Joint Labor Search and the Tax-Transfer System*

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Abstract

Tax-and-transfer systems differ in whether the individual or the household is the unit of taxation and benefit eligibility, with potentially large consequences for couples. We develop an equilibrium random search model of two-person households in which workers choose search effort, job acceptance, and quits, households save in a risk-free asset, and firms create jobs. Couples therefore insure against job-loss risk through three private channels — within-household risk sharing, precautionary savings, and precautionary job search — that interact in general equilibrium. We calibrate the model to U.S. data on job-finding, mobility, and separation rates and couples' wage and wealth distributions. A balanced-budget reform replacing joint with separate progressive taxation raises employment by about 1.6 percentage points, as secondary earners face lower marginal tax rates. In contrast, a broad suite of unemployment insurance reforms — varying benefit generosity, duration, and spousal eligibility — produces smaller effects on employment and welfare, because couples' private insurance channels crowd out public insurance. The unit of taxation, rather than the generosity of unemployment insurance, is thus the margin with first-order consequences for couples' employment and welfare.

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1 Introduction

Labor markets are characterized by frictions that expose workers to job loss risk and frictional wage dispersion. Tax and transfer systems provide insurance against these risks, but vary in whether the individual or household constitutes the relevant unit. In the U.S., income is taxed jointly at the household level and social assistance is conditioned on household income, while unemployment insurance (UI) is primarily individual-based.[1] These design choices have important consequences. Joint taxation, due to its progressivity, imposes high marginal and participation tax rates on secondary earners, affecting labor supply, human capital accumulation, savings, and inequality.[2] At the same time, couples can buffer job-loss risk privately — through a working spouse's earnings, household savings, and continued job search — which may substitute for the insurance that the tax-transfer system provides (Cullen and Gruber, 2000). This raises the question of how features of the tax-transfer system, e.g. the unit of taxation and the generosity and eligibility of UI benefits, matter for couples' employment and welfare.

Our aim is to answer this question and to clarify the labor-market and welfare consequences of the design of the tax-and-transfer system for couples. Specifically, we ask: How are couples' job-search strategies, their job mobility, and earnings dynamics shaped by the tax system? How do they interact with consumption-saving choices at the household level? And what are the aggregate and distributional consequences of reforming tax and transfer systems? Addressing these questions is vital in light of salient trends in the partition of households into singles and couples as well as married women's labor supply.

We build a random search equilibrium model of two-person households, with endogenous job creation and wage bargaining. Workers are risk averse and face job-loss and reallocation risk in a frictional labor market. The model brings together three channels through which households insure against this risk, each typically studied in isolation. First, households self-insure through precautionary savings in a risk-free asset (Aiyagari, 1994). Second, couples provide within-household insurance: when one spouse loses a job, the other can raise effort and search for a higher wage — an added-worker effect (Lundberg, 1985) in the joint-search setting (Guler et al., 2012). The interaction of this risk sharing with savings is in itself consequential for labor supply (Ortigueira and Siassi, 2013). Third, workers self-insure through precautionary job search: by searching on the

[1] Some states provide modest dependent allowances.

[2] These issues are usually studied under the assumption of a frictionless labor market (e.g., Guner et al., 2012; Olivetti and Petrongolo, 2017; Bick and Fuchs-Schündeln, 2018; Borella et al., 2023; Holter et al., 2023).

job and climbing the wage ladder, they raise the value of employment and cushion future shocks (Chaumont and Shi, 2022). These three channels interact in general equilibrium: households' search, quit, and savings decisions jointly shape the pool of job seekers and the value of filled jobs, which firms internalize when posting vacancies. This interaction shapes the tax-transfer system's rich effects on employment, earnings, savings, and welfare.

The first goal of this paper is to use the model to analyze the effects of the joint progressive taxation of couples. Our framework has novel implications for couples' employment and earnings dynamics. In models with competitive labor markets, a worker's wage is pinned down by current productivity; in our model, it reflects past search behavior and the worker's position on the job ladder. Joint search, in turn, responds to the tax code. Under joint taxation, the secondary earner's income is effectively taxed starting at the primary earner's marginal rate, so the secondary earner faces high marginal and participation tax rates while the primary earner faces relatively low ones. The first-order consequence is for participation: with weak after-tax returns to work — especially when the partner's earnings or household assets are high — the secondary earner exerts little search effort and may remain in, or quit into, non-employment. Replacing joint with separate taxation lowers the secondary earner's marginal rate and draws them into employment, the main margin through which the reform operates. The same wedge also shapes earnings dynamics within the couple: under joint taxation the primary earner, facing a lower marginal rate, has stronger incentives to climb the wage ladder and the secondary earner weaker ones, while separate taxation reverses this and raises the secondary earner's incentive to move to better-paid jobs. Against the backdrop of rising dual-earner shares and persistent gender earnings gaps, these forces shape couples' careers under different tax treatments. Our model allows us to quantify them and to evaluate their consequences for employment, the costs of job loss, and household welfare.

We calibrate our model to match key moments of U.S. labor market data from the Survey of Income and Program Participation (SIPP), jointly explaining unemployment, job-finding rates, job-to-job transition rates, and the share of separations that are voluntary quits. First, we evaluate a balanced-budget tax reform replacing joint with separate progressive taxation. Non-employment falls by approximately one-tenth — aggregate employment rises by about 1.6 percentage points — as secondary earners face lower marginal tax rates and increase search effort, raising the dual-earner couple share from 74 to 77 percent. The welfare gain is positive but modest: higher consumption from increased employment is largely offset by the cost of foregone household specialization and by general-equilibrium effects on job creation. These results show that the interplay between household structure, labor market frictions, and tax policy has rich macroeconomic and welfare implications.

Second, we examine the effects of UI for couple households. In many countries, a two-tier transfer system provides laid-off workers with individual UI benefits tied to their previous wage, followed by means-tested social assistance conditioned on household income and assets. Little is known about how such systems affect labor market outcomes of couples. In standard single-worker models, higher UI replacement rates induce workers to search for higher-paid jobs at lower job-finding rates. In couple households, this effect depends on spousal earnings, household assets, and how one spouse's transition to employment affects the other's search strategy. Our model captures the interplay between social insurance and within-household insurance. We examine a broad suite of UI reforms – varying benefit generosity, duration, and spousal eligibility. Their employment effects are an order of magnitude smaller than those of the tax reform. Along the generosity margin there is little room for improvement: the welfare-maximizing replacement rate lies close to its current value, because couples' private insurance channels already absorb much of the risk. The reform that does yield modest welfare gains is making benefits spouse-dependent: more generous UI when a worker's spouse is non-employed than when the spouse works. Taken together, these findings suggest that the prevailing arrangement — pooling income for taxation while individualizing unemployment insurance — assigns the wrong unit to each instrument: in our model, welfare rises both when income taxation is made individual and when UI is made conditional on the spouse's employment status, even if the gains are quantitatively modest.

Our work relates to literature that studies the role of household joint decision-making for job acceptance and quitting (Guler et al., 2012), gender pay gaps (Flabbi and Mabli, 2018), health insurance coverage (Dey and Flinn, 2008) and the marital wage premium (Pilossoph and Wee, 2021). While these models are set in partial equilibrium, Mankart and Oikonomou (2017) and Birinci (2021) analyze the cyclical properties of labor market participation of secondary earners with endogenous job creation, yet abstracting from search on-the-job and simplifying wage setting. Fang and Shephard (2019) study health care reforms in a rich quantitative random search model without savings. Our paper is the first to introduce household decision-making into an equilibrium search model to analyze joint tax-transfer policies. Furthermore, most of the existing literature takes household formation decisions as given. Owing to its tractability, our model could be extended to consider demographic trends in household structure and family composition, for example by endogenizing household formation.

2 The Model

2.1 Environment

We consider an economy populated by households, firms, and a government. Time is continuous, and we consider a stationary equilibrium.

Households There is a unit mass of overlapping generations of households. Households retire with Poisson rate λ. Upon retirement, households are replaced by new working-age households with zero assets. Among all newly entering households, fraction μ are couple households including two workers, and fraction $1 - \mu$ are single households with one worker. Therefore, we have a constant mass of $1 - \mu$ single households and μ couple households in the economy, while abstracting from household formation and dissolution. There are $1 + \mu$ workers at every point in time who can be either (full-time) employed or non-employed. Households are risk-averse, deriving utility $u(c)$ from consumption and disutility from job search which imposes an additive utility cost equal to $k(s)$ where s is the worker's search effort and k is a convex function. Consequently, a single household consuming c goods and searching with effort s enjoys flow utility $u(c) - k(s)$. A couple household divides household consumption c equally between the two worker members. Therefore, the couple household enjoys flow utility $2u(c/2) - k(s_1) - k(s_2)$ where s_i is job search effort of worker $i = 1, 2$. Future utility streams are discounted exponentially with the rate of time preference ρ. Households can save in a risk-free asset with exogenous interest rate r. Borrowing is not permitted. Retiring households exit the economy with zero continuation utility and there is no bequest motive. Hence, the only motive to save is to self-insure against labor market risks.[3]

Firms and jobs Firms operate a linear production technology that adds the output of all jobs. Jobs differ in productivity y which is drawn stochastically from cumulative distribution function H upon matching. Productivity remains constant for the duration of the match. Consequently, a worker employed in a job with match productivity y produces

[3] Although we consider a small open economy with an exogenous interest rate, we interpret the return on savings as the one that is offered as an actuarially fair annuity by a competitive intermediary that collects the accidental bequests of all exiting households and rebates them to surviving households; the interest rate r thus already incorporates the resulting survival premium λ.

flow output y as long as the worker stays employed. To hire workers, firms post vacant jobs at flow cost K. Firms are risk-neutral and maximize the expected discounted profit value where future profits are discounted with the discount rate ρ^f.

Search and matching Employed and non-employed workers in single and couple households randomly match with vacant jobs. For workers, meeting rates depend linearly on search effort and on the employment status of the worker. Specifically, a non-employed worker with search effort s meets a vacant job at Poisson rate $sp(\theta)$, while an employed worker with search effort s meets a vacant job at Poisson rate $\bar{x}sp(\theta)$, where p is an increasing, concave function of labor market tightness θ. The factor $\bar{x}$ represents the relative effectiveness of employed workers in finding jobs compared to non-employed workers.[4] Labor market tightness θ is the ratio between the total number of vacancies and aggregate effective units of job search which is the sum over all individual units of search effort s where search effort of employed workers is weighted with factor $\bar{x}$, plus the flow of reallocated workers (see below) which also enters the job search pool. Consequently, a firm with a vacant job meets a random worker with Poisson rate $q(\theta) = p(\theta)/\theta$.

Separations Employed workers lose the job with Poisson rate $\delta + \chi p(\theta)$. δ is the arrival rate of a layoff event in which case the worker is sent into non-employment. By contrast, $\chi p(\theta)$ is the arrival rate of a reallocation event 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 case the worker rejects the offer, the worker becomes non-employed. We further assume that opportunities to quit the job into non-employment arrive at Poisson rate γ. Although match productivity does not vary over time and the environment is stationary, quits into non-employment may be chosen either when a household accumulates enough assets or by a worker in a couple household when the spouse has found a high-paid job, reminiscent of the "breadwinner cycles" of Guler et al. (2012). In order to smooth out the quit choices across different households, we assume that there are idiosyncratic additive utility shocks ε_i/ξ when quitting the job ($i = 1$) or when not quitting ($i = 0$), where ξ is a parameter that controls the incidence of quitting and its variation across households, and ε_i are type-I extreme-value distributed, and i.i.d. across households and over time. Finally, workers may quit into another job when they receive an outside offer.

