Job Ladder and Wealth Dynamics in General Equilibrium*

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Abstract

This paper develops a macroeconomic model that combines an incomplete-markets overlapping-generations economy with a job ladder featuring sequential wage bargaining, endogenous search effort of employed and non-employed workers, and differences in match quality. With these ingredients our model provides a joint microfoundation for the three main inputs in aggregate production: capital, employment and labor efficiency. The calibrated model offers a good fit to the empirical age profiles of search activity, job-finding rates, wages and savings. We use the model to analyze the impact of tax and transfer policies for labor market dynamics and aggregate economic activity via capital, employment and labor efficiency channels. Lower unemployment benefits and a less progressive tax schedule bring about welfare losses for a newborn worker which are mainly driven by higher consumption risk and costlier search effort; both policies have differential effects along the age, income and wealth dimensions.

JEL classification: E21; E24; H24; J64; J65

Keywords: Search and matching; Job-to-job transitions; Incomplete markets; Overlapping generations; Wealth accumulation

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1 Introduction

The objective of this paper is to analyze the joint dynamics of wages, match quality and wealth over the life cycle and their implications for aggregate outcomes. To this end, we develop a macroeconomic model that allows us to quantify these relationships and to conduct counterfactual experiments of policies that affect the motives to search, to accept and quit jobs, and to save. In a nutshell, this paper bridges the gap between macroeconomic incomplete-markets models (Bewley, 1977; Imrohoroğlu, 1989; Huggett, 1993; Aiyagari, 1994) and frictional job-ladder models with sequential bargaining (Cahuc, Postel-Vinay and Robin, 2006). In doing so, our paper makes three contributions.

First, our theory provides new microfoundations for macroeconomics with heterogeneous households. Within an aggregate production function relationship of the form $F(K, AL)$, all three inputs capital K, employment L and labor efficiency A are *jointly* determined by asset and labor market choices of firms and heterogeneous households in equilibrium. Search frictions in the labor market coupled with job mobility and differences in match quality take an impact on aggregate employment L and labor efficiency A, while the aggregate capital stock K results from firms' investment and households' savings decisions in an incomplete asset market. By combining these ingredients, our model incorporates novel linkages between the labor and the capital market. On the one hand, workers' endogenous labor market risks affect their saving motives and therefore the aggregate demand for assets, while the firms' supply of assets depends on the number and quality of matches in the labor market. On the other hand, the distribution of assets held by households matters for their job search effort, job acceptance and quitting decisions, which, together with the equilibrium interest rate, determine firms' labor demand and hence aggregate employment and labor efficiency. Our microfounded model helps to understand and quantify the role of these linkages for aggregate and distributional outcomes.

Second, our model sheds light on the relationship between household wealth, labor market transitions and earnings over the life cycle. Households of different ages decide about search effort, job acceptance and saving, so that our model has implications for the interaction between savings and labor market dynamics. We document empirically that search activity of employed and non-employed workers declines with age and with the wealth position of the household. Our model is consistent with these patterns, as well as with the age and wealth profiles of job-finding rates, and we explore the mechanisms behind these relationships.

The third contribution is to analyze the macro, labor market and welfare effects of two policies: lower unemployment benefits and a less progressive income tax schedule. Both poli-

cies change the saving and labor market decisions of heterogeneous households and therefore influence aggregate activity through the capital, employment and labor efficiency channels as described above. We explain the differential effects of the policies across the age, income and wealth distribution, how firms' capital and labor demands amplify or mitigate the policy effects in general equilibrium, and we analyze the policy impact on welfare.

In Section 2, we begin by presenting selected empirical findings that motivate the key ingredients of our model. We use data from two panel surveys of German households to document that search effort and job finding of employed and non-employed workers decline with age and wealth, conditional on a number of individual and household controls. While other studies also find that search effort and job-finding rates of the unemployed decline with savings or better access to credit,[1] we obtain a similar negative relationship between savings, search effort and job-finding rates also for employed workers.[2]

Our model is presented in Section 3. It integrates a random-search job-ladder model with sequential wage bargaining into an overlapping-generations economy with risk-averse worker households and incomplete financial markets where households save in a single risk-free asset due to precautionary, retirement and bequest motives. Thus, we adopt the most basic specification of standard incomplete-markets models, leaving extensions in relevant directions – such as different asset classes and return heterogeneity – for future research. Workers choose between active and passive search, both on and off the job, as key ingredients to link savings and labor market transitions. Workers typically move to jobs of better quality, unless they are hit by reallocation shocks that may involve a loss of match quality. Workers separate into non-employment either voluntarily (with or without a reallocation shock) or exogenously in response to a layoff shock. Wages follow a standard surplus-splitting rule and are renegotiated whenever one party has a credible threat to quit. Different from job-ladder models with directed search, our random-search environment features search intensity and selectivity (job acceptance and quitting) as two important margins governing job mobility.

The model further includes unemployment benefits, progressive income taxation, and a public pension system. We close it with firms choosing capital investment and job creation, a balanced budget of the government and an endogenous interest rate equilibrating demand and supply of the risk-free asset. Solving the stationary equilibrium of the model is computationally tractable due to the bargaining structure with surplus sharing which entails that only the current wage and match productivity, next to assets and age, enter the worker's value function so that standard global solution methods can be applied.

[1] See e.g. Rendon (2006); Chetty (2008); Lentz (2009); Herkenhoff et al. (2024); Huang and Qiu (2024).

[2] Although this relationship is robust to adding many individual and household controls, it has no causal interpretation. Our structural model allows us to examine the joint determinants of savings and search effort.

In stationary equilibrium, transitions between non-employment and employment and across jobs, as well as wages and savings, are endogenous outcomes. Nonetheless, the model is parsimonious and straightforward to calibrate, which we do in Section 4. We target selected data moments for the German economy and evaluate the fit of the model in non-targeted dimensions.[3] Although none of the calibrated parameters – except worker productivity in the pre-retirement age group – depend on worker age, the model delivers a good fit to the life-cycle profiles of employed and non-employed workers' search effort, job-finding rates (NE and EE rates), wages and wealth. We also investigate the mechanisms behind the age profiles of labor market transitions and show that life-cycle wealth accumulation plays an important role for the declines of job-finding and job-switching rates early in life.

Our policy results are presented in Section 5. In response to a cut of unemployment benefits by 10%, our economy experiences a long-run increase of aggregate output by 2.9% which is driven by 2.7% higher employment and 5.4% higher capital, together with a mitigating decline of aggregate labor efficiency by 0.6%. The latter arises since non-employed workers and employed workers hit by a reallocation shock are willing to accept more low-productivity jobs. The aggregate effects are amplified by enhanced job creation in general equilibrium and by rising precautionary savings and job search effort, with stronger responses among wealth-poor households. Widening productivity dispersion between acceptable jobs results in greater wage inequality. A newborn household dislikes the policy regime with weaker public insurance, greater earnings risk and higher job search effort, which together result in a welfare loss equivalent to 1.35% lower consumption, in spite of increased aggregate consumption and aggregate employment.

In our second policy experiment we reduce the tax progressivity parameter from the German to the U.S. value, adjusting the tax level parameter to maintain budget balance. While high earners benefit from less progressive income taxes, the majority of workers end up with lower after-tax earnings. As a result, some jobs at the bottom of the productivity distribution cease to be viable, so that the economy ultimately experiences a decline of aggregate employment by 1.4% in combination with an increase of aggregate labor efficiency by 0.7%. Negative employment effects are realized for all prime-age workers who are less likely to take low-productivity jobs. Although job search effort of employed and non-employed workers goes up slightly, weakened job acceptance and higher job quitting reduces firms' labor and capital demands, so that aggregate output declines by 0.5% in general equilibrium. In spite of higher average earnings, a newborn household experiences a welfare loss equivalent to

[3]Using a survey of German HR managers, Caldwell et al. (2024) find that the majority of firms are willing to offer a higher wage to retain a worker holding an outside offer, which lends support to a model structure with on-the-job wage bargaining in this labor market context.

1.1% lower consumption, which is mostly driven by greater earnings risk.

Related Literature

Our labor market modeling builds on the sequential auction models of Postel-Vinay and Robin (2002) and Cahuc et al. (2006) which are able to generate endogenous earnings dynamics with transitions between unemployment and employment, job-to-job flows and wage changes on and off the job. At the same time, these early approaches have risk-neutral workers and exogenous matching rates. Bringing these models closer to the macro-labor literature, Robin (2011) includes aggregate productivity risk and Lise et al. (2016) add a job-creation condition with an aggregate matching technology. To study richer wage dynamics within and between jobs, Bagger et al. (2014) introduce human capital accumulation to which Ozkan et al. (2023) add a life-cycle structure with ex-ante worker heterogeneity in order to analyze the determinants of lifetime earnings inequality. To describe wage processes with a tractable log-linear structure, these two papers have risk-averse workers with logarithmic utility, yet rule out savings. As in our work, Lentz (2010) and Bagger and Lentz (2019) consider a sequential bargaining model with endogenous search intensity. While their models have no savings or capital, they feature sorting of workers and firms of different skill and productivity types. In our model, jobs differ in match-specific productivity, but there is neither permanent (ex-ante) heterogeneity of workers and firms, nor accumulation of human capital. Adding these features would be interesting directions for future research.

Early contributions featuring a worker's consumption-saving choice in job search models are Acemoglu and Shimer (1999) and Lentz and Tranaes (2005) which abstract from search on-the-job. Lise (2013) considers a model with search on and off the job, and studies saving and search effort choices at different positions on the job ladder, while the wage-offer distribution is exogenous. More recently, Hubmer (2018), Kuhn and Ploj (2020) and Larkin (2019) also consider precautionary savings in job-ladder models with exogenous wage distributions.

The first paper that embeds a frictional labor market into a macroeconomic incomplete-markets model with heterogeneous households is Krusell et al. (2010). In their model, the labor market has a standard Diamond-Mortensen-Pissarides structure with random search, endogenous job creation, wages set via Nash bargaining and no job-to-job transitions. In subsequent work, Krusell et al. (2017) consider a richer labor market structure with on-the-job search, a labor force participation margin, and aggregate risk, yet their model has exogenous wages and an exogenous interest rate. Recently, Cajner et al. (2024) consider an incomplete-markets model with a life-cycle structure and search on-the-job, but matching rates are exogenous functions of age and wages are exogenously linked to productivity. Chaumont and Shi (2022) develop a directed search model with job ladders, savings and

incomplete markets. Different from our paper, the interest rate is exogenous, workers do not choose search effort, job acceptance or job quitting, and there is no life cycle – ingredients that we consider essential for the micro and macro implications of economic policies. Griffy (2021) analyzes a similar model as Chaumont and Shi (2022), adding a life cycle and human capital accumulation, while keeping search effort and the interest rate exogenous. In ongoing work, Griffy and Rabinovich (2022) and Krusell et al. (2019) study similar directed-search job-ladder models with aggregate risk. Birinci et al. (2024) build a HANK model with on-the-job search, yet without search effort, job acceptance or job quitting into non-employment. Abstracting from search on-the-job and building on Krusell et al. (2010), Lalé (2019) studies the impact of severance payments on endogenous job separations, while Eeckhout and Sepahsalari (2024), Herkenhoff et al. (2024) and Huang and Qiu (2024) analyze match productivity and sorting with permanent heterogeneity of firms and/or workers.

Related to our policy analysis is the literature on unemployment insurance in general-equilibrium settings with search frictions and precautionary savings (e.g. Young, 2004; Mukoyama, 2013; Popp, 2017; Piguillem et al., 2021).[4] Our work contributes to this literature by considering a model with richer earnings dynamics due to search on-the-job and a selectivity margin, which are key for the aggregate and welfare effects of unemployment benefits.

Next to the large literature on progressive taxation and (intensive margin) labor supply in macroeconomics (e.g. Heathcote et al., 2017), our work is related to research studying the relationship between income taxation and the allocation of labor in a frictional market (see e.g. Gentry and Hubbard, 2004; Kreiner et al., 2015; Bagger et al., 2018, 2021). Our work complements these studies in that we consider an incomplete-markets economy with savings, endogenous search effort, and a selectivity margin that determines job acceptance and job quitting which is central for our policy findings.[5]

2 Empirical Facts

We begin by presenting selected empirical relationships motivating the key ingredients of our model and guiding the model calibration and validation. In particular, we show how job search and job finding vary with age and with the household's wealth position. We utilize

[4]There is also a literature that considers the effects of unemployment insurance in settings with search frictions and precautionary savings (with an exogenous interest rate). Acemoglu and Shimer (2000) show that more generous unemployment benefits can help financially constrained workers to search for better jobs, which may eventually raise output. This mechanism is also effective in Eeckhout and Sepahsalari (2024) who consider a richer setup that is closer to ours but abstracts from job-to-job transitions.

[5]Pizzo (2023) examines the welfare effects of tax progressivity in a model combining incomplete markets and search frictions, yet abstracting from on-the-job search.

two household surveys for our analysis.

The Panel Study Labour Market and Social Security (PASS) is an annual household panel survey which is provided by Germany's Institute for Employment Research (IAB). PASS covers about 10,000 households during the years 2007–2019 with interviews of all household members aged 15 and older.[6] From the person questionnaire, we use information about job search activity in the past four weeks which is reported by employed and non-employed individuals. From the household questionnaire, we use information about financial wealth and debt (excluding mortgages) of the household.[7] We only consider individuals of ages 25–66 who are closely attached to the labor force. Specifically, we remove all persons with less than 70% of their worklife (after age 25) in paid employment, or who are currently in education, in parental leave, childcare leave or sick leave. Appendix A.1 contains further details and reports various household and person statistics about this sample.

Figure 1 shows how search activity of employed and non-employed workers varies with age and with the financial wealth position of the household. The four graphs show unconditional and conditional averages where the latter are residualized by several person and household characteristics which play no role in our model (i.e. education, household size, gender, marital status, hours worked) as well as time fixed effects. Employed workers are generally less likely to search than non-employed workers in our sample (6.3% versus 32.6%). Note that, for non-employed individuals, the active search question differentiates between unemployed and out-of-labor-force individuals.[8]

The age profile in panel (a) shows that active search among employed workers is steeply decreasing over the life cycle, while panel (b) indicates that the proportion of active searchers among non-employed prime-age workers is stable at around 40% but drops sharply after age 55. Panels (c) and (d) show that active search is strongly decreasing with the financial wealth of the household. In comparison to workers in the bottom wealth quartile, the search proportion of employed workers in the top quartile is only about half as large. For non-employed workers we also observe a decline in active search with household wealth holdings.

[6] While the PASS oversamples households with unemployment benefit recipients, it also provides sampling weights to the German residential population which are applied in our analysis.

[7] Financial wealth includes savings accounts, stocks, mutual funds, and life assurances among others (yet excluding deposit accounts). Both financial wealth and non-mortgage debt is reported in eight categories ranging from zero to over €50,000.

[8] To be precise, 96% of non-employed active searchers also report that they could start work in the next two weeks, hence are considered unemployed as defined by the International Labour Organization. We also find that non-employed workers reporting search have an 80 percent higher job-finding rate compared to those reporting no search activity in our sample; see Appendix A.1 for further details. We also show in this Appendix that non-employed searchers exert higher search effort than employed workers reporting active search, as measured by the number of search channels, time spent on job search, broadness of search, or number of applications sent, which is consistent with the U.S. evidence provided by Faberman et al. (2022).

In both panels (c) and (d), the wealth gradients are attenuated when person and household controls are applied.



Figure 1: Active search by age and wealth

NOTES: Proportions of active searchers among employed and non-employed workers in PASS data. "w/o controls" are unconditional means, "controls" are residualized by years of education, household size, hours worked, gender, marital status and year fixed effects. The reported averages are obtained from regressing the active search dummy on these controls and adding the mean of the residuals to the unconditional average, separately for each age group or wealth quartile. Wealth quartiles are built based on the proportions in the original eight categories of financial wealth in PASS.

Clearly, household wealth and the age of household members are positively correlated, and both also correlate with other household or personal characteristics that may influence a worker's job search behavior. In Table A.6 in the Appendix we regress the active search dummy on age, financial wealth and the controls that are also applied in Figure 1. We find that active search is less likely if the person is older or more wealthy, with sizable coefficient estimates: Compared to the zero wealth reference category, workers with financial wealth above €20,000 have a 7.6 percentage point (pp) lower probability to search actively

when employed and a 15.1 pp lower probability to search when non-employed. Controlling for further worker characteristics which are endogenous in our model (i.e. income, spell duration, number of previous employers) reduces the coefficient estimates only slightly, while they remain economically and statistically significant. Finally, when we include controls for household debt, the negative relationships with age and wealth continue to hold and we find that higher indebted workers are more likely to search (except for high-debt non-employed workers where the difference to zero-debt individuals is statistically insignificant).[9]

We further use statistics from the Socio-Economic Panel (SOEP), a representative household survey administered by the German Institute for Economic Reserch (DIW Berlin). We use the survey waves 2005–2015 during which SOEP covers around 30,000 individuals in around 15,000 households. We impose sample restrictions similar to those with the PASS data; see Appendix A.2 for details, construction of the variables and descriptive statistics. Different from the PASS survey, SOEP collects information about all self-reported wealth and debt, including real and financial wealth and all household debt including mortgages, in quinquennial survey modules. We define net wealth as the value of real estate, financial wealth, and other business and real wealth minus all outstanding debt, and group households into four net wealth quartiles.[10] We use information from the monthly calendar module in SOEP to construct quarterly transition rates between employment and non-employment.[11] In this section, we relate the job-finding rates for employed and non-employed workers (EE and NE rates) to worker age and household wealth.

Figure 2 shows quarterly EE and NE rates by age (top panels) and household wealth quartile (bottom panels), where again the conditional relationships are controlled for variables which play no role in our model (education, household size, gender, marital status and time fixed effects). While the EE rate drops sharply from the first to the second age group after which it decreases at a slower rate, the NE rate also decreases in age but exhibits the largest decline between the 45-54 and 55-66 age groups. Regarding relationships with household wealth, we find that EE rates are decreasing in the wealth holdings of the household

[9] In Appendix A.4 we present results for the U.S. from the Survey of Consumer Expectations where we also find that search activity is decreasing in age and financial wealth and increasing in household debt, conditional on other individual and household characteristics.

[10] We find that financial wealth is highly correlated with total household wealth in SOEP data. While our model does not distinguish between financial and real wealth, we consider total net wealth the appropriate counterpart of household wealth in our model.

[11] Hertweck and Sigrist (2015) is the first analysis of worker flows in Germany based on SOEP data. Unlike the PASS survey, SOEP has no information about search activity among employed workers. We also calculate worker flow rates from the PASS survey and find only minor discrepancies in the levels and in the age relationships which are likely due to differences in survey design and in the respective worker samples. From transition rates measured in PASS, we find that NE and EE rates are substantially higher for active searchers, see Appendix A.1.

with the biggest gap between wealth quartiles one and two. In contrast, NE rates are mildly increasing in household wealth quartiles Q1–Q3, but are significantly lower for workers in the highest wealth quartile.



Figure 2: Quarterly EE and NE rates by age and wealth

NOTES: Quarterly job-finding rates (in %) of employed and non-employed workers (EE and NE rates) in SOEP data by age and wealth. "w/o controls" are unconditional means, "controls" are residualized by years of education, household size, gender, marital status and time fixed effects. The reported averages are obtained from regressing the EE and NE dummies on these controls and adding the mean of the residuals to the unconditional average, separately for each age group or wealth quartile. Wealth quartiles are based on the net wealth distribution in the wealth modules of SOEP.

Since labor market transitions jointly depend on the age of the worker and various person and household characteristics, including household wealth, we further regress the job-finding outcome variable (i.e. quarterly EE and NE dummies) on these variables and report the results in Table A.7 of Appendix A.3. Similar to the regression results for active search, we find that age and wealth are jointly negatively related to job-finding rates in economically and statistically significant ways. Employed workers with financial wealth above €25,000 have

a 2.2 pp lower probability to make a job-to-job transition, compared to employed worker in the zero wealth reference category and controlling for age and various characteristics. For non-employed workers, the corresponding estimates yield a 3.7 pp lower probability of transitioning to employment. Moreover, the coefficient estimates on wealth remain roughly unchanged when we introduce household debt in the regressions, and they are robust to adding further controls such as spousal income and regional (Lander) dummies. In these regressions, the EE rate decreases by 1 pp for every additional 5.3 years of age, while for the NE rate the 1 pp decline occurs for every additional 2.8 years of age.

In sum, we document that job search and job finding of employed and non-employed workers vary with age and with the wealth position of the household, generally with declining patterns. These facts motivate the key ingredients of the equilibrium model presented in the next section, featuring overlapping generations of individuals who decide each period about consumption and saving, job search and job acceptance.

3 The Model

3.1 The Environment

We consider a stationary equilibrium of a closed economy which is populated by households, firms and a government. Time is discrete.

