Spousal Insurance and the Amplification of Business Cycles

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Abstract

I develop a Heterogeneous Agent New Keynesian model with dual-earner households that offers new insights into the role of spousal labor supply at both the micro and the macro levels. The model matches existing microeconomic evidence on the response of household earnings and consumption to the job loss of the primary earner. Specifically, it implies that the average job loser suffers large income loss, only a small fraction of which is compensated by the spouse. Nevertheless, the model reveals that this low average spousal earnings response to job loss masks substantial benefits for consumption smoothing. Looking at the average income replaced by the spouse is misleading for two reasons: heterogeneity and interdependence between different margins of the adjustment. At the macro level, countercyclical labor supply of secondary earners can stabilize aggregate demand but it also crowds out primary earners searching for jobs. The model implies that the aggregate demand channel dominates, and spousal insurance is an effective automatic stabilizer.

Keywords: spousal labor supply, heterogeneous agent New Keynesian models, dynamic discrete-continuous choice

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1 Introduction

Households face large income uncertainty that varies systematically with the business cycle. Idiosyncratic income risk is not fully insurable, but it is mitigated by three partial insurance mechanisms: (i) savings; (ii) progressive taxes and transfers; and (iii) risk sharing within the family. According to Blundell, Pistaferri and Saporta-Eksten (2016), the family channel contributes more to consumption smoothing than the other two channels combined. Yet, general equilibrium studies of risk and uncertainty have focused almost exclusively on the first two channels[1]. The business cycle implications of intra-family insurance have remained largely unexplored.[2]

In this paper, I develop a structural model that offers new insights into the role of spousal labor supply at both micro and macro levels.

At the household level, I demonstrate that recent, high quality evidence on small spousal earnings response to job loss does not mean that the insurance value of spousal labor supply is low. My model uncovers that the option of additional spousal income encourages consumption smoothing by other means such as liquid savings. It also predicts substantial heterogeneity in households' use of spousal labor supply. These results suggest that extrapolating from the low average response can be misleading.

At the macro level, my general equilibrium model clarifies that spousal insurance has social costs as well as benefits. Secondary earners seek to support their own household by entering the labor force in bad times. All else equal, this makes it more difficult for unemployed primary earners to find job. Nevertheless, the model predicts that spousal insurance's stabilizing effect on aggregate demand dominates. Spousal insurance significantly dampens the propagation of aggregate shocks.

Literature. This paper relates to diverse body of research on idiosyncratic income risk and its ramifications for households and the macroeconomy.

My paper builds on both empirical and modeling insight from the literature on the added worker effect. In her seminal contribution, Lundberg (1985) found that married women whose husbands lost their job are (i) less likely to leave employment; and (ii) more likely to enter the labor force than women whose husbands remained continuously employed. These are the quit and entry margins of the added worker effect. Mankart and Oikonomou (2016) estimate that the entry margin has been increasing in recent decades. Mankart, Oikonomou and Pascucci (2021) argue that this is because structural changes—such as declining gender wage gap—increased the insurance value of the added worker effect. Relatedly, Bacher, Grübener and Nord (2022) show that countercyclical entry is much more pronounced for young than for old households. While most papers after Lundberg (1985) have focused on entry, Ellieroth (2019) argues that procyclical quits are important to account for the acyclic participation rate of married women.

[1] Examples for (i) include Oh and Reis (2012) and McKay and Reis (2016) who study the roles of targeted transfers and automatic fiscal stabilizers. Examples for (ii) include Bayer, Lütticke, Pham-Dao and Tjaden (2019) and Kaplan, Moll and Violante (2018) who focus on precautionary saving in liquid and illiquid assets.

[2] Notable exceptions include Mankart and Oikonomou (2017) and Birinci (2021) which I discuss in more detail in the paper.

I contribute to the existing literature on the added worker effect in two ways. First, I make a novel point about heterogeneity driven by self-selection. Second, I explore the general equilibrium spillovers in the context of a state-of-the-art HANK model.

My work is also related to papers on gender differences in labor market outcomes and their macroeconomic consequences, including Doepke and Tertilt (2016), Fukui, Nakamura and Steinsson (2018), and Albanesi (2019).

In its objective, my paper belongs to the rapidly growing literature that studies how microeconomic heterogeneity affects the transmission of macroeconomic shocks (McKay and Reis 2016, Guerrieri and Lorenzoni 2017, Kaplan et al. 2018, Bayer et al. 2019, Auclert, Rognlie and Straub 2018, De Ferra, Mitman and Romei 2020). Although the distribution of income shocks plays a central role in these models, it is typically let to be determined by an exogenous Markov chain. An important strand of the literature departs from this benchmark by introducing search and matching frictions into HANK (Gornemann, Kuester and Nakajima 2021, Den Haan, Rendahl and Riegler 2018, Kekre 2021, Graves 2020, Alves 2019). My model builds on these papers, and takes an additional step in endogenizing the income distribution by introducing a labor force participation choice.

In terms of methodology, I provide a general extension of the sequence-space Jacobian method of Auclert, Bardóczy, Rognlie and Straub (2021b) to the case of discrete-continuous choices.[3] I hope this approach will be useful for other researchers in the field.

2 Evidence on spousal insurance over the business cycle

I begin by summarizing the empirical evidence on spousal insurance in the specific context of *cyclical* income risk. This section allows me to do two things. First, to connect the findings of different literatures and explain how they inform my analysis. Second, to show that even the best available data and empirical analyses run into subtle limitations. Lacking even better data, I turn to the structural model to make further progress.

Administrative earnings data. The most comprehensive and reliable measure of individual income comes from tax- and social security records. These administrative earnings data have become the gold standard of quantifying income risk in the last ten years. In their seminal work, Guvenen, Ozkan and Song (2014) established that the most prominent cyclical feature of the income growth distribution is its procyclical skewness. During recessions, large income losses become more likely and large gains become less likely. In contrast, the variance of income growth is remarkably stable over the business cycle.

Guvenen et al. (2014) focus on the annual income of prime-age males whose income exceeds a certain threshold. Their findings have been refined along two dimensions that are highly relevant for my purposes.

[3]This functionality is now included in our public Python package. See `https://github.com/shade-econ/sequence-jacobian`.

First, Hoffmann and Malacrino (2019) decompose annual income into employment time (number of weeks employed in a given year) and weekly earnings. They find that the cyclical skewness of the male income growth distribution is driven almost entirely by changes in employment time. During recessions, large income losses become more likely due to longer and more frequent non-employment spells.[4]

Second, Pruitt and Turner (2020) consider the joint income of married couples in the United States. They find that (i) household income is less volatile than individual income; (ii) married women have much less procyclical earnings than married men; (iii) the joint income of married couples displays significantly less procyclical skewness than individual income. Note that (i) is possible if and only if income growth of spouses is negatively correlated.[5] Taken together, facts (i)-(iii) are suggestive of active labor supply decisions to offset income shocks to the family, including the large shocks involving non-employment that drive skewness. The authors also provide some direct evidence for this. The probability that married women with zero earnings in the previous year make positive earnings this year is increasing in the income loss of their husband. On the flipside, the probability that a married woman's income falls is increasing in the income gain of her husband. Notice that spousal insurance seems to be provided primarily by females. A plausible explanation is that females tend to be the secondary earners of the family, and have higher capacity to adjust their earnings when needed.

In sum, administrative earnings data support the idea that spousal labor supply mitigates cyclical income risk. Moreover, the extensive margin of employment is key for capturing cyclical income shocks as well as spousal labor supply. The main limitation of administrative earnings data is the inability to distinguish genuine income shocks (e.g. getting fired) from labor supply choices (e.g. quitting or working lower hours). This leads me to the literature on the consequences of job loss, that uses additional information to identify involuntary job loss (e.g. survey responses or take-up of unemployment benefits).

Labor market flows. A large literature is dedicated to estimating the spousal labor supply response to a job loss of the primary earner. The traditional approach, pioneered by Lundberg (1985), is to look at monthly transition probabilities between employment (E), unemployment (U), and non-participation (N). She finds that married women whose husbands lose their job are significantly (i) less likely to leave employment; and (ii) more likely to enter the labor force than women whose husbands remain continuously employed. These are the two channels of the added worker effect.

