value of the current job and unemployment (SOEP 2019)



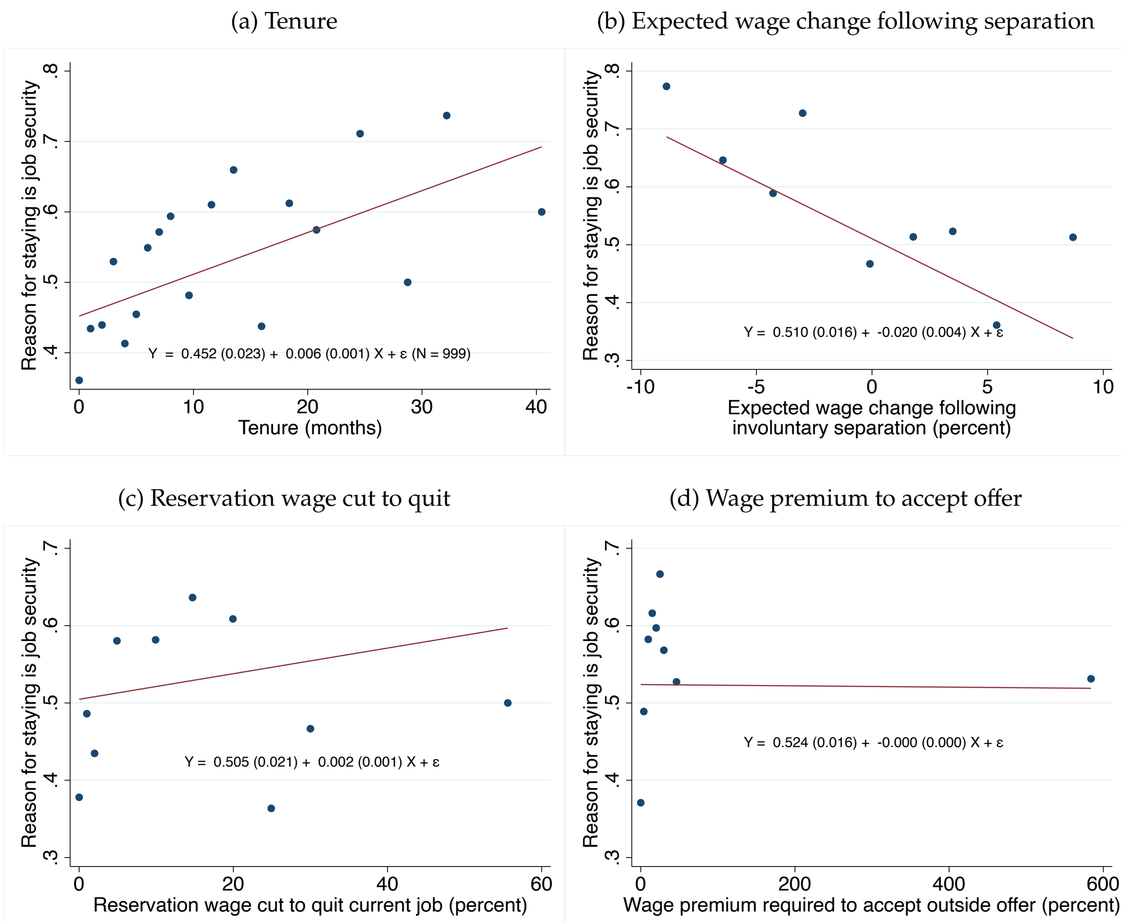
Notes: This figure scatter plots the share of survey respondents that lists job security as a reason not to change jobs against tenure in Panel (a), against expected wage change following an involuntary job separation in Panel (b), against the reservation wage cut that would induce the worker to quit their job within one year in Panel (c) and the wage premium required in an outside offer for the worker to switch jobs in Panel (d) using the data from the 2019 wave of the German Socio-Economic Panel.

Figure A.2: Reasons for not switching employers (SOEP 2020)



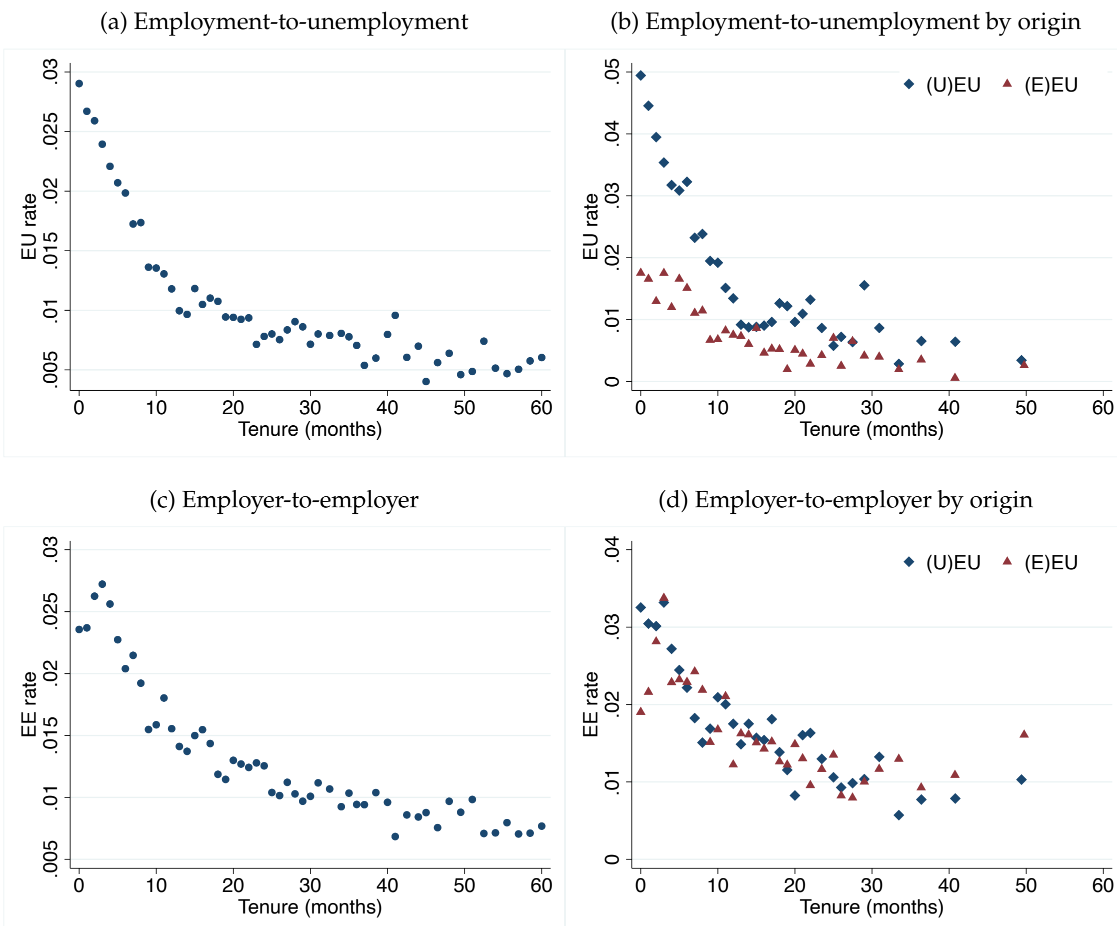
Notes: This figure replicates Figure 1 Panel (a) in the 2020 wave of the survey. This module was run only in 2019 and 2020. The 2020 wave was conducted during the COVID pandemic.