Households. There are overlapping generations of households which stochastically transit through age groups $j = 1, \ldots, J$. The probability to age from $j < J$ to $j + 1$ is μ_j. In ages $j = 1, \ldots, J - 1$, the household includes an individual of working age supplying one unit of indivisible labor. In the following we refer to these individuals as *workers of age* j.[12] Age group $j = J$ is retirement during which the retired worker receives pension income. Retired households die with probability μ_J, and a constant inflow μ_0 into the first working-age group $j = 1$ ensures that the mass of households is constant and normalized to unity.[13]

Each period households enjoy utility from consumption c with strictly increasing and concave utility function $u(c)$. Future utilities are discounted with factor $\beta < 1$. Households have the possibility to save in a riskfree asset at real interest rate r. Asset holdings are denoted by a, and borrowing is not permitted. Households in retirement further have a

[12] We use both terms "household" and "worker" interchangeably, as each of them connects to a specific dimension of our analysis (respectively asset and labor market choices), although there is no difference between them in our model.

[13] Therefore, $\mu_0 = (\sum_{j=1}^{J} \frac{1}{\mu_j})^{-1}$ is the inflow of new households and the measure of workers of age j is equal to μ_0/μ_j which sums to one.

warm-glow bequest motive which is captured by the bequest utility $v(a)$ that is realized upon death. Newborn households enter the economy with initial assets drawn from distribution Φ which are paid from the bequests of dying households.

Workers may undergo transitions between employment and non-employment, as well as transitions between jobs. Workers entering the economy at age $j = 1$ are initially non-employed. Both employed and non-employed workers decide whether to search actively or passively. Active search entails higher search efficiency than passive search, such that the probability to receive a job offer (described below) is proportional to search efficiency. Specifically, s_ℓ^1 (s_ℓ^0) is search efficiency under active search (passive search, resp.) with $s_\ell^0 < s_\ell^1$, where $\ell = e, n$ is the employment status.[14] Active search comes at a fixed additive utility cost ξ_ℓ which depends on employment status. Additionally, there are idiosyncratic additive utility shocks $\varepsilon_i/\gamma_\ell$ when searching actively ($i = 1$) or passively ($i = 0$), where $\gamma_\ell > 0$ are parameters that depend on employment status, and ε_i are type-I extreme-value distributed, and i.i.d. across workers and over time.[15] Search effort (like savings) is a private choice of households and not part of the employment contract, unlike in Lentz (2010) and Bagger and Lentz (2019).

Firms. There is a continuum of identical firms using capital and labor to produce output with constant-returns production function $F(K, E)$. The labor input E is measured in efficiency units which reflect match-specific productivity in worker-job pairs. Specifically, a given worker-job pair draws productivity (labor efficiency) p upon match formation from distribution H. Match productivity remains constant for the duration of the match, so that the output of the worker-job pair is equal to ωp where $\omega = F_E(K, E)$ is the marginal product of labor efficiency. Every period, a firm rents capital K at per-period user cost $r + \delta$ where δ is the depreciation rate. This implies that all firms use capital in the same proportion to their labor efficiency input so that ω is identical for all firms. To hire workers, the firm posts vacant jobs at per-period cost k per vacancy. All firms are held by a mutual fund and maximize their contribution to the value of the mutual fund.

Government. The government pays a transfer b to every non-employed worker and public pension income to every retired worker $w^r(w)$ which is increasing in the worker's last wage w prior to retirement.[16] The government finances these transfers by collecting a progressive labor income tax that is modeled by the parametric function $T(w) = w - \tau_0 w^{1-\tau_1}$

[14] In the model calibration of Section 4, search efficiencies of active and passive searchers (employed and non-employed) reflect job finding differences between workers reporting active search and those that do not.

[15] This specification smoothes out the active search choice among similar household types, a key element of our calibration strategy in Section 4, while permitting a simple closed-form solution.

[16] Linking retirement income to the last wage is a simplified modeling of a contribution-based pension system that avoids keeping track of another continuous state variable in the household's recursive problem.

with parameters τ_0 and τ_1, where w is gross wage income of the household.[17] The government sets the scale parameter τ_0 to maintain budget balance. The government also collects any remaining bequests which are not paid out to newborn households.

Labor market matching. Workers and vacant jobs are paired together with a matching technology such that the probability that a worker with search efficiency s meets a vacancy is $\lambda(\theta)s$, where λ is an increasing and concave matching function of market tightness θ which is the ratio between the number of vacant jobs and aggregate search efficiency. The probability that a firm with a vacant job meets a worker is $\lambda(\theta)/\theta$.

Wage negotiations. We adapt the wage negotiation mechanism of Cahuc et al. (2006) to our setting. That is, wages are negotiated upon hiring and can only be renegotiated by mutual agreement. If a non-employed worker meets a firm, the firm-worker pair observes match productivity p, and the wage is set such that the worker's surplus is a fraction $\eta \in [0, 1]$ of the surplus that would be obtained if the firm paid the marginal product ωp where η is a worker bargaining power parameter. If an employed worker meets another firm, match productivity in the new match is observed, and the worker either changes jobs when the new job is more productive or remains at the incumbent employer when the job at the poaching firm is not more productive. While the firm with the less productive job bids its wage up to marginal product, the worker negotiates with the employing firm a wage such that the worker obtains fraction η of the surplus that would be reached if the more productive job paid the marginal product.

In other circumstances, the wage can only be renegotiated if one party has a credible threat to leave the match. Since we consider a stationary environment and match productivity is constant over time, firms can never initiate wage renegotiations. Workers can only initiate renegotiations if they receive a good enough outside offer or if they have a credible threat to quit into non-employment. In the latter case, we assume that the firm responds with a wage rise that makes the worker indifferent between quitting and staying, whenever this wage does not exceed the marginal product of the worker.[18] If the firm cannot retain the worker without incurring losses, the worker quits.

Separations. Worker-job matches are destroyed with probability $\rho + \kappa\lambda(\theta)$. Here, ρ refers to a layoff shock, where the worker is sent into non-employment. By contrast, $\kappa\lambda(\theta)$ refers to a reallocation shock where the worker is offered a job at another firm with match productivity drawn from distribution H which the worker can either accept or reject in which

[17] We assume that capital income is not taxed which is a reasonable approximation to the German institutional setting where capital income is taxed at a flat rate with rather generous tax exemptions and imputed rents are not taxed.

[18] See Lise et al. (2016) for a similar assumption in a setup with productivity shocks. In our model, workers may have a credible threat to quit due to changes in wealth or age.

case the worker becomes non-employed.

Capital market. There is a competitive capital market where the risk-free interest rate r adjusts to equate the households' demand for assets to the supply of shares in a mutual fund that holds all capital and owns all firms.

Timing. Within the period, events proceed as follows. First, households with employed and non-employed workers realize utility shocks and decide whether to search actively or not. Second, employed workers produce and receive wage income, non-employed and retired workers receive their transfer income, and all households make consumption and saving decisions. Third, separation shocks arrive, firms create vacancies which are matched with job seekers, workers may take (new) jobs, renegotiate with their employer, or quit the job exogenously or voluntarily. Fourth, age transitions and death events take place. Figure 3 shows the time line of events and the notation of household value functions at the different stages which are further described below.

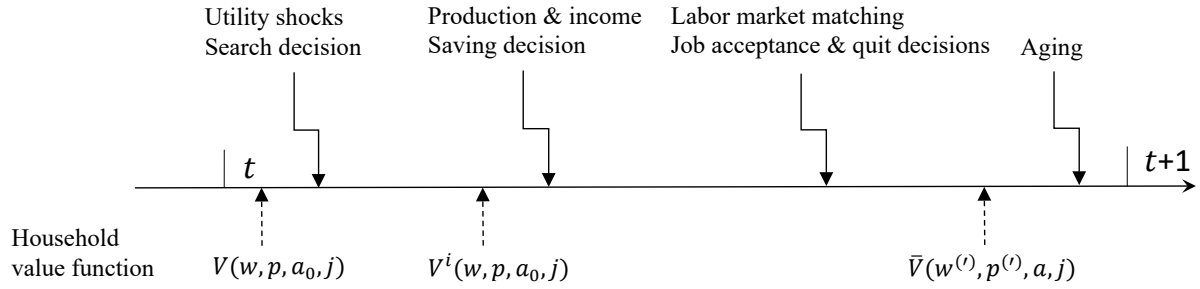


Figure 3: Events within a period and household value functions

3.2 Wage Negotiations

At the wage negotiation stage, the discounted utility of a household of age j with an employed worker earning wage w in a job of match productivity p and assets a is denoted by the value function $\bar{V}(w,p,a,j)$. Note that $w \leq \omega p$, because the firm would make losses otherwise.

Now suppose the employed worker receives an outside offer from another firm where match productivity is higher (i.e. $p' > p$). Then the worker quits and the bargaining process with the poaching firm results in a wage w' defined as the solution to the equation[19]

$$\bar{V}(w',p',a,j) = (1-\eta)\bar{V}(\omega p,p,a,j) + \eta\bar{V}(\omega p',p',a,j) \ . \tag{1}$$

[19] All wage negotiation outcomes build on the property that the worker value function $\bar{V}$ is increasing in its first two arguments while the firm's profit is decreasing in the wage, which we verify in numeric solutions of our model.

In words, the incumbent firm bids the wage to ωp, and the worker negotiates with the poaching firm the wage w' that gives the household a fraction η of the surplus that the poaching firm would be maximally willing to deliver, $\bar{V}(\omega p', p', a, j) - \bar{V}(\omega p, p, a, j)$.[20]

If the match at the poaching firm is not more productive than the job at the incumbent ($p' \leq p$), renegotiation with the incumbent firm results in a wage w' that solves

$$\bar{V}(w', p, a, j) = (1 - \eta)\bar{V}(\omega p', p', a, j) + \eta \bar{V}(\omega p, p, a, j) \ . \tag{2}$$

Here the poaching firm bids up to $\omega p'$, and the worker negotiates fraction η of the surplus $\bar{V}(\omega p, p, a, j) - \bar{V}(\omega p', p', a, j)$. However, such a renegotiation only takes place if p' is large enough such that the worker can realize a wage increase to $w' > w$. Specifically, the poacher's productivity must exceed the threshold value $q(w, p, a, j)$ which is defined by the following indifference condition:

$$\bar{V}(w, p, a, j) = (1 - \eta)\bar{V}(\omega q, q, a, j) + \eta \bar{V}(\omega p, p, a, j) \ . \tag{3}$$

If $p' \leq q(w, p, a, j)$, the worker simply discards the outside offer and no wage renegotiation takes place.

Consider next the wage negotiated by a non-employed worker who receives an offer from a firm with match productivity p. Denote by $\bar{V}(w, 0, a, j)$ the value function of a non-employed worker of age j, assets a and last wage prior to non-employment equal to w.[21] Then the negotiated wage w' solves

$$\bar{V}(w', p, a, j) = (1 - \eta)\bar{V}(w, 0, a, j) + \eta \bar{V}(\omega p, p, a, j) \ , \tag{4}$$

if $\bar{V}(\omega p, p, a, j) \geq \bar{V}(w, 0, a, j)$ in which case the worker obtains fraction η of the surplus $\bar{V}(\omega p, p, a, j) - \bar{V}(w, 0, a, j)$. Define $q^n(w, a, j)$ as the threshold level of productivity where $\bar{V}(\omega q, q, a, j) = \bar{V}(w, 0, a, j)$, so that only jobs with $p \geq q^n(w, a, j)$ are able to attract the worker, while job offers with $p < q^n(w, a, j)$ are turned down. A worker who is separated due to a reallocation shock has the same outside option as a previously non-employed worker. For such a worker the bargaining outcome is also given by equation (4).

[20] As in Bagger et al. (2014) and Ozkan et al. (2023), utility is non-transferable between the worker and the firm, so that this bargaining rule does not correspond to the Nash bargaining solution. However, it can be rationalized as the equilibrium of a finite-horizon bargaining game with alternating offers between the two competing firms and the worker, as described in Cahuc et al. (2003). The same applies to the bargaining outcome of a non-employed worker described below.

[21] If a worker retires from non-employment, the pension is linked to the last wage, which is why this wage enters the value function. For those non-employed workers who never had a job, we set $w = 0$.

Finally, consider a situation where $\bar{V}(w,p,a,j) < \bar{V}(w,0,a,j)$ so that the employed worker in state (w,p,a,j) has a credible threat to quit into non-employment. In this case, the firm prevents the worker from quitting by raising the wage to $w' \leq \omega p$ satisfying

$$\bar{V}(w',p,a,j) = \bar{V}(w,0,a,j) \ , \tag{5}$$

if $\bar{V}(\omega p,p,a,j) \geq \bar{V}(w,0,a,j)$. Otherwise, there is no profitable retention possibility and the worker quits the job.

3.3 Household Decisions

Consider a household with a worker who holds a job of match productivity p paying wage w. At the *beginning of the period*, the household's assets are a_0, and the value function is denoted $V(w,p,a_0,j)$, see Figure 3. For a household with a non-employed worker at the beginning of the period, we use the same notation for the value function, where $p=0$ indicates non-employment and w is the last wage prior to non-employment (set to zero for workers that never had a job). Likewise, the value function of a retired household is $V(w^r,0,a_0,J)$ with pension income w^r.

If the worker is employed, utility shocks ε_i for active or passive search ($i=1,0$) are realized and the household chooses between active search with continuation utility $V^1(w,p,a_0,j) - \xi_e + \frac{\varepsilon_1}{\gamma_e}$ and passive search with continuation utility $V^0(w,p,a_0,j) + \frac{\varepsilon_0}{\gamma_e}$. Due to the distributional assumption, we have[22]

$$\begin{aligned} V(w,p,a_0,j) = \ & \mathbb{E}\max\left[V^1(w,p,a_0,j) - \xi_e + \frac{\varepsilon_1}{\gamma_e}, V^0(w,p,a_0,j) + \frac{\varepsilon_0}{\gamma_e}\right] \\ = \ & \frac{1}{\gamma_e}\ln\left\{e^{\gamma_e[V^1(w,p,a_0,j)-\xi_e]} + e^{\gamma_e V^0(w,p,a_0,j)}\right\} \ , \end{aligned} \tag{6}$$

and the fraction of employed workers in state (w,p,a_0,j) choosing active search is

$$\pi^1(w,p,a_0,j) = \frac{e^{\gamma_e[V^1(w,p,a_0,j)-\xi_e]}}{e^{\gamma_e[V^1(w,p,a_0,j)-\xi_e]} + e^{\gamma_e V^0(w,p,a_0,j)}} \ ,$$

while the fraction of passive searchers is $\pi^0(w,p,a_0,j) = 1 - \pi^1(w,p,a_0,j)$.

After deciding between active or passive search, the household receives wage income, decides about consumption and saving, the worker may separate from the job or receive a job offer in which case a quit or a wage renegotiation may happen. Using the wage protocols

[22] See e.g. Caliendo et al. (2019).

described before, the value of a household searching actively or passively ($i = 1, 0$) satisfies the Bellman equation[23]

$$
\begin{aligned}
V^i(w,p,a_0,j) = \max_{c,a} \Bigg\{ & u(c) + \rho \bar{V}(w,0,a,j) \\
& + \kappa\lambda(\theta) \int \max\left\{(1-\eta)\bar{V}(w,0,a,j) + \eta\bar{V}(\omega x,x,a,j), \bar{V}(w,0,a,j)\right\} \, dH(x) \\
& + s_e^i \lambda(\theta) \int_p (1-\eta)\bar{V}(\omega p,p,a,j) + \eta\bar{V}(\omega x,x,a,j) \, dH(x) \\
& + s_e^i \lambda(\theta) \int_{q(w,p,a,j)}^{p} (1-\eta)\bar{V}(\omega x,x,a,j) + \eta\bar{V}(\omega p,p,a,j) \, dH(x) \\
& + \left[1 - \rho - \kappa\lambda(\theta) - s_e^i\lambda(\theta)\bar{H}(q(w,p,a,j))\right] \max\left[\bar{V}(w,p,a,j), \bar{V}(w,0,a,j)\right] \Bigg\}
\end{aligned} \tag{7}
$$

where maximization is subject to the budget and no-borrowing constraints

$$
c + a = w - T(w) + (1+r)a_0 \quad , \quad a \geq 0 \ .
$$

The Bellman equation involves the following continuation outcomes for a household after the consumption-saving choice is made. The household's worker may lose the job exogenously and become non-employed with value $\bar{V}(w,0,a,j)$ (first line). The worker may receive a reallocation shock in which case she may quit into non-employment or enter a new job with productivity x (second line). The worker may receive an outside offer that results in a quit (third line) or a renegotiation with the incumbent (fourth line). In all other events (fifth line), the worker either stays in the same contract or has a credible threat to quit into non-employment in which case continuation utility is $\bar{V}(w,0,a,j)$, both after a quit or after a wage renegotiation.[24]

In Appendix B.1.1, we present the Bellman equations of non-employed and retired households and the recursive equations describing worker aging at the end of the period. We denote by $\nu(w,p,a_0,j)$ the measure of age-j households with assets a_0 working in a job with wage w and productivity p, at the beginning of a period. Likewise, $\nu(w,0,a_0,j)$ is the measure of households with non-employed workers where w is the last wage prior to non-employment, and $\nu(w^r,0,a_0,J)$ is the measure of retired households with pension income w^r. We further denote by $\mathcal{W}(x,p,a,j)$ the wage that an age-j worker with assets a bargains in a job of

[23] Here $\bar{H} = 1 - H$ denotes the tail distribution of match productivity.

[24] By assumption, layoff shocks, reallocation shocks, and the arrival of outside offers are mutually exclusive events whose probabilities sum to less than one.

productivity p when holding an outside offer with productivity $x \leq p$, where $x = 0$ indicates that there is no outside offer so that the fallback position of the worker is non-employment. Finally, we write $c = \mathcal{C}(w, p, a_0, j, i)$ and $a = \mathcal{A}(w, p, a_0, j, i)$ for the consumption and savings policy functions of a household in state (w, p, a_0, j) searching actively or passively $(i = 1, 0)$, where again $p = 0$ indicates non-employment or retirement.

3.4 Firm Decisions

Firms decide about vacancy postings in every period. Once a vacancy is matched with a worker, match productivity is observed and the worker is possibly hired at the negotiated wage, as described above. Firms rent capital in proportion to their labor efficiency input, which implies that the flow profit of a match is $\omega p - w$ with $\omega = F_E(K, E)$, where the capital-to-labor-efficiency ratio K/E is determined from $F_K(K, E) = r + \delta$.[25]

Since all firms are owned by a mutual fund offering a riskless rate of return r, the value of a firm is the sum of the expected discounted profit stream of all jobs in the firm, where future profits are discounted with interest factor $(1+r)$. Paralleling the notation of household value functions, write $\Pi(w, p, a_0, j)$ for the discounted profit value of a job with productivity p and wage w filled with an age-j worker with assets a_0 at the beginning of a period. Further, write $\bar{\Pi}(w, p, a, j)$ for the profit value after the match/separation stage but prior to worker aging. Appendix B.1.2 describes the Bellman equations for Π and $\bar{\Pi}$ which take into account the wage negotiations, job acceptance and job quitting decisions of households described above.

At the beginning of the period, firms create jobs up to the point where the cost of a vacant job k equals its expected discounted profit value:

$$
\begin{aligned}
k = \frac{\lambda(\theta)}{\theta} \frac{1}{\bar{s}} \Bigg\{ & \int_{j<J} \Big[\sum_{i=0,1} \pi^i(w, 0, a_0, j) s_n^i \int_{q^n(w, a_n^i, j)} \bar{\Pi}(\mathcal{W}(0, x, a_n^i, j), x, a_n^i, j) \; dH(x) \Big] \; d\nu(w, 0, a_0, j) \\
& + \int_{j<J, p>0} \Big[\sum_{i=0,1} \pi^i(w, p, a_0, j) s_e^i \int_{p} \bar{\Pi}(\mathcal{W}(p, x, a_e^i, j), x, a_e^i, j) \; dH(x) \Big] \; d\nu(w, p, a_0, j) \qquad (8) \\
& + \int_{j<J, p>0} \Big[\sum_{i=0,1} \pi^i(w, p, a_0, j) \kappa \int_{q^n(w, a_e^i, j)} \bar{\Pi}(\mathcal{W}(0, x, a_e^i, j), x, a_e^i, j) \; dH(x) \Big] \; d\nu(w, p, a_0, j) \Bigg\},
\end{aligned}
$$

A vacant job meets a random worker with probability $\lambda(\theta)/\theta$. The probability that this worker is in state (w, p, a_0, j) is equal to the search efficiency of workers in this state divided

[25] As in any model with constant-returns production technologies, the firm size distribution is not determined and the number of firms is irrelevant.

by aggregate search efficiency, which is denoted $\bar{s}$ and defined in equation (B.1) in the Appendix. The firm hires the worker whenever match productivity x (drawn from distribution H) exceeds the reservation productivity of the worker. The reservation productivity is either $q^n(w, a_n^i, j)$ when the worker is non-employed with savings $a_n^i = \mathcal{A}(w, 0, a_0, j, i)$ (first line), it is p when the worker is employed in a job with productivity p (second line), or $q^n(w, a_e^i, j)$ for an employed worker who receives a reallocation shock and whose savings are $a_e^i = \mathcal{A}(w, p, a_0, j, i)$ (third line). As explained in the previous section, the starting wages for workers coming from these three states are denoted $\mathcal{W}(0, x, a_n^i, j)$, $\mathcal{W}(p, x, a_e^i, j)$, and $\mathcal{W}(0, x, a_e^i, j)$, respectively.