[4] An equivalent formulation allows the cost of search effort k to differ between employed and non-employed workers while setting $\bar{x} = 1$. As is well known, scale parameters of search cost functions cannot be separately identified from matching efficiencies, in the absence of data on workers' search effort.

Wages We follow the wage determination protocol in Clymo et al. (2026) which builds on Elsby and Gottfries (2022). At each instant dt the worker prepares two offers w_{W1} and w_{W2}, for stage 1 and stage 2, respectively. The firm anticipates all possible stage-1 offers and commits to an acceptance/rejection rule and also commits to its counter-offer w_F in case it rejects w_{W1}. Crucially, the worker's second-stage offer and the firm's counter-offer are take-it or leave-it, and with probability η it is w_{W2} that is selected. If stage 2 ends in disagreement, no output is produced.

With these disagreement payoffs, backward induction implies the following stage-2 offers. If the worker starts, she chooses w_{W2} to maximize her flow payoff, subject to the firm weakly preferring acceptance over disagreement, setting $w_{W2} = y$. If the firm starts, it sets $w_F = 0$. Hence, the expected stage-2 payoffs are ηy and $(1-\eta)y$ for the worker and firm, respectively. Given these stage-2 continuation values, the firm accepts a stage-1 offer w_{W1} whenever $y - w_{W1} \geq (1-\eta)y$. For the worker, any $w_{W1} \geq \eta y$ is better than the expected stage-2 payoff. Therefore, the unique wage that both parties accept in stage 1 is $w = \eta y$, which the worker proposes in equilibrium.

Government The government implements a tax-transfer policy and a UI system. Taxation and transfers are organized at the household level. They are described by a joint tax-transfer schedule with a two-parameter function as in Benabou (2002) and Heathcote et al. (2017) and with a positive floor on after-tax income, which are separately parameterized for single and couple households. Specifically, we assume that household disposable income (after taxes and transfers) is $N^c(Y) \equiv \max[\tau_0^c Y^{1-\tau_1^c}, \bar{f}^c]$ for a couple household and $N^s(Y) \equiv \max[\tau_0^s Y^{1-\tau_1^s}, \bar{f}^s]$ for a single household where gross household income (before taxes and transfers) is equal to Y. Here $\tau_0^{c/s}$ and $\tau_1^{c/s}$ are scale and progressivity parameters of the tax function, and $\bar{f}^{c/s}$ are lower bounds on the household's disposable income which may reflect in-kind transfers (such as food stamps or housing vouchers). In line with U.S. income taxation, we assume that UI benefits are taxed and hence enter before-tax income Y.

Workers that newly enter non-employment are entitled to UI benefits which depend on the last wage. We also entertain the possibility that the UI system may include family allowances that are contingent on the employment status of the spouse. Utilizing that wages are monotonically linked to match productivity, we write $b^x(y)$ for UI benefits where $x = n, e$ indicates non-employment or employment of the spouse (in case of a couple household). Over the duration of a non-employment spell, UI benefits expire with Poisson rate ζ. For non-employed workers with expired benefits, we do not need to keep track of the productivity of the last job, so we set $y = 0$ and write UI income as $b^x(0) = 0$. The government maintains a balanced budget and finances transfers and an exogenous flow spending on public goods G from tax revenues.

2.2 Household Value Functions and Decisions

Let v^{ee}, v^{en}, v^{ne} and v^{nn} denote the value functions of a **couple household** in different labor market states *ee*, *en*, *ne*, and *nn*, with *e* indicating employment and *n* indicating non-employment of the respective worker. These value functions depend on the state vector of the household which is (y_1, y_2, a) where a are assets, and y_i is the productivity of the current job if worker i is employed, or the productivity of the last job if worker i is non-employed where we write $y_i = 0$ if UI benefits have expired. In all following Bellman equations, maximization is subject to the no-borrowing constraint $a \geq 0$ which is omitted to simplify the exposition.

The Bellman equation of a household with two employed workers is

$$\begin{aligned}
(\rho + \lambda + 2\delta + 2\gamma) v^{ee}(y_1, y_2, a) = \max_{c, s_1, s_2} & \, 2u(c/2) - k(s_1) - k(s_2) \\
& + \bar{x} s_1 p(\theta) \int \max \left[v^{ee}(y_1', y_2, a) - v^{ee}(y_1, y_2, a), 0 \right] \, dH(y_1') \\
& + \bar{x} s_2 p(\theta) \int \max \left[v^{ee}(y_1, y_2', a) - v^{ee}(y_1, y_2, a), 0 \right] \, dH(y_2') \\
& + \chi p(\theta) \int \max \left[v^{ee}(y_1', y_2, a), v^{ne}(y_1, y_2, a) \right] - v^{ee}(y_1, y_2, a) \, dH(y_1') \\
& + \chi p(\theta) \int \max \left[v^{ee}(y_1, y_2', a), v^{en}(y_1, y_2, a) \right] - v^{ee}(y_1, y_2, a) \, dH(y_2') \\
& + \delta v^{ne}(y_1, y_2, a) + \frac{\gamma}{\xi} \ln \left[e^{\xi v^{ne}(y_1, y_2, a)} + e^{\xi v^{ee}(y_1, y_2, a)} \right] \\
& + \delta v^{en}(y_1, y_2, a) + \frac{\gamma}{\xi} \ln \left[e^{\xi v^{en}(y_1, y_2, a)} + e^{\xi v^{ee}(y_1, y_2, a)} \right] \\
& + \frac{dv^{ee}(y_1, y_2, a)}{da} \left[ra - c + N^c(w(y_1) + w(y_2)) \right] .
\end{aligned} \tag{1}$$

Here, the first line includes the flow utility of the dual-earner household, while lines two and three show the value changes in the events where one of spouses $i = 1, 2$ receives an outside offer from another firm where match productivity is y_i'. Lines four and five indicate value changes when one of the two workers receives a reallocation shock in which case the worker either moves to another firm or chooses non-employment. Lines six and seven express the change in household value due to a layoff (rate δ) or when a quit opportunity (rate γ) is exercised for any of the two spouses.[5] Line eight indicates the change in value due to asset accumulation where the term in squared brackets is identical to $\dot{a}$.

The Bellman equation of a household where worker 1 is employed and worker 2 is non-employed is

$$\begin{aligned}(\rho+\lambda+\delta+\gamma)v^{en}(y_1,y_2,a) = {} & \max_{c,s_1,s_2} 2u(c/2)-k(s_1)-k(s_2) \\ & + \bar{x}s_1 p(\theta)\int \max\left[v^{en}(y_1',y_2,a)-v^{en}(y_1,y_2,a),0\right]\, dH(y_1') \\ & + \chi p(\theta)\int \max\left[v^{en}(y_1',y_2,a),v^{nn}(y_1,y_2,a)\right]-v^{en}(y_1,y_2,a)\, dH(y_1') \\ & + s_2 p(\theta)\int \max\left[v^{ee}(y_1,y_2',a)-v^{en}(y_1,y_2,a),0\right]\, dH(y_2') \\ & + \delta v^{nn}(y_1,y_2,a)+\frac{\gamma}{\xi}\ln\left[e^{\xi v^{nn}(y_1,y_2,a)}+e^{\xi v^{en}(y_1,y_2,a)}\right] \\ & + \zeta\left[v^{en}(y_1,0,a)-v^{en}(y_1,y_2,a)\right] \\ & + \frac{dv^{en}(y_1,y_2,a)}{da}\left[ra-c+N^c(w(y_1)+b^e(y_2))\right] . \end{aligned} \tag{2}$$

As in Bellman equation (1), the first line of (2) is the household's flow utility. Lines two and three show the change of continuation values if employed worker 1 receives either an outside offer or a reallocation shock. Line four is the change of the continuation value when non-employed worker 2 receives an offer. Line five contains the value changes in the event of a layoff or quit opportunity for spouse 1. Line six indicates the change in value due to UI benefit expiration for spouse 2.[6] Again, the last term is the change in value due to a change in the household's asset position.

The Bellman equation of a household where worker 2 is employed while worker 1 has no job (value function v^{ne}) is analogous and therefore omitted. Finally, the Bellman

[5] We have $\mathbb{E}\max[v^{ne}(y_1,y_2,a)+\frac{\varepsilon_1}{\xi},v^{ee}(y_1,y_2,a)+\frac{\varepsilon_0}{\xi}]=\frac{1}{\xi}\ln[e^{\xi v^{ne}(y_1,y_2,a)}+e^{\xi v^{ee}(y_1,y_2,a)}]$, where the expectation operator is over the realization of the shocks ε_0 and ε_1.

[6] Of course, if worker 2 is not eligible for benefits at the beginning of the period (i.e. $y_2=0$), there is no change in the continuation value in the latter event.

equation of a household with two non-employed workers is

$$
\begin{aligned}
(\rho+\lambda)v^{nn}(y_1,y_2,a) = & \max_{c,s_1,s_2} 2u(c/2) - k(s_1) - k(s_2) \\
& + s_1 p(\theta) \int \max\left[v^{en}(y_1',y_2,a) - v^{nn}(y_1,y_2,a), 0\right] \, dH(y_1') \\
& + s_2 p(\theta) \int \max\left[v^{ne}(y_1,y_2',a) - v^{nn}(y_1,y_2,a), 0\right] \, dH(y_2') \\
& + \zeta\left[v^{nn}(0,y_2,a) - v^{nn}(y_1,y_2,a)\right] + \zeta\left[v^{nn}(y_1,0,a) - v^{nn}(y_1,y_2,a)\right] \\
& + \frac{dv^{nn}(y_1,y_2,a)}{da}\left[ra - c + N^c(b^n(y_1) + b^n(y_2))\right] .
\end{aligned} \tag{3}
$$

Lines two and three show value changes when either spouse receives a job offer. Line four expresses potential UI benefit expiration of either spouse, and line five is again the change in value associated with a change in assets.

Consider next a **single household** who can be employed with value function v^e or non-employed with value function v^n. The state vector of the single household is (y, a) where y is productivity of the current (last) job. Analogous to couple households, the Bellman equations for v^e and v^n are

$$
\begin{aligned}
(\rho+\lambda+\delta+\gamma)v^e(y,a) = & \max_{c,s} u(c) - k(s) \\
& + \bar{x} s p(\theta) \int \max\left[v^e(y',a) - v^e(y,a), 0\right] \, dH(y') \\
& + \chi p(\theta) \int \max\left[v^e(y',a), v^n(y,a)\right] - v^e(y,a) \, dH(y') \\
& + \delta v^n(y,a) + \frac{\gamma}{\xi} \ln\left[e^{\xi v^n(y,a)} + e^{\xi v^e(y,a)}\right] \\
& + \frac{dv^e(y,a)}{da}\left[ra - c + N^s(w(y))\right] ,
\end{aligned} \tag{4}
$$

$$
\begin{aligned}
(\rho+\lambda)v^n(y,a) = & \max_{c,s} u(c) - k(s) \\
& + s p(\theta) \int \max\left[v^e(y',a) - v^n(y,a), 0\right] \, dH(y') \\
& + \zeta\left[v^n(0,a) - v^n(y,a)\right] \\
& + \frac{dv^n(y,a)}{da}\left[ra - c + N^s(b(y))\right] .
\end{aligned} \tag{5}
$$

The household decision problems lead to policy functions for assets, denoted $a' = A^x(y_1, y_2, a)$ for couples in labor market states $x \in \{nn, en, ne, ee\}$ and $a' = A^x(y, a)$ for singles with $x \in \{n, e\}$. We further denote the policies for search effort by $S_i^x(y_1, y_2, a)$ for worker $i = 1, 2$ in a couple household in labor market state $x \in \{nn, en, ne, ee\}$, and $S^x(y, a)$ for a single worker in labor market state $x \in \{n, e\}$.