To get a sense of the magnitude of these responses in recent times, consider Mankart and Oikonomou (2017). Using the Current Population Survey for 1994–2014, they estimate that the probability that a married woman transitions from N to $\{E, U\}$ in any given month in 9.5%. This

[4] Hoffmann and Malacrino (2019) use Italian social security data. In unpublished work, I found very similar results for Germany using the SIAB data. Graves (2020) reaches a similar conclusion for the US based on the Current Population Survey.

[5] Negative correlation of income growth does not contradict positive correlation of (long-run) income level which is what the literature on assortative matching is primarily concerned with (Fernandez, Guner and Knowles, 2005).

probability rises to 17.3% when they condition on the husband experiencing an E to U transition in the same month. The response is far from negligible, but it is clear that only a relatively small fraction of all male job losses will be compensated by new employment of their spouses.

Guner, Kulikova and Valladares-Esteban (2020) offer an alternative way of assessing the importance of the added worker effect from CPS data, which is more closely related to my discussion of cyclical income risk above. They build 9×9 Markov matrix of joint labor market transitions of couples. They isolate the role of added worker effect by shutting down transitions in which one spouse makes an NE or NU transition ("entry") while the other experiences an EU or UU transition ("loss"). They find that shutting down added worker effect this way has a much larger effect on the labor market outcomes of men than women. In particular, it removes most of the difference in the cyclical volatility and skewness of the male and female employment rate. These results are consistent with the annual income-based analysis of Pruitt and Turner (2020), and with the idea that spousal insurance is provided primarily by married women.

Event studies of job loss. The labor market status-based approach to measuring the added worker effect has come under forceful criticism from Birinci (2021) and Andersen, Jensen, Johannesen, Kreiner, Leth-Petersen and Sheridan (2021). These authors make the point that entering the labor force is just an *intention* to provide spousal insurance. What matters for consumption smoothing is the extra income the secondary earner can bring in. Birinci (2021) uses the Panel Study of Income Dynamics to estimate the response of spousal earnings to involuntary job displacement of the household head. He finds that the head suffers a large income loss that lasts for 5 years, while the earnings response of the spouse is statistically insignificant.[6] The estimates are quite noisy due to the small sample size of the PSID, but they're arguably the best that once can achieve with publicly available data.

Andersen et al. (2021) conduct a similar exercise, which is more precise and comprehensive thanks to their ability to combine six different administrative data sets from Denmark. In addition to the labor income of both spouses, they observe spending and saving as well. They find that spousal earnings response is significant but small: it compensates for only 7.5% of the income loss of the the primary earner.[7] Households cope by running down liquid assets (52%) and reducing spending (26%).

Collectively, the evidence shows that spousal labor supply rises in response to job loss in the family, but the response is small in terms of replaced income.

Does this mean that spousal insurance is a weak consumption smoothing mechanism? Not necessarily. Event studies have two important limitations. First, they estimate an average treatment effect. We should expect that heterogeneity matters because adjusting spousal labor supply is a choice. Households who *self-select* into "adding a worker" are those who gain the most from doing so. Second, comparing the observed responses of spending, saving and labor supply ignores their interdependence. Increasing spousal labor supply is an *option*. This option is valuable

[6] See figure 3. in Birinci (2021).

[7] See column (6) of table 2. in Andersen et al. (2021).

even to those who decide not to exercise it at a given time. In particular, having the option of raising spousal income if necessary may encourage households to tap deeper into their liquid savings. In the remainder of the paper, I work out these ideas further with the help of a structural model.

3 Model

In this section, I introduce a macroeconomic model with dual-earner households and endogenous labor force participation. Households face idiosyncratic productivity shocks and unemployment risk that can cause persistent income loss. They smooth consumption by some combination of tapping into their liquid savings and increasing spousal labor supply. In general equilibrium, the consumption, saving, and labor supply choices of individual households impose externalities on other households. First, nominal rigidities imply that aggregate demand has a strong effect on aggregate income and unemployment. Second, search and matching frictions on the labor market give rise to congestion externalities between unemployed workers who search for the same vacancies.

The dual-earner household block builds on Mankart and Oikonomou (2017), with some important differences in timing to accommodate my high-MPC calibration. The rest of the economy builds on Heterogeneous Agent New Keynesian (HANK) models with search and matching frictions, primarily the quantitative random-search model of Gornemann et al. (2021). The main source of additional macro complexity[8] in my model is that firms have to take into account the heterogeneous and state-dependent labor supply decisions of secondary earners.

3.1 Households

There is a unit mass of infinitely-lived households. Each household has a primary earner and a secondary earner who pool their income and assets and maximize their joint utility over consumption and leisure. The primary earner always participates in the labor market. His[9] income evolves according labor market and productivity shocks. The secondary earner is subject to analogous shocks. She also makes a non-trivial participation decision, weighing the benefit of a second income against the utility cost of employment and active job search. That is, her income evolves according to labor supply choices as well as income shocks.

Time is discrete and one period corresponds to a quarter. Households are hit by several shocks and make decisions within a quarter. Next, I describe these events in chronological order and introduce notation along the way. Presenting the decision problem as a sequence of stages makes the problem more transparent, and it also how my efficient numerical implementation works.

- **Stage 0.** Household enters period t with state variables (e_1, e_2, z_1, z_2, a).

[8] By "macro complexity", I mean how difficult it is to find the fixed point that's general equilibrium. In a similar vein, I use the term "micro complexity" to refer to how hard it is to solve individual agents' decision problem.

[9] To ease exposition, I use male pronouns to refer to the primary earner and female pronouns to refer to the secondary earner. This mirrors the calibration of the model, discussed in section 4.

$e_1 \in \{E_g, E_b, U\}$ is the employment status of the primary earner, which stand for employed in good job, employed in bad job, and unemployed. $e_2 \in \{E, N\}$ is the employment status of the secondary earner, which stand for employed, and non-employed. z_1 and z_2 denote the labor productivity of the primary and secondary earner. $a \in [\underline{a}, \infty)$ denotes liquid assets.

- **Stage 1.** Productivity shocks are realized. Joint productivity (z_1, z_2) follows a discrete Markov process $\{\mathcal{G}^z, \Pi^z\}$. For simplicity, I assume that Π^z does not depend on the state of the economy and that the shocks to the primary and secondary earner of the same household are uncorrelated. Both of these assumptions are straightforward to relax, but I view them as a reasonable benchmark. The role of productivity shocks is to generate empirically realistic dispersion in income, wealth, and MPCs. The source of cyclical income risk is unemployment, which I can discipline from labor force survey data.

- **Stage 2.** Separation shocks are realized. If the primary earner is employed (in either a good or a bad job) he becomes unemployed with probability s_{1t}. If secondary earner is employed, she becomes non-employed with probability s_{2t}. Separation rates may differ systematically between primary and secondary earners, but not within these groups. Again, this assumption could be relaxed to allow for heterogeneity in unemployment risk as in Kekre (2021) or Kramer (2022).

- **Stage 3.** Participation decision. If the secondary earner is employed, she decides whether to keep her job or to quit. Staying employed incurs flow utility cost φ. If the secondary earner is non-employed, she decides whether to search for a job or stay out of the labor force. Searching for a job incurs flow utility cost χ.

- **Stage 4.** Job finding shocks are realized. If the primary earner is employed in a good job, he keeps it. If he is employed in a bad job, he transitions into a good job with probability π^{up}. If he is unemployed, he finds a job with probability f_{1t}. This new job is good with probability π^g. Note that (π^{up}, π^g) constitute a simple job ladder, whose purpose is to generate persistent income loss from unemployment that we see in the data (e.g. Davis and von Wachter 2011). If the secondary earner is employed, she keeps her job. If she is searching, she finds a job with probability f_{2t}. Similarly to separation rates, job-finding rates (f_{1t}, f_{2t}) may differ for primary and secondary earners but is homogeneous within the two groups.

  In contrast to some well-known models of labor force participation (Krusell, Mukoyama, Rogerson and Şahin 2017, Mankart and Oikonomou 2017), I assume that no one gets a job offer without exerting search effort in the same period. This helps the model to be jointly consistent with high average MPC (marginal propensity to consume) and low average MPE (marginal propensity to earn). I prioritize matching these moments over the relatively high NE flows in some labor force surveys. See section 4.2 for more details.