3.5 Stationary Equilibrium

Definition: A *stationary equilibrium* is a distribution ν of households over states (w, p, a_0, j), a collection of household value functions V, V^0, V^1, $\bar{V}$, active/passive search policies π^1, π^0, consumption and savings policy $\mathcal{C}$, $\mathcal{A}$, job value functions Π, $\bar{\Pi}$, equilibrium wage function $\mathcal{W}$, aggregate capital K, aggregate labor input E, market tightness θ, interest rate r, marginal product of labor efficiency ω, and tax parameter τ_0, such that

1. Households make optimal search, job acceptance, job quitting, and savings decisions, where wages are set according to the bargaining protocols described in equations (1)–(5).

2. Firms rent capital such that $F_K(K, E) = r + \delta$, the marginal product of efficient labor is $\omega = F_E(K, E)$, and firms choose vacant jobs such that the free-entry condition (8) holds.

3. Government transfers to non-employed and retired workers are equal to the revenues from taxes and from the collection of bequests net of the initial assets received by newborn households:

$$b \int_{j<J} d\nu(w, 0, a_0, j) + \int w^r \; d\nu(w^r, 0, a_0, J) \tag{9}$$
$$= \int_{j<J, p>0} T(w) \; d\nu(w, p, a_0, j) + \mu_J \int \mathcal{A}(w^r, 0, a_0, J, 0) \; d\nu(w^r, 0, a_0, J) - \mu_0 \int a_0 \; d\Phi(a_0) \; .$$

4. Asset supply equals asset demand, i.e. assets of households are equal to the value of

the mutual fund at the end of a period:[26]

$$\int a_0 \, d\nu(w,p,a_0,j) = K + \frac{\int_{j<J,p>0} \Pi(w,p,a_0,j) \, d\nu(w,p,a_0,j)}{1+r} \, . \tag{10}$$

5. Aggregate labor input is
$$E = \int p \, d\nu(w,p,a_0,j) \, .$$

6. ν is an invariant distribution with aggregate measure one, given the policy functions, wage protocols, labor market and demographic transitions.

Solving our model involves the computation of value functions of households and firms, the stationary distribution of households, and aggregate equilibrium conditions for market tightness (job creation), the tax parameter (government budget balance), and the interest rate (asset market equilibrium). The following loop describes the solution procedure.

1. Guess tightness θ, tax parameter τ_0 and the interest rate r.
2. Solve household value and policy functions and the stationary distribution ν.
3. Solve value functions of jobs.
4. Iterate over θ, τ_0 and r until (8), (9) and (10) are fulfilled with reasonable precision.

Note that this is a rather tractable model since equilibrium wage protocols are solved jointly with step 2 which is essentially a standard consumption-saving problem with two continuous income state variables (w,p).

3.6 Macroeconomic Variables

Via Walras's law, the capital market equilibrium condition (10) together with budget constraints of households, firms and the government implies that the goods market is in equilibrium:

$$Y = F(K,E) = C + \delta K + kV \, , \tag{11}$$

with vacancies $V = \theta \bar{s}$ and aggregate consumption

$$C = \int \sum_{i=0,1} \pi^i(w,p,a_0,j) \mathcal{C}(w,p,a_0,j,i) \, d\nu(w,p,a_0,j) \, .$$

[26] The assets a_0 that households hold at the beginning of a period are bought in the previous period after dividends are paid out. Therefore, the value of firms is discounted with factor $(1+r)^{-1}$, which corresponds to the ex-dividend value of all firms. See Appendix B.1.3 on Walras's law for details.

We verify this identity in Appendix B.1.3, where we also derive that output equals the sum of wage, profit and rental income:

$$Y = \int_{j<J,p>0} w \; d\nu(w,p,a_0,j) + \int_{j<J,p>0} [\omega p - w] \; d\nu(w,p,a_0,j) + (r+\delta)K \; .$$

Further note that aggregate labor input can be written $E = AL$ with aggregate employment and aggregate labor efficiency defined by

$$L = \int_{j<J,p>0} d\nu(w,p,a_0,j) \quad \text{and} \quad A = \frac{1}{L} \int_{j<J,p>0} p \; d\nu(w,p,a_0,j) \; .$$

All three inputs into aggregate production $Y = F(K, AL)$ are jointly determined from capital and labor market equilibrium conditions. Figure 4 illustrates how these equilibrium conditions are interrelated in our model. Solid curves in these figures are the relationships for the benchmark calibrated model, while dashed curves are those after a 1% increase of aggregate TFP (further explained below). Panel (c) illustrates equilibrium in the labor market, where the downward-sloping curve is the demand for efficient labor at the equilibrium capital stock K^* defined by $\omega = F_E(K^*, E)$. The curve $E(\omega)$ is the supply of efficient labor, i.e. aggregate efficiency units of labor when the labor market is in equilibrium at a given marginal product of efficient labor ω. This curve increases for three reasons: If labor is more productive, households search more intensively, thus leaving non-employment and climbing the job ladder faster. Second, matching rates are higher because firms create more jobs when they are more profitable at higher ω. Third, together with a higher ω, the interest rate falls due to the downward-sloping factor price frontier in panel (a) which is derived from the aggregate production function. The lower interest rate further stimulates search intensity and job creation.

Panel (b) is equilibrium in the capital market, resembling a standard graph in incomplete-markets models (e.g. Figure IIb in Aiyagari, 1994). The downward-sloping curve is the demand for capital: At a higher interest rate r (and a lower marginal product of labor ω), efficient labor units E are lower and the marginal product of capital falls (because of $F_{KE} > 0$). Together with the higher capital cost, this implies that firms demand less capital. The upward-sloping curve in panel (b) is the supply of capital which equals households' aggregate savings $\mathbf{A}(r)$ minus the aggregate profit value of firms $\mathbf{\Pi}(r)/(1+r)$ which are owned by households. This latter value is decreasing in r,[27] so the total supply of capital is upward-sloping whenever $\mathbf{A}$ is increasing, in which case the capital market equilibrium is

[27] At a higher interest rate and lower marginal product of labor ω, the discounted profits of firms are lower.

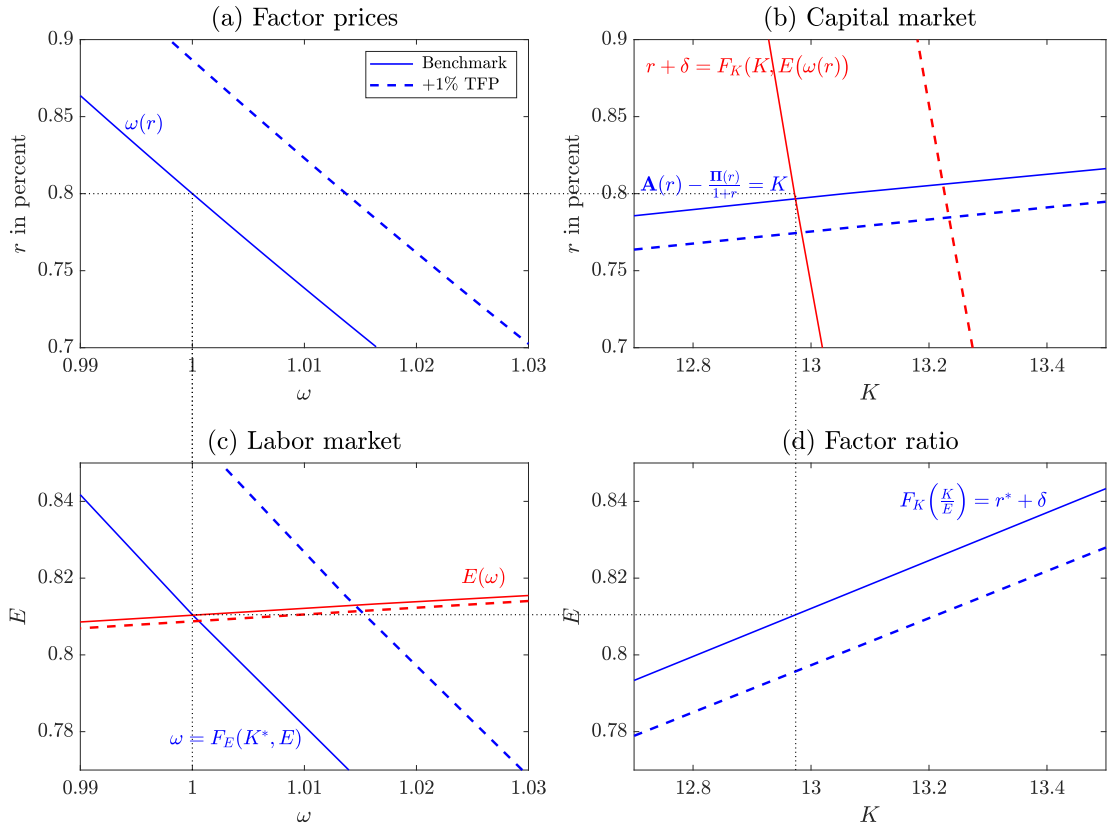


Figure 4: Macroeconomic equilibrium

NOTES: Equilibrium in the capital market (panel b), labor market (panel c), and the equilibrium relationships between factor prices (panel a) and production factors (panel d). Solid curves describe the benchmark calibrated model and dashed curves are the relationships after a 1% increase of TFP.

unique.[28] Panel (d) simply pins down the factor ratio at the equilibrium interest rate.

When the economy experiences a permanent 1% increase of aggregate TFP, the intersections between the dashed curves in Figure 4 indicate the new stationary equilibrium. Capital and labor demand in panels (b) and (c) shift to the right. Together with rising employment and higher wages, household savings go up, shifting the supply of capital in panel (b) to the right, so that the equilibrium interest rate declines slightly. At a given marginal product of efficient labor ω, employment $E(\omega)$ decreases modestly in panel (c). The reason is as follows: With higher TFP the interest rate goes up at a given ω (panel a), and hence job creation and search activity go down with a higher financial discount factor.

[28] As is well known in incomplete-markets models (cf. Aiyagari, 1994), the savings curve $\mathbf{A}(.)$ is continuous but may be non-monotonic. In our model, ω and E fall with higher r, so that households' labor incomes decrease with a higher interest rate which dampens aggregate savings. Different from a standard incomplete-markets model with an exogenous earnings process, however, the higher risk of unemployment stimulates precautionary savings.

Ultimately, this general-equilibrium effect dampens the increase of employment. Nonetheless, while efficient labor E increases by 0.11%, employment L goes up by 0.17% which is a larger long-run response compared to other search-and-matching models with standard calibrations (cf. Shimer, 2005).[29]

4 Calibration and Model Fit

This section describes how we select parameter values for our benchmark model. We then assess the extent to which the model matches important data moments that we do not explicitly target in our calibration.

4.1 Calibration

We calibrate our model to the German economy after the year 2005.

Timing and aging. A period in the model is a quarter. We divide workers into the following age groups: 25-34, 35-44, 45-54, 55-66, and 67+. The aging probabilities μ_j during working age are set to match the average duration within each age group. This yields $(\mu_1, \mu_2, \mu_3, \mu_4) = (1/40, 1/40, 1/40, 1/48)$. In 2008, the conditional life expectancy at age 67 was 15 years for men and 19 years for women in Germany. Based on these numbers, we target an expected duration of 17 years for the retirement stage and set $\mu_5 = 1/68$.

Parameterization. The utility function is specified as $u(c) = \frac{c^{1-\sigma}-1}{1-\sigma}$, where σ is the inverse of the elasticitiy of intertemporal substitution which is set to the standard value $\sigma = 2$. The production function is $F(K, E) = \mathcal{T} K^{\alpha} E^{1-\alpha}$, where $\mathcal{T}$ is total factor productivity, and the matching function is $\lambda(\theta) = \lambda_0 \theta^{\varphi}$ where we set the elasticity to the standard value $\varphi = 0.5$. The distribution of match productivity H is a Gamma distribution with shape parameter $\chi_1 > 0$ and scale parameter $\chi_2 > 0$, and initial assets are Pareto distributed with shape and scale parameters ι_1 and ι_2. The bequest utility function is specified as $v(a) = \frac{\psi_1 (a+\psi_2)^{1-\sigma}}{1-\sigma}$, where ψ_1 determines the strength of bequest motives and ψ_2 governs the extent to which bequests are luxury goods.

Externally calibrated parameters. Table 1 reports the list of externally calibrated parameters. Capital depreciates at 1.5% per quarter. Given that average (quarterly) earnings are normalized to one (see below), we set the cost of a vacant job to $k = 0.17$ which corresponds to average recruiting costs of around 1,600 Euros as reported by Carbonero

[29] Labor market amplification can be partly explained by counter-cyclical hiring standards (cf. Sedláček, 2014), as seen here by a long-term decline of labor efficiency by 0.05% in response to the permanent 1% TFP increase.

Table 1: Externally set parameters

Description	Parameter	Value	Explanation / Source
Aging probabilities	μ_j	–	See text
Elasticity of intertemp. subst.	σ	2	Standard value
Matching elasticity	φ	0.5	Standard value
Capital depreciation rate	δ	0.015	Standard value
Vacancy cost	k	0.17	Carbonero and Gartner (2022)
Initial wealth: Pareto shape	ι_1	1.30	Own estimate
Initial wealth: Pareto scale	ι_2	0.43	Own estimate
Tax progressivity	τ_1	0.13	Qiu and Russo (2022)
Retirement income	w^r	–	Replacement rate with caps (see text)

and Gartner (2022) on the basis of the German Job Vacancy Survey. We estimate the initial distribution of net wealth from the SOEP based on households aged 24–26 years. Our estimates suggest that a Pareto distribution with shape parameter $\iota_1 = 1.3$ provides a good approximation. We set the scale parameter ι_2 of the Pareto distribution to match average net wealth in that sample. The tax function $T(w) = w - \tau_0 w^{1-\tau_1}$ in our model stands for income taxes and social security contributions, while it does not include government transfers. We utilize the estimates of Qiu and Russo (2023) who use a similar definition of post-tax income and set the progressivity parameter to their estimate for Germany which is $\tau_1 = 0.13$. We calibrate the level parameter τ_0 internally to balance the government budget; the resulting tax rate at median income turns out to be 27% which is very close to the empirical estimate of 28% of Qiu and Russo (2023). Finally, we set pensions at 42% of previous earnings with minimum and maximum caps at 14% and 74% of average earnings (see Kaas et al., 2021, for a similar calibration).

Internally calibrated parameters. The remaining parameters are calibrated jointly within the model in order to match selected data moments. Table 2 presents the list of parameter values, data targets, and the data moment that is most closely associated with each parameter.

The discount factor β is chosen to match the ratio between mean net wealth and (quarterly) mean labor earnings as estimated from SOEP data. The elasticity of production to capital input is set to match a quarterly interest rate of 0.8%; this yields $\alpha = 0.27$.

Active and passive search efficiencies are set to match quarterly NE and EE rates, separately for active and passive searchers.[30] The calibrated parameters reveal that passive

[30]Since we relate transition rates to household wealth below, we use transition rates based on SOEP data as described in Section 2. This survey, however, contains no information on active search of employed workers. Therefore we scale the PASS transition rates for active and passive searchers (see Appendix A.1) to match the average level of SOEP transition rates.

Table 2: Internally calibrated parameters

Description	Parameter	Value	Moment	Data	Model
Discount factor	β	0.994	Wealth-to-income ratio	15.6	15.6
Capital elasticity	α	0.269	Interest rate	0.8%	0.8%
Passive search efficiency	s_n^0	1.12	NE rate passive (%)	9.8	9.8
Active search efficiency	s_n^1	1.70	NE rate active (%)	17.6	17.6
Passive search efficiency	s_e^0	1.13	EE rate passive (%)	3.9	3.9
Active search efficiency	s_e^1	4.53	EE rate active (%)	16.4	16.4
Disutility active search	ξ_n	0.63	$\pi^1_{n,\text{all}}$ (%)†	33.8	33.8
Disutility active search	ξ_e	7.08	$\pi^1_{e,\text{all}}$ (%)†	6.7	6.7
Search utility shock	γ_n	2.78	Std dev of $\pi^1_{n,q,j}$ (%)†	11.2	11.2
Search utility shock	γ_e	0.47	Std dev of $\pi^1_{e,q,j}$ (%)†	2.7	2.7
Gamma distrib. shape	χ_1	2.15	EN rate (%)	1.5	1.5
Gamma distrib. scale	χ_2	0.32	Normalize average earnings	1	1
Exogenous separation	ρ	0.006	Share layoffs in EN (%)	38.7	38.7
Reallocation shock	κ	0.130	EE w/ lower wage (%)	26.9	26.9
Bargaining weight	η	0.449	Std dev of log wages	0.49	0.49
Productivity penalty	ζ	0.144	Wages 55-66 vs 25-34	+17%	+17%
Bequest utility weight	ψ_1	5880	Mean wealth 67+	19.5	19.5
Bequest utility shifter	ψ_2	50	P95-P50 wealth ratio 67+	5.3	5.3
Unemployment income	b	0.32	Net replacement rate (%)	45.0	45.0
Tax level	τ_0	0.723	Balanced budget	–	–
Matching function	λ_0	0.169	Normalization $\theta = 1$	–	–
Total factor productivity	$\mathcal{T}$	0.649	Normalization $\omega = 1$	–	–

NOTES: † $\pi^1_{\ell,\text{all}}$ denotes the overall share of active searchers in employment status $\ell = e, n$, and $\pi^1_{\ell,q,j}$ is the share of active searchers in age group j and wealth quartile q. See the text for further details about the calibration targets.

searchers receive about the same number of offers whether employed or not, whereas employed active searchers are much more effective in generating offers than non-employed active searchers (cf. Faberman et al., 2022). This points at the importance of the job acceptance margin for the latter group. The disutility of active search for employed and non-employed workers is chosen to match the fraction of active searchers within these two subpopulations. Notice that active search is far more pervasive among the non-employed than among the employed. The model rationalizes this feature through a higher disutility of active search in employment compared with that in non-employment. The additive utility shock parameters γ_n and γ_e control the extent to which search decisions of (non-)employed workers vary with age and wealth. We estimate these parameters by matching the responsiveness of active search to household age and wealth as documented in Section 2. Specifically, we match the standard deviation of active search shares across the 16 age-wealth cells, classified by age groups and wealth quartiles, separately for employed and non-employed workers.

The shape and scale parameters of the Gamma distribution for match productivity, χ_1 and χ_2, are set to match the transition rate from employment to non-employment (EN rate), and to normalize the average level of earnings in the model to one.[31] The exogenous separation shock ρ is set to match the share of EN transitions that are due to layoffs which we obtain from a SOEP survey question. The reallocation shock parameter κ directly controls the share of job-to-job transitions where workers end up with a lower wage than in the previous job so that we target this moment in the data (26.9%).[32] In the data, this share is increasing in age except for the last age group, i.e. young workers are less likely to experience wage cuts upon EE transitions and their average wage gain is larger. Our model replicates this feature; see Table B.2.

The bargaining parameter η influences the dispersion of wages. Intuitively, a lower value of η implies that workers are willing to accept initially lower-paying jobs in exchange for faster wage growth later, once they receive outside offers. This spreads out the distribution of wages. Accordingly, we set η to match the standard deviation of residualized wages.[33] We further introduce an age-specific productivity shifter ζ for employed workers in age group $j = 4$ (ages 55-66). We estimate ζ to match average wages in this age group relative to wages in the first age group, which implies a productivity drop of roughly 14%, relative to the younger age groups. Note that this is the only parameter that depends on the worker's age in our model. We set the bequest utility parameters ψ_1 and ψ_2 to match mean wealth across retired households, as well as the ratio between the 95th and the 50th percentile of the wealth distribution in this age group. Unemployment benefits are set at 45% of net average earnings which corresponds to the net replacement rate of the long-term unemployed in the post-2005 period (cf. Krebs and Scheffel, 2013). Finally, the scale parameters of the matching function λ_0 and of the aggregate production function $\mathcal{T}$ are set to normalize market tightness and the marginal product of efficient labor.[34]

4.2 Model Fit

We now assess the ability of the estimated model to match untargeted moments, with a particular focus on the empirical facts documented in Section 2 where we compare model

[31] The shape parameter of the distribution controls the mass of match productivity at the bottom, thus influencing how many workers quit to non-employment when receiving a reallocation shock.