Job acceptance choices are characterized by reservation productivity strategies such that a worker accepts a new job (when searching from non-employment or after a reallocation shock) if and only if the productivity of the new job (weakly) exceeds the reservation productivity.

Reservation strategies are optimal because all value functions are monotonically increasing in job productivities.[7] Dual non-employed households have reservation productivities denoted $R_i^n(y_1, y_2, a)$ such that worker $i = 1, 2$ is indifferent between remaining non-employed or accepting a job. Therefore, these reservation productivities satisfy

$$v^{nn}(y_1, y_2, a) = v^{ne}(y_1, R_2^n(y_1, y_2, a), a) = v^{en}(R_1^n(y_1, y_2, a), y_2, a) \,. \tag{6}$$

Couple single-earner households have a reservation productivity for the non-employed worker $i = 1, 2$ denoted $R_i^e(y_1, y_2, a)$ and satisfying

$$v^{en}(y_1, y_2, a) = v^{ee}(y_1, R_2^e(y_1, y_2, a), a) \quad \text{and} \quad v^{ne}(y_1, y_2, a) = v^{ee}(R_1^e(y_1, y_2, a), y_2, a) \,. \tag{7}$$

These reservation productivities govern the job acceptance choices of non-employed workers and of employed workers receiving a reallocation shock. Finally, single workers have reservation productivity $R(y, a)$ defined by

$$v^n(y, a) = v^e(R(y, a), a) \,. \tag{8}$$

Job quitting choices of workers after receiving a quit opportunity shock depend on the realization of idiosyncratic shocks ε_0 and ε_1. Due to the distributional assumption, the fractions of dual-earner households where spouse 1 or spouse 2 quits are given by the closed-form expressions

$$\pi_1^{ee}(y_1, y_2, a) = \frac{e^{\xi v^{ne}(y_1, y_2, a)}}{e^{\xi v^{ne}(y_1, y_2, a)} + e^{\xi v^{ee}(y_1, y_2, a)}} \quad \text{and} \quad \pi_2^{ee}(y_1, y_2, a) = \frac{e^{\xi v^{en}(y_1, y_2, a)}}{e^{\xi v^{en}(y_1, y_2, a)} + e^{\xi v^{ee}(y_1, y_2, a)}} \,.$$

The expressions for the fractions of quitting single-earner households, $\pi^{en}(y_1, y_2, a)$ and $\pi^{ne}(y_1, y_2, a)$, and for the fractions of quitting single households, $\pi(y, a)$, are similar.

Given the value and policy functions, we denote the stationary distribution measures of couple and single households by $\nu^x(y_1, y_2, a)$ with $x \in \{nn, en, ne, ee\}$ and $\nu^x(y, a)$ with

[7] This result follows from standard dynamic programming arguments and the fact that the wage and benefit functions, $w(.)$ and $b(.)$, and the after-tax functions N^c and N^s are (weakly) monotonically increasing.

$x \in \{n, e\}$. These measures integrate to the respective shares in the household population:

$$\mu = \int d\nu^{nn}(y_1, y_2, a) + \int d\nu^{en}(y_1, y_2, a) + \int d\nu^{ne}(y_1, y_2, a) + \int d\nu^{ee}(y_1, y_2, a) , \quad (9)$$

$$1 - \mu = \int d\nu^{n}(y, a) + \int d\nu^{e}(y, a) . \quad (10)$$

2.3 Firm Value Functions and Job Creation

Value functions of jobs are discounted expected profit values. Given that job quitting behavior differs across workers, we need to distinguish between jobs filled with workers in different states. We write $J^e(y, a)$ for the value of a job with productivity y filled with a single worker with assets a. Likewise, we write $J^{ne}(y_1, y_2, a)$ for the value of a job with productivity y_2 filled with worker 2 in a single-earner couple household in state (y_1, y_2, a), and $J^{en}(y_1, y_2, a)$ for the value of a job filled with worker 1 in a single-earner couple household. Finally, $J_i^{ee}(y_1, y_2, a)$ is the value of a job filled with worker $i = 1, 2$ in a dual-earner couple household. For example, the value function of a job filled with a single worker satisfies the Bellman equation

$$\left[\rho^f + \lambda + \delta + \chi p(\theta) + S^e(y, a)\bar{x}p(\theta)\bar{H}(y) + \gamma\pi(y, a)\right] J^e(y, a)$$
$$= y - w(y) + \frac{dJ^e}{da}(y, a)\left[ra - c + N^s(w(y))\right].$$

Flow profits are discounted with the discount rate ρ^f and with the rate at which workers retire λ, job destruction in response to a layoff shock (rate δ), a reallocation shock (rate $\chi p(\theta)$) , after a quit to another job in response to an outside offer (rate $S^e(y, a)\bar{x}p(\theta)\bar{H}(y)$) or a quit to non-employment after a quit opportunity (rate $\gamma\pi(y, a)$). The job-to-job quit rate reflects the worker's private choice of search effort $S^e(y, a)$, so that $S^e(y, a)\bar{x}p(\theta)$ is the arrival rate of an outside offer, while $\bar{H}(y) = 1 - H(y)$ is the probability that the worker accepts the outside offer when match productivity in the new job is higher than in the current job. The profit values of jobs filled with couple workers involve further contingencies such as quitting in response to job finding of the spouse. We present these recursive equations in Appendix A.1.

All firms may create vacant jobs at flow cost K. These vacant jobs are randomly matched with a worker with Poisson rate $q(\theta)$. The probability that the vacant job meets a worker of a given type is proportional to this worker's search effort in relation to aggregate search effort. Then match productivity is drawn from distribution H and the worker decides whether or not to accept the job. These considerations lead to the free-entry condition which pins down labor market tightness θ:

$$K = q(\theta)\mathbb{E}M \,, \tag{11}$$

where $\mathbb{E}M$ is the expected value of a match with a random worker which takes into account the probability that the worker accepts the job and the continuation profit of a filled job. We derive $\mathbb{E}M$ in Appendix A.1.

2.4 Equilibrium Definition

A *stationary equilibrium* is a collection of value functions for couple and single households, value functions of filled jobs, policy functions for savings, search effort, job acceptance and job quitting, labor market tightness θ, distribution measures of couple and single households over idiosyncratic states (y_1, y_2, a) and (y, a), and government spending G such that[8]

1. Single and couple households make optimal labor market and savings decisions.
2. Firms optimally decide to create vacant jobs.
3. The household distribution measures are stationary.
4. The government budget is balanced.

Budget balance of the government says that the difference between all taxes collected and the transfers paid (UI benefits and the transfers implicit in the tax-transfer schedules) is identical to government expenditures:

$$\begin{aligned}
&\int w(y) - N^s(w(y))\, d\nu^e(y,a) - \int N^s(b(y))\, d\nu^n(y,a) \\
&+ \int w(y_1) + w(y_2) - N^c(w(y_1) + w(y_2))\, d\nu^{ee}(y_1,y_2,a) \\
&+ \int w(y_1) - N^c(w(y_1) + b^e(y_2))\, d\nu^{en}(y_1,y_2,a) + \int w(y_2) - N^c(w(y_2) + b^e(y_1))\, d\nu^{ne}(y_1,y_2,a) \\
&- \int N^c(b^n(y_1) + b^n(y_2))\, d\nu^{nn}(y_1,y_2,a) = G \,.
\end{aligned} \tag{12}$$

[8]In our counterfactual policy experiments, we keep government spending G fixed and instead vary parameters of the tax schedules to balance the government budget.

3 Empirical Evidence

In this section, we use the U.S. Survey of Income and Program Participation (SIPP) to document a set of empirical facts on labor market transitions, wages, and wealth of married couples. These facts serve a dual purpose: they provide direct evidence for the joint-search mechanisms emphasized by the model, in particular the distinct behavior of primary and secondary earners, and they supply the empirical moments that discipline the model calibration that follows.

3.1 Data Preparation

We use the Survey of Income and Program Participation (SIPP), which is a longitudinal household survey conducted by the U.S. Census Bureau. It follows individuals over multiple years (waves), collecting detailed information on labor market dynamics, income (including transfers), wealth, and household composition.[9] We use SIPP data covering the period 1996–2005, which is due to to the availability of variables needed to construct our measure of wealth (net liquid wealth). Each wave surveys between 14,000 and 36,700 households every four months, and the questionnaire explicitly refers to each of the past four months. We begin by merging the SIPP waves and performing basic data cleaning tasks (largely following Carrillo-Tudela and Visschers, 2023).

We implement several restrictions to construct our final analysis sample. We focus on prime-age individuals in stable household arrangements with meaningful labor force attachment. To this end, we restrict the sample to individuals aged 25–55 years. For married individuals, we require that both spouses fall within this age range; if either spouse violates this criterion, we drop the entire household. Furthermore, we exclude individuals who are currently enrolled in school or who report being retired, self-employed workers, as well as individuals who report having a disability.

To subdivide our sample into married (two-person, heterosexual) households and single houesholds, we impose two key restrictions related to marital status. First, we retain only individuals who are either married with spouse present or never married, dropping those in other marital categories such as separated, divorced, or widowed. Second, we require a stable marital status throughout the panel period; that is, we drop all observations for any individual who experiences a change in marital status during their time in

[9]The SIPP has been designed to study the usage of social security programs. Survey weights ensure representativeness. In addition to the "core" modules, "topical" modules contain questions that are not asked in every survey round. The topical modules include information on, e.g., wealth, the usage of child care, school enrollment, and healthcare.

the sample. This restriction ensures that we work with stable household types and avoid complications arising from marriage market transitions, which we do not explicitly consider in our model. For married couples, we further require that both spouses are present in the data after applying all other sample restrictions. Couples for which only one spouse remains after the restrictions are applied (e.g., due to age) are dropped from the sample. This ensures that our analysis of couples' joint job search decisions and labor market dynamics is based on complete household information. We construct a unique identifier for married couples by combining information from the sample unit, person number, and spouse pointer variable. Both members of a couple share the same household identifier across all waves.

To ensure our sample consists of individuals with meaningful labor force attachment, we drop households where none of the spouses (or the individual, for singles) are always inactive, that is, not working for the entire panel duration. The primary motivation for this choice is our focus on joint job search strategies of couples, which are unlikely to play an important role if one spouse is permanently out of the labor force. We classify individuals into two mutually exclusive labor market states: employed and non-employed. An individual is classified as employed if their monthly employment status indicates they were at work or had a job but were absent. The non-employed state combines those who were unemployed (actively searching) and those not in the labor force. This two-state classification aligns with our theoretical framework of household job search, where the key distinction is between employment and non-employment rather than between unemployment and inactivity.

Our final analysis sample consists of 1,333,365 person-months for 55,096 unique individuals. 71.7% of these individuls are married and the raw employment rate is 87.4%, with 91.4% for singles and 85.8% for married individuals, respectively. The median number of months each individual appears in the data is 36, with the 10th and 90th percentiles at 16 and 48 months, respectively. The number of married couples, which we focus on in the empirical analysis and for calibrating the model, is 18,092. We subdivide these couples into dual-earner (EE), single-earner (EN), and no-earner (NN) couples, which represent 72.6%, 26.5%, and 1% of all couples, respectively.