Figure A.3: Correlations: probability of giving job security as a reason to not switch to job with higher wage, against proxies for the value of the current job and unemployment (SOEP 2020)



Notes: This figure replicates Appendix Figure A.1 in the 2020 wave of the survey. This module was run only in 2019 and 2020. The 2020 wave occurred during COVID.

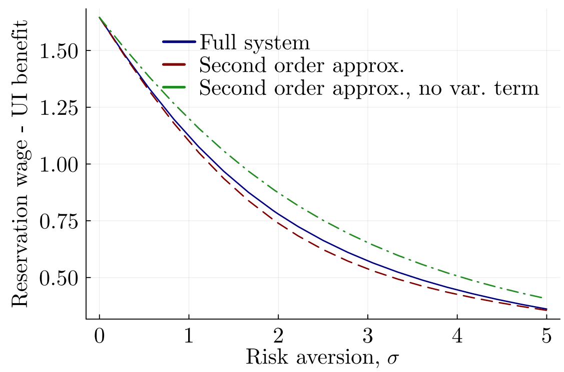
Figure A.4: Worker transition-tenure profiles



Notes: This figure plots monthly worker transition probabilities against tenure on current job. Panel (a) plots the EU rate, Panel (b) plots EU rate by where the job originated from (employment or unemployment), Panel (c) plots the EE rate and Panel (d) plots EE rate by origin against tenure. Source: Survey of Income and Program Participation (SIPP).

B Simple model: additional results

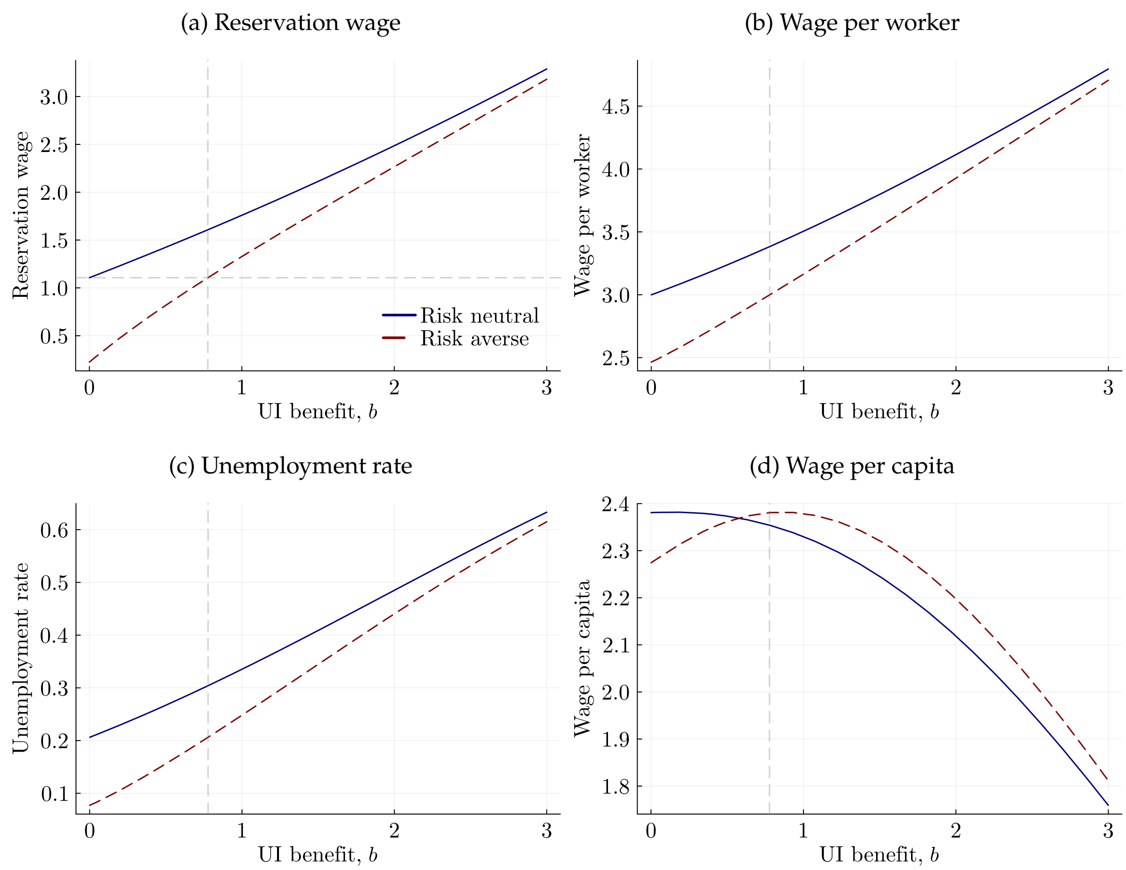
Figure A.5: Inspecting the mechanism: the role of risk aversion