[32] The implied quarterly probability to receive a reallocation shock is $\kappa\lambda_0\theta^{\varphi} \approx 2.2\%$. Among reallocated workers, 41% quit to non-employment and 59% experience an EE transition.

[33] We regress log hourly wages on dummies for education, marital status and calendar year (which all play no role in our model). Without this residualization, the dispersion of hourly wages is only slightly higher.

[34] We show in Appendix B.1.4 that the normalization $\omega = 1$, together with normalizing average earnings to one, is innocuous.

Table 3: Active search

Non-employed	Data	Model	Employed	Data	Model
By age			By age		
25-34	39.8	44.7	25-34	10.2	8.4
35-44	40.6	40.8	35-44	7.8	6.8
45-54	40.0	33.5	45-54	6.1	6.2
55-66	16.6	24.0	55-66	3.0	5.6
By wealth			By wealth		
Quartile 1	38.0	45.8	Quartile 1	8.9	11.4
Quartile 2	33.8	36.7	Quartile 2	7.7	5.9
Quartile 3	26.4	26.7	Quartile 3	5.6	5.2
Quartile 4	26.2	20.1	Quartile 4	5.2	4.3

NOTES: All numbers in percent. Data values are from PASS and residualized by years of education, household size, gender, marital status and time fixed effects (see Section 2 and Appendix A.1).

statistics to the data moments in Figures 1 and 2 conditional on variables which play no role in our model (education, household size, gender, marital status).

Active search. Workers' transitions into a new job, either from non-employment or from a previous job, are jointly determined by workers' search behavior and their reservation productivities (job acceptance). Since our data allow us to identify workers' search choices, we first assess the model fit in that dimension. Table 3 presents the shares of active searchers among non-employed as well as employed workers across age groups and wealth quartiles. Recall that our model calibration targets the mean of active search and the overall standard deviation across age and wealth cells, but not how active search varies in these characteristics. Generally, the model does a good job of replicating the negative relationships between search intensity and either wealth or age observed in the data. Regarding wealth, workers in the bottom part of the distribution are more likely to search actively compared with workers in the upper part of the distribution, where the age gradient is somewhat steeper in the model than in the data. Regarding age, the model generates a decreasing and concave age profile for non-employed workers which is similarly strong (around 20 pp) as in the data, although the decline in the data is only observed in the second half of working life. For employed workers, the model generates around half of the decline in age.

Transition rates. Table 4 reports the quarterly transition rates between employment and non-employment (EN and NE) as well as the job-to-job transition rates (EE) by age and by wealth. The model generates a strong decline of the NE rate over the life cycle, which is consistent with our empirical evidence. Younger workers are also considerably more likely than older workers to make job-to-job transitions, a pattern that we document in the data as

Table 4: Transition rates

	NE rate		EE rate		EN rate	
	Data	Model	Data	Model	Data	Model
By age						
25-34	18.8	17.9	8.3	6.4	2.1	1.2
35-44	16.3	16.8	4.5	5.3	1.3	1.2
45-54	13.7	13.5	3.7	4.5	1.2	1.5
55-66	8.0	6.8	2.3	3.0	1.9	2.1
By wealth						
Quartile 1	13.4	16.1	7.3	7.7	2.4	1.3
Quartile 2	14.2	13.6	4.3	4.3	1.4	1.4
Quartile 3	14.8	9.9	3.7	3.8	1.3	1.6
Quartile 4	10.1	8.4	2.1	3.2	1.0	1.7

NOTES: All numbers in percent. Data values are from SOEP and residualized by years of education, household size, gender, marital status and time fixed effects (see Section 2 and Appendix A.2).

well. While the model matches most data values remarkably well, it slightly underpredicts the high EE rate for early-career workers.

In Appendix B.3 we shed more light on the mechanisms behind the age profiles of NE and EE rates in the model. We decompose the declines of NE and EE rates with worker age into three effects governing search effort and job selectivity: A horizon effect which reflects the shortening of the work life, a wealth effect which captures the impact of life-cycle wealth accumulation, and a selection effect which stands for the role that a higher position on the job ladder plays for search effort and job acceptance. We find that the wealth effect plays an important role for declining NE and EE rates in the first age groups. In Appendix B.4 we consider a model calibration that allows for age variation in search efficiencies in order to exactly match the age patterns in Table 4. We find that the model fit in other dimensions remains rather similar, as are our main policy conclusions.

As for separations into non-employment, the model generates an increasing age pattern, nearly matching the peak in the last age group. One difference though is that there are more EN transitions for young workers as well in the data, whereas in the model the EN transition rates are the same for age groups 25-34 and 35-44.[35]

The lower panel of Table 4 documents how these transition rates vary between workers with different wealth positions.[36] In the data, the NE rate is around 14% in the first three

[35]A potential mechanism that could help generating higher EN and EE separations of young workers is heterogeneity in unemployment risk as in Pinheiro and Visschers (2015) and Jarosch (2023).

[36]In Appendix B.2 we present the joint age-wealth relationships of the three transition rates. Both in the data and in the model, we find that EE and NE rates are falling in age (conditional on wealth) and mostly

quartiles of the wealth distribution (with a mild increase) and then drops to 10% in the top quartile. The model generates a gradual and steeper decline of the NE rate. Job-to-job transition rates (EE) in the data are consistently decreasing across wealth quartiles with the biggest drop between Q1 and Q4. The model matches this feature remarkably well. In contrast, separation rates (EN rates) vary less with the wealth position in the model in comparison to the data where we observe a decreasing pattern.

Wages and wealth by age. The model features a hump-shaped profile of wages by age, with wages rising by respectively 14% and 22% in age groups 35-44 and 45-54 relative to younger workers, and then decreasing to 17% in age group 55-66; see Table 5. We make the model match the latter number through the productivity penalty for older workers. Still, our model generates a plausible age-wage profile of prime-age workers without any other age-specific parameters and without human capital accumulation; the positive age gradient of wages is driven by workers climbing the job ladder and wage renegotiations on the job.

Table 5: Wages by age

	25-34	35-44	45-54	55-66
Data	–	+13%	+18%	+17%
Model	–	+14%	+22%	+17%

NOTES: The table shows average wages by age where hourly wages in SOEP data are residualized by education, gender, marital status and calendar year. All numbers are expressed relative to the first age group.

Turning to the variation of wealth by age, the model predicts a wealth accumulation pattern for working-age households that is similar to the one from the data; see Table 6. Mean wealth relative to average (quarterly) income increases with age, reaching values in the range 11-12 when workers are around 40 years old, to values around 17-21 for middle-aged and older workers. Recall that the model features a bequest utility function which we calibrate to match the mean and upper half of the wealth distribution among retired households so that the wealth-income ratio for the 67+ group matches the calibration target.

Our model not only generates plausible age patterns for mean wealth but also for other percentiles of the wealth distribution, see Figure B.1 in Appendix B.2. Our model further generates a wealth Gini coefficient of 0.67 (compared to 0.74 in SOEP data) which is identical to the wealth Gini coefficient obtained by De Nardi and Fella (2017) when considering a benchmark overlapping-generations Bewley model with an exogenous age-dependent earnings process and no links across generations. As our model does not include direct intergenerational links, entrepreneurs or superstar earners, it underpredicts wealth concentration

decreasing in wealth (conditional on age), albeit with some differences in the respective magnitudes.

at the top.

Table 6: Wealth by age

	25-34	35-44	45-54	55-66	67+
Data (SOEP)	4.4	12.1	17.2	21.2	19.5
Model	4.7	10.8	17.6	21.5	19.5

NOTE: The table shows wealth by age expressed relative to average income.

5 Policy Analysis

In this section we analyze the impact of tax and transfer policies on our economy and on the welfare of different households. Before doing so, we emphasize that the model includes several frictions which potentially give rise to inefficient outcomes along three decision margins. First, in the presence of incomplete markets, aggregate savings may be inefficiently high or low, which relates to the distribution of capital and labor income across households; see Davila et al. (2012) who find that the capital stock is inefficiently low in a reasonably calibrated model from a utilitarian planner perspective. Our benchmark calibration has a similar feature: When we slightly decrease the capital stock (thus raising the interest rate and lowering the marginal product of labor) without any further equilibrium adjustments, we obtain a welfare reduction.[37] Intuitively, newborn households dislike the wage reductions more than they enjoy higher returns on savings. Second, in a random search economy firms' vacancy creation may be inefficiently high or low. In the presence of on-the-job search, it is well-known that the standard Hosios condition does not guarantee efficiency. For an analytic treatment see Fukui and Mukoyama (2024) who also find that a job-ladder model calibrated to the U.S. economy has excessive job creation. Our benchmark calibration shares this feature: At the margin, the costs of additional vacancy creation exceed the output gains (due to higher employment and efficiency gains from the job ladder).[38] Third, we consider constant wage employment contracts with renegotiations while workers' search effort is a private choice that does not internalize the losses/gains of current/future employers or the congestion externality on other workers. As a result, job search effort on- and off-the-job may be inefficiently high or low.

[37] We evaluate welfare with the expected utility of a newborn household in the stationary equilibrium (see Section 5.2 and Appendix B.1.5).

[38] Inspired by Fukui and Mukoyama (2024), we also examine the welfare effect of a tax on job creation. When we introduce a tax that reduces vacancies by 5% and rebate the tax revenues as lump-sum transfers to households, we obtain a welfare gain of 1.86% in consumption-equivalent variation. This confirms that our benchmark calibration has excessive vacancy creation at the margin.

While there are many ways how public policy could help correcting these inefficiencies, we consider here the effects of two policies that are widely discussed in the literature and that affect various decision margins in our model: First we consider a cut of unemployment insurance (UI) benefits. UI benefits provide public insurance against the risk of job loss which disincentivizes both precautionary savings and job search effort, differentially by the age and wealth position of non-employed workers.[39] Second, we lower the degree of tax progressivity. The shape of the income tax schedule affects savings and job search choices of workers at different rungs on the job and wealth ladders, as well as the search effort and job acceptance choices of non-employed workers. Tax progressivity also mitigates income risks among employed workers. Next to these direct effects, both policies also have indirect consequences: The government balances the budget by adjusting the level of taxes, while wages, the interest rate and job creation adjust in general equilibrium. In the following, we disentangle the partial and general equilibrium effects of both policy experiments and we analyze the welfare consequences and the policy impact on different types of households.

5.1 Aggregate Effects

Table 7 presents the aggregate effects of both policy experiments. Specifically, in the first experiment we lower UI benefits b by 10% which brings the replacement rate of UI benefits closer to that for the U.S. labor market. In our second experiment, we reduce the progressivity parameter of the income tax function τ_1 from 0.13 to 0.05, which is the value that has been estimated by Qiu and Russo (2023) for the United States. In both experiments, we adjust the tax level parameter τ_0 to ensure budget balance and we solve for a stationary equilibrium.[40] The second and third columns in Table 7 show our results for the UI experiment, where the second column is the response with a constant interest rate and fixed labor demand ("partial equilibrium") while the third column shows the full general-equilibrium response.[41] Similarly, columns four and five show the partial and general equilibrium results of the tax progressivity experiment.

In terms of macroeconomic aggregates, the UI reform leads to increases of employment by 2.7% and output by 2.9%. The employment increase is driven by several factors: First,

[39] We show in Appendix B.6 that the earnings and consumption profiles after job loss differ substantially with household age and wealth.

[40] Our tax experiment implies higher net earnings for workers earning 25% or more than average, at the expense of lower net earnings for all other workers.

[41] To be precise, the partial equilibrium refers to an equilibrium of the Cahuc et al. (2006) block of our model (parts 1 and 6 of the equilibrium definition in Section 3.5) where households decide job search, job acceptance, quitting and savings at fixed offer-arrival rates, while wages reflect worker-firm bargaining and the household distribution is stationary.

Table 7: Policy analysis – Aggregate results

	Benchmark	UI ↓		Tax Progressivity ↓	
		PE†	GE†	PE†	GE†
Output Y	1.109	+1.4	+2.9	−0.7	−0.5
Capital K	12.97	+1.4	+5.4	−0.4	−0.0
Employment L	85.92	+1.9	+2.7	−1.4	−1.4
Efficiency A	1.325	−0.5	−0.6	+0.7	+0.7
Interest rate r (%)	0.800	–	−5.4bp	–	−1.1bp
MP of labor ω	1.000	–	+0.9	–	+0.2
Tightness θ	1.000	–	+3.6	–	−2.3
Asset supply	15.61	+5.0	+4.6	−0.7	−0.0
EE rate (%)	4.74	+0.29pp	+0.47pp	−0.26pp	−0.24pp
NE rate (%)	12.45	+1.18pp	+1.91pp	−0.63pp	−0.58pp
EN rate (%)	1.49	−0.10pp	−0.13pp	+0.10pp	+0.09pp
Active search					
Employed (%)	6.69	+0.44pp	+0.50pp	+0.09pp	+0.09pp
Non-employed (%)	33.80	+3.64pp	+4.67pp	−0.05pp	+0.03pp
Average wage	1.000	−0.9	−0.4	+1.3	+1.4
Average productivity	1.325	−0.5	+0.2	+0.8	+0.8
Gini: Earnings	0.250	+3.6	+4.9	−3.4	−3.2
Gini: Wealth	0.620	−1.4	−1.5	+2.1	+2.0

NOTES: UI ↓ reduces b by 10%. Tax Progressivity ↓ reduces τ_1 from 0.13 to 0.05.
† Percentage change with respect to benchmark value, unless otherwise noted where bp = basis points and pp = percentage points.
PE is partial equilibrium (interest rate and labor demand fixed), GE is general equilibrium.

job search effort among non-employed workers goes up, and non-employed and reallocated workers become less selective about job productivity. The latter is reflected in a 0.6% reduction of aggregate labor efficiency, in spite of an increase of job search and greater job mobility among the employed. Second, the employment increase is substantially amplified in general equilibrium where firms' labor demand (job creation) responds to the increase in labor supply. With stronger labor demand, workers also search more intensively and accept more low-productivity matches, which further stimulates aggregate employment. Third, since households must rely more on precautionary savings to insure against non-employment risk, capital supply goes up and the interest rate falls. In general equilibrium, the capital stock increases by 5.4% which further stimulates job creation and employment.

Our model also provides insights into the effects of the UI reform on labor market

dynamics. It predicts a sharp increase in search activity and in the EE and NE rates which are also affected by lower reservation productivities. For instance, the share of active searchers among the non-employed increases by more than 13 percent (4.67 percentage points, pp). Job search activity among employed workers also increases by more than 7% (0.5 pp) which contributes to a higher EE rate. The increase in job-to-job mobility can be traced back to three reasons. First, the fact that non-employed workers are willing to accept less productive jobs spreads out the distribution of wages (as seen in a larger earnings Gini coefficient) and implies that more workers are moving up from the lower rungs of the job ladder. Second, more workers that are hit by a reallocation shock are willing to remain employed in a less productive job. Third, a larger precautionary savings motive induces them to incur the costs of job search in order to be able to earn more and save up. It is worth noting that part of the overall employment increase in response to lower government transfers is due to a lower job separation rate (cf. Hartung et al., 2024).

Regarding the reform of the tax schedule, we find that a lower degree of tax progressivity leads to a 0.5% reduction of output which is due to a sizeable decline of aggregate employment by 1.4%. At the same time, the reform raises average labor efficiency by 0.7%. Less progressive taxes affect the labor market in our model mainly through the selection of workers into more productive matches. In particular, since after-tax earnings decline for low-wage workers, some of the least productive matches cease to generate positive surplus and hence become not viable. Likewise, reallocated workers are unwilling to accept those low-productivity jobs. As a result, the NE rate decreases and the EN rate increases. Higher reservation productivities further compress the earnings distribution as seen in a lower earnings Gini coefficient. The employment decline is amplified due to weaker labor demand in general equilibrium: Since it becomes less likely to match with a worker, firms create fewer jobs. Nonetheless, the employment effects in partial and general equilibrium are almost the same since the interest rate falls slightly in general equilibrium.

Interestingly, with less progressive taxes we observe sizable declines in the job-finding rates of employed and non-employed workers (EE and NE rates), despite the fact that search intensity increases slightly. This shows that the effects of a less progressive tax system mainly operate through the reservation productivity margin. While non-employed workers simply accept fewer job offers, job-to-job mobility falls even though the less progressive tax code increases the marginal net-of-tax gain from climbing the wage ladder. The intuition is, again, that average job productivity is higher in equilibrium, so that employed workers are less likely to quit to jobs of better match quality.

5.2 Welfare

We evaluate the welfare consequences of policy reforms by the expected utility of a newborn worker in our model which we express by the consumption equivalent variation (CEV); see Appendix B.1.5 for the calculation. As seen in Table 8, both policies bring about welfare losses equivalent to more than one percent of consumption. Regarding the UI experiment, newborn individuals would be willing to give up 1.35% of consumption to keep the more generous public unemployment insurance level of the benchmark model. Although employment prospects are better after the reform, workers incur greater utility costs of job search, they end up in less productive jobs, earn 0.4% lower wages on average and face greater earnings inequality (Table 7). To dig a little deeper, we decompose the change in expected utility into four terms: costly search effort, level and risk of consumption, and the utility of leaving bequests. As Table 8 shows, the welfare loss of lower UI benefits is predominantly due to higher utility cost of search, but also due to the greater consumption risk. To a much smaller extent, lower bequests also reduce utility. On the other hand, aggregate consumption rises together with aggregate employment and income. This brings a substantial welfare gain which does not compensate the other three terms, however. We also calculate the optimal level of UI benefits and find that it is seven percent above the benchmark level; that is, a replacement rate of about 48% maximizes expected utility of a new worker in our model, equivalent to a consumption increase of 0.49%.

Table 8: Decomposition of welfare effects

	UI ↓	Tax Prog ↓
Total	−1.35	−1.10
Search disutility	−2.12	−0.13
Consumption level	+1.84	−0.24
Consumption volatility	−0.89	−0.68
Bequest utility	−0.17	−0.05

All numbers in percent.

The negative welfare consequences of lower UI benefits contrast with related findings based on calibrated general equilibrium economies with search frictions, precautionary savings and capital (see e.g. Young, 2004; Krusell et al., 2010; Mukoyama, 2013; Popp, 2017). When calibrated to U.S. data, they find welfare gains from the elimination or reduction of UI benefits which result from the stimulative effect of lower public insurance on savings, capital accumulation and production. Different from these studies, Piguillem et al. (2021) find that

a slight increase in UI benefits relative to the U.S. benchmark improves welfare, based on a model that includes finite life spans and human capital accumulation where the capital-labor ratio does not rise in general equilibrium. Our study indicates that despite an increase of the capital-labor ratio in general equilibrium (Table 7), less generous UI benefits bring about larger utility costs of job search and greater volatility of earnings and consumption which contribute to an overall welfare loss.[42] As discussed at the beginning of this section, the benchmark economy is characterized by excessive job creation, so that additional vacancies are harmful (ceteris paribus) despite the welfare-enhancing increase of the capital stock.

As the second column of Table 8 shows, a newborn worker in our model dislikes the less progressive tax system which gives a welfare loss equivalent to 1.1% lower consumption. Here we see that all four terms contribute to the welfare reduction, with the lion share coming from higher consumption risk. There are two explanations behind this result: First, the greater disparity of after-tax earnings widens the changes in net earnings when workers make job-to-job transitions. Second, unemployment rises which additionally contributes to greater earnings and consumption risk. Due to higher unemployment, aggregate income and aggregate consumption are lower which explains the second main contributor to the welfare loss. Slightly higher search effort and higher unemployment also lead to a modestly higher disutility of search which, together with somewhat smaller bequests, add to the overall welfare reduction.

As in, e.g., Conesa and Krueger (2006), Krueger and Ludwig (2013) and Heathcote et al. (2017), the progressive tax in our model is a partial substitute for imperfect insurance against idiosyncratic labor market risk. An essential difference is that these studies feature an intensive labor supply margin which is distorted by the labor tax: a less progressive tax system induces high-productivity workers to work more, thereby increasing hours at the top while decreasing them at the bottom, which leads to higher labor efficiency. Our model focuses on adjustments at the extensive margin in a frictional labor market where taxation distorts the job-selectivity and search-effort margins.[43] Less progressive taxes raise labor efficiency since workers select into more productive jobs at the expense of lower aggregate employment. Different from other studies investigating the effects of taxation in frictional labor markets (e.g. Gentry and Hubbard, 2004; Kreiner et al., 2015; Bagger et al., 2021), we

[42] Potentially, the presence of a zero borrowing constraint may contribute to the welfare loss when the provision of public insurance is lower. However, we find that this is not the case: When we implement a non-zero borrowing constraint which never binds for households in equilibrium (precisely, a quarter of average earnings for working-age households) and recalibrate all other parameters in line with the same targets as in Section 4, we obtain very similar aggregate and normative results as in our benchmark model with a zero borrowing constraint.

[43] Another difference with those studies is that they analyze the tax distortions for skill formation.

find little impact on the search-effort margin. Finally, when calculating the optimal degree of tax progressivity, based on the two-parameter tax function and given the benchmark level of transfers, we obtain $\tau_1 = 0.73$ which amounts to a substantial redistribution of income among employed workers.