- **Stage 5.** Consumption-savings decision. The Bellman equation can be written as

$$
\begin{aligned}
V_t^{(5)}(e_1, e_2, z_1, z_2, a) &= \max_{c,a'} u(c) + \beta \mathbb{E}_t V_{t+1}^{(0)}(e_1, e_2, z_1, z_2, a') \\
\text{s.t. } c + a' &= (1+r_t)a + (1-\tau_t)\Big[y_{1t}(e_1, z_1) + y_{2t}(e_2, z_2) + d_t(z_1, z_2)\Big]^{1-\lambda} \\
a' &\geq \underline{a}
\end{aligned}
\tag{1}
$$

  where $V_t^{(j)}$ refers to the value function of stage j. Flow utility in this stage $u(c)$ is an increasing, concave, and smooth function of consumption. The utility costs associated with the labor supply of the secondary earner are accounted for in stage 3. As such, they are reflected in the continuation value $V_{t+1}^{(0)}$. Income tax is progressive with parameter $\lambda \in [0, 1)$ and levied on household income. Pre-tax labor earnings are given by

$$
y_{1t}(e_1, z_1) = \begin{cases} w_t z_1 & \text{for } s_1 = E_g \\ (1-\varrho) w_t z_1 & \text{for } s_1 = E_b \\ b z_1 & \text{for } s_1 = U \end{cases} \qquad y_{2t}(e_2, z_2) = \begin{cases} w_t z_2 & \text{for } s_2 = E \\ 0 & \text{for } s_2 = N \end{cases} \tag{2}
$$

  where w_t is the common real wage per efficiency units of labor, ϱ is the productivity penalty in bad jobs, and b is the unemployment benefit. For parsimony, I assume that only primary earners get unemployment benefits.[10] Finally, $d_t(z_1, z_2)$ denotes income from other sources.

Notation. Let $P_t(e_2'|e_1, e_2, z_1, z_2, a)$ denote the probability that a household with state (e_1, e_2, z_1, z_2, a) chooses employment status e_2' in stage 3. Let $a_t(e_1, e_2, z_1, z_2, a)$ and $c_t(e_1, e_2, z_1, z_2, a)$ denote the asset and consumption policy functions in stage 5. From now on, I will not write out the elements of the state space explicitly. Let $D_t^{(j)}$ denote the probability measure ("distribution") of households over the entire state space in the beginning of stage $j = 1, \ldots, 5$. Similarly, let $D_t^{(j)}(X)$ denote the measure of households over the subspace where condition X holds. For example, $D_t^{(j)}(e_1 = U)$ refers to the measure of households with an unemployed primary earner, defined over the rest of the state space.

3.2 Retailers

There is a continuum of firms indexed by j who are engaged in monopolistic competition. They produce differentiated goods using a linear technology in labor with the same productivity $y_{jt} = \Theta_t L_{jt}$. They do not buy labor directly from households. Instead, they buy it from a competitive labor agency for price h_t. Each retailer sets the price of its product p_{jt} subject to a demand curve with constant elasticity ϵ_p and quadratic price adjustment costs as in Rotemberg (1982). Retailers discount future profits with the economy-wide ex-ante real interest rate r_t^e subject to an aggregate risk premium shock ε_t^{rp}.

[10] If secondary earners had UI benefits, I'd have to distinguish three non-employment states: unemployed and eligible for benefits, unemployed and ineligible for benefits, and non-participant. This is doable but not crucial for the results.

This is a standard New Keynesian setup. There exists a symmetric equilibrium in which all retailers produce the same amount of goods and set the same price. Omitting j subscripts, the Bellman equation of any one retailer is

$$
\begin{aligned}
J_t(p_{t-1}) = \max_{L_t, y_t, p_t} & \left\{ \frac{p_t}{P_t} y_t - h_t L_t - \frac{\Psi}{2} \left[\log \left(\frac{p_t}{p_{t-1}} \right) \right]^2 Y_t + \mathbb{E}_t \frac{J_{t+1}(p_t)}{1 + r_t^e + \varepsilon_t^{rp}} \right\} \\
\text{s.t. } y_t &= \Theta_t L_t \\
y_t &= \left(\frac{p_t}{P_t} \right)^{-\epsilon_p} Y_t
\end{aligned}
\tag{3}
$$

where Y_t is aggregate output and P_t is aggregate price level that the retailers take as given. Optimal price setting gives rise to a New Keynesian Phillips curve

$$
\log(1+\pi_t) = \frac{\varepsilon_p}{\Psi} (mc_t - mc_{ss}) + \mathbb{E}_t \frac{1}{1 + r_t^e + \epsilon_t^{rp}} \frac{Y_{t+1}}{Y_t} \log(1 + \pi_{t+1}) \tag{4}
$$

where real marginal cost is $mc_t = h_t / \Theta_t$.

3.3 Labor agency

There is a competitive labor agency that hires all workers on a frictional labor market. Search is random. The firm posts vacancies v_t, each of which is filled with probability q_t. Following Christiano, Eichenbaum and Trabandt (2016), I assume a two-tiered cost of hiring. The agency pays κ_v to create a vacancy and then κ_h once the vacancy is filled. The role of κ_h is similar to wage stickiness in models without search and matching. It dampens the procyclicality of marginal costs and hence profits. This is especially important in HANK models where strongly countercyclical profits can have large—and unrealistic—redistributive effects (Broer, Harbo Hansen, Krusell and Öberg, 2020).

I assume that the labor agency does not observe the productivity of individual workers, only average labor productivity Z_t. Z_t is time-varying for two reasons. First, the share of primary earners employed in good jobs falls in recessions. Second, the subset of secondary earners who choose to participate and have jobs varies with the business cycle. Given the assumption of random search, Z_t is sufficient for the agency to figure out optimal employment N_t. Endogenous participation also implies that probability of keeping the average incumbent worker P_t^{keep} is time-varying. The firm has to know P_t^{keep} to figure out how much vacancies it has to post to hit its employment target. The formal definitions of the sufficient statistics (Z_t, P_t^{keep}) are somewhat tedious, thus I relegate them to appendix A.2.

All in all, the Bellman equation of the labor agency can be written as

$$
\begin{aligned}
J_t(N_{t-1}) &= \max_{N_t, v_t} (h_t - w_t) Z_t N_t - (\kappa_v + \kappa_h q_t) v_t + \mathbb{E}_t \frac{J_{t+1}(N_t)}{1 + r_t^e + \varepsilon_t^{rp}} \\
\text{s.t. } N_t &= P_t^{keep} N_{t-1} + q_t v_t
\end{aligned}
\tag{5}
$$

which implies a job creation curve

$$
\frac{\kappa_v}{q_t} + \kappa_h = (h_t - w_t) Z_t + \mathbb{E}_t \frac{P_{t+1}^{keep}}{1 + r_t^e + \varepsilon_t^{rp}} \left(\frac{\kappa_v}{q_{t+1}} + \kappa_h \right) \tag{6}
$$

Following Graves (2020), I assume that the real wage tracks the labor price with elasticity ϵ_w

$$
\frac{w_t}{w_{ss}} = \left(\frac{h_t}{h_{ss}} \right)^{\epsilon_w} \tag{7}
$$

Alternatively, Nash bargaining between the labor agency and a union representing all workers is straightforward to implement.