3.2 Key Variables

We construct several key variables for our analysis, which fall into two categories: (i) outcomes of interest, i.e., variables that depend on endogenous choices by households and firms in our model (e.g., labor market transition rates, wages, wealth); (ii) controls, i.e., variables capturing heterogeneity that we do not explicitly include in our model but that are known to affect our outcomes of interest (e.g., gender, age, education, or the presence children), which we therefore net out by residualiting all outcomes of interest. Using the couple identifier, it is straightforward to keep track of partners' variables and control for the characteristics of both spouses in married couples, which also allows us to account for marital sorting.

Labor Market Transitions We construct labor market transition indicators by comparing individuals' employment states across consecutive months within the panel. For each individual, we track month-to-month transitions between employment (E) and non-employment (N). We create four binary transition indicators that capture all possible monthly transitions in our two-state framework: Individual is employed in both month t and month $t+1$ ($E \rightarrow E$); individual transitions from employment to non-employment ($E \rightarrow N$), including both quits and layoffs, which we distinguish below; individual transitions from non-employment to employment ($N \rightarrow E$); individual stays non-employed ($N \rightarrow N$). In addition to the employment state transitions, we identify job-to-job transitions (J2J) using the SIPP's employer identifier. A job-to-job transition occurs when an individual is employed in two consecutive months but the employer identifier changes between periods.[10]

Wages We construct individual-level wage and income measures from the SIPP's monthly earnings and hours-worked variables. For each individual, we observe monthly earnings and usual hours worked per week for up to two jobs. We clean the hours variables by setting hours to missing if they are coded as varying or exceed 80 hours per week, which likely reflects measurement error or extreme outliers. We construct total monthly income as the sum of earnings from the primary and secondary job (if both are present). If an individual holds only one job, total income equals earnings from that job alone. We set monthly earnings to missing when the corresponding hours variable is missing to ensure consistency in our wage calculations. Similarly, we construct total hours worked as the sum of hours on both jobs when available, or hours on the single job when the individual holds only one position. We then calculate the hourly wage as total monthly income divided by total hours worked. We also construct a primary job hourly wage using only

[10]For each transition indicator, we set the value to missing under three conditions: (1) the observation is the individual's last month in the panel, so we cannot observe the subsequent state; (2) there is a gap in the individual's panel participation (the time difference between consecutive observations exceeds one month), as we cannot reliably measure transitions across gaps; (3) the current or next month's employment state is missing.

earnings and hours from the main job. For married couples, we construct household-level income measures by summing each spouse's income within each couple-month observation, with and without transfers (unemployment insurance and supplemental security income benefits). Moroever, within dual-earner couples, we classify individuals as primary or secondary earners based on their relative monthly income. The primary earner is defined as the spouse with higher monthly income, while the secondary earner has lower monthly income.[11]

Wealth We construct a measure of net liquid wealth at the household level, which is meant to capture financial resources that households can readily access for consumption or to smooth income shocks. We construct net liquid wealth as total household wealth minus equity in illiquid assets minus household debt. The illiquid assets we exclude are home equity, business equity, other real estate equity, pension wealth, and vehicle equity. Thus, we remove wealth that is tied up in housing, retirement accounts, and other assets that cannot easily be liquidated, leaving a measure of liquid financial assets that include checking accounts, savings accounts, stocks, and bonds. Our household debt variable includes credit card debt, loans, and other consumer debt of both spouses.

Controls We observe calendar time, gender, and age and create indicators for the presence and number of children in the household as well as for the receipt of transfer income. Furtheremore, we observe a categorical education variable with 5 outcomes (less than high school, high school graduate, some college, college graduate, advanced degree).

Deflating, Trimming, and Residualizing All nominal wage, income, and wealth variables are converted to real terms using year fixed effects. To this end, we estimate survey-weighted regressions of each nominal variable on year indicators (with 2000 as the base year) and subtract the estimated year effects to obtain real values. This approach accounts for aggregate wage and price growth over the sample period while preserving cross-sectional variation. After deflating to real terms, we trim all wealth wage and income variables at the 5th and 95th percentiles of their distributions.

To isolate variation that is not explained by observable worker characteristics or labor market conditions, we construct residualized transitions rates, wages, income, and wealth

[11] To avoid classification instability from small income differences, we require a 10 percent gap: an individual is classified as the primary earner only if their income exceeds 110 percent of their partner's income, and as the secondary earner only if their income is less than 90 percent of their partner's income. Couples with smaller income differences are excluded from analyses that condition on earner type.

variables using the controls defined above. We regress our outcomes on month fixed effects, year fixed effects, own education, partner education, own age and age squared, partner age and partner age squared, sex, and number of children, while absorbing person fixed effects. This specification controls for both time-invariant individual heterogeneity, time-varying observable characteristics, and business cycles.[12]

3.3 Descriptive Statistics

All reported descriptive statistics are based on regressions that account for the SIPP survey design. We use person-level weights and stratification variables, with appropriate adjustments for household-level clustering when analyzing couple outcomes. This ensures that our estimates are representative of the U.S. population of (married) prime-age workers during the sample period. Furthermore, we net out compositonal differences between groups in terms of socio-economic characteristics like age and education because we do not consider heterogeneity in these dimensiones in our model. In the following, we focus on married individuals.

Table 1 shows labor market transition rates of married individuals. We find an overall ($N \rightarrow E$) rate of 7.1%, whereas 1% of employed married individuals transitions into non-employment ($E \rightarrow N$) on average per month (Panel A). Panels B and C contain the implied transition rates between couple types (dual earner, single earner, no earner) and couple-type shares in steady state. In line with the raw data, the transition rates imply a majority of dual-earner couples. The main reason is that the rate at which single-earner couples become dual-earner couples is more than three times higher than the rate at which one of the dual-earners transitions into non-employment. (7% vs. 2%). Overall, the share of no-earner couples is negligible, so we do not consider them in the following empirical analyses. However, what stands out is that the job-finding rate of non-employed individuals is more than three times higher for no-earner as compared to one-earner couples. There is also noteworthy heterogeneity in separation rates. In line with the implications of our model, secondary earners in dual earner households are most likely to transitions into non-employment (1.3% per month), including a high share of voluntary quits (see below). The separation rate of primary earners is less than half (0.6%) and 30% lower than the separation rate of employed individuals in one-earner couples.

Importantly, the SIPP survey asks workers who transitioned out of employment about the reasons for the termination of their last employment relationship. This allows us to

[12]We extract the residuals from this regression and add back the sample mean wage to obtain mean-centered residualized measures.

Table 1: Labor Market Transition Rates for Married Individuals and Couples

	Transition Rates (Weighted)		
Panel A: Individual-Level Transitions (Married Individuals)			
	Next Period State		
Current State	E	N	
E	0.990	0.010	
N	0.071	0.929	
Panel B: Implied Couple-Level Transitions			
	Next Period State		
Current State	EE	EN	NN
EE (dual earner couple)	0.980	0.020	0.000
EN (single earner couple)	0.070	0.920	0.009
NN (no earner couple)	0.005	0.132	0.863
Panel C: Implied Steady-State Couple Shares			
EE (dual earner couple)	0.726		
EN (single earner couple)	0.265		
NN (no earner couple)	0.009		
Panel D: Heterogeneous Transition Rates			
N→E rate, NN couples	0.165		
N→E rate, EN couples	0.051		
E→N rate, EN couples (single earner)	0.009		
E→N rate, EE couples (primary earner)	0.006		
E→N rate, EE couples (secondary earner)	0.013		

Notes: Panel A shows individual-level monthly transition probabilities for married individuals between employment (E) and non-employment (N), with steady-state employment rate. Panel B shows couple-level transition matrix where EE denotes both spouses employed, EN denotes one spouse employed, NN denotes neither spouse employed. Panel C reports cross-sectional shares of couples in each employment state. Panel D shows heterogeneous transition rates conditioning on partner employment status. All estimates control for month fixed effects, year fixed effects, education (own and partner for couple-level), age (own and partner for couple-level), sex, and number of children.

analyze whether the reasons for transitioning into non-employment differ by couple type. In Table 2, we separate $E \to N$ transitions into those that can be attributed to the firm (e.g., layoffs, plant closure, low demand, bankcruptcy) from those that can be attributed to the family (e.g., childcare, family obligations). We interpret the latter transitions as voluntary quits, in line with endogenous quits in our model. Notably, the share of voluntary quits is highest among secondary earners (29%) and lowest among primary earners (9%) in dual-earner couples. For single earners, the share of voluntary quits is intermediate (18%).

Next, we consider job-to-job transitions. Table 3 displays the rates at which transi-

Table 2: Reasons for Job Separation

	By Household Type			EE Couples	
	All	EE	EN	Primary	Secondary
Firm-related	0.782	0.777	0.815	0.912	0.700
Family-related	0.204	0.209	0.173	0.085	0.283
Share of quits	21%	21%	18%	9%	29%

Notes: This table shows the composition of job separations by reported reason. Firm-related separations include layoffs, plant closings, slack work, and position/shift abolishment. Family-related separations include separations attributed to family or personal obligations, health, pregnancy, retirement, or school. Quit rates are the fraction of all job separations that are classified as quits (voluntary separations). EE couples have both spouses employed; EN couples have one spouse employed. Within EE couples, primary (secondary) earners have monthly income exceeding (less than) their partner's by at least 10 percent.

tions between employers happen for the same types of married individuals: employed spouses in single-earner households as well as primary and secondary earners in dual-earner households. We observe the lower job-to-job mobility for primary earners (1.5%) while secondary and single earners have rates around 1.6%. However, while there is limited heterogeneity in job-to-job mobility rates across employed married individuals, there is noteworthy heterogeneity in the share of transitions with wage cuts and, thus, in the relevance of the reallocation shocks that we introduced in our model. In line with the ranking of wages described below, secondary earners have the lowest share of J2J transitions with wage cuts (37.6%) while for primary earners almost every second job-to-job transition comes with a wage cut (48.9%). And despite the fact that their job-to-job mobility is comparable to secondary earners, single earners have a lower share with wage cuts (44.6%). Finally, the raw (unweighted) job-to-job transition rate in our sample is 1.8%, in the lower range of the benchmarks in the literature (Fallick and Fleischman, 2004; Bjelland et al., 2011), consistent with our focus on prime-age married individuals. Moreover, job-to-job transition rate for singles tend to be higher than those for all married individuals (roughly 2% and 1.7% in our sample, respectively).

Next, we analyze the wages of employed married individials along with moments of their distribution that we use to calibrate our model. They are summarized in Table 4. The mean-min ratio in our data, calculated based on the distribution of residualized hourly wages as described above, is in line with typical estimates in the literature (see, e.g., Hornstein et al., 2011; Tjaden and Wellschmied, 2014).[13] There is minimal dispersion of median wages across couple types. Surprisingly, the distribution of single-earner wages is con-

[13]Note that we treat the 5th percentile of the distribution as the minimum.

Table 3: Job-to-Job Transition Rates

	Rate	Share with Wage Cut
Panel A: By Household Type		
Dual-earner, primary	0.0148	0.489
Dual-earner, secondary	0.0159	0.376
Single-earner	0.0160	0.446
Panel B: Summary		
Overall share with wage cut		0.432

Notes: Job-to-job transitions are defined as employer changes among individuals employed in consecutive months. Estimates control for month fixed effects, year fixed effects, education, age, marital status, sex, and presence of children. Primary (secondary) earners are individuals whose monthly income exceeds (is less than) their partner's by at least 10 percent. Share with wage cut indicates the proportion of job-to-job transitions where the hourly wage in the new job is less than 95% of the previous wage.