5.3 Heterogeneity

To understand how the two policies affect different types of households, we focus on two outcome variables: job finding (NE and EE rates) and welfare (CEV). We consider the four working-age groups, and differentiate between non-employed workers, and employed workers with high and low wage income. Additionally, for each of these groups we differentiate between households with high and low wealth holdings. Concretely, we choose the 25th and 75th percentiles of the wealth distribution, conditional on age and employment status. For employed workers, we choose the 25th and 75th percentiles of the age-specific wage distribution to distinguish between low- and high-income workers.[44] We select these specific household types to illustrate in a simple way how policy effects differ in the age, income and wealth dimensions, keeping in mind that the aggregate results above are based on the full distribution over the four-dimensional state space.

Figures 5 and 6 show how both policies affect different households in terms of job-finding rates (top panels in percentage points) and welfare (bottom panels in percent of CEV). The left and middle panels show the impact on employed workers with low and high income, while the right panels show the impact on non-employed workers. Finally, the left and right bars differentiate between low- and high-wealth households as defined above.

When UI benefits are reduced, NE and EE rates increase more strongly for younger and prime-age workers who have greater incentives to provide more search effort when public insurance is weaker, in comparison to workers closer to retirement. In Online Appendix B.7, we confirm that the increase in search effort is indeed larger for younger workers and for wealth-poor workers. In terms of welfare, however, older worker-households suffer from bigger losses which are also increasing in wealth. The reason for this result is the adjustment of factor prices, i.e. a lower interest rate and higher marginal product of labor, which harms particularly older and wealthier households.[45] We also see that employed workers with higher wealth experience more EE transitions, with some variation by age and income. The explanation is that search effort of these workers responds more strongly to the relative

[44] These percentiles pin down the wage w. To select the productivity p at the current job, we choose the respective median of the productivity distribution across workers with the same wage w.

[45] When calculating welfare changes in partial equilibrium, we confirm this intuition: Welfare losses are more similar across age and larger for low-wealth workers.

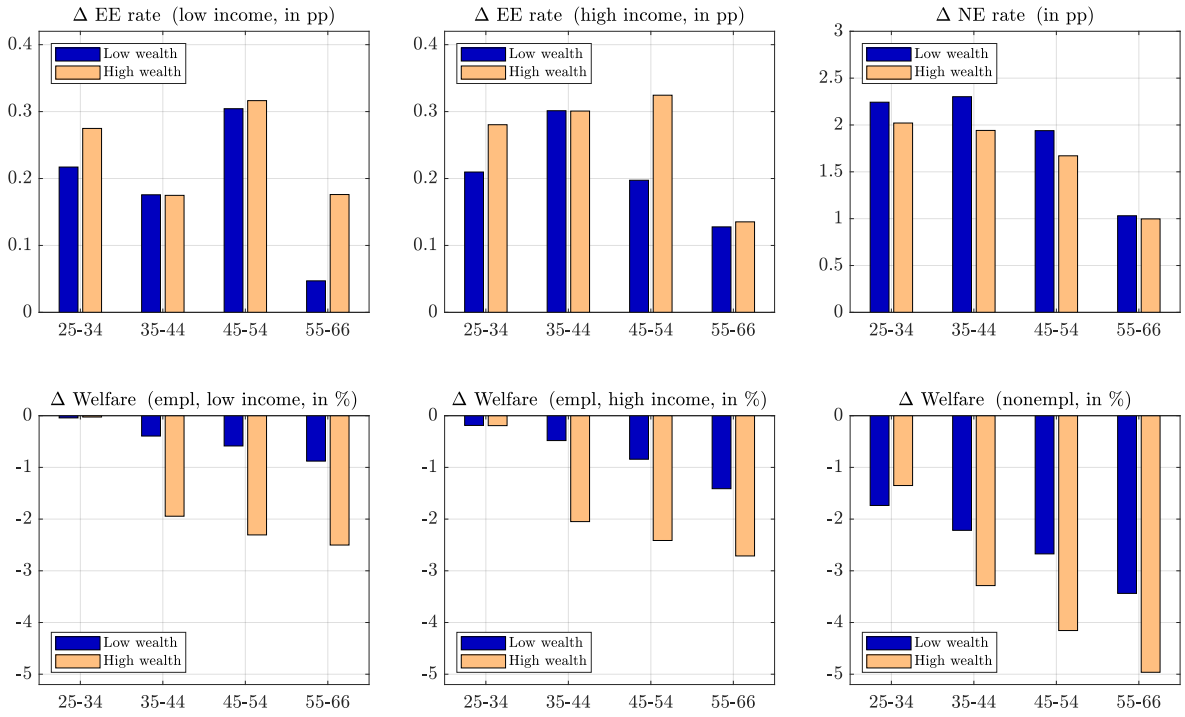


Figure 5: Effects on different households: Lower UI benefits

change of factor prices.

In contrast, when tax progressivity is reduced, the welfare losses are strongest for younger workers as seen in Figure 6. Intuitively, younger workers are those that are willing to accept the least productive and lowest paid jobs in the benchmark economy. By making taxes less progressive and raising the tax level, these low-productivity matches disappear, worsening job-finding prospects of non-employed younger and prime-age workers (top right panel), but also reducing incomes of employed younger workers whose net incomes go down and who find fewer opportunities to quit to better jobs due to the weaker labor market (top left and middle panels). In Online Appendix B.7, we further show that prime-age workers increase their precautionary savings, as these workers face a higher risk of job loss and also experience stronger wage increases compared to older workers (see Table B.10).

5.4 Plausibility

In the previous subsections, we leveraged our model to analyze the long-term aggregate and welfare effects of policies, which are typically beyond the scope of reduced-form analyses. At the same time, as emphasized in Section 4, our model closely aligns with moments from

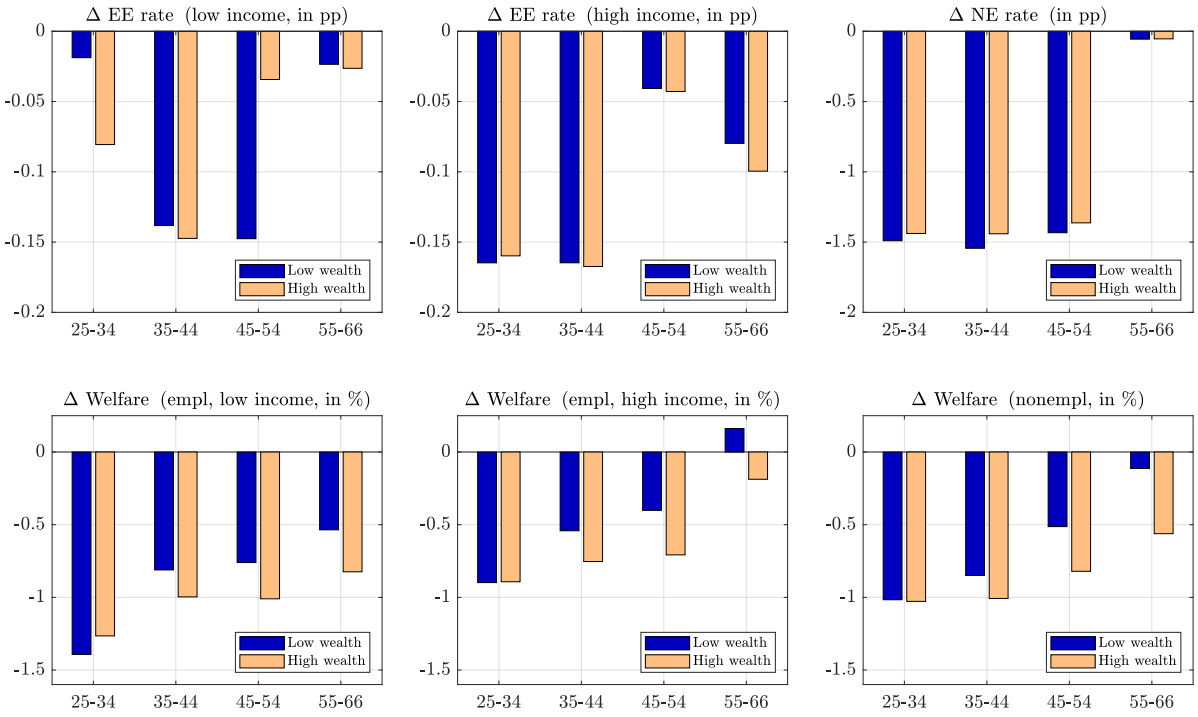


Figure 6: Effects on different households: Less progressive taxes

microeconomic data. In this section, we capitalize on this feature to deepen our discussion of policies. Specifically, we draw on findings from microeconometric studies of policy effects and use our model as a laboratory to replicate these research designs, aiming to further test the credibility of our results. Given the limited empirical evidence on the effects of tax progressivity on the labor market, we focus on the effects of UI benefits.[46]

Precautionary savings. From the perspective of our model, precautionary savings is a key outcome of interest for assessing the effects of UI benefits. However, the empirical literature provides limited evidence on this relationship. Notably, Le Barbanchon et al. (2024) do not cite any studies on this topic, and Schmieder and Von Wachter (2016) reference only one: Engen and Gruber (2001). Engen and Gruber (2001) analyze data from the Survey of Income and Program Participation to examine the relationship between households' expected UI benefit replacement rates and their financial assets. They leverage the exogenous variation in income insurance provided by differences in the benefit schedules of state UI systems to identify this relationship.

[46]We rely on the survey articles by Schmieder and Von Wachter (2016) and Le Barbanchon et al. (2024) to identify studies on the effects of UI benefits that are both representative of the broader literature and based on credible research designs that our model can replicate or closely approximate.

Engen and Gruber (2001) find that an increase in the replacement rate of UI benefits by 10 percent lowers the asset-to-income ratio by 2.8% for the median household in the baseline regression (Table 2 of their paper), and by 6.8% in one of the main alternative specifications (first row of Table 3).[47] When we adopt the same sample restriction, namely when we look at working-age households (25-64 years), and analyze the partial-equilibrium effect of UI benefits on the asset-to-income ratio, we find that reducing the replacement rate of UI benefits by 10 percent increases the asset-to-income ratio by 4.9% which falls well within the range of the empirical estimates.[48]

Nonemployment duration. There is a large body of empirical evidence showing that more generous UI benefits lead to longer nonemployment durations; see Le Barbanchon et al. (2024). To obtain estimates for UI benefit *levels*, not their durations, we use the survey by Schmieder and Von Wachter (2016). Panel A of Table 2 in this survey reports estimates of the elasticity of nonemployment duration with respect to UI benefit levels for several European countries. Looking at the averages of the lowest and largest three estimates, the Table indicates that this elasticity is between 0.43 and 1.53.[49]

The relevant counterpart from our model is computed as a short-run partial equilibrium response. We obtain the policy functions of nonemployed households under the baseline UI benefit level and under a different benefit level, and we calculate the nonemployment durations associated with these policy functions using the stationary distribution of the baseline economy. We find an elasticity of 0.80, which lines up well with the estimates from European studies. Also of note is that the long-run elasticity computed in general equilibrium (i.e., based on the stationary equilibrium with a different benefit level) is 1.19, which is somewhat larger but still within the range of plausible empirical estimates.

Wages. In a recent study, Jäger et al. (2020) implement difference-in-difference designs around four major reforms of UI benefit levels in Austria to study the impact on wages, with a view to comparing them with the effects predicted by search-and-matching models. The striking headline result of this study is that a $1 change in UI benefits leads to only a $0.01

[47] The distribution of gross financial wealth is extremely skewed in the data, with wealth holdings being quite low for the majority of the population. This skewness raises issues with running an OLS regression of wealth-to-income ratios on the replacement rate of UI benefits. The first specification in Table 3 of Engen and Gruber (2001) uses the log of the wealth-to-income ratio to address this issue.

[48] In general equilibrium, the asset-income ratio of the working-age population rises by 6.0%. Moreover, the aggregate changes of output and assets in Table 7 reveal that the aggregate asset-output ratio increases by 1.7% in general equilibrium when UI benefits are lowered.

[49] Estimates of the elasticity of nonemployment duration with respect to benefit levels seem to be lower in U.S. studies. When pooling all U.S. and non-U.S. studies together, the estimates in Schmieder and Von Wachter (2016) suggest an elasticity of 0.60. The empirical literature on the effects of benefit *durations* on unemployment in the U.S. is rather inconclusive. The recent study of Acosta et al. (2023) bridges the gap between the micro and macro estimates in the literature.

response in wages.

We draw a random sample of employed workers (aged 25-54-years-old, as in Jäger et al. (2020)) from the stationary distribution in our benchmark economy, simulate histories with and without a change in UI benefit level, and consider wage outcomes after one year. In doing so, we use the same sequence of shocks over time, aiming to replicate Jäger et al. (2020)'s careful research design. We find a wage response of 0.08. The standard errors in Jäger et al. (2020) indicate empirical wage responses between -0.03 and 0.02 (Column (6) of Table III, which corresponds to their preferred specification). Hence, our model overstates the response of wages, but by a reasonably small amount. This result buttresses one of Jäger et al. (2020)'s main points: that the data favors models which partially insulate wages from the value of nonemployment, such as the sequential auctions framework. In further analyses, we find that it is the sensitivity of re-employment wages (that is, following a transition through nonemployment) that drives the overall wage responses of the model above the empirical ones.

To summarize, our model simulations of the effects of UI benefits on precautionary savings, nonemployment durations, and wages align reasonably well with findings from microeconometric studies. These overidentifying tests provide additional credibility to the policy analyses discussed in the previous subsections.

6 Conclusions

We combine an incomplete-markets, overlapping-generations economy with a frictional job-ladder model with wage bargaining and endogenous search effort off- and on-the-job. The resulting model is rich and connects to many microdata moments on the dynamics of search activity, job-finding rates, wages and wealth that we document in German data. We use the model to isolate factors that drive the decline of non-employment-to-employment as well as job-to-job transitions with respect to age.

Our model, which is cast in general equilibrium, allows us to revisit the effects of policies that have been extensively analyzed in the macroeconomic literature. One striking result concerns the consequences of making the tax system less progressive. According to our model, the reform leads to a contraction of output through lower employment, while at the same time labor efficiency increases. These effects come about from the labor market structure of our model: low-productive jobs are associated with lower after-tax earnings, which makes workers become more selective after the reform, to which firms respond by creating fewer jobs. This policy generates a welfare loss which stems predominately from

greater consumption risk. Similarly, consumption risk rises when unemployment benefits are lowered which, together with more costly search effort, generates a welfare loss, despite an increase of aggregate employment and aggregate income.

Our analysis is a new step towards bridging the gap between macroeconomic incomplete-markets settings and frictional labor market models. Future research could extend our framework in at least five directions. First, our model could be generalized to include human capital accumulation. This would provide further predictions for the interplay between search, wealth, and life-cycle earnings dynamics, and for the consequences of job losses. Second, introducing ex-ante worker heterogeneity could bring the model closer to empirical earnings processes that are typically used as inputs in standard incomplete-markets models. Third, while productivity in our model is match-specific, an alternative model with firm heterogeneity might have different policy implications which also depend on how the entry margin is specified (i.e. whether firm productivity is drawn before or after the entry cost is paid). Fourth, while we consider an economy with a single risk-free asset, extensions to different asset classes which differ in liquidity, risk or returns would allow to analyze interactions between labor market behavior and portfolio choice over the life cycle. Fifth, incorporating dual-earner households, although potentially difficult, could provide novel insights into the relations between search and wealth dynamics in single and couple households as well as for the effects of progressive income taxation.

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Online Appendix

A Data Appendix

A.1 PASS

The Panel Study Labour Market and Social Security (PASS) is an annual representative household survey starting in the year 2007. The survey covers about 10,000 households including about 15,000 persons aged 15 or older. We use information elicited from the person and household questionnaires. The former includes a large set of demographic characteristics and information about the individual's employment and non-employment histories for which PASS also provides a biography spell module. All working-age household members (employed or non-employed) report whether they have been looking for jobs during the last four weeks, and if so, they report further information about job search behavior. See Trappmann et al. (2019) for a detailed description of these data.

Here we present descriptive statistics about households and workers surveyed in the PASS (waves 2007–2019). As described in the main text, we only consider persons aged 25–66 who are neither in education, parental leave, childcare leave or sick leave. Moreover, we exclude all individuals who spent less than 70% of their worklife (after age 25) in paid employment. Therefore, the non-employed workers in our sample are closely attached to the labor force. Cross-sectional sampling weights are applied throughout.

Tables A.1 and A.2 show cross-sectional means of various household and individual characteristics. Table A.2 compares all working-age individuals in PASS data with our sample. Given that PASS oversamples benefit recipients and program participants, many of whom are out of work for many years, the sample is much smaller when we apply our restrictions. Workers in our sample are also less often female, more often German nationality, more likely to be employed, and higher skilled.

Table A.3 reports in the first row the share of active searchers among employed and non-employed workers in our sample. Conditional on active searching, the other rows report the means of further statistics about job search behavior. Relative to employed job seekers, non-employed searchers make use of more search channels, they send more applications, they apply more broadly and spend more time on job search. Finally, Figure A.1 shows the age profiles of quarterly EE and NE transition rates in PASS data, separately for workers reporting active search and those who do not report active search. Among non-employed workers, active search raises the job-finding rate by 7.1 percentage points on average (16.0%

Table A.1: Household characteristics (means)

Wealth	
Zero	0.110
Low	0.230
Middle	0.377
High	0.283
Income	2945.3
Household size	2.357
Number of children	0.639
Debt	
Zero	0.579
Low	0.205
High	0.215
Observations	9331

NOTE: For financial wealth, "Low" is above zero and up to €2,500, "Middle" is €2,500 – 20,000, "High" is over €20,000. For (non-mortgage) debt, "Low" is above zero and up to €5,000, "High" is over €5,000.

Table A.2: Individual characteristics (means)

	All	Our sample
Age	43.01	43.49
Female	0.490	0.410
German	0.845	0.883
Married	0.674	0.699
Education		
Years	12.36	12.76
Unskilled	0.169	0.104
Vocational training	0.650	0.690
University	0.180	0.206
Employment Status		
Employed	0.654	0.917
Non-employed	0.346	0.083
Number of employer changes	0.684	0.753
Net labor earnings	1721.7	1854.2
Weekly working hours	34.99	38.36
Observations	28,967	11,444

vs 8.9%). For employed workers, the job-to-job transition rate is on average 5.1 percentage points higher for active searchers (6.7% vs 1.6%). Taking the average proportions of active searchers in these two groups into account, the average NE rate in PASS is 11.2% and the average EE rate is 1.9%.

Table A.3: Job search (means)

	Employed	Non-employed
Job Search	0.068	0.324
Job Search Channels		
Number	2.323	3.667
Newspaper	0.580	0.724
Public agency job posting	0.376	0.694
Other internet sources	0.669	0.726
Private networks	0.518	0.719
Public agency	0.0978	0.579
Private agent	0.0822	0.225
Number of applications	3.747	11.34
More than one occupation	0.548	0.664
Any possible occupation	0.192	0.285
Hours of job search per week	2.523	8.528
Observations	48626	4864

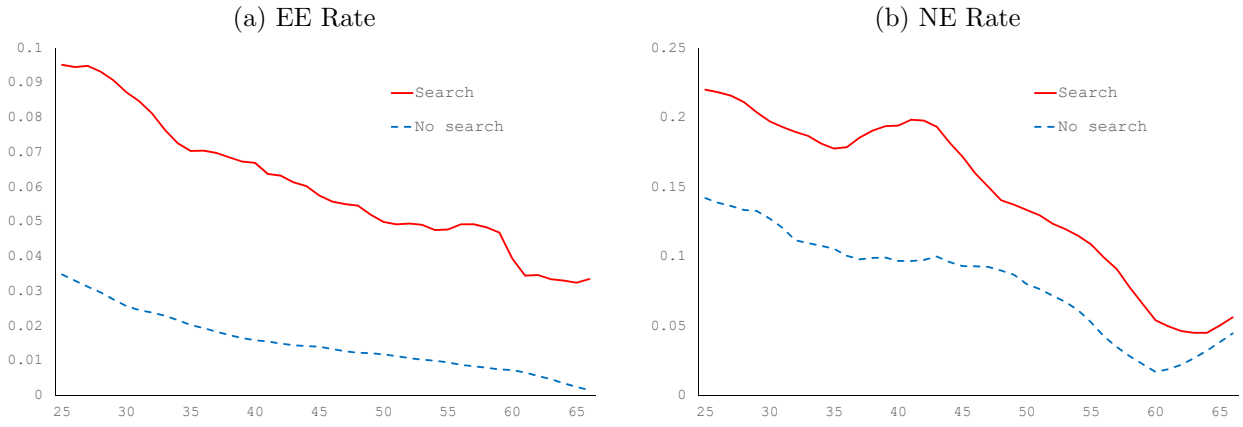


Figure A.1: Quarterly EE and NE rates by age and search status (PASS)

NOTES: EE and NE dummies in PASS data are regressed on age and time dummies, separately for searching and non-searching workers in PASS data. The graphs show centered 7-year moving averages of the age coefficients.