3.4 Matching

New matches are formed on the labor market according to the matching function from Den Haan, Ramey and Watson (2000)

$$
M(u_t, v_t) = \frac{u_t v_t}{(u_t^\ell + v_t^\ell)^{\frac{1}{\ell}}} \tag{8}
$$

where $u_t = u_{1t} + \vartheta u_{2t}$ is the sum of primary earners and secondary earners that seek jobs and ϑ is the relative search efficiency of secondary earners. Defining labor market tightness as $\theta_t = v_t / u_t$, the job finding and vacancy filling probabilities are

$$
f_t = f_{1t} = \frac{\theta_t}{(1 + \theta_t^\ell)^{1/\ell}}, \qquad f_{2t} = \vartheta f_t, \qquad q_t = \frac{f_t}{\theta_t} \tag{9}
$$

This setup implies that the job-finding rates of primary and secondary earners in terms of log-deviation from steady state are equal. Based on appendix B, this is not bad as a first approximation. Table B2 shows that the cyclicality of logged UE transition rates of men and women are quite similar.[11]

3.5 Government policy

The fiscal authority collects income taxes T_t and issues long-term bonds B_t to finance its expenditures on the final good G_t and on unemployment benefits UI_t. A long bond issued in period t pays δ^s in period $t + 1 + s$ for all $s \geq 0$. Assuming standard one-period bonds ($\delta = 0$) would imply an

[11] The unemployment rate of men is much more procyclical than the unemployment rate of women, but the gap is driven primarily by the separation rate (EU transition) that is exogenous in this model.

unrealistically high exposure of government budget to fluctuations in the short-term interest rate. This can matter a great deal in HANK models because fiscal policy is generically non-Ricardian. Given the economy-wide short-term real interest rate r_t^e, the bond price q_t^b satisfies[12]

$$q_t^b = \frac{1 + \delta \mathbb{E}_t q_{t+1}^b}{1 + r_t^e} \tag{10}$$

The bond price jumps in response to unanticipated aggregate shocks. The ex-post return r_t that bond holders get is

$$1 + r_t = \frac{1 + \delta q_t}{q_{t-1}} \tag{11}$$

Tax revenues are given by

$$T_t = \int \left[y_t - (1 - \tau_t) y_t^{1-\lambda} \right] dD_t^{(5)} \tag{12}$$

where $y_t = y_{1t} + y_{2t} + d_t$ denotes the taxable income of a household. Similarly, unemployment claims equal

$$UI_t = \int b z_1 dD_t^{(5)} (e_1 = U) \tag{13}$$

The government budget constraint is

$$T_t + q_t^b B_t = G_t + UI_t + (1 + \delta q_t^b) B_{t-1} \tag{14}$$

Following Auclert, Rognlie and Straub (2020), I assume that the fiscal authority adjusts the tax rate τ_t to stabilize debt-to-output ratio in the long run according to the rule

$$\tau_t - \tau_{ss} = \phi_B q_{ss} \frac{B_{t-1} - B_{ss}}{Y_{ss}} \tag{15}$$

where $\phi_B > 0$ governs the speed of fiscal adjustment. Government spending G_t is a free exogenous variable.

Monetary policy sets the nominal interest rate i_t according to a standard inertial Taylor rule

$$i_t = \rho_r i_{t-1} + (1 - \rho_r) \left[i_{ss} + \phi_\pi \pi_t \right] + \varepsilon_t^{mp} \tag{16}$$

where $\rho_r \in [0, 1)$ is the persistence of the policy rate, and ε_t^{mp} is a monetary policy shock.

[12]This pricing equation can be thought of as a no arbitrage condition between the long bond and a risk-free asset with return r_t^e that is in zero net supply.

3.6 Market clearing

I assume that firm equity is non-tradable, and the profit of retailers and the labor agency is transferred to households according to the incidence rule $d_t(z_1, z_2)$ that satisfies the accounting identity

$$\int d_t(z_1, z_2) dD_t^{(5)} = Y_t \left[1 - \frac{\Psi}{2} \log(1+\pi_t)^2\right] - w_t Z_t N_t - \kappa_t q_t v_t \tag{17}$$

Asset market clears when private sector savings equal the value of government debt

$$\int a_t dD_t^{(5)} = q_t^b B_t \tag{18}$$

Labor market clears when demand of retailers equal supply of labor agency

$$L_t = Z_t N_t \tag{19}$$

Goods market clears when output is fully spent on private consumption, public consumption, hiring costs, and price adjustment costs

$$Y_t = \int c_t dD_t^{(5)} + G_t + (\kappa_v + \kappa_h q_t) v_t + \frac{\Psi}{2} \log(1+\pi_t)^2 Y_t \tag{20}$$

In appendix A.1, I demonstrate what Walras's law holds, by deriving equation (20) from the other market clearing conditions and budget constraints. The definition of competitive equilibrium is standard and relegated to appendix A.2.

4 Calibration

With the model set up, I proceed with describing the calibration strategy and validation of the model.

4.1 Calibration strategy

My main concern is to capture the extent of unemployment risk. This has three components. First, the frequency and length of unemployment spells is dictated by job finding and separation rates. Second, job loss leads to income loss that persists well beyond the original unemployment spell (e.g. Jacobson, LaLonde and Sullivan 1993, Davis and von Wachter 2011). Third, many households have trouble smoothing transitory income shocks which transmit to their consumption (Johnson, Parker and Souleles 2006, Fagereng, Holm and Natvik 2021). The rest of the calibration follows Gornemann et al. (2021) and Auclert et al. (2020) for the most part. Some adjustments are necessary given that my model does not have capital.

Households. In mapping the primary/secondary earner setup to the data, I identify primary earners with married men and secondary earners with married women. This is a gross simplification that I make for tractability—like most of the added worker literature.

The utility function is $u(c) = \frac{c^{1-1/\sigma}}{1-1/\sigma}$ with an EIS of $\sigma = 0.5$. I set the borrowing limit to $\underline{a} = 0$. The discount factor β is calibrated internally to deliver an average annual MPC of 55%.

I assume that productivities (z_1, z_2) follow independent AR(1) processes that I discretize on 7×7 grid via the Rouwenhorst method. I set the persistence to $\rho_e = 0.95$ and choose the standard deviations to hit the cross-sectional standard deviation of log pre-tax income of 0.943 among primary earners and 0.86 among secondary earners. These are the values that Song, Price, Guvenen, Bloom and Von Wachter (2019) report for men and women, respectively. I normalize the mean productivity of primary earners to 1 and calibrate the mean of secondary earners to match a gender wage gap of 19%. This is the average gender wage gap in the CPS between 1995 and 2019.

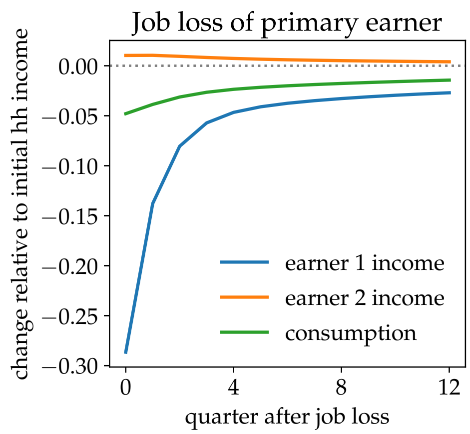
The progressivity parameter of the income tax schedule is set to $\lambda = 0.18$ based on Heathcote, Storesletten and Violante (2017). I set unemployment benefits b to 20% of the real wage. Although the typical replacement rate in the United States is close to 50%, more than half of unemployed individuals do not receive benefits, even if their unemployment duration is short enough to qualify (Graves, 2020). I fix the productivity penalty in bad jobs to $\varrho = 0.25$, and the probability of moving to a good job (from either a bad job or unemployment) to $\pi^{up} = 1 - \pi^{g} = 0.025$ as in Gornemann et al. (2021). These choices imply that an individual who loses a good job will earn 15% less after 6 years.

I calibrate search frictions to hit targets for quarterly labor market transition probabilities of married men and women aged 25–54 from the CPS. For primary earners, I set $f_1 = 0.59$ to match the UE transition probability, and $s = 0.10$ to match the probability of staying employed. That is, separations are mapped to the sum of EU and EN transition probabilities, at least for primary earners. In contrast, secondary earners have a meaningful participation decision, which allows me to distinguish EU and EN flows in the context of the model.I set $f_2 = 0.45$ to match the UE transition probability and calibrate $\{\varphi, \chi, s_2\}$ jointly to match the employment rate, EU transition rate, and EN transition rate. Appendix B describes in detail how I arrive at these targets.

Rest of the model. I use TFP Θ to normalize output to $Y = 1$. I fix the elasticity of substitution between intermediate goods at $\varepsilon_p = 7$ and set price adjustment cost $\Phi = 140$. These choices imply that the slope of the Phillips curve is 0.05. I fix the real interest rate at $r = 0.005$ and choose the decay rate of government bonds δ to match the average duration of US government debt of 5 years. I assume that government spending G is 20% of output. Given these choices, I solve for the amount of bonds B to clear the asset market and for tax rate τ to satisfy the government budget constraint. This strategy leads to an aggregate liquidity to annual output ratio of $A/(4Y) = 0.21$, almost the same value as in Auclert et al. (2020). The remaining policy parameters are set to standard values: $\phi_B = 0.1$, $\phi_\pi = 1.5$, and $\rho_r = 0.8$.

