

On Households and Unemployment Insurance

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Abstract

We study unemployment insurance in a framework where the main source of heterogeneity among agents is the type of household they live in: some agents live alone while others live with their spouses as a family. Our exercise is motivated by the fact that married individuals can rely on spousal income to smooth labor market shocks, while singles cannot. We extend a version of the standard incomplete markets model to include two-agent households and calibrate it to the US economy, with special emphasis on matching differences in labor market transitions among different types of households and aggregate wealth moments. Our central finding is that the current unemployment insurance program is, on average, too generous (is welfare reducing) and that married households value it less than their single counterparts. We show that this result is driven by the amount of self-insurance existing in married households and, thus, we highlight the interplay between self- and government-provided insurance and its implication for policy.

Keywords: Households, Marriage, Family, Unemployment, Unemployment Insurance, Worker Flows, Heterogeneous Agents.

JEL Codes: D91, E24, J64, J65

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1 Introduction

This paper studies the welfare effects of publicly provided Unemployment Insurance (UI) in an environment where the main source of heterogeneity among individuals is the type of household they live in: some agents live alone while others live with their spouses as a family. While the standard framework used to study the effects of UI focuses on single-agent models, this paper provides a more complete picture because of three reasons. First, as pointed out in [Choi and Valladares-Esteban \(2017\)](#), married and single individuals display striking differences in labor market dynamics and performance, even after controlling for observable differences.¹ Married individuals have lower unemployment rates than their single counterparts, suggesting that the two groups may have different needs with respect to UI. Second, the family can be an important source of insurance since, when one family member is laid off, the other can start working to smooth consumption. Third, labor supply decisions might depend on the presence of a spouse in the household and the economic situation of this spouse. Hence, the aggregate labor supply response to a change in UI can mask rich heterogeneity in the reaction of different groups of people.

The framework we use here extends the Aiyagari-Bewley-Huggett economy in [Krusell, Mukoyama, Rogerson, and Şahin \(2017\)](#).² In our model, households decide labor supply along the extensive margin, agents are subject to non-insurable income and working opportunity shocks, cannot borrow, and can only save using a risk free asset. Moreover, there is exogenous heterogeneity in terms of gender and marital status. Married agents make joint decisions within a unitary framework and pool income, consumption, and savings. The unemployment insurance program is run by a government that taxes labor income and keeps a balanced budget. Finally, the model accounts for general equilibrium in aggregate prices.

To discipline the model, we use a sample of the Current Population Survey for the U.S. economy where we remove the influence of observable characteristics (with the exception of gender and marital status) as well as other common issues found in the literature, such as time aggregation and misclassification of labor market states.³ We also discipline the model in terms of the overall asset distribution heterogeneity across households of different gender and marital status. The model

¹Throughout this paper the terms single and non-married are used interchangeably, referring to any person who is labeled as "never married", "separated", "divorced" or "widowed" in the Current Population Survey (CPS). We ignore cohabiting individuals, given the inability to distinguish them in a non-arbitrary way.

²See [Aiyagari \(1994\)](#), [Bewley \(1980\)](#), and [Huggett \(1993\)](#).

³See the details in [Choi and Valladares-Esteban \(2017\)](#).

is not only able to account for the monthly transitions across labor market states and the labor market stocks associated to these transitions, it also generates realistic outcomes for overall asset inequality and matches facts regarding the "added worker effect".⁴

Our main quantitative exercise with the model amounts to modifying the level of unemployment benefits (funded through income taxes) and computing overall and household specific welfare changes across different economies. We present three main findings. First, the UI program, as it is currently implemented, is overly generous to both the average single and married household. However, a reduction in the UI would lead to *small* welfare gains. Second, married households value the UI much less than singles. The driver of this result is that, in the model, the family is a better insurance device than the publicly provided UI program. In several counterfactual experiments we show that this result does not depend on the fact that married households face less unemployment risk than singles, that married households hold more assets, nor that the UI program redistributes from married to single households. Thirdly, we show that the employment and unemployment rates of married and single agents respond differently to changes in the generosity of the UI. That is, the response of the aggregate labor market stocks to changes in the UI masks rich heterogeneity in the responses of agents by marital status.