A.2 SOEP

To obtain further statistics for calibration and evaluation of model fit, we use data from the German Socio-Economic Panel (SOEP). SOEP is a well-known and widely used longitudinal panel dataset of the population in Germany. Every year, surveyed individuals provide information on their income, employment history, and education, among other topics. The survey also includes modules that are administered at a lower frequency, such as the quinquennial survey of wealth introduced in 2002. When measuring transition rates by wealth groups in the main text, we use a respondent's most recent reported information from the quinquennial survey of wealth to define his/her own wealth.

Tables A.4 and A.5 show cross-sectional means of various household and individual characteristics from the 2005-2015 waves of SOEP which we use for our analysis. We impose sample restrictions similar to those with the PASS data, namely we exclude unattached workers by requiring that individuals spent at least 70% of their worklife in employment, and we further exclude workers whose part-time experience accounts for more than 50% of their total work experience. As shown in A.5, this restriction leads to a lower share of female workers in our sample, but the other personal characteristics are otherwise similar to the larger sample of all working-age individuals in the survey.

Table A.4: Household characteristics (means)

Income	2,970
Household size	2.5
Number of children	0.5
Financial wealth	
Zero	47.8
Low	11.7
Middle	24.2
High	16.4
Debt	
Zero	49.7
Low	20.0
High	30.3
Observations	6,696

NOTES: For financial wealth, "Low" is above zero and up to €5,000, "Middle" is €5,000 – €25,000, "High" is over €25,000. For debt, "Low" is above zero and up to €25,000, "High" is over €25,000

Table A.5: Individual characteristics (means)

	All	Our sample
Age	45.8	46.1
Female	50.0	34.8
German	90.3	92.8
Married	59.3	60.8
Education		
Number of years	12.3	12.6
Less than high school	10.8	5.9
High school	64.2	66.4
More than high school	24.9	27.7
Employment status		
Salaried employed	65.5	82.4
Self-employed	7.6	10.3
Registered unemployed	7.3	4.7
Out of the labor force	19.6	2.6
Net labor earnings	1,672	1,967
Weekly working hours	38.5	42.1
Observations	16,518	8,273

A.3 Regressions

Here we present OLS regressions of the binary active search outcome (PASS data) and of EE and NE transition dummies (SOEP data). Using alternative probit specifications lead to no meaningful differences in results.

Table A.6 shows how active search of employed and non-employed worker varies with financial wealth in four categories where "zero" is the reference category and with worker age, applying different sets of controls. "Controls I" are those variables that play no role in our model and that are also applied in Figure 1 (education, gender, household size, marital status, and calendar time). "Controls II" are variables which are endogenous in our model (household income, labor earnings, spell duration and number of previous employers) but which may have an independent impact on the workers' search behavior. In both specifications, seen in columns (1) and (3) for employed workers and in columns (2) and (4) for non-employed workers, we confirm the main insights from Figure 1 that active search is declining in wealth and in age. When more controls are applied, most of the coefficient estimates go down but they remain economically and statistically significant. Columns (5) and (6) additionally include household debt (without mortgages) in three categories (zero debt as the reference), applying the first set of controls.[50] Active search again is declining

[50] Applying also Controls II again reduces the coefficient estimates and raises R-squared without meaningful

in wealth and in age, with rather similar coefficient estimates as in columns (1) and (2). Additionally, indebted workers have a somewhat higher propensity to search, with the exception of high-debt non-employed workers where the difference to zero-debt individuals is statistically insignificant.

Table A.6: Active search of employed and non-employed workers

	(1) Employed	(2) Non-employed	(3) Employed	(4) Non-employed	(5) Employed	(6) Non-employed
Low wealth	-0.0253***	-0.0068	-0.0204***	-0.0117	-0.0246***	-0.0099
	(0.0054)	(0.0188)	(0.0055)	(0.0193)	(0.0054)	(0.0189)
Middle wealth	-0.0611***	-0.0821***	-0.0453***	-0.0892***	-0.0574***	-0.0830***
	(0.0053)	(0.0234)	(0.0054)	(0.0238)	(0.0053)	(0.0236)
High wealth	-0.0765***	-0.1514***	-0.0509***	-0.1455***	-0.0695***	-0.1496***
	(0.0057)	(0.0271)	(0.0059)	(0.0289)	(0.0057)	(0.0275)
Age	-0.0020***	-0.0064***	-0.0009***	-0.0058***	-0.0020***	-0.0063***
	(0.0002)	(0.0008)	(0.0002)	(0.0008)	(0.0002)	(0.0008)
Low debt					0.0207***	0.0491**
					(0.0038)	(0.0186)
High debt					0.0254***	0.0038
					(0.0039)	(0.0197)
Controls I	Y	Y	Y	Y	Y	Y
Controls II	N	N	Y	Y	N	N
Observations	44,212	4,313	43,252	4,114	43,870	4,270
R^2	0.025	0.191	0.035	0.213	0.027	0.194

NOTES: OLS regressions of the active search dummy in PASS data. "Controls I" are years of education, household size, hours worked, gender, marital status and year fixed effects. "Controls II" are household income, duration of the current spell, number of previous employers. Zero financial wealth is the reference category, "Low wealth" is up to €2,500, "Middle wealth" is €2,500-20,000, "High wealth" is over €20,000. In columns (5) and (6), zero debt is the reference category, "Low debt" is up to €5,000, "High debt" is over €5,000. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

In Table A.7, we analyze the relation between job-finding rates and age and financial wealth, controlling for a host of person and household characteristics. The table is organized similar to Table A.6: We consider four financial wealth categories, we further add household debt on the right-hand side of the regressions, and apply different sets of controls. The table shows an economically and statistically significant negative relation between job-finding rates and the variables of interest. Having financial wealth above €25,000 leads to a robust 2.2 pp lower probability of making an EE transition, no matter what set of controls we consider. The corresponding estimates for the NE rate is between -3.4 and -3.7 pp. As shown in the table, "Controls II" increases the R-squared of the regression and makes the coefficient on the "Middle wealth" dummy more negative for the NE rate, without altering the magnitude

difference in the conclusions.

of the effects. In results not reported here, we find that the conclusions remain unchanged when we replace financial wealth on the right-hand side of the regressions by net wealth and when we consider either net wealth dummies or a polynomial function of net wealth.

Table A.7: NE and EE Rate Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	EE Rate (%)	NE Rate (%)	EE Rate (%)	NE Rate (%)	EE Rate (%)	NE Rate (%)
Low wealth	-1.439***	-1.302	-1.390***	-1.243	-1.433***	-1.390
	(0.493)	(1.216)	(0.495)	(1.204)	(0.490)	(1.219)
Middle wealth	-1.871***	-0.473	-1.802***	-0.704	-1.890***	-0.287
	(0.376)	(1.107)	(0.376)	(1.067)	(0.379)	(1.094)
High wealth	-2.212***	-3.686***	-2.136***	-3.532***	-2.227***	-3.400***
	(0.407)	(1.091)	(0.420)	(1.117)	(0.405)	(1.076)
Age	-0.188***	-0.356***	-0.189***	-0.366***	-0.184***	-0.348***
	(0.021)	(0.048)	(0.021)	(0.047)	(0.021)	(0.048)
Low debt					0.376	2.341*
					(0.455)	(1.222)
High debt					-1.517***	-0.593
					(0.328)	(0.963)
Controls I	Y	Y	Y	Y	Y	Y
Controls II	N	N	Y	Y	N	N
Observations	63,646	27,825	63,646	27,825	63,646	27,825
R-squared	0.012	0.044	0.014	0.056	0.014	0.045

NOTES: OLS regressions of EE and NE rates (%) in SOEP data. "Controls I" are years of education, household size, gender, marital status and time fixed effects. "Controls II" are a dummy for German nationality, spousal income, and regional (Lander) fixed effects. Zero financial wealth is the reference category, "Low wealth" is above zero and up to €5,000, "Middle wealth" is €5,000 – €25,000, "High wealth" is over 25,000. In columns (5) and (6), zero debt is the reference category, "Low debt" is up to 25,000, "High debt" is over €25,000. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

A.4 Job Search and Wealth in U.S. Data

We conduct an empirical analysis similar to the one presented in Section 2 for the United States, using the Survey of Consumer Expectations (SCE). As explained below, the sample is much smaller than that of the German PASS data. As a result, the U.S. estimates are less precisely estimated. Nonetheless, our results confirm, at least qualitatively, the empirical patterns of the relationships between active search on the one hand, and age and wealth on the other hand, found in German data.

The SCE is a nationally representative, online survey of a rotating panel of approximately 1,300 household heads, administered by the Federal Reserve Bank of New York. The survey is carried out monthly, with respondents participating in the panel for up to twelve months. The SCE focuses primarily on expectations about economic outcomes. In addition, all participants fill out a labor market survey (which includes information on wages, occupation,

etc. and job search behavior) and a household finance survey. Since our analysis requires linking respondents who participate in both modules to the core survey, we lose a fraction of the SCE panel. We then restrict the analysis to individuals between the ages of 25 and 66 who participate in the labor market and who are not permanently disabled (as a labor force status), retired or studying. The resulting sample contains about 2,000 individuals.

Beginning with the labor market questions, we classify as "employed" those individuals who are either working full time or part time or are currently on leave. We classify as "non-employed" those individuals who are not working but would like to work and those who are on temporary lay-off. For employed workers, we consider that the individual is actively searching if s/he has been looking for a new job or for an additional job in the last four weeks. For non-employed workers, we classify them as actively searching if they report searching for work in the last four weeks. Next, from the household finance module, we extract information about household wealth and debt. The financial wealth variable corresponds to the total value of checking and savings accounts, certificates of deposit, money market funds, savings bonds, mutual funds or investment trusts, and treasury bonds. Note that it does not include the value of retirement accounts. For debt, the variable includes balances on credit cards (including retail cards), student loans, vehicle loans, and other personal loans, as well as medical or legal bills; it excludes housing-related debt.

A.4.1 Main Findings

We first verify that the univariate correlations between search and financial wealth that we document in the German PASS data are also present in the U.S. SCE data. When we group individuals by wealth in three bins of roughly the same size, we find that the fraction of active searchers is at 28% for those with less than $8,000 of financial wealth vs. about 20% among those with between $8,000 and $50,000, and slightly under 20% above $50,000 of financial wealth. This negative relation continues to hold when we restrict the analysis to individuals who are currently employed. At the same time, we find a positive relation between active search and debt. Among workers with debt under $2,500, the fraction searching is at roughly 20%, while it increases to 22-23% for those with debt between $2,500 and $21,000, and to about 28% above the latter debt threshold.

Next, as with the German PASS data, we observe a negative relation between active search and age. When looking across all individuals, employed and non-employed, we find that the fraction actively searching decreases from slightly more than 30% at the beginning of the working life to about 15% when workers are in their 60s. One difference with the German data, though, is that a substantial share of the decline in active search in the U.S.

Table A.8: Active search

	(1) All workers	(2) Employed	(3) All workers	(4) Employed
Middle wealth	-0.0474*	-0.0428*	−0.0354	−0.0306
	(0.0209)	(0.0211)	(0.0211)	(0.0212)
High wealth	-0.0113	-0.0102	0.0088	0.0100
	(0.0253)	(0.0255)	(0.0258)	(0.0260)
Age	−0.0042***	−0.0046***	−0.0039***	−0.0044***
	(0.0008)	(0.0008)	(0.0008)	(0.0008)
Middle debt			0.0273	0.0269
			(0.0226)	(0.0229)
High debt			0.0853***	0.0881***
			(0.0217)	(0.0219)
Observations	2,088	1,995	2,088	1,995
R^2	0.117	0.070	0.124	0.078

NOTES: OLS regressions on the active search dummy. Further controls include gender, marital status and presence of children, annual income, education and race dummies. "Low wealth", defined as wealth up to \$8,000, is the reference category; "Middle wealth" is \$8,000-\$50,000, "High wealth" is over \$50,000. In columns (3) and (4), "Low debt", defined as debt up to \$2,500, is the reference category, "Middle debt" is \$2,500-\$21,000, "High debt" is over \$21,000. * $p < 0.05$, ** $p < 0.01$, * $p < 0.001$.

data occurs between the ages of 25 and 40; the fraction plateaus between the ages of 40 and 60, and then falls again as individuals get closer to retirement.

The next step of our analysis is a multivariate regression analysis similar to Table A.6. We run OLS regressions of the active search indicator on age, wealth and debt, and a number of individual and household controls. Table A.8 reports the results.

First, the regressions confirm the negative relationships between age and active search and between financial wealth and active search. The wealth coefficients reported in Table A.8 are barely statistically significant at conventional levels, but note that the regression includes many individual controls that correlate with wealth. Second, there is a positive relationship between debt and active search; this is shown in columns (3) and (4) of Table A.8. In sum, the U.S. SCE data confirm, albeit with less precision in the estimates, the empirical patterns that we document using the German PASS data.

B Model Appendix

B.1 Further Model Details

B.1.1 Households' Bellman Equations

Similar to a household with an employed worker, a household with a non-employed worker decides between active and passive search at the beginning of the period. The expected value prior to the realization of utility shocks is

$$V(w,0,a_0,j) = \frac{1}{\gamma_n} \ln \left\{ e^{\gamma_n [V^1(w,0,a_0,j) - \xi_n]} + e^{\gamma_n V^0(w,0,a_0,j)} \right\} \ ,$$

where the continuation values under active and passive search ($i = 1, 0$) are

$$\begin{aligned} V^i(w,0,a_0,j) = \max_{c,a} \Big\{ & u(c) + [1 - s_n^i \lambda(\theta) \bar{H}(q^n(w,a,j))] \bar{V}(w,0,a,j) \\ & + s_n^i \lambda(\theta) \int_{q^n(w,a,j)} (1-\eta) \bar{V}(w,0,a,j) + \eta \bar{V}(\omega x, x, a, j) \ dH(x) \Big\} \end{aligned}$$

subject to

$$c + a = b + (1+r)a_0 \quad , \quad a \geq 0 \ .$$

With probability $s_n^i \lambda(\theta) \bar{H}(q^n(w,a,j))$, the worker receives an offer from a firm with match productivity $x \geq q^n(w,a,j)$ that the worker accepts. Otherwise the worker remains non-employed with continuation utility $\bar{V}(w,0,a,j)$.

Similar to employed workers, the fraction of non-employed workers in state $(w,0,a_0,j)$ choosing active search is

$$\pi^1(w,0,a_0,j) = \frac{e^{\gamma_n [V^1(w,0,a_0,j) - \xi_n]}}{e^{\gamma_n [V^1(w,0,a_0,j) - \xi_n]} + e^{\gamma_n V^0(w,0,a_0,j)}} \ ,$$

while the fraction of passive searchers is $\pi^0(w,0,a_0,j) = 1 - \pi^1(w,0,a_0,j)$.

At the end of the period, households age with probability μ_j. For $j < J-1$, this implies

$$\bar{V}(w,p,a,j) = \beta \left[\mu_j V(w,p,a,j+1) + (1-\mu_j) V(w,p,a,j) \right] \ .$$

For $j = J-1$, an aging event is a transition into retirement:

$$\bar{V}(w,p,a,J-1) = \beta \left[\mu_{J-1} V(w^r(w),0,a,J) + (1-\mu_{J-1}) V(w,p,a,J-1) \right] \ ,$$

where the value function in retirement solves a standard consumption-saving problem with a warm-glow bequest motive:

$$V(w^r, 0, a_0, J) = \max_{c,a} u(c) + \beta(1-\mu_J)V(w^r, 0, a, J) + \beta\mu_J v(a)$$

$$\text{s.t.} \quad c + a = w^r + (1+r)a_0 \ , \ a \geq 0.$$

B.1.2 Firms' Bellman Equations

To describe the Bellman equation of a firm with a job filled with a worker in state (w, p, a_0, j) at the beginning of the period, note first that wage renegotiations may occur in two situations. First, the worker (with savings a at the match/separation stage) receives an outside offer from a firm with productivity $x \in [q(w, p, a, j), p]$ in which case the wage is renegotiated to $w' = \mathcal{W}(x, p, a, j)$. Second, the worker has a credible threat to quit to non-employment, in which case either the quit occurs or the wage is raised. Write $w' = \mathcal{W}^c(w, p, a, j)$ for the continuation wage which satisfies

$$\mathcal{W}^c(w, p, a, j) = \begin{cases} w & \text{if } \bar{V}(w, p, a, j) \geq \bar{V}(w, 0, a, j) \ , \\ \min[w', \omega p] & \text{else, where } w' \text{ satisfies } \bar{V}(w', p, a, j) = \bar{V}(w, 0, a, j) \ . \end{cases}$$

In the first line, the worker has no credible threat to quit so that the wage remains at w. In the second case, the firm either retains the worker if $w' \leq \omega p$. But if $w' > \omega p$, the worker quits and the continuation profit is zero which is (for the firm) equivalent to employing the worker at continuation wage ωp.

The Bellman equation for the profit value of a job is

$$\Pi(w, p, a_0, j) = \omega p - w + \sum_{i=0,1} \pi^i(w, p, a_0, j) \Bigg\{ s_e^i \lambda(\theta) \int_{q(w,p,a^i,j)}^{p} \bar{\Pi}(\mathcal{W}(x, p, a^i, j), p, a^i, j) \ dH(x) \\ + \left[1 - \rho - \kappa\lambda(\theta) - s_e^i \lambda(\theta) \bar{H}(q(w, p, a^i, j))\right] \bar{\Pi}(\mathcal{W}^c(w, p, a^i, j), p, a^i, j) \Bigg\} \ ,$$

with assets $a^i = \mathcal{A}(w, p, a_0, j, i)$. The continuation profits on the right-hand side entail the following possibilities: Either the worker (searching actively or passively in proportions π^1 and π^0) obtains an outside offer. If match productivity at the poaching firm is above $q(.)$ and below p (which happens with probability $s_e^i \lambda(\theta)[H(p) - H(q(.))]$, a renegotiation takes place (first line). If the job at the poaching firm is more productive (probability $s_e^i \lambda(\theta) \bar{H}(p)$), and also if an exogenous separation shock occurs (probability $\rho + \kappa\lambda(\theta)$), the worker quits

and continuation profit is zero (not shown in the Bellman equation). In all other events (shown in the second line), the job either survives with continuation wage $\mathcal{W}^c(.) < \omega p$. Or, alternatively, if the worker cannot be profitably retained ($\mathcal{W}^c = \omega p$), the worker quits and the continuation profit $\bar{\Pi}(\omega p, p, a^i, j)$ is zero.

After the matching and renegotiation stage and before aging, profit values satisfy the recursions

$$\begin{aligned}\bar{\Pi}(w,p,a,j) &= \frac{1}{1+r}\left[\mu_j \Pi(w,p,a,j+1) + (1-\mu_j)\Pi(w,p,a,j)\right] \ , \ j < J-1 \ , \\ \bar{\Pi}(w,p,a,J-1) &= \frac{1}{1+r}(1-\mu_{J-1})\Pi(w,p,a,J-1) \ .\end{aligned}$$

In the last equation, the worker retires with probability μ_{J-1} in which case continuation profit is zero. Next-period profit values Π are discounted with financial discount factor $(1+r)^{-1}$.