Table 4: Wage Distribution Moments

	All Married	EE Couples	EN Couples
Panel A: Residualized Wages			
Median	62.93	62.94	62.88
P90	81.32	80.94	83.35
P10	46.50	47.17	43.11
P90/P50	1.292	1.286	1.326
P50/P10	1.353	1.335	1.459
Mean/Min(P5)	1.674	1.632	1.900
Panel B: Relative Wages (Normalized)			
EN couple, employed spouse	1.005		
EE couple, primary earner	1.047		
EE couple, secondary earner	0.960		

Notes: Residualized wages are obtained by regressing real hourly wages on month fixed effects, year fixed effects, own and partner education, own and partner age, sex, and number of children, absorbing person fixed effects. All wage values are in 2000 dollars. Relative wages are normalized such that the average wage across all employed individuals equals 1.00. Standard errors for elasticity estimates in parentheses.

siderably more dispersed than the distribution of wages in dual-earner couples, as shown by the percentile ratios in Panel A. The implied P90/P10 ratio is 1.93 for single-earner and 1.72 for dual-earner couples (12.6% more dispersion). In terms of relative wages (Panel B), which we normalize by dividing through the mean, we see that single earners' wages are close to the overall mean while primary and secondary earners' wages are 4.7% higher

Table 5: Wealth Distribution Moments

	All Married	EE Couples	EN Couples
Panel A: Net Liquid Wealth			
Median	20,862	20,857	20,866
P90	40,112	40,853	37,562
P10	296	−367	2,196
P90/P50	1.923	1.959	1.800
P50/P10	70.54	−56.76	9.500
Mean/Min(P5)	−1.252	−1.234	−1.282
Panel B: Assets-to-Income Ratio			
Median	3.463	3.454	3.488
P90	7.260	7.064	8.297
P10	−0.918	−0.804	−1.567
P90/P50	2.096	2.045	2.379
P50/P10	−3.774	−4.294	−2.225
Panel C: Debt-to-Income Ratio			
Median	0.403	0.403	0.405
P90	0.903	0.874	1.081
P10	−0.120	−0.099	−0.248
P90/P50	2.239	2.171	2.670
P50/P10	−3.367	−4.053	−1.633
Panel D: Hand-to-Mouth Status			
Share with assets $< \frac{1}{2} \times$ income	0.388	0.372	0.473

Notes: Net liquid wealth equals total household wealth minus equity in illiquid assets (home equity, business equity, other real estate, IRA/pension wealth, vehicle equity) minus household debt. All values are in 2000 dollars. Wealth and income ratios are calculated at the household level for married couples. Hand-to-mouth households are defined as those with net liquid wealth less than half of monthly household income. EE couples have both spouses employed; EN couples have one spouse employed.

and 4% lower than the mean, respectively. This implies that the relatively low dispersion of wages in dual-earner couples masks a significant amount of dispersion within dual-earner couples.

Finally, we analyze the wealth distribution in Table 5. Panel A displays moments of net liquid wealth for all married individuals any by couple type. Notably, the P90/P50 percentile ratio is significantly lower (8.1%) for single-earner couples as compared to dual-earner couples. That is, in contrast to the evidence based on residualized wages (more dispersion among single-earner couples), we observe less dispersion in terms of net liquid wealth for single-earner couples relative to dual-earner couples.[14] In other words, single-earner couples have less upper-tail wealth dispersion than dual-earner couples.

Based on our residualized wealth variables, we also calculate assets-to-income (Panel B) and debt-to-income (Panel C) ratios for all married individuals and by household type. The median assets-to-income ratio is around 3.5 with little variation across couple types. This value is consistent with other papers that estimate this ratio using U.S. data. (see, e.g., Koehne and Kuhn, 2015). Interestingly, higher dispersion in wages appears to dominate lower dispersion in net liquid wealth: the assets-to-income P90/P50 percentile ratio for single-earner households is 16.3% higher compared to dual-earner households, so single-earner couples have more upper-tail dispersion in their assets-to-income ratio. Intuitively, single-earner households with high assets relative to income likely include households where one spouse is not working precisely because they have sufficient wealth.

The debt-to-income ratio in Panel C confirms, however, that lower net liquid wealth is often associated with higher debt. Single-earner couples have again more upper-tail dispersion (23% more than dual-earner households). Thus, heavily indebted single-earner households carry significantly more debt relative to the median compared to indebted dual-earner households. This could reflect that single-earner households face more financial stress when debt levels are high, since they have only one income stream to service the debt.

4 Calibration and Model Fit

This section describes how we calibrate the benchmark model using the U.S. SIPP data described above. For now, we consider an economy that is only populated by couple households and set $\mu = 1$ accordingly. All parameter values are calibrated at a monthly frequency.

4.1 Parameterization and Calibration

Parameterization. We assume that the flow utility function for an individual worker is given by $u(c) - k(s) = \frac{c^{1-\sigma}}{1-\sigma} - \frac{1}{\varphi}s^{\varphi}$. We specify the matching function as $M(S, V) = \sqrt{SV}$, and job productivity draws come from a log-normal distribution $H \sim LN(\mu_y, \sigma_y^2)$.

Parameters set externally. We set the coefficient of relative risk aversion to $\sigma = 2$. The annual real interest rate is set to 2%, implying a monthly value of $r = 0.0017$. We assume

[14] We only consider the P90/P50 ratio for this statemens as P10 is negative for dual-earner couples.

Table 6: Benchmark calibration

Description	Param.	Value	Moment/Source	Target	Model
A. External calibration					
Risk aversion	σ	2	Standard value	–	–
Real interest rate	r	0.0017	2% annual rate	–	–
Retirement rate	λ	0.0021	40 years average	–	–
Bargaining weight	η	0.5	Standard value	–	–
Replacement rate	ψ	0.4	Based on U.S. data	–	–
UI eligibility expiration	ζ	0.1823	6-month avg duration	–	–
Search efficiency empl.	$\bar{x}$	3.22	Faberman et al. (2022)	–	–
Quit opportunity rate	γ	1	1-month notice period	–	–
Tax level	τ_0^c	0.7852	Wu and Krueger (2021)	–	–
Tax progressivity	τ_1^c	0.1327	Wu and Krueger (2021)	–	–
B. Internal calibration					
Time preference rate	ρ	0.0044	Median asset/income	3.46	3.45
Search cost function	φ	1.244	Monthly EE rate (%)	1.66	1.66
Vacancy posting cost	K	11.262	Monthly NE rate (%)	7.10	7.10
Exog. separation rate	δ	0.0080	Monthly EN rate (%)	1.01	1.01
Reallocation rate	χ	0.0126	EE w/ wage cut (%)	43.2	43.2
Productivity distrib.	μ_y	0.0029	Income normalization	1.0	1.0
Productivity distrib.	σ_y^2	0.3210	Mean-min ratio wages	1.67	1.67
Guaranteed income	$\bar{f}^c$	0.058	Repl rate (food stamps)	10.0	10.0
Empl. disutility shocks	ξ	0.054	Quit share (%)	20.7	20.6
Government spending	G	0.203	Residual (see text)	–	–

that couples stay on average for 40 years in the model and set the retirement rate to $\lambda = 0.00208$. We set the bargaining weight to $\eta = 0.5$ and the worker's outside option to $z = 0$. We assume that UI benefits replace a fraction ψ of the last wage and set the replacement rate to $\psi = 0.4$, proxying the U.S. system. We target an average duration of six months for regular UI benefits, implying an expiration rate of $\zeta = 0.1823$. We set the relative search efficiency of employed workers compared to nonemployed workers to $\bar{x} = 3.22$ as estimated by Faberman et al. (2022). The quit opportunity rate γ is assumed to be $\gamma = 1$, proxying a 1-month termination notice period. Turning to the tax function, we adopt the parameters values $(\tau_0^c, \tau_1^c) = (0.7852, 0.1327)$ as estimated by Wu and Krueger (2021) for a sample of married couples where the male household is aged 30-57 and participates in the labor market. We normalize average household income in the benchmark economy to one (see below), which allows us to rescale the level parameter τ_0 accordingly and calibrate it externally.

Parameters calibrated internally. The remaining parameters are jointly calibrated to match the following empirical targets (we report in parenthesis the most closely associated parameter for each moment):

1. The median ratio between assets and income is 3.46. (ρ)
2. The monthly EE rate is 1.66%. (φ)
3. The monthly NE rate is 7.10%. (K)
4. The monthly EN rate is 1.01%. (δ)
5. The share of EE transitions associated with a wage cut is 43.2%. (χ)
6. Average household income is normalized to one. (μ_y)
7. The mean-to-min ratio for wages is 1.67. (σ_y^2)
8. The guaranteed income transfer equals 10% of the average wage. ($\bar{f}^c$)
9. The share of quits among EN transitions is 20.7%. (ξ)
10. Government spending G is the residual in the budget constraint. (G)

We report our benchmark calibration in Table 6.

4.2 Model Fit

Table 7 reports the model's fit to key labor market stocks and flows. In the benchmark economy, dual-earner couples account for 73.8% of all couples, closely matching the empirical share of 72.6%. Among the remaining households, most are single-earner couples (25.2% in the model versus 26.5% in the data), while couples with no earners represent only a small fraction of the population.

Turning to labor market transitions, recall that the aggregate NE and EE rates are calibration targets, leaving values disaggregated by the number of earners in the household as untargeted moments. Overall, the model captures these patterns reasonably well. For job-to-job transitions, the model slightly overpredicts the EE rate among workers in single-earner couples (1.97% versus 1.60% in the data). It also reproduces the empirical ranking within dual-earner households, where secondary earners exhibit higher EE rates than primary earners, although the quantitative gap is somewhat overstated.

Table 7: Model fit– Labor market stocks and flows

	Data	Model		Data	Model
Employment	87.5	86.4	NE rate	7.10†	7.10
Nonemployment	12.5	13.6	Zero earners	16.50	15.69
Single-earner couples	26.5	25.2	One earner	5.11	6.42
Dual-earner couples	72.6	73.8			
No-earner couples	0.9	1.0			
EE rate	1.66†	1.64	EN rate	1.01†	0.99
One earner	1.60	1.97	One earner	0.90	0.82
Dual, primary	1.48	1.27	Dual, primary	0.60	0.89
Dual, secondary	1.59	1.92	Dual, secondary	1.30	1.13
EE rate ($\Delta w < 0$)	0.71	0.72	EN rate (vol. quit)	0.20†	0.21
One earner	0.71	0.80	One earner	0.18	0.06
Dual, primary	0.73	0.91	Dual, primary	0.09	0.09
Dual, secondary	0.60	0.50	Dual, secondary	0.29	0.36

NOTE: † Calibration target. All numbers in percent.

Notably, job-to-job transitions associated with wage cuts (i.e. induced by a reallocation shock) come close to matching the empirical figures, even when disaggregated by household type. Regarding job finding from nonemployment, the model implies substantially higher NE rates for individuals whose spouse is also nonemployed than for those living in single-earner households. Finally, the model captures the heterogeneity in voluntary EN transitions across household types observed in the data. The fit is particularly close for primary earners in dual-earner couples, although the model understates voluntary quits among single earners and somewhat overstates them among secondary earners.