Notes: This figure plots the difference between the reservation wage and UI benefit level against the extent of risk aversion σ. The blue solid line is based on Equation (3), the red-dashed line is based on the second-order Taylor approximation in Footnote 6 and the green dash-dotted line is based on the first-order approximation in Equation (4).

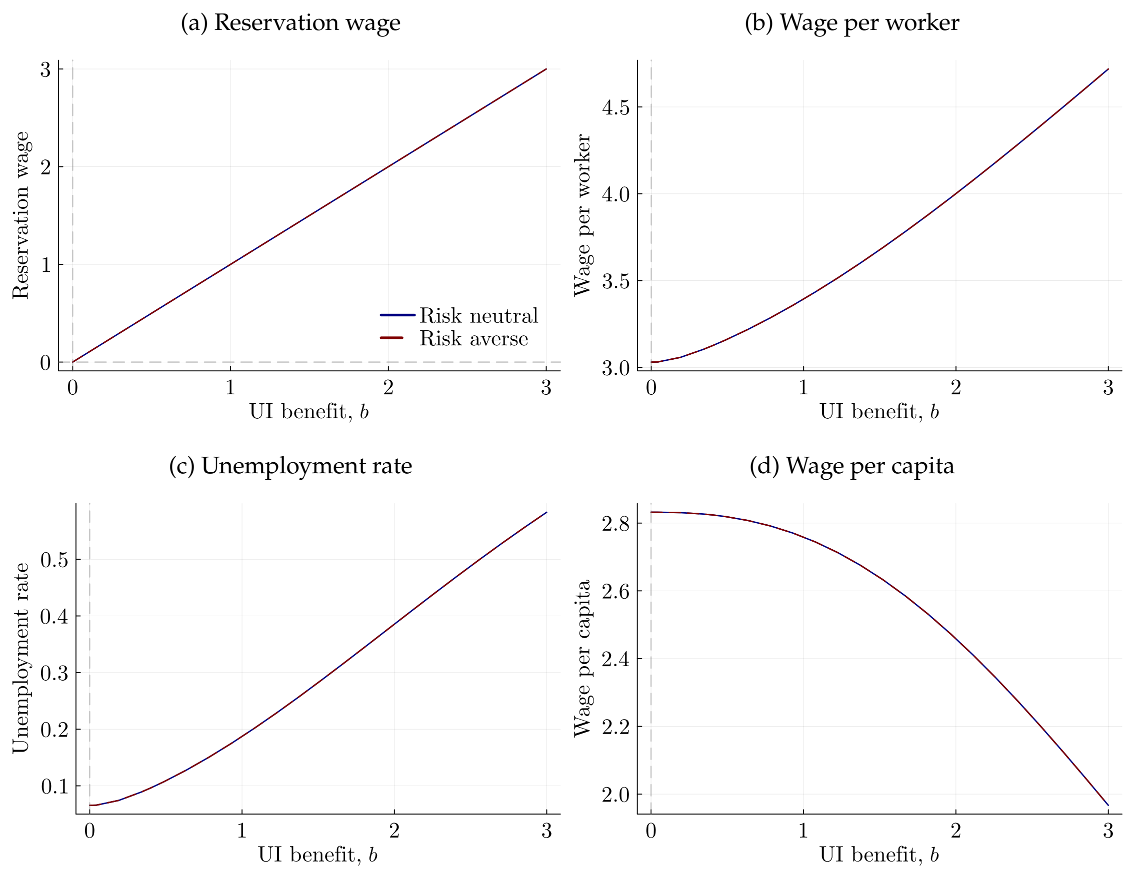
B.1 Homogeneous separation risk

Figure A.6: Effects of UI benefits: on the job search with $\lambda_1 < \lambda_0$ and homogeneous separation risk