Finally, the free-entry condition (8) reflects that the probability to meet a worker in a given state (w,p,a_0,j) is given by the search efficiency of workers in that state, which is $\sum_{i=0,1} s^i_\ell \pi^i(w,p,a_0,j) d\nu(w,p,a_0,j)$ for $\ell = e,n$, relative to aggregate search efficiency which is the sum of search efficiency of all employed and non-employed workers, including those employed workers receiving reallocation shocks:

$$\bar{s} \equiv \int_{j<J,p>0} \sum_{i=0,1} \pi^i(w,p,a_0,j)(s^i_e+\kappa)\, d\nu(w,p,a_0,j) + \int_{j<J} \sum_{i=0,1} \pi^i(w,0,a_0,j) s^i_n \, d\nu(w,0,a_0,j) \ . \tag{B.1}$$

B.1.3 Walras's Law

To derive the goods-market equilibrium condition, write

$$M = (1+r)K + \int_{j<J,p>0} \Pi(w,p,a_0,j)\ d\nu(w,p,a_0,j)$$

for the (cum-dividend) value of the mutual fund at the beginning of a period. This value satisfies the recursion

$$M = rK + \int_{j<J,p>0} [\omega p - w]\ d\nu(w,p,a_0,j) - kV + \frac{M}{1+r} \ . \tag{B.2}$$

Stationarity of the household distribution implies that the assets bought in any period, net of those bequests which are not paid to newborn households (hence collected by the

government), are identical to households' asset holdings at the beginning of a period, i.e.

$$\int \sum_{i=0,1} \pi^i(w,p,a_0,j)\mathcal{A}(w,p,a_0,j,i)\ d\nu(w,p,a_0,j)$$
$$-\mu_J \int \mathcal{A}(w^r,0,a_0,J,0)\ d\nu(w^r,0,a_0,J) + \mu_0 \int a_0\ d\Phi(a_0) = \int a_0\ d\nu(w,p,a_0,j)\ . \quad \text{(B.3)}$$

From capital market equilibrium (10) and equation (B.2) follows that

$$\begin{aligned}(1+r)\int a_0\ d\nu(w,p,a_0,j) &= M \qquad \text{(B.4)}\\ &= rK + \int_{j<J,p>0} [\omega p - w]\ d\nu(w,p,a_0,j) - kV + \frac{M}{1+r}\\ &= -\delta K + F_K(K,E)K + F_E(K,E)E - W - kV + \frac{M}{1+r}\ ,\end{aligned}$$

with aggregate wage income $W = \int_{j<J,p>0} w\ d\nu(w,p,a_0,j)$. The third line follows from $F_K = r+\delta$ and $\int \omega p\ d\nu(w,p,a_0,j) = \omega E = F_E E$. Adding up budget constraints of all (employed, non-employed, retired) households gives

$$(1+r)\int a_0\ d\nu(w,p,a_0,j) = \qquad \text{(B.5)}$$
$$\begin{aligned}&\int_{j<J,p>0} \sum_{i=0,1} \pi^i(w,p,a_0,j)[\mathcal{C}(w,p,a_0,j,i) + \mathcal{A}(w,p,a_0,j,i) - w + T(w)]\ d\nu(w,p,a_0,j)\\ &\quad + \int_{j<J} \sum_{i=0,1} \pi^i(w,0,a_0,j)\ [\mathcal{C}(w,0,a_0,j,i) + \mathcal{A}(w,0,a_0,j,i) - b]\ d\nu(w,0,a_0,j)\\ &\quad\quad + \int [\mathcal{C}(w^r,0,a_0,J,0) + \mathcal{A}(w^r,0,a_0,J,0) - w^r]\ d\nu(w^r,0,a_0,J)\\ &\quad = \int \sum_{i=0,1} \pi^i(w,p,a_0,j)\ [C(w,p,a_0,j,i) + \mathcal{A}(w,p,a_0,j,i)]\ d\nu(w,p,a_0,j)\\ &- \int_{j<J,p>0} w\ d\nu(w,p,a_0,j) - \mu_J \int \mathcal{A}(w^r,0,a_0,J,0)\ d\nu(w^r,0,a_0,J) + \mu_0 \int a_0\ d\Phi(a_0)\\ &\quad = C - W + \int a_0\ d\nu(w,p,a_0,j)\ .\end{aligned}$$

Here the second equation uses the government budget constraint (9), and the third equation uses (B.3).

Equating (B.4) and (B.5), using $F_K(K,E)K + F_E(K,E)E = F(K,E)$ and capital market equilibrium (10) yields the goods market equilibrium identity (11). The partition of $F(K,E)$ into wage, profit and rental income follows since $F_E(K,E)E = W + \int_{j<J,p>0}[\omega p -$

$w]\ d\nu(w, p, a_0, j)$.

B.1.4 Normalization

Here we explain why the normalization of the marginal product of labor efficiency $\omega = 1$ together with the normalization of average earnings to one is innocuous. For arbitrary ω, write $\tilde{p} = \omega p$ for the marginal product of a job with labor efficiency p. We calibrate the gamma distribution of $\tilde{p}$ to normalize average earnings to one and to target the average NE rate, as explained in Section 4. For the calibrated value of the real interest rate r and the normalized tightness (vacancy-to-search-efficiency ratio) $\theta = 1$, together with further externally calibrated parameters (governing pensions, initial assets), we can solve the household problem, equilibrium wages and the stationary distribution ν. Hence we obtain aggregate labor efficiency $E = \int_{p>0} p\ d\nu$, and define $\Omega = \omega E$. Note that Ω is independent of the choice of ω, since the distribution of $\tilde{p}$ (and not the distribution of p) is calibrated to match average earnings $\int_{p>0} w\ d\nu / (\int_{p>0} d\nu) = 1$. Instead, aggregate labor efficiency $E = \Omega/\omega$ scales inversely proportional with ω.

We can also solve aggregate household assets, firm profits (from firms' value functions) and obtain aggregate capital K from capital market equilibrium and hence independent of ω.

From the marginal products of capital and efficient labor:

$$(r + \delta) = F_K = \alpha \mathcal{T} K^{\alpha-1} E^{1-\alpha} \quad , \quad \omega = F_E = (1-\alpha) \mathcal{T} K^{\alpha} E^{-\alpha} \ .$$

Substituting $E = \Omega/\omega$ into the second equation implies

$$\omega^{1-\alpha} = (1-\alpha) \mathcal{T} K^{\alpha} \Omega^{-\alpha} \ .$$

This shows that any arbitrary choice of ω pins down aggregate TFP $\mathcal{T}$ proportionate to $\omega^{1-\alpha}$. The choice of ω (and $\mathcal{T}$) has no consequence for any economic outcomes, however. The capital cost satisfies

$$r + \delta = \frac{\alpha}{1-\alpha} \frac{\Omega}{K} \ ,$$

which shows how the calibrated values of r and δ determine parameter α uniquely.

Aggregate output is

$$Y = \mathcal{T} K^{\alpha} E^{1-\alpha} = \mathcal{T} \omega^{\alpha-1} K^{\alpha} \Omega^{1-\alpha} = \frac{\Omega}{1-\alpha} \ ,$$

which is unaffected by the choice of ω.

B.1.5 Consumption-Equivalent Variation

We describe how we calculate the percentage increase in consumption $\hat{c}$ (the consumption-equivalent variation CEV) that would make a newborn household in the benchmark economy (index B) indifferent to the newborn household in the post-reform environment (index P). Due to the presence of idiosyncratic search utility shocks, we cannot calculate $\hat{c}$ directly from the obtained value functions, so that we need to resort to simulations.

For both economies B and P, we simulate a large number i of newborn households until they either die or until time exceeds an implausibly large number (1000 quarters). We calculate the average discounted utility of consumption for both economies and denote them

$$U^B = \text{Average}^B \left(\sum_{t \geq 0} \beta^t \tilde{u}(c_t^i) \right) ,$$
$$U^P = \text{Average}^P \left(\sum_{t \geq 0} \beta^t \tilde{u}(c_t^i) \right) ,$$

with $\tilde{u}(c) = c^{1-\sigma}/(1-\sigma)$. It is important to use $\tilde{u}(c)$ at this stage and not the original CRRA utility function $u(c) = (c^{1-\sigma} - 1)/(1-\sigma)$.

From the solution of the model, we can calculate the value functions of newborn households:

$$V^B = \mathbb{E}V^B(0, 0, a_0, 1) \quad , \quad V^P = \mathbb{E}V^P(0, 0, a_0, 1) ,$$

where the expectation is over the initial asset endowment a_0. Then we calculate the component of utility which is due to the fixed utility costs of search, the idiosyncratic search utility shocks, the utility from bequests, and the constant term in the utility function, as the residuals

$$X^B = V^B - U^B \quad , \quad X^P = V^P - U^P .$$

The consumption-equivalent variation $\hat{c}$ increases (decreases) U^B to $U^B(1+\hat{c})^{1-\sigma}$ when $\hat{c} > 0$ ($\hat{c} < 0$). From the above terms, we obtain

$$\hat{c} = \left(\frac{V^P - X^B}{U^B} \right)^{\frac{1}{1-\sigma}} - 1 .$$

To calculate the contributions of search disutility, consumption level and volatility, and bequest utility to the overall welfare effect seen in Table 8, we proceed as follows. We

isolate the search disutility component by first computing similar values $\tilde{U}^B$ and $\tilde{U}^P$ as above, this time embedding the discounted utility of bequests as well. We then compute the ensuing residual $\tilde{X}^P = V^P - \tilde{U}^P$. The consumption-equivalent variation from different search disutility $\hat{c}^{\text{s}}$ can then be computed as $\hat{c}^{\text{s}} = -\big((V^B - \tilde{X}^P)/\tilde{U}^B)^{\frac{1}{1-\sigma}} - 1\big)$. Similarly, the bequest utility component is calculated as $\hat{c}^{\text{b}} = -\big((V^B - X^P)/U^B)^{\frac{1}{1-\sigma}} - 1\big) + \hat{c}^{\text{s}}$. The level effect of consumption is simply equal to the change in average consumption, $\hat{c}^{\text{c,lev}} = \bar{C}^P/\bar{C}^B - 1$, where C^P and C^B denote average consumption in the benchmark and post-reform economies, respectively. Finally, we define the volatility effect of consumption as the residual $\hat{c}^{\text{c,vol}} = \hat{c} - \hat{c}^{\text{s}} - \hat{c}^{\text{b}} - \hat{c}^{\text{c,lev}}$.

B.2 Model Fit: Further Results

Table B.1 reports the transition probabilities for each age and wealth group, in both data and the model. As in the main text, the thresholds that define the four quartiles are defined based on individuals' employment statuses, but they are not conditional on age.

We observe in the data panel of Table B.1 that NE transition rates are declining in age for all wealth quartiles. The model matches these conditional declines very well. Conditional on age, the data show declining relationships with wealth for workers until age 44 which is partly captured by the model. The model also predicts mild declines of NE rates in wealth for older workers, while the relationship in the data is hump-shaped.

The middle panel of Table B.1 shows the model fit with respect to the EE transition rates by age and wealth. Similar to NE transitions, the rate of job-to-job transitions decreases with age conditional on the wealth quartile, which is also true in a model with a weaker age gradient. On the other hand, EE transitions in the data are falling in wealth separately for each age group, and the model does a good job at capturing these patterns.

Last, we report transitions from employment to non-employment. As shown in the bottom left panel of Table B.1, these transitions show some variation by age and wealth in the data. In the model, EN rates are rather similar among prime-age workers, and higher for older workers as they are in the data, with little variation in wealth for all age groups.

Table 6 in the main text shows that the model generates a hump-shaped wealth-age profile. While this table reports mean wealth for each age group (in relation to average income), Figure B.1 shows the 25th, 50th, 75th and the 95th percentiles of wealth (again in relation to average income), separately for each of the five age groups. Generally, the model matches the data profile rather well, suggesting that it generates reasonable wealth distributions by age.

Finally, Table B.2 reports statistics about wage growth upon EE transitions in the data

Table B.1: Transition rates by age and wealth: data vs. model

	Data					Model			
NE rate	Q1	Q2	Q3	Q4	NE rate	Q1	Q2	Q3	Q4
25-34	20.2	18.8	15.5	16.9	25-34	17.8	18.4	16.9	16.3
35-44	17.8	16.1	16.9	12.6	35-44	17.7	16.7	15.8	15.3
45-54	12.6	13.1	18.4	11.1	45-54	15.7	13.5	13.2	12.4
55-66	7.2	8.9	9.4	7.7	55-66	8.7	7.1	6.8	6.1
EE rate	Q1	Q2	Q3	Q4	EE rate	Q1	Q2	Q3	Q4
25-34	10.6	7.4	6.0	7.1	25-34	8.2	4.9	4.4	4.2
35-44	7.7	3.7	3.0	3.3	35-44	7.6	4.5	4.4	4.1
45-54	5.9	3.6	4.3	2.0	45-54	7.2	4.3	4.1	3.7
55-66	4.6	2.8	2.3	1.0	55-66	5.8	3.2	2.9	2.4
EN rate	Q1	Q2	Q3	Q4	EN rate	Q1	Q2	Q3	Q4
25-34	2.5	1.9	1.6	1.9	25-34	1.2	1.2	1.2	1.2
35-44	1.9	1.3	1.1	0.8	35-44	1.2	1.2	1.2	1.2
45-54	2.3	1.0	1.2	0.6	45-54	1.3	1.5	1.5	1.5
55-66	3.5	1.7	1.8	1.4	55-66	1.8	2.0	2.0	2.1

NOTES: All numbers in percent.

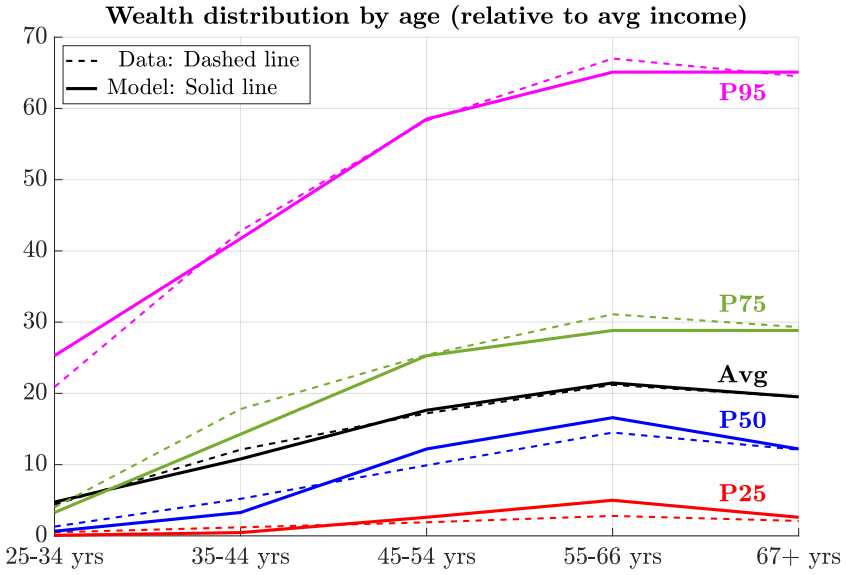


Figure B.1: Percentiles of net wealth by age

and in the model. In the model, the reallocation shock parameter κ is calibrated to match

the share of job-to-job transitions where workers experience a decline of the wage, which is 26.9%. Table B.2 shows that this share is increasing in age up until the 45-54 age group and then falls to the 55-66 group, similarly in the data and in the model. Average wage growth upon EE transitions in the data (model) is 10.4% (8.5%), and both the data and the model show U-shaped age profiles, albeit there are sizable discrepancies in the age groups 35-44 and 55-66.

Table B.2: Wage growth upon EE transitions

	All	25-34	35-44	45-54	55-66
% negative					
Data	26.9†	23.7	29.6	33.2	31.3
Model	26.9	23.5	29.8	30.0	23.3
Mean					
Data	10.3	15.3	10.2	4.3	5.7
Model	8.5	12.6	3.0	5.1	14.8

† Calibration target

B.3 Age Profiles of Labor Market Transitions

We demonstrate in Section 4.2 that job-finding rates of employed and non-employed workers are declining in age, an outcome that arises without any age variation in the exogenous parameters that govern search efficiency or utility costs of search. To examine how the characteristics of workers – namely age, wealth and match quality – matter for these life-cycle patterns, we conduct a decomposition analysis similar to the approach of Menzio et al. (2016).

Given the stationary distribution ν over characteristics (w, p, a_0, j), we calculate various conditional distributions. Denote by $\nu^e(w, p, a_0|j)$ the distribution of (w, p, a_0) among employed workers conditional on age j, $\nu^e_{job}(w, p|a_0, j)$ the distribution of job characteristics (w, p) conditional on age j and assets a_0, and $\nu^e_a(a_0|j)$ the distribution of assets conditional on age. All these are probability distributions conditional on employment, hence they integrate to one. Write $\text{EE}(w, p, a_0, j)$ for the EE rate of a worker with characteristics (w, p, a_0, j) and EE_j for the average EE rate of workers of age j. The difference in EE rates between age

groups j and $j-1$ can be split into three terms as follows:

$$\begin{aligned}\text{EE}_j - \text{EE}_{j-1} = &\underbrace{\int \text{EE}(w,p,a_0,j)\; d\nu^e(w,p,a_0|j) - \int \text{EE}(w,p,a_0,j-1)\; d\nu^e(w,p,a_0|j)}_{\text{horizon effect}} \\ &+ \underbrace{\int \left[\int \text{EE}(w,p,a_0,j-1)\; d\nu^e_{job}(w,p|a_0,j)\right] d\nu^e_a(a_0|j) - \int \left[\int \text{EE}(w,p,a_0,j-1)\; d\nu^e_{job}(w,p|a_0,j)\right] d\nu^e_a(a_0|j-1)}_{\text{wealth effect}} \\ &+ \underbrace{\int \left[\int \text{EE}(w,p,a_0,j-1)\; d\nu^e_{job}(w,p|a_0,j)\right] d\nu^e_a(a_0|j-1) - \int \left[\int \text{EE}(w,p,a_0,j-1)\; d\nu^e_{job}(w,p|a_0,j-1)\right] d\nu^e_a(a_0|j-1)}_{\text{selection effect}}\;.\end{aligned}$$

The first line is the direct contribution of age to EE rates, labeled the *horizon effect*, which represents the role of the expected duration of working life on search behavior on-the-job (cf. Chéron et al., 2013; Menzio et al., 2016). The second line is the *wealth effect* which is the difference between the EE rate of age $j-1$ workers who counterfactually have the same wealth and job characteristics of age j workers and the EE rate of age $j-1$ workers who counterfactually have the same job characteristics as age j workers. This effect measures the extent to which wealth accumulation over the life cycle contributes to declining job transitions. The third line is the *selection effect* which is the difference between the EE rate of age $j-1$ workers who counterfactually have the job characteristics of age j workers and the actual EE rate of age $j-1$ workers. It captures the effect of a higher position on the job ladder to fewer job-to-job transitions as a worker ages.

Regarding non-employed workers, denote by $\nu^n(w,a_0|j)$ the distribution of (w,a_0) conditional on age j, $\nu^n_{wage}(w|a_0,j)$ the distribution of previous wages w conditional on age j and assets a_0, and $\nu^n_a(a_0|j)$ the distribution of assets conditional on age. Again, these are all probability distributions conditional on non-employment. As above we can split the difference in job-finding rates between ages j and $j-1$ into a *horizon effect*, a *wealth effect*, and a *selection effect*:

$$\begin{aligned}\text{NE}_j - \text{NE}_{j-1} = &\underbrace{\int \text{NE}(w,a_0,j)\; d\nu^n(w,a_0|j) - \int \text{NE}(w,a_0,j-1)\; d\nu^n(w,a_0|j)}_{\text{horizon effect}} \\ &+ \underbrace{\int \left[\int \text{NE}(w,a_0,j-1)\; d\nu^n_{wage}(w|a_0,j)\right] d\nu^n_a(a_0|j) - \int \left[\int \text{NE}(w,a_0,j-1)\; d\nu^n_{wage}(w|a_0,j)\right] d\nu^n_a(a_0|j-1)}_{\text{wealth effect}} \\ &+ \underbrace{\int \left[\int \text{NE}(w,a_0,j-1)\; d\nu^n_{wage}(w|a_0,j)\right] d\nu^n_a(a_0|j-1) - \int \left[\int \text{NE}(w,a_0,j-1)\; d\nu^n_{wage}(w|a_0,j-1)\right] d\nu^n_a(a_0|j-1)}_{\text{selection effect}}\;.\end{aligned}$$

Here, $\text{NE}(w,a_0,j)$ is the job-finding rate of a non-employed worker in state $(w,0,a_0,j)$, and NE_j is the average NE rate of workers of age j.

Table B.3: Decomposition of age profiles of EE and NE rates

	$EE_2 - EE_1$	$EE_3 - EE_2$	$EE_4 - EE_3$	$NE_2 - NE_1$	$NE_3 - NE_2$	$NE_4 - NE_3$
Total	−1.09	−0.80	−1.47	−1.09	−3.21	−6.71
Horizon	−0.03	−0.14	−0.43	−0.55	−2.48	−5.80
Wealth	−0.69	−0.52	−0.26	−0.30	−0.45	−0.18
Selection	−0.38	−0.14	−0.77	−0.23	−0.28	−0.73

NOTE: EE_j and NE_j denote the average EE and NE rates of workers in age group j. All numbers are in percentage points.

Table B.3 shows how the declines of EE and NE rates with age (first row in percentage points) is decomposed into the three effects. Regarding NE rates, the horizon effect plays the dominant role for the declining age patterns: as workers become older, their incentives to search actively for jobs decrease at an accelerating pace over the life cycle (cf. Table 3). The wealth effect plays a sizable role for falling job-finding rates early in working life, accounting for around 28% of the decline of the NE rate between the ages 25-34 and 35-44. According to our model, as younger workers accumulate wealth, the incentives to search actively go down and the reservation productivity increases.[51] The selection effect is least important early in life, but it accounts for a 0.73 pp lower job-finding rate (around 11% of the total drop) in the pre-retirement age group, where the wealth effect plays only a negligible role. Intuitively, as older non-employed workers have on average higher previous wages (and hence pension claims), their incentives to search for re-employment or to accept low-productivity jobs are lower.