Next, we compare the model-generated distributions of wages and assets with their empirical counterparts (cf. Table 8). As shown in Panel A, the wage distribution in the benchmark model is remarkably close to the distribution of residualized wages in the data. This holds for both the lower and the upper halves of the distribution. For instance, the 10th (90th) percentile wage in the model is 31% below (37% above) the mean wage, compared with 27% (28%) in the data. In terms of relative wages, employed workers in single-earner couples earn slightly more than the overall average (Panel B). Among dual-earner couples, the model generates a somewhat larger wage gap between the primary earner and the secondary earner than observed in the data. Turning to the asset distribu-

Table 8: Model fit– Distributional statistics for wages and assets

	Data	Model		Data	Model
A. Wages			*C. Assets*		
P10†	0.73	0.69	P10†	0.00	0.07
P50†	0.99	0.96	P50†	1.00	0.73
P90†	1.28	1.37	P90†	1.92	2.28
P50/P10	1.35	1.39	P50/P10	70.54	16.00
P90/P50	1.29	1.43	P90/P50	1.92	2.64
Mean/Min(P5)	1.67	1.61			
B. Relative wages			*D. Assets/Income*		
EN couple, empl	1.01	1.07	Median†‡	3.46	3.47
EE couple, primary	1.05	1.15	P10†	-0.92	0.42
EE couple, secondary	0.96	0.83	P90†	7.26	10.39

NOTE: † Relative to respective mean. ‡ Calibration target.

tion, we note that our model generates substantial wealth inequality across couples (Panel C). At the lower end of the distribution, the data reveal a sizable share of couples with negligible or even negative net wealth. The corresponding share of couples at or near the borrowing constraint is somewhat smaller in our model.[15] The upper tail of the wealth distribution is matched quite well. households at the 90th percentile hold roughly 2.3 times average wealth in the model, compared with 1.9 times in the data. Panel D shows that the distribution of assets-to-income ratios in the model also aligns with the data.

4.3 Distributions and Policy Functions

We provide further details on the model-implied steady state distributions of wages, household income, and assets on Figure 1. The upper-left panel illustrates the well-known effect of on-the-job search that manifests itself as a right shift of the wage distribution relative to the offer distribution. As we show on the upper-right panel, the wage distribution of sole earners has a thicker right tail than that of primary earners in double-employed households. The employment status-dependent asset distributions are shown on the lower-left panel. Finally, we plot the household-income distribution on the lower-right panel. Double non-employed households are over-represented in the left tail of the household income distribution.

[15] We have experimented with a negative borrowing constraint and found our results to be unaffected.

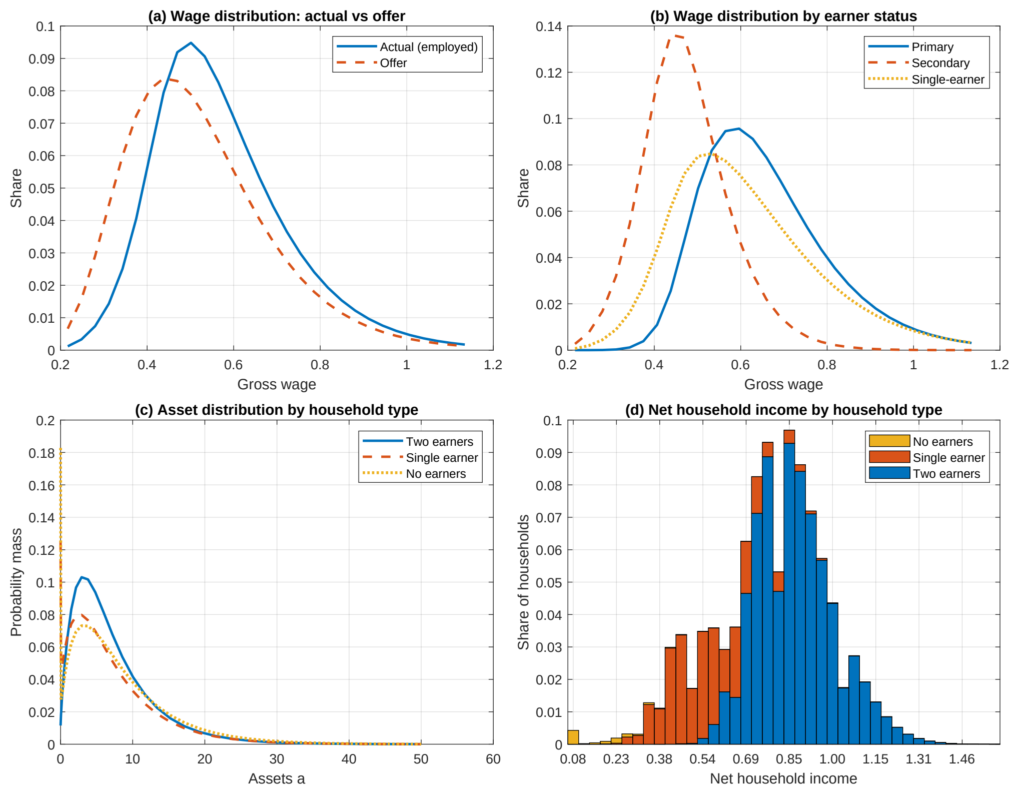

Figure 1: Model-implied steady-state distributions

4.4 Job Finding Rate Elasticity

An important test for the model fit is how responsive the job-finding rate is to variation in unemployment insurance benefits. We compute the elasticity of the job finding rate with respect to UI in our model. Following the literature, we fix job offer arrival rate and other policy parameters and perturb the UI replacement rate to compute the elasticity. We report the results of this exercise in Figure 2.

The average elasticity is 0.20 in the model and increases to 0.26 for liquidity-constrained couples. The workers with a spouse who receives UI are the most elastic. This is sensible, as in their household both spouses are UI recipients. The UI recipients with a spouse without any income respond to UI a bit less. The workers in households where the spouse works are least elastic. Overall, the elasticity falls with respect to household assets. Qualitatively, the patterns implied by our model resemble those reported by Koehne and Kuhn (2015) who report the range of values between 0.33 and 0.54 for the wealthiest and the poorest (single-worker) households in the model, respectively. In our case, this range is slightly shifted down, arguably due to our focus on couples, but it is well within the empirically supported range (Le Barbanchon et al., 2024).

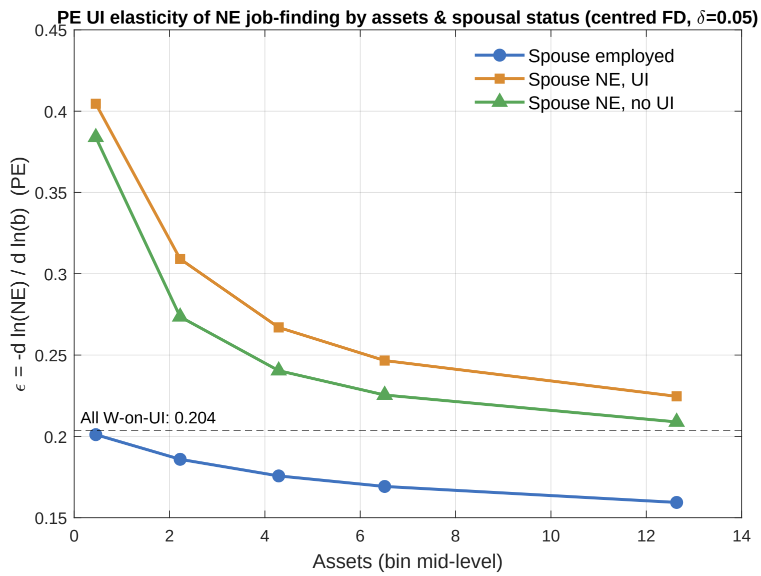

Figure 2: Job finding elasticity as a function of assets and spousal status.

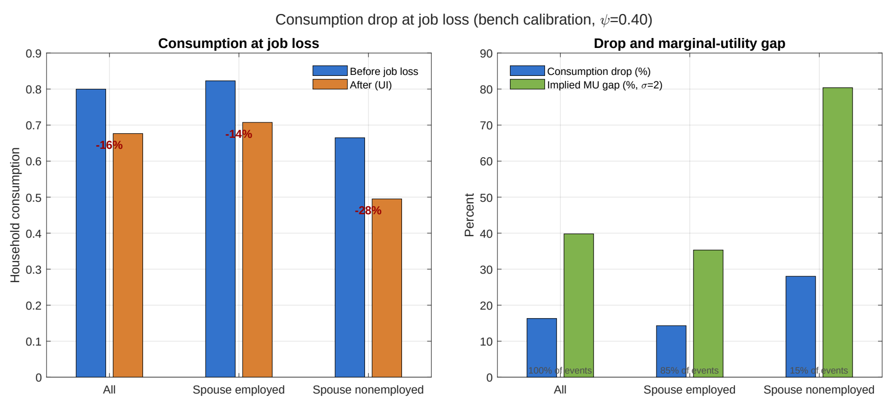

Figure 3: Consumption drop upon job loss: spousal employment.

4.5 Consumption Drop Upon Job Loss

Furthermore, we investigate the predictions of the model for the consumption consequences of a job loss. When a worker loses a job, their gross income drops by 60% since the UI replacement rate is forty percent. The pass-through of this shock is about one-fourth, as, on average, consumption drops by 16% in the month following job loss. This average, though, masks significant heterogeneity that hinges on the spousal employment status. In households where the spouse of the worker who loses job is employed, the consumption drop is 14%. For households where the other spouse has been non-employed at the time of the job loss, consumption drops by nearly 30%, see Figure 3.

The asset position matters for the consumption drop too, and interacts with spousal labour market status as we show on Figure 4. Here again household heterogeneity matters a lot. For households who are liquidity constrained and the spouse is non-employed, the pass-through is almost one-to-one with consumption dropping by about 52% which is almost two-and-a-half the drop for unconstrained households where spouse is not currently working.

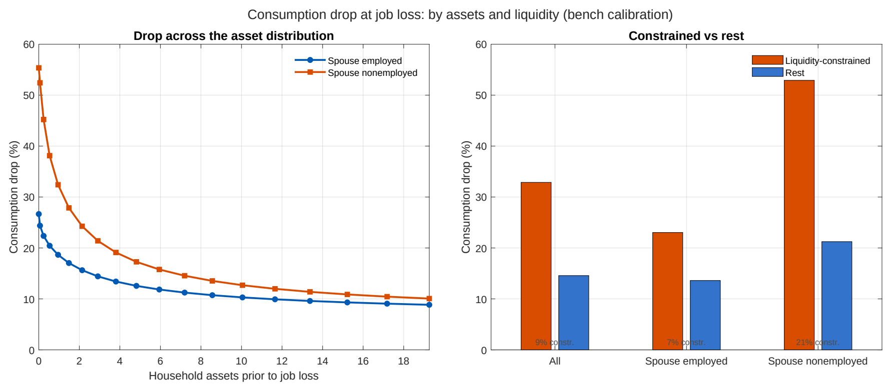

Figure 4: Consumption drop upon job loss: assets.

5 Policy Experiments

Equipped with our benchmark model, we simulate a series of counterfactual policy reforms to the tax-transfer system. We focus on the long-run effects by comparing the stationary equilibrium in our benchmark economy with the one arising after the reform.

5.1 Joint vs. Separate Tax Filing

In our first reform, we replace joint taxation by a system where workers file their income taxes individually. We keep the progressivity parameter at its benchmark value of $\tau_1^c = 0.1327$ and adjust the level parameter τ_0^c to balance the government budget.[16]

Our results are reported in Table 9. We find that moving from joint to separate tax filing increases aggregate employment from 86.4 to 88.0 percent, reducing nonemployment by 1.6 percentage points. This effect is driven primarily by a shift from single-earner to dual-earner households: the share of single-earner couples falls from 25.2 to 22.1 percent, while the share of dual-earner couples rises from 73.8 to 77.0 percent. The positive

[16]We keep the value of τ_1^c unchanged. Under the conditions that (i) a couple with average income $Y = 1$ pays the same total tax under both joint and separate filing; and (ii) in a couple where both workers earn exactly the same, the marginal tax rate should be the same under both filing schemes, it can be shown that τ_1^c must take the same value under joint and separate filing.