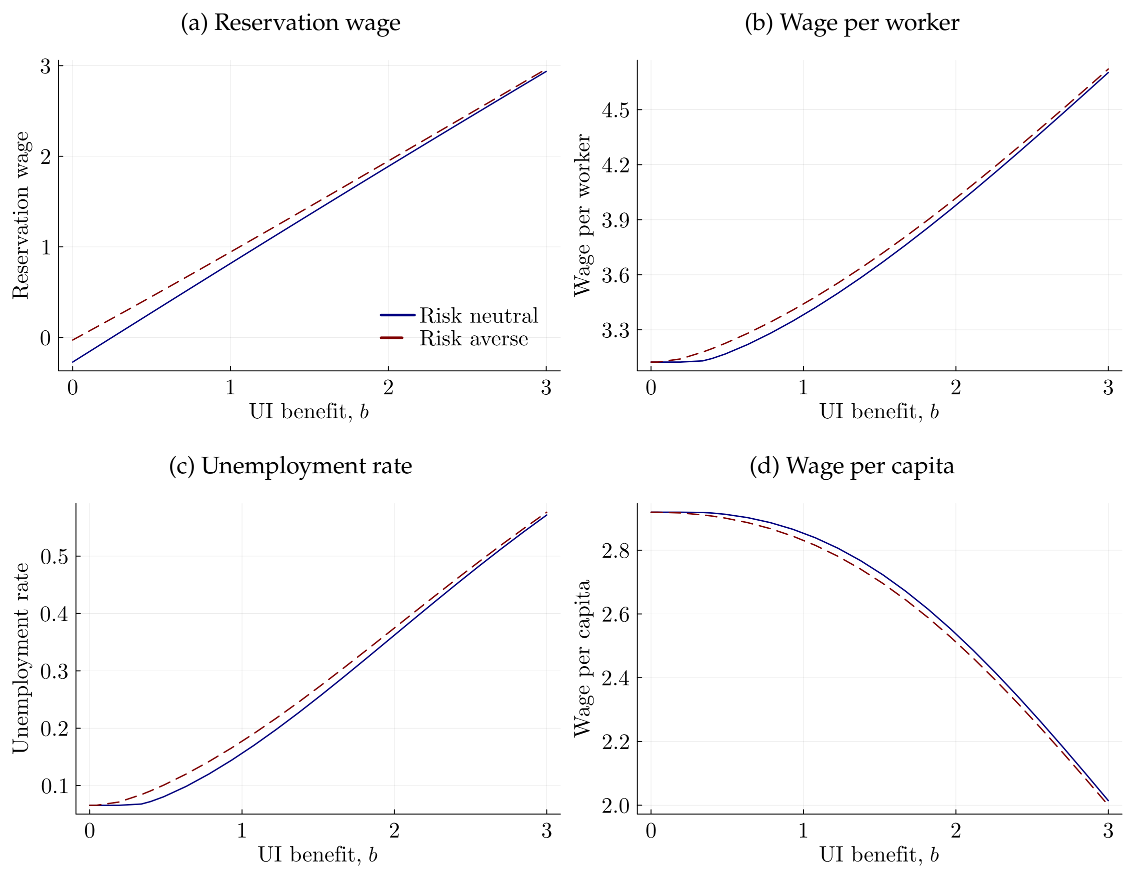
Notes: This figure plots the reservation wage, wage per employed worker, the unemployment rate and wage per capita against UI benefit level b in the model with homogeneous separation risk and where on-the-job search is less efficient than unemployed job search for the risk-neutral (blue solid line) and risk-averse (red dashed line) economies.

Figure A.7: Effects of UI benefits: on the job search with $\lambda_1 = \lambda_0$ and homogeneous separation risk



Notes: This figure plots the reservation wage, wage per employed worker, the unemployment rate and wage per capita against UI benefit level b in the model with homogeneous separation risk and where on-the-job search is equally efficient as unemployed job search for the risk-neutral (blue solid line) and risk-averse (red dashed line) economies.

Figure A.8: Effects of UI benefits: on the job search with $\lambda_1 > \lambda_0$ and homogeneous separation risk

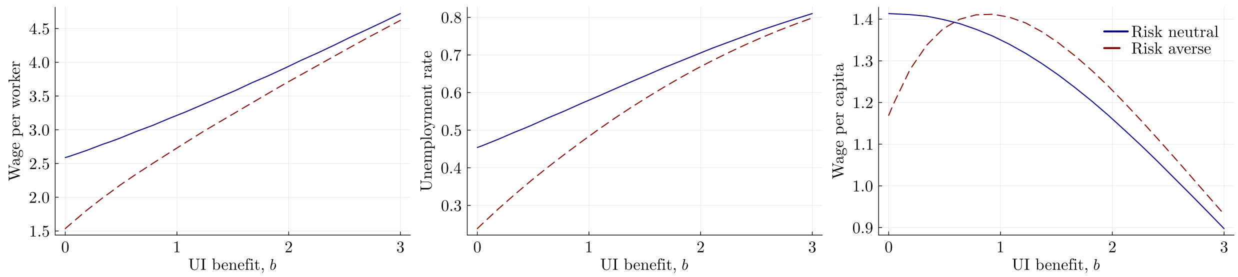


Notes: Notes: This figure plots the reservation wage, wage per employed worker, the unemployment rate and wage per capita against UI benefit level b in the model with homogeneous separation risk and where on-the-job search is more efficient than unemployed job search for the risk-neutral (blue solid line) and risk-averse (red dashed line) economies.

B.2 Heterogeneous separation risk

Figure A.9: Effects of UI benefits: no on the job search and heterogeneous separations

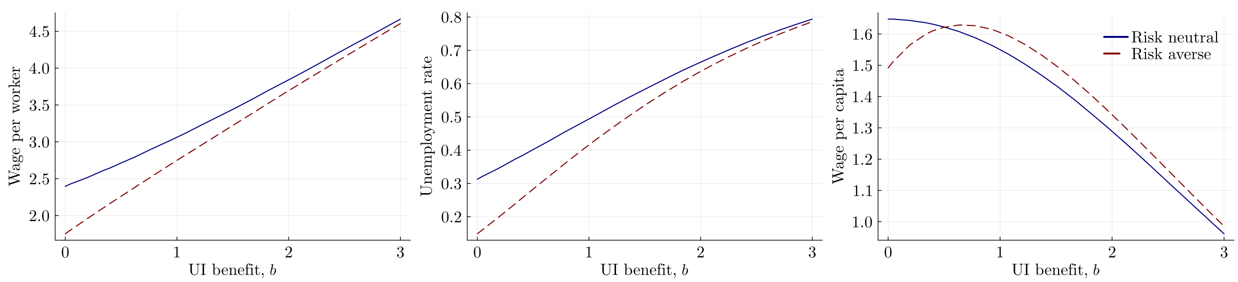
(a) Wage per worker (b) Unemployment rate (c) Wage per capita



Notes: This figure plots wage per employed worker, the unemployment rate and wage per capita against UI benefit level b in the model with heterogeneous separation risk and no on-the-job search for the risk-neutral (blue solid line) and risk-averse (red dashed line) economies.