There are several papers which study the welfare implications and the effects of unemployment insurance programs. [Abdulkadiroğlu, Kuruşçu, and Şahin \(2002\)](#) point out how important hidden assets are in determining the optimal unemployment insurance scheme. [Gomes, Greenwood, and Rebelo \(2001\)](#) study the effects of unemployment insurance and business cycles in an incomplete markets framework in which the decision to accept or reject jobs is modeled explicitly. [Hansen and Imrohoroğlu \(1992\)](#) find that the inability of the government to distinguish between voluntary and involuntary non-employment may reduce the welfare gains of unemployment insurance. [Hopenhayn and Nicolini \(1997\)](#) show how to design an unemployment insurance program in an environment where search effort is not observable by the insurance provider. [Rendon \(2006\)](#) analyzes the interactions between wealth accumulation and job search dynamics. [Shimer and Werning \(2008\)](#) highlight the role of unemployment insurance as a liquidity provision device.

Similarly to [Abdulkadiroğlu et al. \(2002\)](#), [Gomes et al. \(2001\)](#), [Hansen and Imrohoroğlu \(1992\)](#), [Rendon \(2006\)](#), and [Shimer and Werning \(2008\)](#), in our framework agents accumulate assets to self-insure against employment shocks. We depart from these studies by introducing the family as

⁴See [Lundberg \(1985\)](#) as the inception of the literature on the "added worker effect".

another source of insurance for some of the agents in the economy (we also allow for heterogeneity in the amount of non-employment risk across types of agents).

Much less work has been done on the effects of unemployment insurance in frameworks where the family plays an important role, although there are some exceptions. The closest study to ours is [Ortigueira and Siassi \(2013\)](#), who use an Aiyagari-Bewley-Huggett economy to analyze the amount of insurance provided by married households against non-employment risks. Our analysis differs from theirs in several dimensions. Our model accounts for the labor stocks and transitions across employment, unemployment and non-participation associated with the four types of individuals considered (single females, single males, married females, and married males). Also, the UI system we consider incorporates a past-employment requirement resembling one of the eligibility conditions existing in the US system. This element plays an important role in the employment decisions of the agents.

Some other authors have also analyzed unemployment insurance in multi-agent environments. [Ek and Holmlund \(2010\)](#) study optimal unemployment insurance of couples in a Diamond-Mortensen-Pissarides framework. Our paper differs from their work in two dimensions. First, we do not consider unemployment benefits as the outside option of a worker in a bargaining process and, second, the model used here is able to account for multiple moments of the data associated with the different labor market dynamics between singles and married individuals in the US economy. [Di Tella and MacCulloch \(2002\)](#) study the provision of unemployment insurance in a context where agents form networks to share risk (these networks are what they consider families). We consider the family as the union generated by the contract of marriage and we abstract from commitment issues between spouses. Moreover, instead of a theoretical approach, we propose a quantitative exercise to test the effect of public intervention.

Although single-agent environments are predominant in quantitative macroeconomic and public policy analysis, there is a growing literature which is moving towards two-agent frameworks. [Guner, Kaygusuz, and Ventura \(2012\)](#) study the welfare implications of changes in the US tax code in a model where decisions are taken by two-earner households. [Heathcote, Storesletten, and Violante \(2010\)](#) explore the quantitative and welfare implications of the rise in college premium, the narrowing of the gender wage gap, and the increase of wage volatility using a model in which the decision unit is a two-agent household. [Hong and Ríos-Rull \(2007\)](#) analyze social security with two-member households. [Kleven, Kreiner, and Saez \(2009\)](#) study optimal taxation modeling explic-

itly second-earner decisions. We follow this stream of the literature by analyzing the implications of an unemployment insurance program in a model with single and married households.

This paper is also related to the literature that studies household interactions and frictions in the labor market. [Mankart and Oikonomou \(2016\)](#) show that a household search model can account for some regularities of the US data that cannot be replicated by single-agent search models. [Guler, Guvenen, and Violante \(2012\)](#) theoretically analyze a McCall-type search problem of a two-member household, under different types of preferences. [Dey and Flinn \(2008\)](#) study the implications of health insurance coverage in a search model where the decision unit is the household. [Flabbi and Mabli \(2012\)](#) analyze the bias in structurally estimated parameters in search models where the misspecification is related to joint-search.

2 The Model

Time is discrete and the time horizon is infinite. The economy is populated by a continuum of infinitely lived households with total mass equal to one. There are agents of two genders, females (f) and males (m). Agents may live alone, in single households (\mathcal{S}) or with their spouse, in married households (\mathcal{M}).