I pin down the matching parameter $\ell = 1.62$ by targeting a quarterly vacancy filling rate of $q = 0.71$. I calibrate the total cost of hiring a worker $\frac{\kappa_v}{q} + \kappa_h$ to be 7% of the quarterly wage. Given all other choices, the wage itself is pinned down by the job creation curve. I assume that κ_h accounts for 94% of the hiring cost as in Christiano et al. (2016). I set the elasticity of wage

Figure 1: Average consumption and labor supply responses to two kinds of income shocks



$\varepsilon_w = 0.45$ as in Graves (2020).

4.2 Validation

Before using the model for counterfactual experiments, I verify that it's predictions for household behavior are consistent with the empirical evidence from section 2.

Figure 1 show average consumption and labor supply responses to two kinds of unanticipated income shocks. The left panel shows the effect of a small one-time increase in income, the HANK literature's favorite yardstick of household behavior. The annual MPC—the amount consumed within the first year—is targeted in the calibration. The blue line shows that time path fits the evidence in Fagereng et al. (2021), too: consumption jumps on impact and then decays slowly. Although most HANK models can fit iMPCs rather easily, models with frictionless labor supply can struggle to match the small and flat response of labor supply at the same time.[13] My model generates this pattern thanks to a sufficiently high degree of search frictions: very few secondary earners will give up their jobs upon receiving a one-time transfer.

Restricting labor supply to the extensive margin subject to search frictions does not necessarily deliver low MPEs. Models of endogenous labor force participation typically assume that non-participants also receive job offers, albeit at a lower rate than searchers.[14] The motivation for this is that, in labor force surveys, a significant share of respondents report being out of the labor force in one month and employed in the next. The problem, in my experience, is that matching the average NE transition rate requires a very high underlying job finding rate, since many agents refuse offers. In models with "free job offers", the average MPE can easily become too high. I avoid this issue by assuming that job finding always requires search effort. The corresponding interpretation is that we observe NE flows due to time aggregation bias and survey misclassification.

[13]See Auclert, Bardóczy and Rognlie (2021a) and references therein.

[14]Including the dual-earner household model of Mankart and Oikonomou (2017) and the single household model of Krusell et al. (2017).

Table 1: Cumulative responses relative to primary earner's income loss

	Data	Model
Spousal income	0.079	0.098
	(0.035)	
Consumption	0.396	0.348
	(0.088)	

The right panel of figure 1 shows the results of an event study of job loss in the model. We see that the primary earner's income falls by almost 30% of pre-displacement household income on impact. Recovery is rapid for a few quarters (finding a job is quick) and then it slows down (finding a good job is slow). The response of spousal earnings is tiny in comparison. It replaces less than 10% of the primary earner's income loss in the first 12 quarters. Consumption loss equals about 5% of pre-displacement household income on impact, and is very persistent. All in all, almost 35% of the income loss of the primary earner transmits into consumption in the first 12 quarters.

Table 1 compares the relative responses of spousal income and consumption to the estimates of Andersen et al. (2021). The data column shows the mean and standard deviation of their estimate from Table 2, column (4). The model's predictions are well within the range of the best available evidence.

I conclude that the model performs well in terms of matching the average responses of consumption and spousal labor supply to both small and large idiosyncratic income shocks.

5 Counterfactuals

Having quantified and validated the model, I use it to isolate the role of spousal insurance in counterfactual experiments. At the micro level, I demonstrate that spousal labor supply contributes meaningfully to consumption smoothing through unemployment spells of primary earners, despite the low average earnings response of the spouses. At the macro level, I show that spousal insurance acts as an automatic stabilizer that dampens the volatility of aggregate fluctuations.

5.1 Isolating the role of spousal insurance

I turn off spousal insurance by assuming that the participation decision in stage 3 of the household's problem is random. The optimal decision $P_t(e_2'|e_1, e_2, z_1, z_2, a)$ depends on the state of the household and of the macroeconomy. I replace this with the average decision in steady state. Formally, the counterfactual probability of choosing state $e_2' \in \{E, U, N\}$ is

$$P^*(e_2') = \int P_{ss}(e_2'|e_1, e_2, z_1, z_2, a) dD_{ss}^{(3)} \tag{21}$$

This implies that the shares of secondary earners who are employed or search for a job are the same as in the baseline economy. However, they do so at random instead of by optimal choice. Spousal labor supply responds neither to idiosyncratic shocks to the household nor to the business cycle.

The counterfactual households are still better insured than the single-earner households of typical HANK models. They pool income and assets in the face of uncorrelated shocks. To my knowledge, Kekre (2021) is the only HANK model to date that allows for passive spousal income in some form. My next results demonstrate that passive channel alone falls short of capturing spousal insurance.

At the macro level, I keep structural parameters constant and let prices adjust to restore general equilibrium. The only additional restriction I impose is that the fiscal authority adjusts its debt B such that the liquidity to output ratio remains the same as in the baseline equilibrium. This ensures that average MPC stays almost the same and facilitates a clean comparison. Total employment remains the same by construction, but output and consumption fall as employed secondary earners are not positively selected anymore. The real interest rate falls sharply to clear the asset market under a stronger precautionary saving motive.

5.2 Spousal insurance and the consequences of job loss

Households have income from four sources: (i) labor income of primary earner, (ii) labor income of secondary earner, (iii) financial income, and (iv) transfers. Job loss of the primary earner is a bigger shock to households whose main income source is (i). Relatedly, we should expect heterogeneity in their willingness and capacity to adjust (ii) and (iii) to smooth consumption. This heterogeneity is key to understand the headline result of this subsection: the average consumption loss from an unemployment spell by 20% larger in the counterfactual economy with random labor force participation of secondary earners.

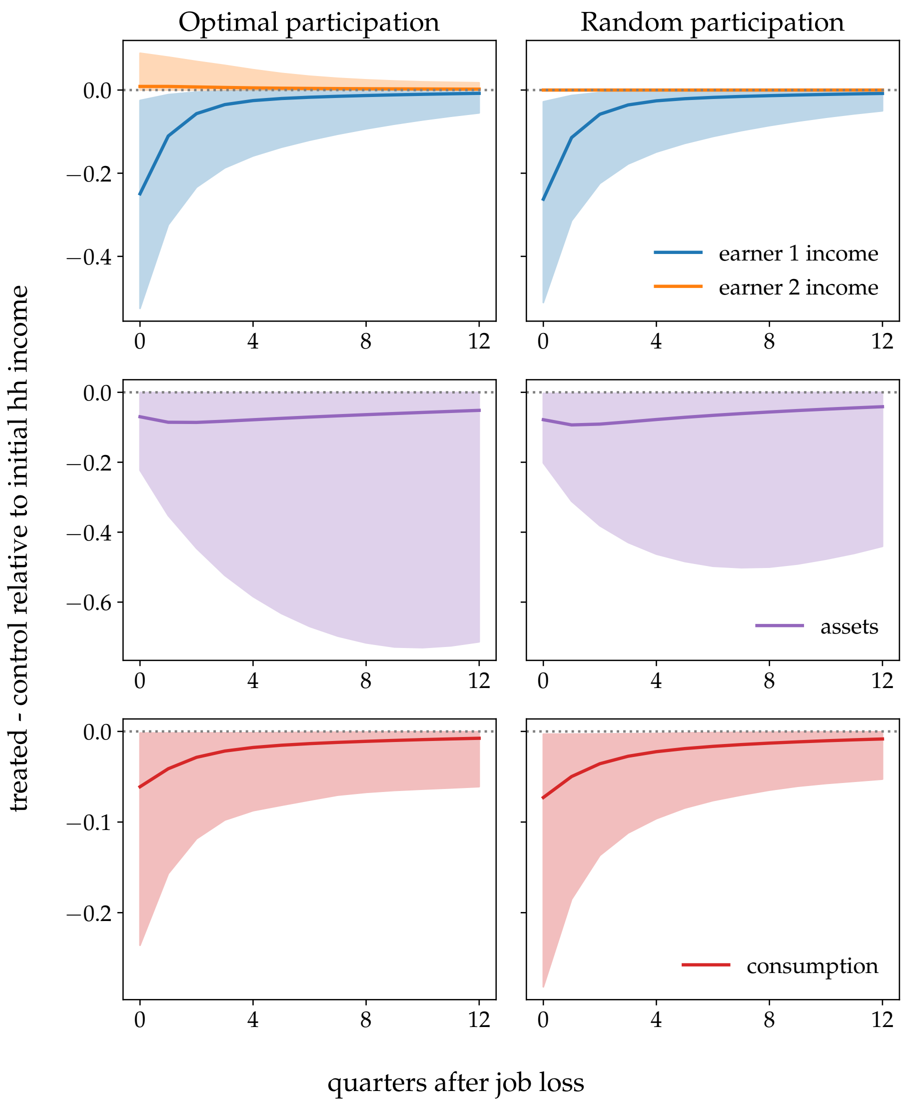
I compute the heterogeneous effects of job loss as follows. I start with the subset of households with an employed primary earner $e_1 \in \{E_g, E_b\}$. This group is heterogeneous with respect to their other states $(e_2, z_1, z_2, a) \equiv \Lambda_{-e_1}$. For every household in this set, I trace out the expected paths of $\{y_1, y_2, a, c\}$ for $t = 0, 1, \ldots, T$ periods twice. First, assuming that the primary earner loses his job in $t = 0$. Second, assuming that the primary earner does not lose his job in $t = 0$. I take the difference between the two paths to get a treatment effect for each Λ_{-e_1}.[15] Finally, I normalize the treatment effects by pre-job loss level of household income.