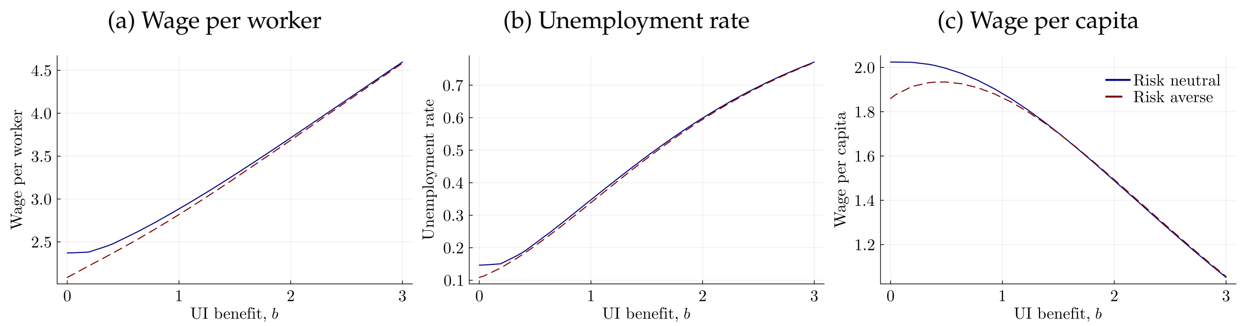
Figure A.10: Effects of UI benefits: on the job search with $\lambda_1 < \lambda_0$ and heterogeneous separations

(a) Wage per worker (b) Unemployment rate (c) Wage per capita



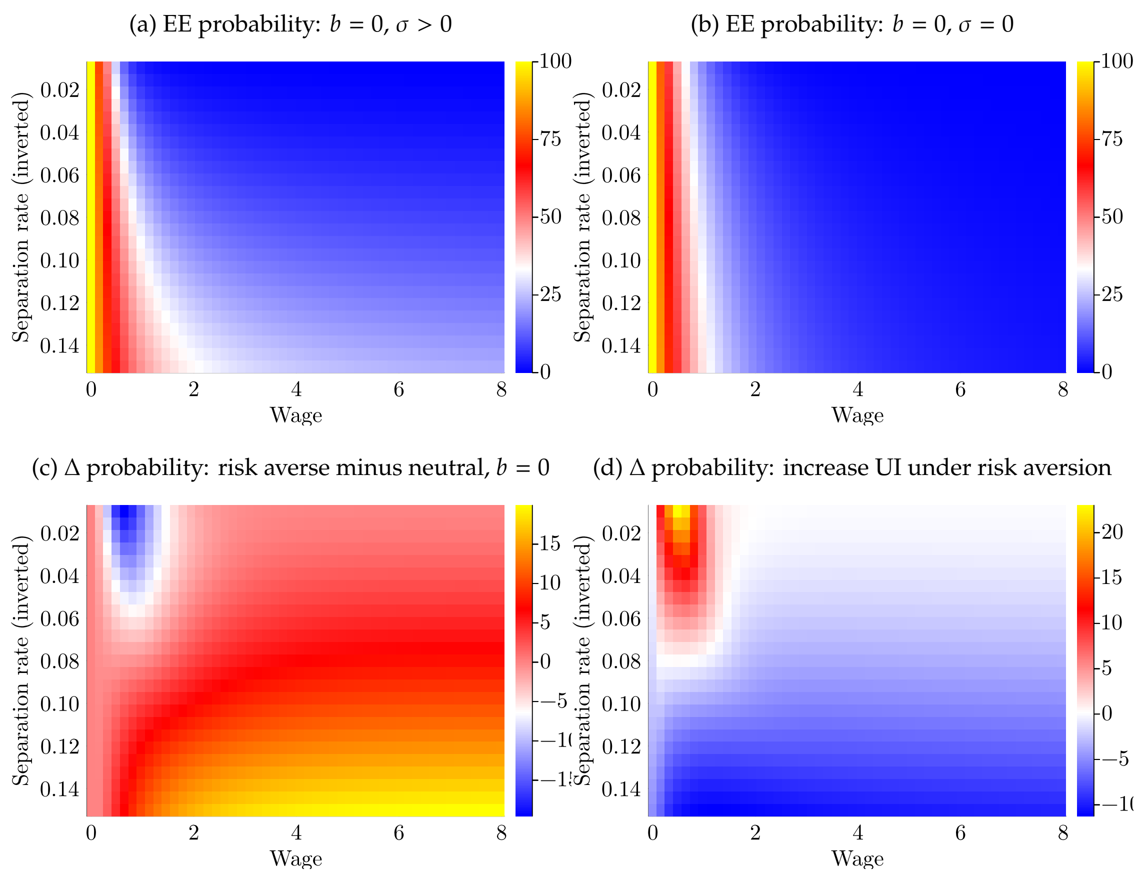
Notes: This figure plots wage per employed worker, the unemployment rate and wage per capita against UI benefit level b in the model with heterogeneous separation risk and where on-the-job search is less efficient than unemployed job search for the risk-neutral (blue solid line) and risk-averse (red dashed line) economies.

Figure A.11: Effects of UI benefits: on the job search with $\lambda_1 > \lambda_0$ and heterogeneous separations



Notes: This figure plots wage per employed worker, the unemployment rate and wage per capita against UI benefit level b in the model with heterogeneous separation risk and where on-the-job search is more efficient than unemployed job search for the risk-neutral (blue solid line) and risk-averse (red dashed line) economies.

Figure A.12: Heat maps of EE probability: OJS with $\lambda_1 = \lambda_0$ and heterogeneous separation risk



Notes: Panel (a) plots a heat map of the probability of making an EE switch conditional on receiving an offer in the risk-averse economy with no UI. Panel (b) does the same for the risk-neutral economy. Panel (c) plots the change in EE probability moving from the risk neutral to the risk averse economy under no UI. Panel (d) plots the change in probability moving from no UI to a positive level of UI under the risk averse economy.