Table 9: Policy experiment– Joint vs. separate tax filing

	Baseline	Separate Filing		Baseline	Separate Filing
Employment	86.4	88.0	Wages	0.57	0.57
Nonemployment	13.6	12.0	P50/P10	1.39	1.39
Single-earner couples	25.2	22.1	P90/P50	1.43	1.43
Dual-earner couples	73.8	77.0	Assets	4.77	5.15
EE rate	1.66	1.65	% Liq.-constr.	11.1	9.5
One earner	2.02	2.01	P50	3.46	3.82
Dual, primary	1.27	1.27	P90	10.90	11.49
Dual, secondary	1.94	1.95	Δ Cons. upon job loss (%)	16.3	16.1
NE rate	7.10	8.05	Liq.-constr.	32.9	33.1
Zero earners	15.69	16.00	Δ Welfare	–	+0.09%
One earner	6.42	7.39			
EN rate	1.00	0.98			

employment effect is largely driven by an increase in the NE rate. Under separate tax filing, participation incentives for secondary earners become substantially stronger. This induces an increase in the NE rate for nonemployed workers in one-earner couples by more than 15 percent, from 6.42 to 7.39. Related to this, the EN rate declines slightly as fewer workers find it optimal to quit voluntarily. Average wages and wage inequality remain virtually unchanged, suggesting that the reform mainly affects participation decisions rather than the wage distribution. Households accumulate more assets in the new steady state, with average wealth increasing from 4.77 to 5.15. Overall, separate filing generates a modest welfare gain of 0.09 percent in consumption-equivalent terms for newborn agents.

5.2 Unemployment Insurance

In our second set of policy experiments, we examine the effects of unemployment insurance for couple households. First, we simulate a reform that raises the generosity of UI benefits. Second, we compute the welfare-maximizing replacement rate for couples in our model. Third, we explore the potential gains from making unemployment insurance benefits spouse dependent.

5.2.1 Generosity of UI

We start out by studying a policy reform that raises the UI replacement rate from 40 percent to 50 percent. We adjust the level parameter in the income tax function τ_0^c to balance the government budget.

Table 10: Policy experiment– Raising UI replacement rate ψ

	Baseline	Repl rate $\psi = 0.5$		Baseline	Repl rate $\psi = 0.5$
Employment	86.4	86.2	Wages	0.57	0.57
Nonemployment	13.6	13.8	P50/P10	1.39	1.39
Single-earner couples	25.2	25.5	P90/P50	1.43	1.43
Dual-earner couples	73.8	73.4	Assets	4.77	4.64
EE rate	1.66	1.66	% Liq.-constr.	11.1	11.5
One earner	2.02	2.01	P50	3.46	3.35
Dual, primary	1.27	1.27	P90	10.90	10.65
Dual, secondary	1.94	1.94	Δ Cons. upon job loss (%)	16.3	15.5
NE rate	7.10	7.03	Liq.-constr.	32.9	29.8
Zero earners	15.69	15.14	Δ Welfare	–	-0.05%
One earner	6.42	6.36			
EN rate	1.00	1.01			

Our results are reported in Table 10. Increasing the UI replacement rate from 40 to 50 percent leads to a small decline in employment, from 86.4 to 86.2 percent, and a corresponding increase in nonemployment. The share of dual-earner couples falls slightly, while the share of single-earner couples rises. Labor market transition rates are affected only modestly, with a small decrease in the nonemployment-to-employment rate and a slight increase in the employment-to-nonemployment rate. Average wages and wage inequality remain essentially unchanged. Higher UI generosity reduces precautionary savings, lowering average asset holdings from 4.77 to 4.64.

To gain a better understanding of these effects, we use our model to perform a sequence of decomposition experiments. Our focus is on quantifying the role of various margins in our model, in particular, the different insurance channels couples can use to self-insure against unemployment risk. We also quantify the importance of the labor demand side as firms post more or less vacancies.

Table 11 shows our results. In the first row of this table, we report the impact on employment and welfare, keeping all adjustment margins fixed. That is, we only change the replacement rate ψ and let τ_0^c adjust to balance the government budget, but keep both couples' policy functions and vacancies posted by firms at their respective benchmark values. Then, the second row of the table reports the effects once the policy function for consumption-saving decisions are allowed to adjust, and so on.

Table 11: Decomposition of the $\psi : 0.4 \to 0.5$ effect by margin

	Δ Welfare (%)	Δ Employment (pp)
Direct (insurance, no response)	+0.32	−0.23
+ Consumption–savings response	−0.29	+0.13
+ Labor demand (vacancies)	−0.08	−0.01
+ Quits	+0.00	−0.10
+ Search effort	+0.00	−0.01
+ Interactions	+0.00	−0.01
Total ($\psi : 0.4 \to 0.5$)	−0.05	−0.23

Newborn consumption-equivalent welfare. Each behavioral row = full $\psi = 0.5$ equilibrium minus the economy with that margin frozen at its baseline rule (others at $\psi = 0.5$); "Direct" = all margins frozen. Leave-one-out, so terms are additive up to the small interaction residual.

Focusing first on welfare, we find that providing more generous UI benefits would actually lead to a positive welfare gain. However, once couples in the model are allowed to adjust along the consumption-saving margin, the positive welfare effect virtually disappears. This suggests that public insurance via more generous UI benefits crowds out private self-insurance through precautionary saving. Further, we find that the labor demand channel has a considerably negative effect on welfare. As UI generosity increases, nonemployed workers exert less search effort which, in turn, leads to less vacancy posting by firms. In terms of employment, the direct effect of raising UI benefits is negative (first row). This is a composition effect rather than a behavioral one: more generous UI slows asset decumulation during non-employment, shifting the (fixed-policy) distribution of non-employed workers toward higher assets, where the frozen search-effort rule prescribes lower search, so the aggregate job-finding rate falls even though no policy rule responds. Once the consumption-saving rule is allowed to adjust, part of the negative employment effect is offset: households hold fewer precautionary assets, and the frozen search rule prescribes more search at lower assets (second row). We find that the labor demand channel is less important for employment than for welfare, while behavioral responses along the quit margin tend to matter more.

Taken together, our results suggest that behavioral responses along the consumption-saving margin are key to understanding the effects of unemployment insurance reforms.

Couples in our benchmark economy seem to be well-insured against unemployment risk. Motivated by this finding, we now turn to studying optimal policy.

5.2.2 Optimal UI

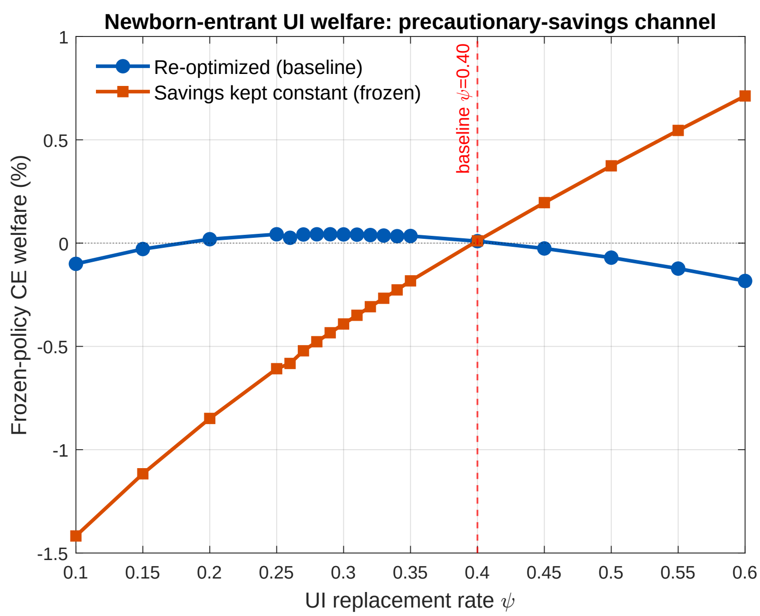

Figure 5: Welfare as a function of ψ and the role of consumption-savings choice

We now study the optimal level of unemployment insurance for couples in our model. To this end, we vary the replacement rate ψ and let the tax level parameter τ_0^c adjust to balance the government budget. Figure 5 shows welfare effects for values of ψ ranging from 0.1 to 0.6 (recall that ψ equals 0.4 in our benchmark model). We find that the welfare-maximizing level of ψ lies slightly below the benchmark, at around 0.30. This suggests that, through the lens of our model, the current degree of public insurance through UI benefits is close to optimal; if anything, couples are slightly overinsured. A key reason for this result is the fact that couples are able to respond along the consumption-saving margin. In fact, the red line in Figure 5 shows the welfare effects that would obtain if the policy function for savings was kept fixed at the benchmark. In that scenario, cuts to UI would leave couples worse off as they would not be able to respond via higher precautionary saving.

5.2.3 Spouse-Dependent UI

As noted in the introduction, in some U.S. states the size of UI benefits varies with the employment state of the spouse. Our model allows us to study the effects of spouse-dependent unemployment insurance. We consider reforms where the replacement rate of a worker's UI benefits is a function of the employment status of the spouse. Again, we compute stationary equilibria for different values of ψ, this time further differentiating between ψ_E (replacement rate if spouse is employed) and ψ_N (replacement rate if spouse is nonemployed). As before, the tax level parameter τ_0^c balances the government budget.

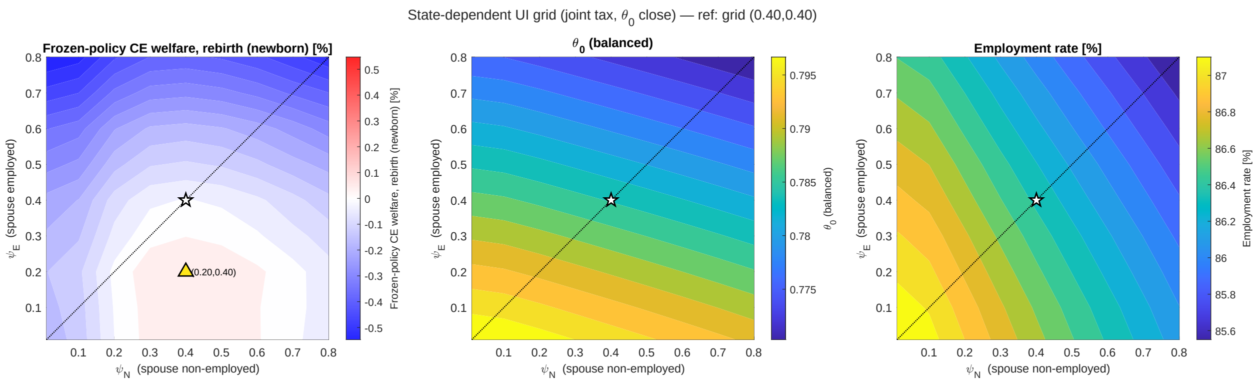

Figure 6: Spouse-dependent UI

Figure 6 depicts our results. We find that the optimal policy prescribes a larger replacement rate for couples where the spouse is nonemployed, indicating that public insurance is more valuable for these couples than for those where the other spouse is working (left chart). Welfare is maximized if the replacement rate ψ_E is lowered to a value of 0.20, while ψ_N is kept at a value of 0.40. Employment effects are fairly asymmetric and tend to be larger for variations of ψ_E (right chart).

Table 12 shows outcomes under the welfare-maximizing policy.