Figure 2 visualizes the dispersion in treatment effects under optimal and random labor force participation of secondary earners. Specifically, the shaded areas show the central 99% of treatment effects.

Let's start by considering the blue area. Job loss of the primary earner leads to as much as 51% income loss for some households, and as little as 2.8% for others. The response of y_1 is almost the same under optimal and random participation. The reason is that y_1 evolves independently of

[15] Two treatment effects for each Λ_{-e_1} to be precise, one for $e_1 = E_g$ and one for $e_2 = E_b$.

Figure 2: Heterogeneous effects of job loss



household decisions. Primary earners always want to work, thus fluctuations in their income are driven purely by shocks. In contrast, spousal earnings response is differenced out under random participation, but shows considerable dispersion under optimal participation. On the low end, the response of y_2 is zero. On the upper end, it's about 10 times larger (as a fraction of initial household earnings) than the mean response.

Turning to assets, we see evidence for the option value of spousal insurance. Under optimal participation, households run down their assets more aggressively in order to smooth consumption. The bottom panel shows the implications for consumption. Some households can smooth consumption perfectly, with or without spousal insurance. However, spousal insurance mitigates the largest consumption drops. Under optimal participation, the biggest loss is about 23% of previous income, which rises to more than 28% under random participation. All in all, the present value of expected consumption loss from an unemployment spell is 20% larger under random participation than under optimal participation.

I conclude that the consumption smoothing benefit of spousal insurance is much more substantial than one would expect based on how small the response of spousal earnings is on average. The first reason is *selection*: the average is pulled down by households who don't need to raise spousal earnings at all to cope with the shock. The second reason is *option value*: households use liquid assets more aggressively if they can count on spousal earnings.

5.3 Spousal insurance and aggregate shocks (incomplete)

I argued that spousal labor supply mitigates the consequences of job loss at the household level. The next step is to quantify the role of spousal insurance on macroeconomic dynamics over the business cycle.

The potential to influence aggregate dynamics comes from the fact that spousal insurance affects the precautionary behavior of almost every household. And change in the collective behavior of households creates spillovers in general equilibrium that may amplify or dampen the effect. It does not matter that most households don't experience job loss even in a deep recession.

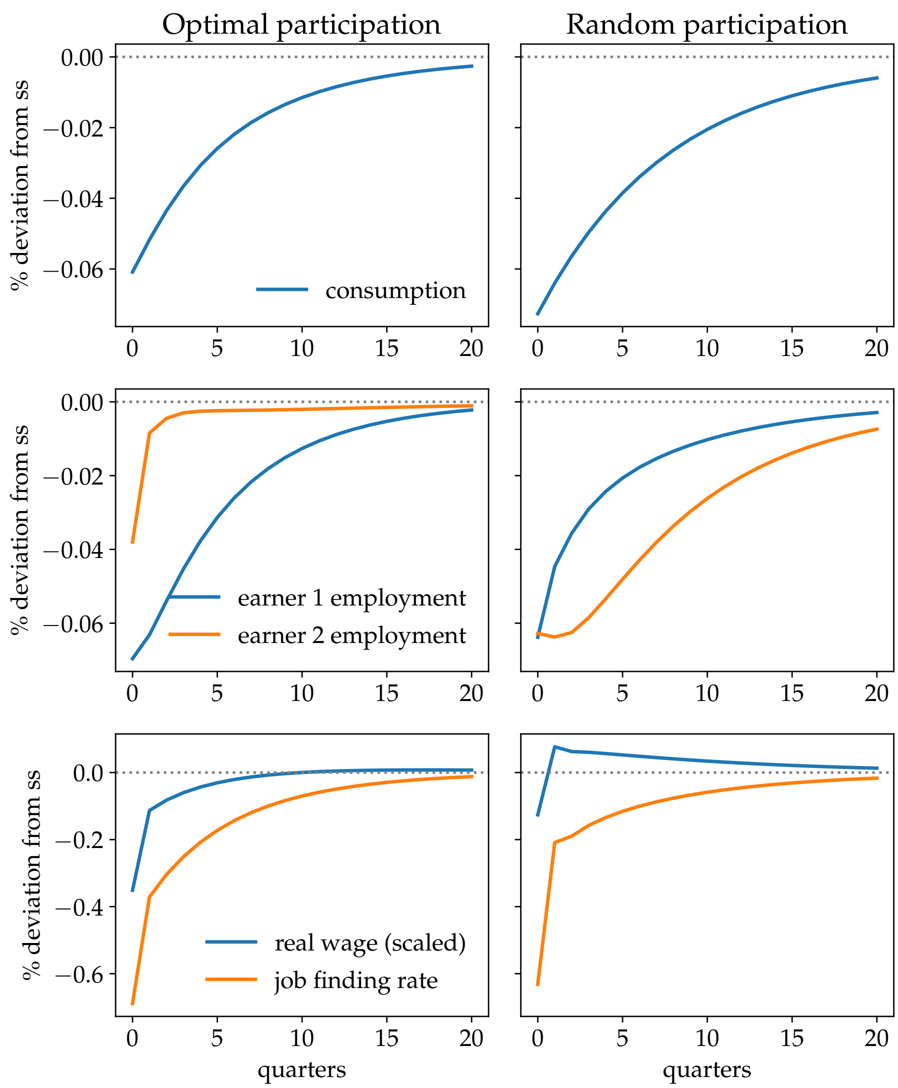
My model captures two forms of general equilibrium spillovers that seem particularly relevant. First, if aggregate demand becomes less procyclical due to spousal insurance, it dampens countercyclical unemployment risk. This is standard Keynesian cross logic. Second, secondary earners may crowd out primary earners in the search for open vacancies. This is the logic of congestion externality in search models.

Figure 3 shows the impulse responses to persistent increase in the risk premium ε_t^{rp}. This is a pure aggregate demand shocks. The labor agency cuts back on vacancy creation which increases unemployment and creates a recession. Under random participation, aggregate consumption falls more and more persistently. To be precise, the present value of aggregate consumption loss in 33.5% larger under random participation.

The second and third rows provide some insight into this result. Under optimal participation, the employment rate of secondary earner is almost acyclical. It falls initially, but recovers very rapidly as households react to the shock and overcome search frictions. Under random participation, the employment rate of secondary earners is even more countercyclical than that of primary earners. We see congestion externality from the fact that the employment of primary earners—which is driven purely by the job finding rate—actually falls more under optimal participation. Moreover, the real wage (which tracks the labor price) falls less and eventually rises under random participation. This suggests that labor supply is weaker relative demand in the counterfactual economy.

In sum, the aggregate demand channel dominates the negative labor market spillovers. Spousal insurance acts as a powerful automatic stabilizer. A careful analysis of aggregate dynamics—unpacking the transmission mechanism and considering multiple shocks—is a work in progress.