Single households can be composed of either one female or one male agent, while married households consist of two members, one of each gender. Hence, there are four types of agents: single females (\mathcal{S},f), single males (\mathcal{S},m), married females (\mathcal{M},f), and married males (\mathcal{M},m). A fraction $\Phi_{\mathcal{S},f}$ of the households corresponds to single females, a fraction $\Phi_{\mathcal{S},m}$ to single males, and the rest ($1 - \Phi_{\mathcal{S},f} - \Phi_{\mathcal{S},m} = \Phi_{\mathcal{M}}$) are married households.⁵ We assume household type and gender to be exogenous.

Households discount the future at rate $0 < \beta < 1$, derive utility from consumption streams over time and pay a utility cost when working or when searching for a job: this is represented by parameters $\{\alpha_{\mathcal{S},g}, \alpha_{\mathcal{M},g}\}$ and $\{\gamma_{\mathcal{S},g}, \gamma_{\mathcal{M},g}\}$ for $g \in \{f, m\}$, respectively. We further assume that if the two members of a married household work at the same time, an extra utility cost ($\alpha_{\mathcal{M}}$) is incurred, which may reflect childcare needs or missed home production. The disutility of job search is assumed to be an i.i.d. random variable, in order to capture the high level of transitions between unemployment and inactivity status for agents. Notice that our assumptions imply that there only exists an extensive margin of labor supply in our economy.

⁵We make appropriate adjustments, for example, when we account for total population as opposed to just households.

With respect to consumption, preferences are different across single and married households. For singles, it is a standard log utility, $\log(c)$, while for married households, preferences are given by:

$$\log\left(\frac{c - \underline{c}}{\phi}\right). \quad (1)$$

Our assumption above implies a unitary framework for families, in which consumption is a public good adjusted by an adult equivalence factor ϕ . Within married households, the *individual* disutilities of working ($\alpha_{\mathcal{M},g}$) and searching ($\gamma_{\mathcal{M},g}$) are suffered by the household as a whole. On top of this, we assume that married households need to sacrifice some consumption each period, in the form of a consumption floor \underline{c} . This parameter represents inherent costs of living inside a couple, and its presence introduces extra risk sensitivity for married households, which helps in matching asset moments.

The individual labor income of any agent in the economy, irrespective of gender or household type, is given by

$$(1 - \tau) wz, \quad (2)$$

where τ is a linear labor income tax, w is the equilibrium wage rate per efficiency unit of labor and z is a random variable representing efficiency units of labor. The idiosyncratic shock z is also independent of demographics and follows an AR(1) stochastic process in logs:

$$\log z' = \rho \log z + \varepsilon', \quad (3)$$

where ρ represents the persistence parameter of the process and $\varepsilon \sim N(0, \sigma_\varepsilon)$ is the innovation shock in the current period.

Besides the discrete labor supply choice, households decide how much to consume and how much to save for the future. The only technology available for saving is a risk-free asset which pays a real interest rate r . Households are not allowed to borrow against future income.

2.1 The Labor Market

Labor income shocks are not the only source of uncertainty in this economy. To capture frictions in the labor market, agents are subject to shocks to their working opportunities that determine whether an agent has the possibility to work or not in a given period. Hence, individuals can be in three mutually exclusive labor market states: employed, unemployed or out of the labor

force, which we represent by E , U and N respectively. Employed agents lose their jobs with probability $\delta_{\mathcal{H},g}$. Agents who are currently not working, receive job offers with probability $\lambda_{\mathcal{H},g}^i$, where $i \in \{N, U\}$. Generically, $\lambda_{\mathcal{H},g}^N \neq \lambda_{\mathcal{H},g}^U$, which means that the rate at which agents receiving job offers is different whether they are in the inactive (not searching) or unemployment (searching) state. This is reflected below, where agents can choose whether to be in either N or U , with the subsequent consequence on job arrival rates.

The fact that both job arrival and destruction probabilities depend on gender and household type captures potential differences among single females, single males, married females, and married males in the composition of unobservable characteristics that these groups might present in the data. For example, if there is some unobservable characteristic that leads people to both be more likely to get married and less likely to be unemployed, this parametrization should be able to capture this idea.

Agents in our model may *quit* their jobs. The decision to work or not, in the case of single households, is mainly determined by the amount of assets, productivity, and the unemployment eligibility status of the agent. For married individuals, the labor market situation of the spouse plays also a very important role along with the factors listed for singles.