C Quantitative model: additional results

C.1 Analytical results

Lemma 1. *[Wages under CRRA preferences] Suppose $u(c) = c^{1-\sigma}/(1-\sigma)$. Then, wages are a linear function of match productivity z:*

$$w = \frac{1}{1 + \frac{1-\psi}{\psi a}} z, \tag{A.1}$$

with $a = (\sigma - 1)/\left[(\chi)^{1-\sigma} - 1\right]$. This leads to $0 < w(z) < z$ for finite σ, and has a well defined limit in the case of log utility ($\sigma \longrightarrow 1$).

This result follows immediately from specifying $u(c)$ as in the Lemma and setting $w_{-1} = w$ in Equation (25). Since wages are strictly less than z and there are no fixed costs, all matches are acceptable to firms, who never voluntarily terminate or turn down a match. The more risk averse the workers are (higher σ), the lower the labor share paid to workers.

C.2 Additional figures and tables

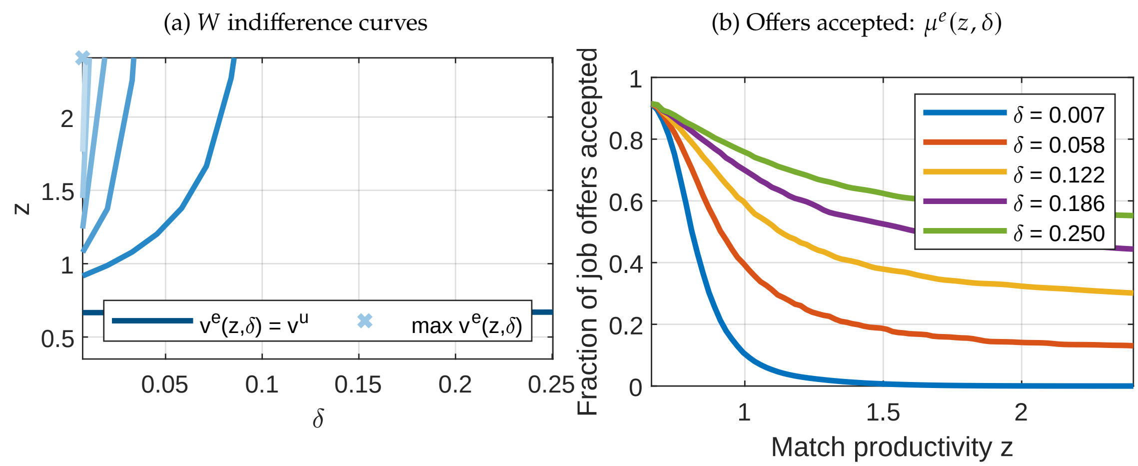
Value and policy functions: how does risk affect job mobility. In Figure A.13 Panel (a), we plot level curves of the employed worker value function, $W(z, \delta)$. As this function is increasing in productivity and decreasing in risk, the level curves illustrate the trade-off between the two. This trade-off becomes stronger the higher the productivity — as workers have more to lose by accepting more risk — as shown by the indifference curves becoming more upwards sloped for higher level curves.

Then, we demonstrate the job search of employed workers in Figure A.13 Panel (b). The job acceptance policy is a four-dimensional object (current job characteristics and the productivity and safety of the new job), which we compress by plotting the fraction of job offers that a worker would accept as a function of their current productivity and risk, $\mu^e(z, \delta)$.

The x-axis gives the worker's current productivity, and the different lines the separation risk level of the worker's current job. All lines are downwards sloping, as workers in higher productivity matches tend to accept only relatively high productivity offers, reducing the fraction of job offers they accept. However, acceptance also depends on the current job separation rate. Since job offers have relatively high risk, workers in safer jobs (lower δ) accept fewer job offers than workers in risky jobs (higher δ) at the same current productivity. In the lower half of the productivity grid, this effect is increasing in current productivity, as workers become increasingly unwilling to move out of safe jobs the higher they climb up the productivity ladder.[35]