Figure 3: Impulse responses to contractionary risk premium shock



6 Conclusion

I develop a model of dual earner households and uninsurable unemployment risk that closely matches the available empirical evidence on the consequences of job loss. I use the model to argue that the low average response of spousal earnings is consistent with sizable consumption smoothing benefits of spousal insurance. To derive the aggregate implications of spousal insurance, I embed this household block in a general equilibrium model with nominal rigidities and search and matching frictions on the labor market. The model implies that spousal insurance acts as a powerful automatic stabilizer that dampens the volatility of aggregate output, consumption, and employment.

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A Appendix to section 3

A.1 Walras's law

Let's start by aggregate household budget constraint

$$C_t + A_t = (1+r_t)A_{t-1} + (1-\tau_t)\int y_t^{1-\lambda} dD_t^{(5)} \tag{22}$$

Substituting the definition of tax revenues (12) and the government budget (14) we get

$$C_t + A_t = (1+r_t)A_{t-1} + \int y_t dD_t^{(5)} - T_t \tag{23}$$

$$C_t + A_t = (1+r_t)A_{t-1} + \int y_t dD_t^{(5)} - G_t - UI_t - (1+\delta q_t^b)B_{t-1} + q_t B_t \tag{24}$$

Next, use asset market clearing (18) and the ex-post return on long bonds (11) to eliminate A_t terms

$$C_t + G_t = (1+r_t)q_{t-1}B_{t-1} + \int y_t dD_t^{(5)} - UI_t - (1+\delta q_t^b)B_{t-1} \tag{25}$$

$$C_t + G_t = (1+\delta q_t)B_{t-1} + \int y_t dD_t^{(5)} - UI_t - (1+\delta q_t^b)B_{t-1} \tag{26}$$

$$C_t + G_t = \int y_t dD_t^{(5)} - UI_t \tag{27}$$

Let's unpack income, which consists of labor income of primary and secondary earners, unemployment benefits of primary earners, and dividends.

$$C_t + G_t = w_t Z_t N_t + \int d_t(z_1, z_2) dD_t^{(5)} \tag{28}$$

Finally, use the expression for dividends (17)

$$C_t + G_t = Y_t\left[1 - \frac{\Psi}{2}\log(1+\pi_t)^2\right] - \kappa_t q_t v_t \tag{29}$$

which can be rearranged to obtain (20) in the main text.

A.2 Competitive equilibrium

Given initial conditions for the distribution of households D_{-1}, employment N_{-1}, government debt B_{-1}, and sequences of exogenous variables $\{\epsilon_t^{rp}, \epsilon_t^{mp}, \Theta_t, G_t\}$, a competitive equilibrium is a sequence of prices $\{\pi_t, w_t, h_t, r_t^e, r_t, i_t, q_t^b\}$, aggregates $\{Y_t, L_t, \tau_t, mc_t, Z_t, N_t, q_t, v_t, P_t^{keep}, \theta_t, u_t, f_t, f_{1t}, f_{2t}, T_t, UI_t, B_t\}$, policy functions $\{a_t, c_t, P_t\}$, and distributions $\{D_t^{(j)}\}$ such that households optimize, retailers optimize, labor agency optimizes, wage rule is satisfied, monetary and fiscal policies follow their rules, markets clear, job finding and vacancy filling probabilities are consistent with the matching function, and $\{N_t, Z_t, P_t^{keep}\}$ are consistent with the laws of motion of the household block. Specifically,

$$N_t = \underbrace{D_t^{(5)}(e_1 = \{E_g, E_b\})}_{N_{1t}} + \underbrace{D_t^{(5)}(e_2 = E)}_{N_{2t}} \tag{30}$$

$$Z_t N_t = \int z_1 dD_t^{(5)}(e_1 = E_g) + \int (1-\varrho) z_1 dD_t^{(5)}(e_1 = E_b) + \int z_2 dD_t^{(5)}(e_2 = E) \tag{31}$$

$$P_t^{keep} = \frac{N_{1t-1}}{N_{t-1}}(1 - s_{1t}) + \frac{N_{2t-1}}{N_{t-1}}\left(1 - s_{2t} - \int P_t(N|\bullet)\, \mathrm{d}D_t^{(3)}(e_2 = E)\right) \tag{32}$$

B Data

This appendix presents data on labor market transition probabilities of US workers from the Current Population Survey. The observations inform the setup of the model in section 3 and some moments serve as explicit calibration targets in section 4.

B.1 CPS data

The Current Population Survey is the primary source of labor force statistics for the population of the United States. It is conducted at the household level, and provides information about all household members. The most convenient way to access the micro data is to download the harmonized files from IPUMS[16]. I use the basic monthly files and the Annual Social and Economic Supplement (ASEC) for the years 1962–2019. The monthly files are the source of worker flows. The ASEC provides information on wages. In all cases, I restrict the sample to the civilian population aged 25–54 in order to reduce the effect of higher education and retirement on the outcomes.

The basic monthly files have a rotating panel structure. Households are interviewed for four months, have eight months off, then are interviewed again for four months. Therefore, in principle, 75% of households are observed in two consecutive months. I link individuals based on their unique identifier. I validate matches using gender, age, and marital status. Keeping matches where marital status remains constant is in line with my theoretical model which abstracts from divorce.

[16] https://cps.ipums.org/cps/

Given the linked sample, the transition probability between, say, employment and unemployment in month t can be computed as follows. Count people who report being employed in $t-1$ and unemployed in t, then divide by the number of all people who report being employed in $t-1$. By construction, the number is between 0 and 1. To make the flows representative of the intended population, I use the time-t sample weights.

B.2 Labor market flows

Figure B1 shows all six transition probabilities by gender and marital status for the period 1976–2019. One of the the most prominent features of these time series is the decline in the EN transitions by married women that lasted until the mid 1990s. Since my primary interest is business cycle fluctuations, I choose the 1995–2019 period as my baseline sample. By this time female labor force participation has plateaued. Although most of the observations I make in this appendix apply to the entire sample, separating recent cycles from long-term trends makes the exercise cleaner.

Tables B1, B2, and B3 condense the information in the time series into just two numbers: their long-run average and cyclicality. I measure the latter as the unconditional elasticity with respect to detrended GDP, in the spirit of Doepke and Tertilt (2016). To be precise, I report β from the linear regression $\log p_t = \alpha + \beta \log Y_t + u_t$ where p_t is a quarterly average of a monthly transition rate[17], and Y_t is quarterly real GDP HP-filtered with a smoothing parameter of 1600.

Outflows from employment. Table B1 summarizes the EU and EN flows. First, the relative importance of EU and EN flows differ markedly by gender. For men, average EU and EN flows are approximately the same. For women, the average EN flow is significantly higher than the average EU flow. Second, the level differences between the four groups are large: the average EU rate is more than twice as large for single men than for married women; and the average EN rate of married women is more than three times as large as that of married men. The bottom panel shows that the EU rate is strongly countercyclical for all groups, with an almost twofold difference between men and women.[18] In contrast, the EN rate is acyclical for singles and married men, and mildly procyclical for married women.

In interpret these findings as follows. EU flows are mostly involuntary: resulting from layoffs, firings, and expiration of temporary contracts. Such events become more common in recessions. EN flows reflect a mix of choices (to not search actively) and acyclical shocks (e.g. to health). The latter (choices and acyclical shocks) are more relevant for women than for men. Notably, the procyclical EN rate of married women is indicative of spousal insurance on the exit margin provided by women.

Inflows to employment. Table B2 summarizes the UE and NE flows. The panel on averages shows two well-known facts about US labor markets. First, monthly UE flows are high, which translates into short unemployment durations. Second, NE rates are far from negligible. Turning

[17] The quarterly flows display strong seasonal patterns, I adjust them by running the X-13ARIMA-SEATS program provided by the US Census Bureau with default parameters.

[18] Albanesi and Şahin (2018) estimate that gender difference in industry composition accounts for most of the difference in payroll employment changes during recessions.

to cyclicality, we see that UE flows are strongly procyclical for all groups, and more similar than EU flows. Men have somewhat more procyclical job-finding rates than women, but the difference is not too large. NE rates are also procyclical, albeit to a much lesser degree.

In interpret these findings as follows. NE transitions require finding a job, which is less likely in recessions. However, a large share of non-participants don't want a job, which mitigates the cyclicality of NE flows relative to UE flows. Notice that married people have significantly less procyclical NE flows than single people, which is indicative of spousal insurance on the entry margin.