2.2 The Government and the Unemployment Insurance

In this economy there is a government that taxes labor income, finances an Unemployment Insurance (UI) program, and balances its budget period by period. We assume that all agents who are hit by the destruction probability ($\delta_{\mathcal{H},g}$) and do not find a new working opportunity ($1 - \lambda_{\mathcal{H},g}$) are compensated with a transfer $b(z)$ from the government.

The UI policy is defined by two parameters: a replacement rate b and a benefit cap \bar{b} . In case of losing a job, individuals receive either $(1 - \tau)bwz$ or $(1 - \tau)\bar{b}w$ as unemployment insurance payments. The latter happens if $bz > \bar{b}$. We also control the length of unemployment benefit eligibility through a constant probability μ of becoming ineligible. Finally, we assume that the government collects labor taxes from the entire population at rate τ and gives out lump-sum transfers in amount T per household. That is, tax revenues are used both to finance the UI program and the unconditional transfer T .

2.3 Single Households

Five factors define the situation of a single household. First, whether the agent in the household is working or not. Second, the level of assets held by the agent (a). Third, her/his labor income shock (z), which evolves according to the process described in Equation (3). Fourth, the agent's eligibility for unemployment benefits in case of not being at work and, fifth, the realization of the disutility cost of job search γ .

We set up the problem of single households recursively. We denote by W_g , U_g , and N_g the value function of a single agent of gender g who is employed, unemployed, and out of the labor force, respectively. The state space for each function is given by $\{a, z, \gamma, i\}$, where i is an indicator variable on the eligibility for unemployment insurance.

Using these definitions we can further define the value of *not* having a job opportunity $J_g = \max\{U_g, N_g\}$ and the value of having one $V_g = \max\{W_g, J_g\}$. Now, the value of inactivity can be defined as:

$$N_g(a, z, \gamma, i) = \max_{a' \geq 0} \log(c) + \beta E [\lambda_{S,g}^N V_g(a', z', \gamma', i') + (1 - \lambda_{S,g}^N) J_g(a', z', \gamma', i')] \quad (4)$$

$$s.t. \quad c + a' = (1 + r)a + T.$$

The value of unemployment is given by

$$U_g(a, z, \gamma, i) = \max_{a' \geq 0} \log(c) - \gamma_{S,g} + \beta E [\lambda_{S,g}^U V_g(a', z', \gamma', i') + (1 - \lambda_{S,g}^U) J_g(a', z', \gamma', i')] \quad (5)$$

$$s.t. \quad c + a' = (1 + r)a + (1 - \tau)b(z)i + T.$$

Note that the difference between the value of inactivity versus the value of unemployment is given by the i.i.d. variable that represents the disutility cost $\gamma_{S,g}$ of searching, the different job arrival probabilities, and the potential extra income in the form of the unemployment insurance that those that are jobless (but search for a job) may receive.

For single employed households, the value of being employed is:

$$W_g(a, z, \gamma, 0) = \max_{a' \geq 0} \log(c) - \alpha_{\mathcal{S},g} + \beta E \begin{bmatrix} (1 - \delta_{\mathcal{S},g}) & V_g(a', z', \gamma', 0) & + \\ \delta_{\mathcal{S},g} \lambda_{\mathcal{S},g}^U & V_g(a', z', \gamma', 0) & + \\ \delta_{\mathcal{S},g} (1 - \lambda_{\mathcal{S},g}^U) & J_g(a', z', \gamma', 1) & \end{bmatrix} \quad (6)$$

$$s.t. \quad c + a' = (1 + r)a + (1 - \tau)wz + T.$$

From this problem, note that employed individuals who receive a separation shock, may receive a job opportunity within the period at rate λ^U .

As in [Krusell et al. \(2017\)](#), the mapping between model and data in terms of labor force status is direct: agents who are working in the model are employed. Of those not in employment, we label as unemployed those who chose to incur the search cost $\gamma_{\mathcal{S},g}$, while the rest are the inactive population.

2.4 Married Households

The state space for married households depends on the working prospects of both members of the household, as well as the level of joint savings. Thus, households need to consider $\{a, z, z^*, \gamma, \gamma^*, i, i^*\}$ as states, where we use asterisk to denote information from the second member of the household. Without loss of generality, we take females as the first member and males as the second member of the household.