6 Conclusions

We have developed an equilibrium random search model of two-person households in which couples insure against job-loss risk through three private channels: within-household risk sharing, precautionary savings, and precautionary job search. All channels interact with endogenous job creation. Calibrated to U.S. data, the model reproduces the labor-market transitions, wage dispersion, and wealth holdings of couples. We use it to study two dimensions of the tax-transfer system. First, replacing joint with separate progressive taxation raises aggregate employment by about 1.6 percentage points, almost entirely by drawing secondary earners into work; wages and inequality barely move, and the welfare gain is positive but modest. Second, a broad suite of unemployment insurance reforms,

Table 12: Policy experiment– Optimal spouse-dependent UI

	Baseline	Optimal spouse-dep.		Baseline	Optimal spouse-dep.
Employment	86.4	86.6	Wages	0.57	0.57
Nonemployment	13.6	13.4	P50/P10	1.31	1.31
Single-earner couples	25.2	24.9	P90/P50	1.47	1.47
Dual-earner couples	73.8	74.1	Assets	4.77	4.98
EE rate	1.66	1.66	% Liq.-constr.	11.1	10.6
One earner	2.02	2.04	P50	3.45	3.64
Dual, primary	1.27	1.27	P90	10.90	11.30
Dual, secondary	1.94	1.94	Δ Cons. upon job loss (%)	16.3	17.1
NE rate	7.10	7.11	Liq.-constr.	32.9	36.5
Zero earners	15.69	15.86	Δ Welfare	–	+0.09%
One earner	6.42	6.43			
EN rate	1.00	0.99			

Joint progressive. UI replacement rate made spouse-dependent and optimized over the budget-balanced (ψ_E, ψ_N) grid: optimum $\psi_E = 0.20$ (spouse employed), $\psi_N = 0.40$ (spouse non-employed); τ_0^c re-balanced 0.7852 → 0.7908. ΔWelfare = frozen-policy newborn CE vs the flat baseline.

varying generosity, duration, and spousal eligibility, has much smaller employment effects, and the welfare-maximizing replacement rate lies close to its current level: because couples already self-insure, additional public insurance is largely redundant. The one UI reform that improves welfare is making benefits spouse-dependent, paying more when a worker's spouse is non-employed.

Taken together, the results point to a consistent message: for couples, the unit of the tax-transfer system matters more than its generosity. The prevailing arrangement in the U.S.—pooling income for taxation while individualizing unemployment insurance—assigns the wrong unit to each instrument; welfare rises both when taxation is made individual and when UI is conditioned on the spouse's employment status, even if the gains are quantitatively modest. The model's tractability makes it a natural laboratory for questions we leave to future work, including endogenous household formation, shifts in the single–couple composition of the population, and the transition dynamics between steady states.

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A Appendix

A.1 Firms' Value Functions

Here we describe the Bellman equations for the values of jobs filled with couple workers and we present the expected value of a vacant job matched with a random worker.

Consider first the value of a job filled with a worker in a single-earner household, denoted J^{en}. Specifically, worker 1 is employed and worker 2 is non-employed, while the reverse situation leads to the analogue expression of the firm's job value J^{ne}. $\bar{H} = 1 - H$ is the tail distribution of match productivity. The Bellman equation is

$$\begin{aligned}\left[\rho^f + \lambda + \delta + \chi p(\theta) + S_1^{en}(y_1, y_2, a)\bar{x}p(\theta)\bar{H}(y_1) + \gamma\pi^{en}(y_1, y_2, a)\right] J^{en}(y_1, y_2, a) = y_1 - w(y_1) \\ +\zeta[J^{en}(y_1, 0, a) - J^{en}(y_1, y_2, a)] \\ +S_2^{en}(y_1, y_2, a)p(\theta)\int_{R_2^e(y_1,y_2,a)}[J_1^{ee}(y_1, y_2', a) - J^{en}(y_1, y_2, a)]\, dH(y_2') \\ +\frac{dJ^{en}(y_1, y_2, a)}{da}\left[ra - c + N^c(w(y_1) + b^e(y_2))\right] .\end{aligned}$$

The discounting of the profit flow on the left side includes the Poisson rates of the events of retirement, job destruction, reallocation shocks, outside offers of the employed worker 1 whose search effort is $S_1^{en}(y_1, y_2, a)$, or quits after a quit opportunity shock which happens then with flow probability $\pi^{en}(y_1, y_2, a)$. The second line is the change in continuation value when UI benefits of the spouse (worker 2) expire. The third line is the change in continuation value in the event of job-finding of the non-employed spouse. The spouse searches with effort $S_2^{en}(y_1, y_2, a)$ and accepts the job only when match productivity y_2' is greater or equal to reservation productivity $R_2^e(y_1, y_2, a)$. The fourth line is change in continuation profit due to asset accumulation.

Second, consider the value of a job filled with worker 1 in a dual-earner household denoted J_1^{ee}. An analogue expression applies for J_2^{ee}, the value of a job filled with worker 2 in the dual-earner household. We denote by $a' = A^{ee}(y_1, y_2, a)$ household savings which enters continuation values and reservation productivities.

$$\left[\rho^f + \lambda + \delta + \chi p(\theta) + S_1^{ee}(y_1, y_2, a)\bar{x}p(\theta)\bar{H}(y_1) + \gamma\pi_1^{ee}(y_1, y_2, a)\right] J_1^{ee}(y_1, y_2, a) = y_1 - w(y_1)$$
$$+\bar{x}S_2^{ee}(y_1, y_2, a)p(\theta)\int_{y_2}[J_1^{ee}(y_1, y_2', a') - J_1^{ee}(y_1, y_2, a)]\, dH(y_2')$$
$$+\chi p(\theta)\int[\mathbb{I}_{y'2\geq R^e(y_1,y_2,a)}J_1^{ee}(y_1, y_2', a') + \mathbb{I}_{y'2<R^e(y_1,y_2,a)}J^{en}(y_1, y_2, a) - J_1^{ee}(y_1, y_2, a)]\, dH(y_2')$$
$$[\delta + \gamma\pi_2^{ee}(y_1, y_2, a)][J^{en}(y_1, y_2, a) - J_1^{ee}(y_1, y_2, a)]$$
$$+\frac{dJ_1^{ee}(y_1, y_2, a)}{da}\left[ra - c + N^c(w(y_1) + w(y_2))\right]\ .$$

The left side includes again the Poisson rates of the events of retirement, job destruction, a reallocation shock, an outside offer of the employed worker 1 whose search effort is $S_1^{ee}(y_1, y_2, a)$, or a quit after a quit opportunity shock which happens then with probability $\pi_1^{ee}(y_1, y_2, a)$. The second line is the change in continuation value when the spouse receives an outside offer and quits. The third line is the value change when the spouse receives a reallocation shock in which case the spouse may take another job with productivity y_2' when $y'2 \geq R^e(y_1, y_2, a)$ or quit otherwise. The fourth line are the events where the spouse is laid off or quits voluntarily into non-employment (rate $\gamma\pi_2^{ee}(y_1, y_2, a)$). The fifth line is change in continuation profit due to asset accumulation.

Consider now the value of a vacant job when matched with a random worker which is denoted $\mathbb{E}M$. The probability that the vacant job matches with a worker of a given type is proportional to this worker's search efficiency in proportion to the aggregate measure of search efficiency $\bar{s}$ which is derived below. For example, the vacant job matches with a non-employed single worker in state (y, a) with probability $\frac{S^n(y,a)}{\bar{s}}d\nu^n(y, a)$, or it matches with a reallocated single worker in state (y, a) with probability $\frac{\chi}{\bar{s}}d\nu^n(y, a)$. Then match productivity is drawn and the worker accepts the job when match productivity is greater or equal to this worker's reservation productivity. If the worker accepts, the job realizes a positive continuation profit. Consequently, we obtain $\mathbb{E}M$ from the following identity:

$$
\begin{aligned}
\bar{s}\mathbb{E}M = & \int \left[S^n(y,a) \int_{R(y,a)} J^e(y',a) dH(y') \right] d\nu^n(y,a) + \int \left[\bar{x} S^e(y,a) \int_y J^e(y',a) dH(y') \right] d\nu^e(y,a) \\
& + \int \left[\chi \int_{R(y,a)} J^e(y',a) dH(y') \right] d\nu^e(y,a) \\
& + \int \left[S_1^{nn}(y_1,y_2,a) \int_{R_1^n(y_1,y_2,a)} J^{en}(y',y_2,a) dH(y') \right] d\nu^{nn}(y_1,y_2,a) \\
& + \int \left[S_2^{nn}(y_1,y_2,a) \int_{R_2^n(y_1,y_2,a)} J^{ne}(y_1,y',a) dH(y') \right] d\nu^{nn}(y_1,y_2,a) \\
& + \int \left[S_1^{ne}(y_1,y_2,a) \int_{R_1^e(y_1,y_2,a)} J^{ee}(y',y_2,a) dH(y') \right] d\nu^{ne}(y_1,y_2,a) \\
& + \int \left[\bar{x} S_2^{ne}(y_1,y_2,a) \int_{y_2} J^{ne}(y_1,y',a) dH(y') \right] d\nu^{ne}(y_1,y_2,a) \\
& + \int \left[S_2^{en}(y_1,y_2,a) \int_{R_2^e(y_1,y_2,a)} J^{ee}(y_1,y',a) dH(y') \right] d\nu^{en}(y_1,y_2,a) \\
& + \int \left[\bar{x} S_1^{en}(y_1,y_2,a) \int_{y_1} J^{en}(y',y_2,a) dH(y') \right] d\nu^{en}(y_1,y_2,a) \\
& + \int \left[\bar{x} S_1^{ee}(y_1,y_2,a) \int_{y_1} J^{ee}(y',y_2,a) dH(y') \right] d\nu^{ee}(y_1,y_2,a) \\
& + \int \left[\bar{x} S_2^{ee}(y_1,y_2,a) \int_{y_2} J^{ee}(y_1,y',a) dH(y') \right] d\nu^{ee}(y_1,y_2,a) . \\
& + \int \left[\chi \int_{R_2^n(y_1,y_2,a)} J^{ne}(y_1,y',a) dH(y') \right] d\nu^{ne}(y_1,y_2,a) \\
& + \int \left[\chi \int_{R_1^n(y_1,y_2,a)} J^{en}(y',y_2,a) dH(y') \right] d\nu^{en}(y_1,y_2,a) \\
& + \int \left[\chi \int_{R_1^e(y_1,y_2,a)} J^{ee}(y',y_2,a) dH(y') \right] d\nu^{ee}(y_1,y_2,a) \\
& + \int \left[\chi \int_{R_2^e(y_1,y_2,a)} J^{ee}(y_1,y',a) dH(y') \right] d\nu^{ee}(y_1,y_2,a) .
\end{aligned}
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The first line shows the values when the vacant job meets a worker in a single household. All other lines are the values when the vacancy meets a worker in a couple household in different states. All these meetings may arise due to endogenous search effort of any worker or after a reallocation shock with Poisson rate χ.

Finally, aggregate search efficiency units are obtained from

$$
\begin{aligned}
\bar{s} = & \int S^n(y,a) d\nu^n(y,a) + \int [\bar{x} S^e(y,a) + \chi] d\nu^e(y,a) + \int S_1^{nn}(y_1,y_2,a) + S_2^{nn}(y_1,y_2,a) d\nu^{nn}(y_1,y_2,a) \\
& + \int S_1^{ne}(y_1,y_2,a) + \bar{x} S_2^{ne}(y_1,y_2,a) + \chi d\nu^{ne}(y_1,y_2,a) + \int S_2^{en}(y_1,y_2,a) + \bar{x} S_1^{en}(y_1,y_2,a) + \chi d\nu^{en}(y_1,y_2,a) \\
& + \int \bar{x} S_1^{ee}(y_1,y_2,a) + \bar{x} S_2^{ee}(y_1,y_2,a) + 2\chi d\nu^{ee}(y_1,y_2,a) .
\end{aligned}
$$