Participation margin. Table B3 summarizes the UN and NU flows. Note that these flows are somewhat less reliable than the flows on the employment margin, because the CPS is prone to classification error between U and N (Abowd and Zellner 1985). With this caveat in mind, the UN flows are procyclical across the board, though slightly more so for the married than singles. Elsby, Hobijn and Şahin (2015) attribute this to a composition effect. In recessions, a large number of workers who lose their jobs have high attachment to the labor market and thus are less likely to leave the labor force.

NU flows in turn are countercyclical and significantly more so for married people. Again, this difference is consistent with the added worker effect: non-working spouses enter in bad times when the primary earner faces more risk. The conventional wisdom is that the added worker effect should be stronger for women, who are more likely to be secondary earners. This is not what we see in aggregate NU flows: they are more cyclical for married men than women and substantial for singles as well. This is sometimes interpreted as evidence that the added worker effect is weak (Elsby et al. 2015). This is certainly true in the sense that the added worker effect cannot be the dominant driver of aggregate NU flows. However, it does not mean that the added worker effect is weak at the household level. In the aggregate, it may be masked by the fact that, among non-participants, the average married woman is less attached to the labor force than the average married man.

Correlation of job loss within the family. If married women lost their job every time their husbands did, spousal insurance would be quite weak. Empirically, this is not the case: the correlation of EU transitions among dual-earner couples is just 0.042 in the 1995–2019 period. Such a low value is consistent with the family economics literature. For example, exploiting the longer panel in the Survey of Income and Program Participation (SIPP), Shore and Sinai (2010) report that that the probability that a married couple has overlapping unemployment spells in a year is 1.4% on average.[19]

[19]See their table 3, column (4). They emphasize that the probability of joint unemployment is larger for couples who have the same occupation, but such couples are only 3% of their sample.

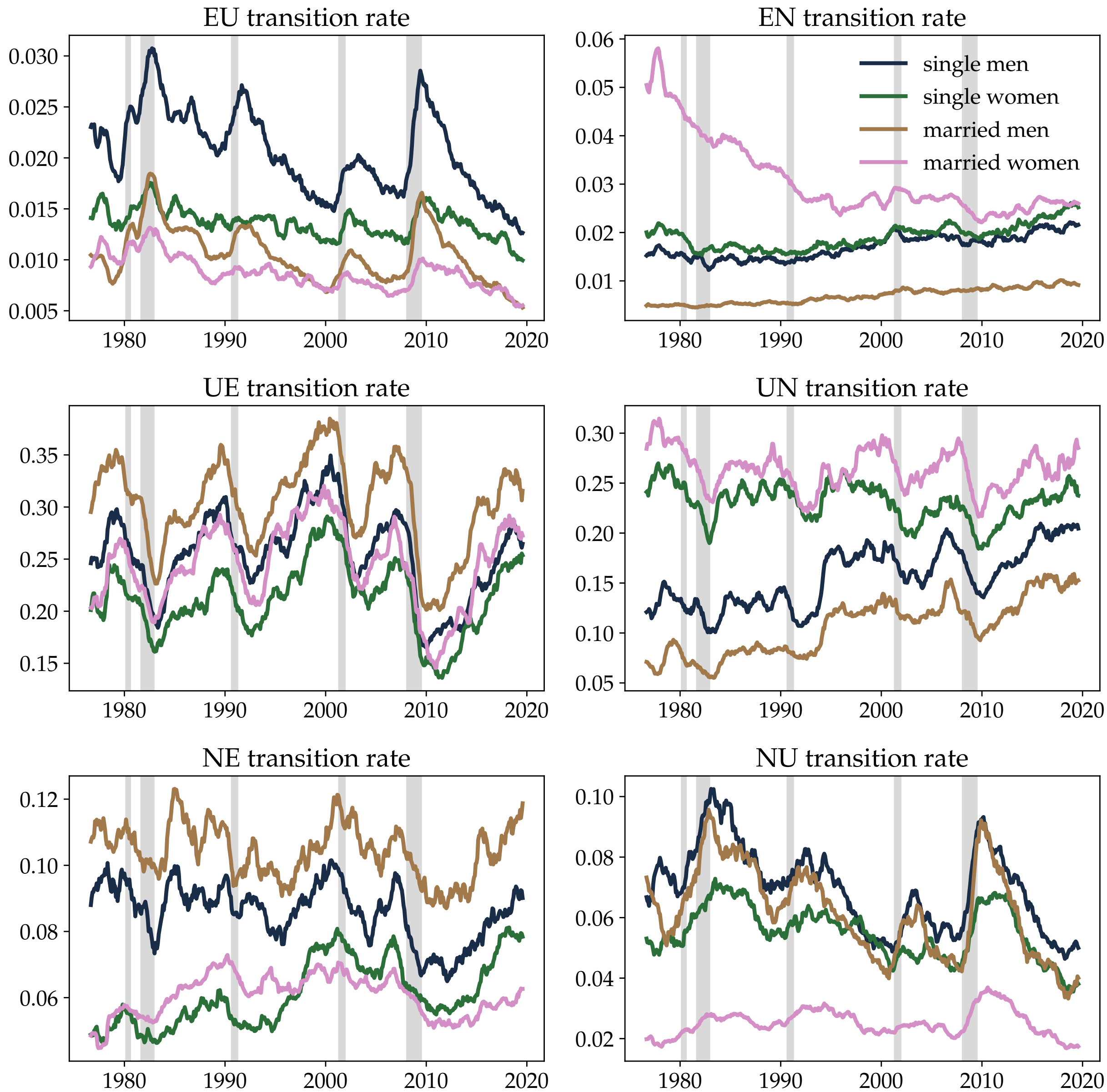

Figure B1: Worker flows by gender and marital status

Source: CPS monthly files. Sample is restricted to civilian population aged 25-54. Plotting 12-month centered moving averages of monthly transition probabilities.

Table B1: Outflows from Employment by Gender and Marital Status

		single men	single women	married men	married women
Average	*EU*	1.82%	1.29%	0.92%	0.77%
	EN	1.89%	2.06%	0.81%	2.59%
Cyclical	*EU*	-10.12***	-5.68***	-13.60***	-7.87***
		(1.53)	(0.87)	(1.92)	(0.99)
	EN	0.90	1.28	-0.61	2.40**
		(0.69)	(0.84)	(0.89)	(0.74)

Table B2: Inflows to Employment by Gender and Marital Status

		single men	single women	married men	married women
Average	UE	25%	22%	30%	25%
	NE	8%	7%	10%	6%
Cyclical	UE	10.71***	8.72***	10.36***	8.40***
		(1.32)	(1.55)	(1.17)	(1.55)
	NE	4.74***	3.74***	2.78**	2.30*
		(1.06)	(1.00)	(0.91)	(0.75)

Table B3: Flows on the Participation Margin

		single men	single women	married men	married women
Average	*UN*	18%	23%	13%	26%
	NU	6%	5%	5%	2%
Cyclical	*UN*	5.91***	4.09***	6.64***	5.43***
		(1.00)	(0.81)	(1.22)	(0.64)
	NU	-10.06***	-6.55***	-13.98***	-8.73***
		(1.34)	(1.23)	(1.47)	(1.23)

Source: Current Population Survey, monthly files for 1995–2019.
Sample: Civilian population aged 25–54.
Average: average of monthly transition rates.
Cyclical: elasticity to real GDP. HAC standard errors in parentheses. ***: p-value < 0.01, **: p-value < 0.05.

B.3 Calibration targets

Tables B1, B2, and B3 report monthly average transition rates. The model in section 3 is quarterly. I convert the monthly values by raising the associated 3-state Markov matrix to the power of 3. Table B4 shows the result.

Table B4: Average quarterly transition probabilities

(a) Married men

	To		
From	*E*	*U*	*N*
E	0.959	0.018	0.023
U	0.589	0.204	0.206
N	0.289	0.079	0.631

(b) Married women

	To		
From	*E*	*U*	*N*
E	0.912	0.014	0.074
U	0.451	0.132	0.417
N	0.173	0.032	0.795

In addition, I obtain an average gender wage gap of 19% for the reference period of 1995–2019 from the ASEC dataset.