Expanding on the notation for single households, the following value functions define joint labor supply decisions:

$$JJ\{a, z, z^*, \gamma, \gamma^*, i, i^*\} = \max\{UU, UN, NU, NN\},$$

$$JV\{a, z, z^*, \gamma, \gamma^*, i, i^*\} = \max\{UW, NW, JJ\},$$

$$VJ\{a, z, z^*, \gamma, \gamma^*, i, i^*\} = \max\{WU, WN, JJ\},$$

$$VV\{a, z, z^*, \gamma, \gamma^*, i, i^*\} = \max\{WW, WU, WN, UW, NW, JJ\}.$$

Take value JJ : it is the value of a household where both members do not have job opportunities. In that case, they need to decide who looks for a job and who stays at home. On the other hand, the value JV represents the value for a household where the female (first member) is jobless, while

the male (second member) can become employed. The rest of the value functions can be defined accordingly. For exposition, below we present a subset of the associated bellman equations omitting symmetric cases between household members.

The problem for a household where both members are out of the labor force is given by

$$\begin{aligned}
NN(a, z, z^*, \gamma, \gamma^*, i, i^*) &= \max_{a' \geq 0} \log \left(\frac{c - \underline{c}}{\phi} \right) \\
&+ \beta E \left[\begin{array}{cc} \lambda_{\mathcal{M},f}^N \lambda_{\mathcal{M},m}^N & VV(a', z', z^*, \gamma', \gamma^*, i', i^*) + \\ (1 - \lambda_{\mathcal{M},f}^N) \lambda_{\mathcal{M},m}^N & JV(a', z', z^*, \gamma', \gamma^*, i', i^*) + \\ \lambda_{\mathcal{M},f}^N (1 - \lambda_{\mathcal{M},m}^N) & VJ(a', z', z^*, \gamma', \gamma^*, i', i^*) + \\ (1 - \lambda_{\mathcal{M},f}^N) (1 - \lambda_{\mathcal{M},m}^N) & JJ(a', z', z^*, \gamma', \gamma^*, i', i^*) \end{array} \right] \quad (7) \\
s.t. \quad c + a' &= (1 + r)a + T.
\end{aligned}$$

In this problem we see that households are subject to twice as many employment shocks as single households, as seen from the comparison of the term in brackets of this problem versus the one in (5).

The problem for a household where both members are unemployed is given by

$$\begin{aligned}
UU(a, z, z^*, \gamma, \gamma^*, i, i^*) &= \max_{a' \geq 0} \log \left(\frac{c - \underline{c}}{\phi} \right) - \gamma_{\mathcal{M},f} - \gamma_{\mathcal{M},m} \\
&+ \beta E \left[\begin{array}{cc} \lambda_{\mathcal{M},f}^U \lambda_{\mathcal{M},m}^U & VV(a', z', z^*, \gamma', \gamma^*, i', i^*) + \\ (1 - \lambda_{\mathcal{M},f}^U) \lambda_{\mathcal{M},m}^U & JV(a', z', z^*, \gamma', \gamma^*, i', i^*) + \\ \lambda_{\mathcal{M},f}^U (1 - \lambda_{\mathcal{M},m}^U) & VJ(a', z', z^*, \gamma', \gamma^*, i', i^*) + \\ (1 - \lambda_{\mathcal{M},f}^U) (1 - \lambda_{\mathcal{M},m}^U) & JJ(a', z', z^*, \gamma', \gamma^*, i', i^*) \end{array} \right] \quad (8) \\
s.t. \quad c + a' &= (1 + r)a + (1 - \tau) [b(z)i + b(z^*)i^*] + T.
\end{aligned}$$

The main differences between this and the definition of the NN Bellman equations is the existence of i.i.d. search costs (for the female and the male) and different job arrival probabilities λ^U .