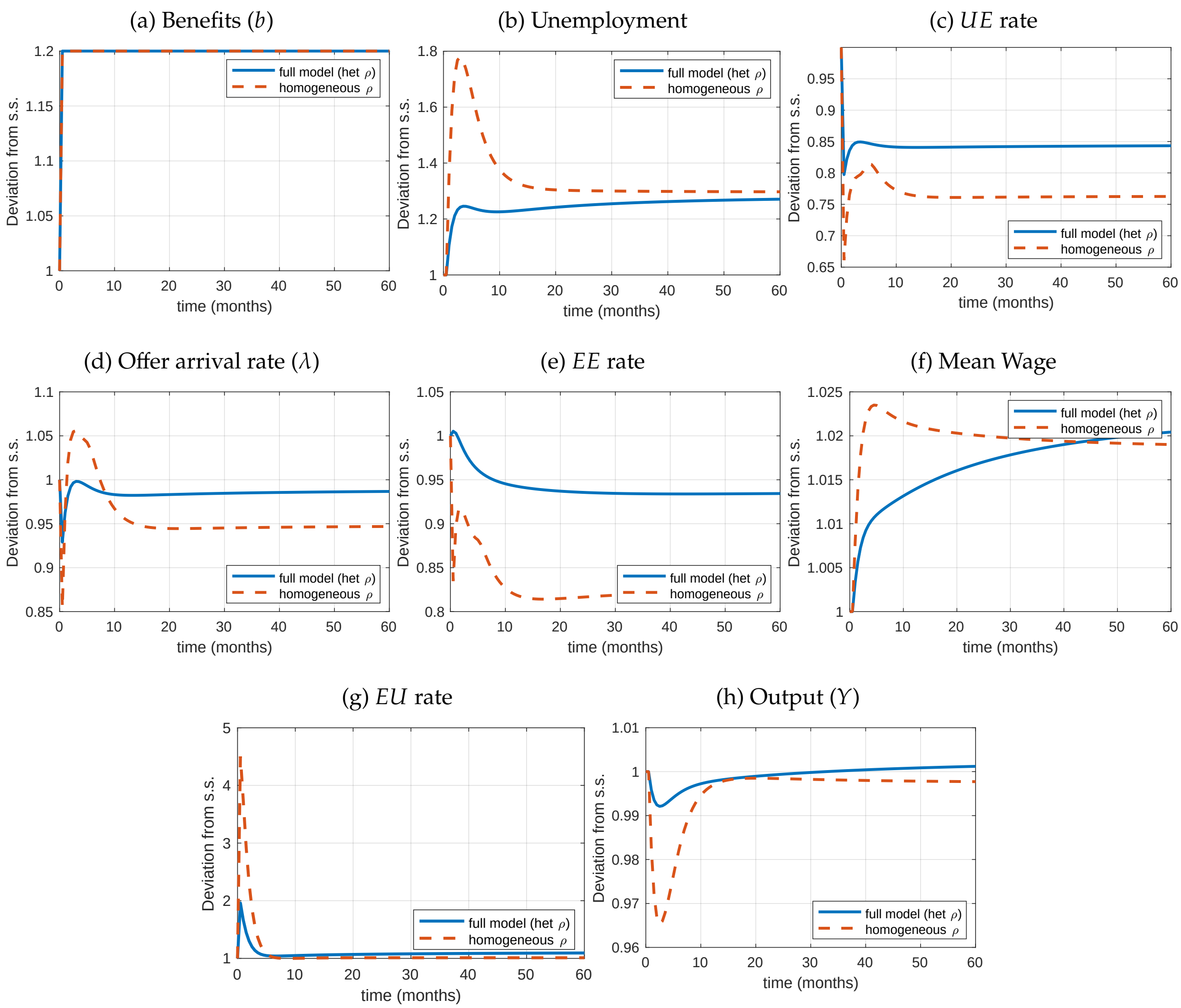
[35]Towards the top of the productivity distribution the gap in acceptance rates between jobs with currently low and high risk shrinks. This is mechanical, because the productivity grid has a maximum productivity level $\bar{z}$ and workers have no job offers left to accept as they approach this maximum.

Figure A.13: Steady state: Indifference curves and employed job acceptance policy



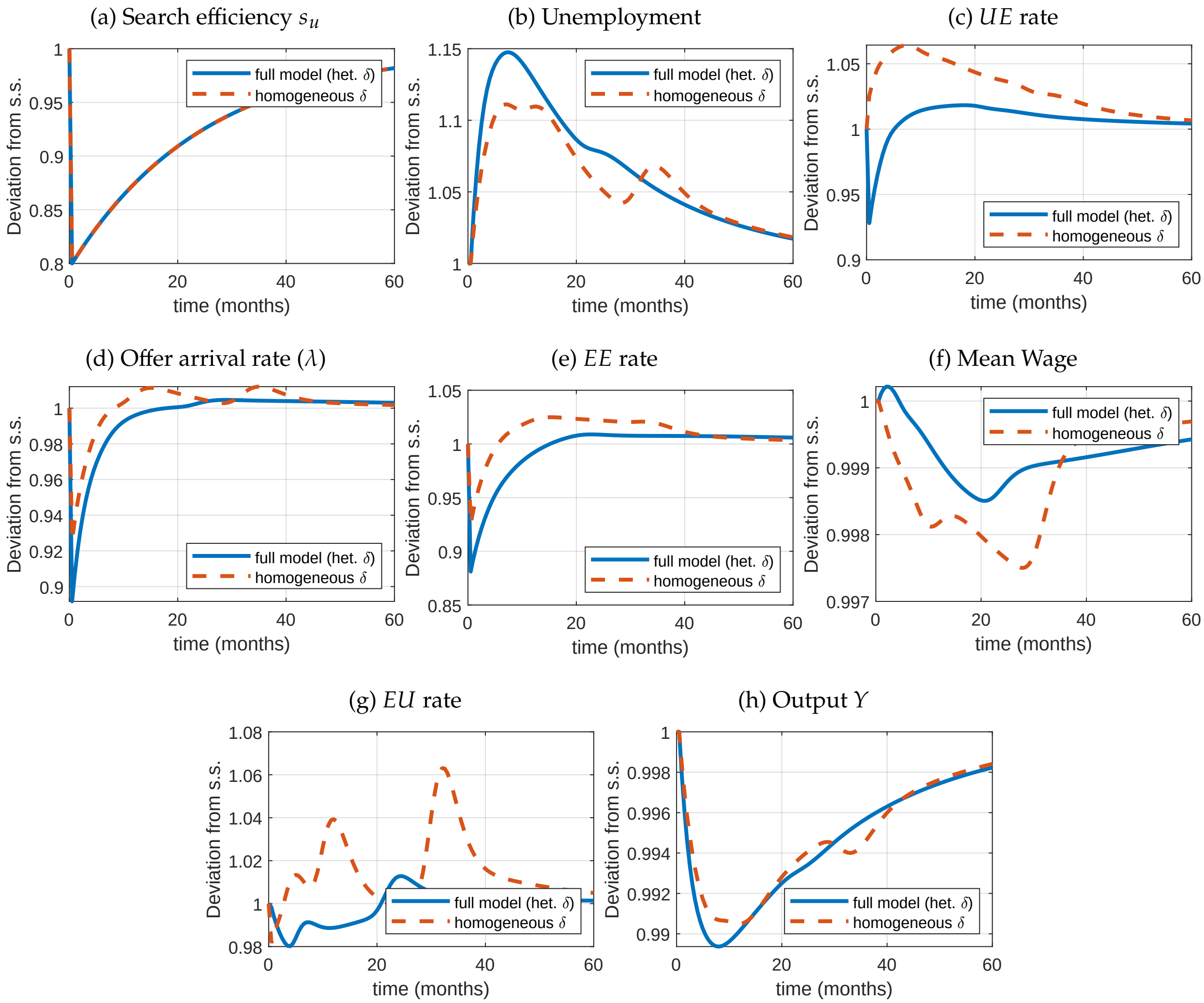
Notes: Left panel plots the employed value function, $W(z, \rho)$ represented as indifference curves. The lowest line gives the points with indifference to unemployment, and the cross is the highest attainable value. Value is increasing in the north-west direction. The right panel plots a representation of the EE job acceptance policy for employed workers: the fraction of job offers they would accept as a function of current job productivity and risk.