Turning to the decline of job-to-job transition rates with age, we find that the wealth effect is the main driver for prime-age workers, explaining 63% of the decline going from age group 25-34 to age group 35-44, and 65% of the decrease to the subsequent age group 45-54. In contrast, fewer job switches of workers in the pre-retirement phase are mostly explained by the selection effect since older workers in productive and/or well-paid jobs have a lower chance to climb the job ladder further and hence decide to search less. Finally, search intensity on the job and the willingness to remain employed after a reallocation shock decrease with age due to a shorter working life horizon, especially for workers closer to retirement.

[51] Generally, there are two mechanisms for the variation of NE rates across workers: search intensity (active or passive search) and selectivity (job acceptance conditional on a job offer). In Appendix B.5 we provide a variance decomposition which reveals that the selectivity margin is generally the dominant force, while search intensity plays a prominent role for variation of job-finding rates for workers in the first two age groups.

B.4 Robustness: Age-Dependent Search Efficiency

In our benchmark calibration, neither the utility cost of search nor the search efficiencies of active and passive searchers on and off the job depend on worker age. Even with this calibration, our model matches the age relationships of active search and job finding rather well (Tables 3 and 4). Nonetheless, we find that the EE rate in the model decreases less in age than it does in the data, while the decrease of the NE rate is a bit too strong in the model. Clearly, these discrepancies can be avoided when we allow search efficiencies to depend on worker age. Here we present the main findings of such an alternative model calibration.

Specifically, we allow the search efficiency parameters s_n^0, s_n^1, s_e^0 and s_e^1 to vary with age in order to (i) match the job-finding rates (NE and EE) by age exactly, and (ii) impose that the relative search efficiency of active versus passive search is the same as in our benchmark model across all age groups in order to match the gap in NE and EE rates between active and passive searchers as in the data. All other parameters are fully recalibrated to match the same set of moments as in the benchmark calibration.

Table B.4: Search efficiency parameters

Age	s_e^1	s_e^0	s_n^1	s_n^0
25-34	3.94	0.98	1.03	0.68
35-44	2.50	0.62	1.21	0.80
45-54	2.34	0.58	1.32	0.87
55-66	1.81	0.45	1.36	0.89

We report the estimated search efficiency parameters in Table B.4, where the results are as expected: In the benchmark calibration, the age gradient of the EE rate is not steep enough, so that declining age-dependent search efficiencies can resolve this discrepancy. Conversely, search efficiency of the non-employed is required to increase in age to attenuate the age gradient of the NE rate in the model.

Importantly, however, the model fit in the other main untargeted moments (active search by age and wealth and transition rates by wealth) remains very similar (see Tables B.5 and B.6). Moreover, our policy conclusions are very similar to those for the benchmark model with slightly weaker effects on aggregate outcomes (see Table B.7). Welfare losses are also slightly smaller with -1.04 (UI cut) and -0.88 (lower tax progressivity) respectively.

Table B.5: Active search

Non-employed	Data	Model	Employed	Data	Model
By age			By age		
25-34	39.8	44.8	25-34	10.2	9.7
35-44	40.6	39.1	35-44	7.8	6.3
45-54	40.0	33.3	45-54	6.1	5.8
55-66	16.6	24.7	55-66	3.0	5.2
By wealth			By wealth		
Quartile 1	38.0	46.2	Quartile 1	8.9	10.9
Quartile 2	33.8	35.9	Quartile 2	7.7	6.0
Quartile 3	26.4	26.3	Quartile 3	5.6	5.3
Quartile 4	26.2	19.0	Quartile 4	5.2	4.6

Table B.6: Transition rates

	NE rate		EE rate		EN rate	
	Data	Model	Data	Model	Data	Model
By age						
25-34	18.8†	18.8	8.3†	8.3	2.1	0.8
35-44	16.3†	16.3	4.5†	4.5	1.3	1.4
45-54	13.7†	13.7	3.7†	3.7	1.2	1.6
55-66	8.0†	8.0	2.3†	2.3	1.9	2.1
By wealth						
Quartile 1	13.4	16.9	7.3	8.0	2.4	1.3
Quartile 2	14.2	13.5	4.3	4.1	1.4	1.4
Quartile 3	14.8	10.6	3.7	3.4	1.3	1.6
Quartile 4	10.1	9.2	2.1	2.9	1.0	1.7

† Calibration target

B.5 The Role of Search Effort and Selectivity for NE Rates

To uncover the mechanisms behind the variation of job-finding rates in our model, we analyze how endogenous search intensity and differences in reservation productivity (selectivity) account for the differences in NE rates.

The job-finding rate (NE rate) of a worker in state $(w, 0, a_0, j)$ is

$$\text{NE}(w, a_0, j) = \pi^1(w, 0, a_0, j) s_n^1 \lambda(\theta) \bar{H}(q^n(w, A^1, j)) + \pi^0(w, 0, a_0, j) s_n^0 \lambda(\theta) \bar{H}(q^n(w, A^0, j)) \ ,$$

where we use the abbreviation $A^i = A(w, 0, a_0, j, i)$, $i = 0, 1$ for assets of active and passive searchers at the matching stage. To understand to what extent job-finding rates are driven either by the search intensity margin or by the reservation productivity margin, we calculate

Table B.7: Policy analysis – Aggregate results

	Benchmark	UI ↓		Tax Progressivity ↓	
		PE†	GE†	PE†	GE†
Output Y	1.090	+1.2	+2.3	−0.3	−0.3
Capital K	13.37	+1.2	+4.2	−0.3	+0.1
Employment L	86.61	+2.0	+2.4	−0.8	−1.1
Efficiency A	1.268	−0.8	−0.8	+0.6	+0.6
Interest rate r (%)	0.800	–	−4.2bp	–	−0.9bp
MP of labor ω	1.000	–	+0.7	–	+0.2
Tightness θ	1.000	–	+3.2	–	−1.9
Asset supply	15.65	+4.4	+4.5	+4.7	−0.0
EE rate (%)	4.60	+0.25pp	+0.37pp	−0.12pp	−0.19pp
NE rate (%)	13.20	+1.40pp	+1.84pp	−0.32pp	−0.53pp
EN rate (%)	1.48	−0.12pp	−0.13pp	+0.07pp	+0.07pp
Active search					
Employed (%)	6.71	+0.31pp	+0.32pp	+0.06pp	+0.07pp
Non-employed (%)	33.82	+4.69pp	+5.61pp	+0.01pp	−0.04pp
Average wage	1.000	−1.2	−0.7	+1.0	+1.2
Average productivity	1.268	−0.8	−0.1	+0.6	+0.7
Gini: Earnings	0.225	+3.5	+4.5	−2.5	−2.9
Gini: Wealth	0.612	−1.1	−1.2	+1.1	+1.8

counterfactual transition rates that arise when the search intensity margin is turned off. To do so, let $\bar{\pi}_n^1$ denote the share of active searchers among all non-employed workers, so that $\bar{\pi}_n^0 = 1 - \bar{\pi}_n^1$ denotes the share of passive non-employed searchers.

To deactivate the search intensity margin, we assign any worker to active or passive search according to the respective population shares. The resulting counterfactual job-finding rates vary only due to the reservation-productivity margin. These transition rates are given by

$$\mathrm{NE}^{rp}(w, a_0, j) \equiv \bar{\pi}_n^1 s_n^1 \lambda(\theta) \bar{H}(q^n(w, A^1, j)) + \bar{\pi}_n^0 s_n^0 \lambda(\theta) \bar{H}(q^n(w, A^0, j)) \ .$$

The variation of job-finding rates accounted for by the search intensity margin is then obtained by the residuals

$$\mathrm{NE}^{si}(w, a_0, j) \equiv \mathrm{NE}(w, a_0, j) - \mathrm{NE}^{rp}(w, a_0, j) \ .$$

To analyze how much of the variation in job-finding rates is accounted for by the two mar-

gins, we calculate the variance decomposition (using population weights from the stationary distribution ν):

$$\text{var}(\text{NE}) = \text{var}(\text{NE}^{rp}) + \text{var}(\text{NE}^{si}) + 2\text{cov}(\text{NE}^{rp}, \text{NE}^{si}) \ .$$

Results are shown in Table B.8, where the first row shows the overall variance and the other rows are separate decompositions for each age group. While overall the reservation-productivity margin accounts for the majority of the variation in NE rates, the search intensity margin plays a prominent role for the variation among workers in the first two age groups. This is intuitive since younger workers are much less selective about the jobs they accept compared to workers in the other age groups.

Table B.8: Variance decomposition of NE rates

	Decomposition†			Total Variance*
	Reservation Productivity	Search Intensity	Covariance Term	
Overall	81.9	1.7	16.4	275.5
By age				
25-34	103.7	39.5	-43.3	3.7
35-44	35.6	31.6	32.8	15.6
45-54	56.1	11.6	32.3	43.7
55-66	83.7	2.1	14.2	54.9

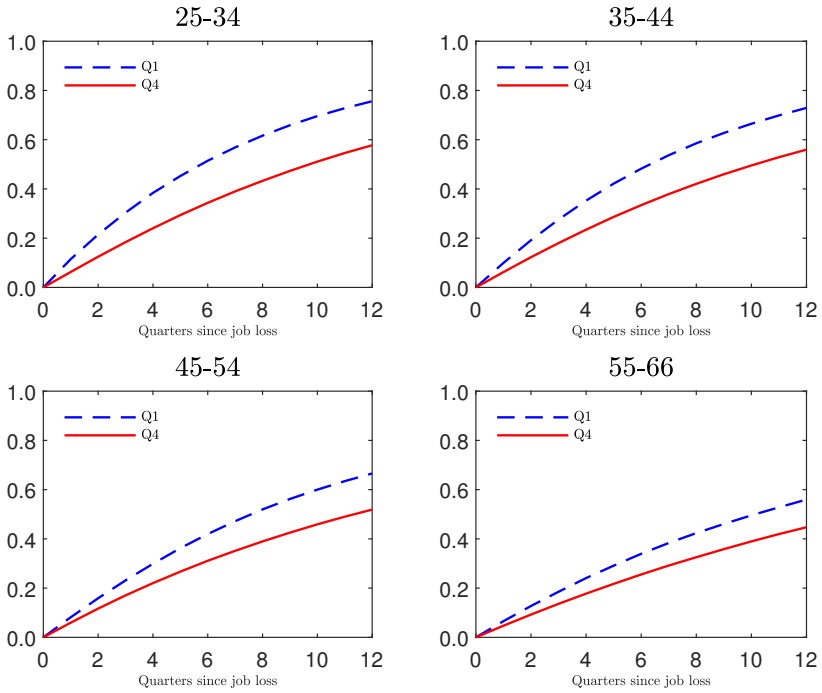
NOTES: † All numbers in percent. * All numbers multiplied by 10^5.

B.6 The Consequences of Job Loss

In this appendix, we analyze the consequences of job loss, with a view to understanding how age and wealth shape household earnings and consumption dynamics in our model. We simulate a panel and consider individuals who get hit by the exogenous layoff shock ρ in some time period denoted as quarter zero. We then track their outcomes over the subsequent twelve quarters (3 years) in relation to individuals with identical characteristics that do not experience a layoff shock in quarter zero.

Figure B.2 reports the trajectories of earnings, separately for workers in the four age groups and with wealth holdings in the lowest and highest quartiles of the respective age groups. For all workers, the model generates substantial and protracted earnings losses after a layoff shock. On average among prime age workers (25 to 54 years old), earnings after three years remain 30% below those of identical workers not losing their job in quarter zero.

This number lines up well with the results of Jarosch (2023) based on German administrative data (see Figure 12 in his paper), although the recovery of earnings in our model follows a more gradual pattern compared to the data.[52]



NOTES: Earnings in each quarter following job loss in relation to earnings of identical workers not losing their job at time zero. Solid curves describe the average of relative earnings among workers with pre-displacement wealth in the fourth quartile (Q4) while dashed curves correspond to workers in the first wealth quartile (Q1). Wealth quartiles are defined separately for each age group.

Figure B.2: Consequences of job loss – Earnings

In the bottom panels of Figure B.2 we observe that the negative consequences of job loss are more severe for older workers. In the age group 55–66, the earnings loss remains at a staggering 49% after three years, while the corresponding figure for workers of ages 25–34 is 37%. The correlation between age and the size of earnings losses is consistent with the evidence reviewed in Davis and von Wachter (2011).[53] In our model, there are two margins driving the recovery of earnings: active vs. passive search and reservation productivity. As discussed in the previous subsection, older workers have lower returns to engaging into active

[52] Our model abstracts from several features (specific human capital, job security, accumulation of employment rents) that are likely important to explain the empirical dynamics of earnings following job loss. Thus, we expect the model to generate a dynamics that is simpler than in the data.

[53] Using earnings records from the U.S. social security administration, Davis and von Wachter (2011) document that the present discounted value of earning losses is much larger for workers displaced in their 40s and 50s compared to younger workers (see Table 2 in their paper).

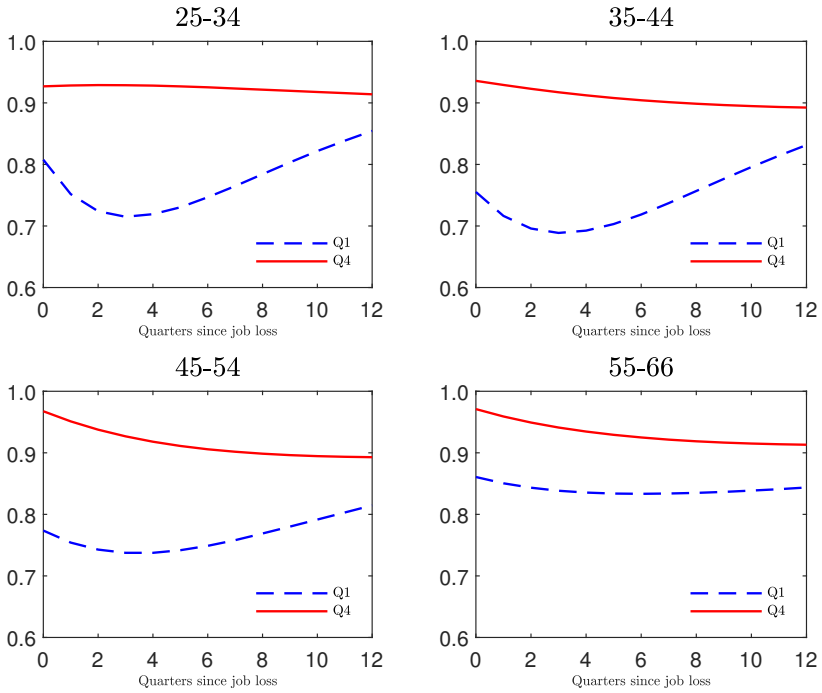
search and are more selective about match productivity mainly due to the shorter distance to retirement.

Another important observation of Figure B.2 is that poorer individuals recover faster than their wealthier peers. On average among prime-age workers, the Q1-Q4 earnings difference three years after layoff is about 14%. As discussed before, wealthier individuals are less likely to search and more selective in their job acceptance which ultimately contributes to the slower earnings recovery.

Different from standard labor market models without savings, our model offers a distinct set of predictions about the consequences of job loss for consumption. These are depicted in Figure B.3, again separately for wealth-poor and wealth-rich workers of different ages. To begin with, the model generates a consumption reduction by 13% on impact and by 12% after three years, on average across age and wealth groups. The initial drop in consumption is in the upper range of available estimates from studies that span countries with more and less generous unemployment insurance systems; see Ganong and Noel (2019) for the U.S. and Andersen et al. (2023) for Denmark. The high persistence also seems to line up with the data. For instance, Stephens (2001) finds (in U.S. data) that five years after job loss, consumption remains below its initial level by about 10%.

The consequences of job loss for consumption of workers with high and low wealth are rather distinct from the earnings consequences seen in Figure B.2. For those in the top quartile of wealth, the impact drop in consumption is modest (5% on average across the four age groups), and there is no recovery after three years in relation to the "control group" of identical workers who do not experience job loss at time zero – that is, consumption does go up over time, but not by more than among workers from the same age-and-wealth group who do not lose their job during quarter 0. Workers in the bottom wealth quartile suffer a drop by 20% on impact, followed by a gradual recovery, with consumption remaining 16% below pre-displacement levels three years after job separation. The interpretation of these differences is straightforward: Workers in the top quartile have enough assets to dampen the fall in consumption upon job loss, while their less wealthy peers experience a larger pass-through from earnings losses onto consumption. As earnings in the latter group recover more quickly, however, the consumption gap between the two groups shrinks over time.

Figure B.3 further indicates an important relationship between the magnitude of consumption losses and workers' age. In particular, workers in the pre-retirement group experience no consumption recovery, essentially because the earnings recovery for this group is much weaker. Hence, the consumption gap between wealth-rich and wealth-poor workers remains almost unchanged even three years after job loss.



NOTES: Consumption in each quarter following job loss in relation to consumption of identical workers not losing their job at time zero. Solid curves describe the average of relative consumption among workers with pre-displacement wealth in the fourth quartile (Q4) while dashed curves correspond to workers in the first wealth quartile (Q1). Wealth quartiles are defined separately for each age group.

Figure B.3: Consequences of job loss – Consumption

In sum, our model generates rich patterns of job loss consequences, and most importantly, produces consumption effects that are substantially different from the effects on labor earnings – something that standard job search models have little to say about. It also predicts heterogeneous effects across workers' age and wealth which is relevant for our understanding of tax and transfer policies aimed at mitigating the effects of labor market risks.

B.7 Policy Experiments: Further Results

To complement the policy findings in the main text, we show how the two policy experiments affect the decisions of different households about active search, savings and consumption. Table B.9 reports the percentage-point changes of active search for employed and non-employed workers, differentiated by age and wealth. Regarding the reduction of unemployment benefits, the findings are broadly consistent with those of Figure 5: Active search goes up more strongly for low-wealth non-employed workers which then raises their job-finding rates. Regarding variation by age, the increase in active search is weakest for non-employed workers in the oldest age group which is then reflected in a smaller increase of the NE rate compared to

prime-age workers. The increase in active search is also weaker for older employed workers, in line with our findings for EE rates.

Table B.9: Policy analysis – Active Search

	Non-employed			Employed		
	Bench	UI ↓	TaxPr ↓	Bench	UI ↓	TaxPr ↓
By age						
25-34	44.72	+7.56	−0.37	8.45	+0.99	+0.13
35-44	40.82	+6.01	−0.33	6.82	+0.48	+0.13
45-54	33.55	+4.40	−0.25	6.16	+0.37	+0.09
55-66	23.95	+2.36	+0.08	5.56	+0.25	+0.04
By wealth						
Quartile 1	45.83	+7.73	−0.57	11.38	+1.35	+0.10
Quartile 2	36.68	+3.73	−0.44	5.93	+0.28	+0.00
Quartile 3	26.71	+3.49	−0.14	5.23	+0.30	−0.01
Quartile 4	20.09	+1.64	−0.04	4.32	+0.18	−0.00

NOTES: The second and third columns of each panel report the percentage point changes with respect to the benchmark values shown in the first columns.

Changes in tax progressivity have much smaller effects on the active search choices compared with the UI experiment, which is also seen in Table 7. Hence, the policy effects are mainly driven by the selectivity margin. Still, there are noteworthy differences on the search choices of households in different age and wealth groups. Low wealth and young non-employed workers reduce their search activity most since these workers are now less likely to find employment in low-productivity jobs.

Table B.10 reports the percent changes of savings (asset holdings), consumption and wage earnings across age groups after both policies are implemented. Regarding lower UI payments, the increase of savings in response to weaker public insurance is rather homogeneous across age groups, but we observe a steep age gradient in the consumption response: Although aggregate employment goes up for all workers, young workers' consumption goes up least while consumption in the pre-retirement group increases by almost 2%, although wage earnings of workers in the pre-retirement group decline most. This is intuitive since the youngest (oldest) workers have the highest (lowest) need for additional precautionary savings.

Regarding the tax progressivity reform, we find that consumption and savings increase for prime-age workers, while both go down for older workers. The explanation is that despite lower overall employment, wages increases are larger for younger workers who also have a

Table B.10: Policy analysis – Assets, Consumption and Wages

	Bench	UI ↓	TaxPr ↓
Assets			
25-34	4.74	+7.84	+0.09
35-44	10.79	+7.39	+0.55
45-54	17.64	+6.23	+0.47
55-66	21.46	+6.91	−0.47
67+	19.51	+0.58	−0.17
Consumption			
25-34	0.540	+0.71	+0.30
35-44	0.618	+1.26	+0.20
45-54	0.688	+1.60	+0.07
55-66	0.746	+1.95	−0.26
67+	0.734	+0.38	+0.15
Wage			
25-34	0.881	−0.11	+1.85
35-44	1.001	+0.11	+1.40
45-54	1.073	−0.47	+1.38
55-66	1.031	−0.93	+0.94

NOTES: The second and third columns report the percent changes with respect to the benchmark values shown in the first column.

stronger motive for additional precautionary savings due to the higher risk of job loss. In contrast, reduced chances of re-employment and lower average incomes reduce consumption and savings for older workers.