Next, consider the problem of a household where the first member (female) is working while

the second member (male) is out of the labor force:

$$\begin{aligned}
WN(a, z, z^*, \gamma, \gamma^*, i, i^*) &= \max_{a' \geq 0} \log \left(\frac{c - \underline{c}}{\phi} \right) \\
&+ \beta E \left[\begin{array}{l}
(1 - \delta_{\mathcal{M},f}) \lambda_{\mathcal{M},m}^N \quad VV(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, i^{*'}) + \\
\delta_{\mathcal{M},f} \lambda_{\mathcal{M},f}^U \lambda_{\mathcal{M},m}^N \quad VV(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, i^{*'}) + \\
\delta_{\mathcal{M},f} (1 - \lambda_{\mathcal{M},f}^U) \lambda_{\mathcal{M},m}^N \quad JV(a', z', z^{*'}, \gamma', \gamma^{*'}, 1, i^{*'}) + \\
(1 - \delta_{\mathcal{M},f}) (1 - \lambda_{\mathcal{M},m}^N) \quad VJ(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, i^{*'}) + \\
\delta_{\mathcal{M},f} \lambda_{\mathcal{M},f}^U (1 - \lambda_{\mathcal{M},m}^N) \quad VJ(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, i^{*'}) + \\
\delta_{\mathcal{M},f} (1 - \lambda_{\mathcal{M},f}^U) (1 - \lambda_{\mathcal{M},m}^N) \quad JJ(a', z', z^{*'}, \gamma', \gamma^{*'}, 1, i^{*'})
\end{array} \right] \quad (9) \\
s.t. \quad c + a' &= (1 + r)a + (1 - \tau)wz + T.
\end{aligned}$$

The problem where the female is working while the male is unemployed is quite similar and is given by:

$$\begin{aligned}
WU(a, z, z^*, \gamma, \gamma^*, i, i^*) &= \max_{a' \geq 0} \log \left(\frac{c - \underline{c}}{\phi} \right) - \gamma_{\mathcal{M},m} \\
&+ \beta E \left[\begin{array}{l}
(1 - \delta_{\mathcal{M},f}) \lambda_{\mathcal{M},m}^U \quad VV(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, i^{*'}) + \\
\delta_{\mathcal{M},f} \lambda_{\mathcal{M},f}^U \lambda_{\mathcal{M},m}^U \quad VV(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, i^{*'}) + \\
\delta_{\mathcal{M},f} (1 - \lambda_{\mathcal{M},f}^U) \lambda_{\mathcal{M},m}^U \quad JV(a', z', z^{*'}, \gamma', \gamma^{*'}, 1, i^{*'}) + \\
(1 - \delta_{\mathcal{M},f}) (1 - \lambda_{\mathcal{M},m}^U) \quad VJ(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, i^{*'}) + \\
\delta_{\mathcal{M},f} \lambda_{\mathcal{M},f}^U (1 - \lambda_{\mathcal{M},m}^U) \quad VJ(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, i^{*'}) + \\
\delta_{\mathcal{M},f} (1 - \lambda_{\mathcal{M},f}^U) (1 - \lambda_{\mathcal{M},m}^U) \quad JJ(a', z', z^{*'}, \gamma', \gamma^{*'}, 1, i^{*'})
\end{array} \right] \quad (10) \\
s.t. \quad c + a' &= (1 + r)a + (1 - \tau)[wz + b(z^*)i^*] + T.
\end{aligned}$$

Finally, consider the value for a household with two working members:

$$\begin{aligned}
WW(a, z, z^*, \gamma, \gamma^*, i, i^*) &= \max_{a' \geq 0} \log \left(\frac{c - \underline{c}}{\phi} \right) - \alpha_{\mathcal{M},f} - \alpha_{\mathcal{M},m} - \alpha_{\mathcal{M}} \\
&+ \beta E \left[\begin{array}{ll}
(1 - \delta_{\mathcal{M},f}) (1 - \delta_{\mathcal{M},m}) & VV(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, 0) + \\
\delta_{\mathcal{M},f} \lambda_{\mathcal{M},f}^U (1 - \delta_{\mathcal{M},m}) & VV(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, 0) + \\
\delta_{\mathcal{M},f} (1 - \lambda_{\mathcal{M},f}^U) (1 - \delta_{\mathcal{M},m}) & JV(a', z', z^{*'}, \gamma', \gamma^{*'}, 1, 0) + \\
(1 - \delta_{\mathcal{M},f}) \delta_{\mathcal{M},m} \lambda_{\mathcal{M},m}^U & VV(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, 0) + \\
\delta_{\mathcal{M},f} \lambda_{\mathcal{M},f}^U \delta_{\mathcal{M},m} \lambda_{\mathcal{M},m}^U & VV(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, 0) + \\
\delta_{\mathcal{M},f} (1 - \lambda_{\mathcal{M},f}^U) \delta_{\mathcal{M},m} \lambda_{\mathcal{M},m}^U & JV(a', z', z^{*'}, \gamma', \gamma^{*'}, 1, 0) + \\
(1 - \delta_{\mathcal{M},f}) \delta_{\mathcal{M},m} (1 - \lambda_{\mathcal{M},m}^U) & VJ(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, 1) + \\
\delta_{\mathcal{M},f} \lambda_{\mathcal{M},f}^U \delta_{\mathcal{M},m} (1 - \lambda_{\mathcal{M},m}^U) & VJ(a', z', z^{*'}, \gamma', \gamma^{*'}, 0, 1) + \\
\delta_{\mathcal{M},f} (1 - \lambda_{\mathcal{M},f}^U) \delta_{\mathcal{M},m} (1 - \lambda_{\mathcal{M},m}^U) & JJ(a', z', z^{*'}, \gamma', \gamma^{*'}, 1, 1)
\end{array} \right] \quad (11) \\
s.t. \quad c + a' &= (1 + r)a + (1 - \tau) [wz + wz^*] + T.
\end{aligned}$$