Figure A.14: Impulse response to permanent UI rise: Full model vs. standard model



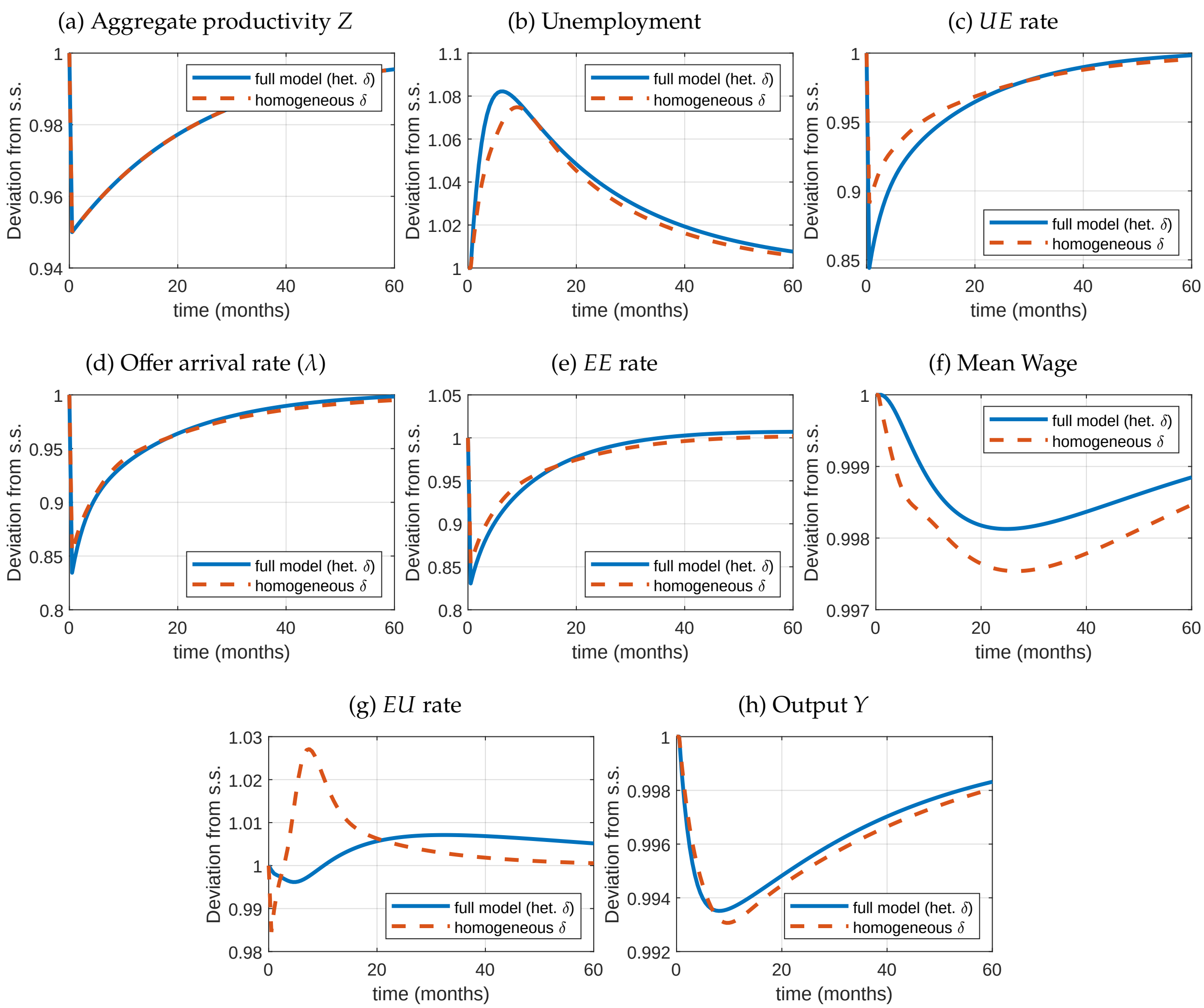
Notes: The figure plots results from a transition experiment where benefits are permanently raised by 20%. The blue line plots results for our full model with heterogeneous separation risks, and the dashed red line a simpler model where all jobs have the same separation risk. Each panel plots a different variable, and all lines are deviations from the original steady state.

Figure A.15: Impulse response to search efficiency s_u shock: Full model vs. auxiliary model



Notes: The figure plots results from a transition experiment where vacancy posting cost, κ, temporarily increases. The blue line plots the results for our full model with heterogeneous separation risks, and the dashed red line is a simpler model where all jobs have the same separation risk. Each panel plots a different variable, and all lines are deviations from the original steady state.

Figure A.16: Impulse response to an aggregate productivity shock: Full model vs. auxiliary model



Notes: The figure plots results from a transition experiment where aggregate productivity, Z, temporarily increases. The blue line plots the results for our full model with heterogeneous separation risks, and the dashed red line is a simpler model where all jobs have the same separation risk. Each panel plots a different variable, and all lines are deviations from the original steady state.