The bracketed term in the problem above shows all possible scenarios a household with two working members may face next period. Our exposition makes explicit the different paths in which a two agent household may end up with, for example, two job opportunities, and also how unemployment insurance eligibility changes from case to case. Only those who experience a job destruction shock are entitled to unemployment insurance payments, thus, the eligibility dummy i equals zero in cases where a member of the household may consider quitting his/her job.

The rest of the bellman equations are analogous or symmetrical and vary on three dimensions: disutility costs of working/search, probability trees for each future value function, and the budget constraint faced by the household.

2.5 Equilibrium

Output in the economy is produced by an aggregate Cobb-Douglas production function $K^\theta L^{1-\theta}$. In standard fashion, we assume a continuum of competitive firms who hire capital and efficient units of labor in spot markets, leading to aggregate prices

$$r = \theta K^{\theta-1} L^{1-\theta} - \delta_K \text{ and} \quad (12)$$

$$w = (1 - \theta) K^\theta L^{-\theta}, \quad (13)$$

where K is the sum of assets by all types of households and L is the sum of supplied efficient units of labor by them.

As for the government, it manages the unemployment insurance payments, according to parameters b (replacement rate), \bar{b} (cap on unemployment insurance payments), and μ (hazard probability of UI benefits ending), while taxing labor income at rate τ and giving transfers T to each household.

Our equilibrium concept is standard. In a steady state, we find the interest rate r , real wages w , and transfers T , such that aggregate quantities (K and L) are compatible between the problem of each household and the problem of the representative firm and the budget of the government is balanced. This is a simple extension of the equilibrium concepts in models with only single agents.

3 Mapping the model to US data

A model period is one month. The model considers four types of individuals: single females, single males, married females, and married males. We take their weights from the data, which in the year 2000 in the US economy, amounts to roughly equal shares of each population. The objective of our calibration is to match labor market transitions across different market states for the four groups, along other salient features of the US economy.

We take some parameters directly from [Krusell et al. \(2017\)](#): the AR(1) process for income shocks (equation 3) is parameterized using $\rho = 0.996$ and $\sigma_\epsilon = 0.096$.⁶ The unemployment insurance is defined by a replacement rate of $b = 0.23$; the cap on benefits equals $\bar{b} = 0.465$ of average wage in the steady state and the hazard rate of extinction of UI benefits is set to $\mu = 1/6$. We also set labor taxes to $\tau = 0.3$ and find the transfer T which balances the government budget in the steady state equilibrium. The parameter in the Cobb-Douglas production function θ is set to 0.3 and the aggregate depreciation rate is $\delta_K = 0.0067$. We also set β such that the monthly interest rate in the model is 0.33%. As for household assets, we target the empirical ratio between average assets of married households to single households of 2.8482, which in the model is related to the minimum consumption floor \underline{c} .⁷

For each household type in the model, transitions in and out of each labor market state are determined simultaneously by five parameters: the disutility of work $\alpha_{\mathcal{H},g}$, job offer probabilities out of unemployment and out of inactivity ($\lambda_{\mathcal{H},g}^U$ and $\lambda_{\mathcal{H},g}^N$ respectively), the job destruction probability

⁶We discretize using the method in [Kopecky and Suen \(2010\)](#), which is suitable for highly persistent processes.

⁷The empirical ratio between average assets of married households to single households is computed by [Kuhn and Ríos-Rull \(2016\)](#) and available at <https://sites.google.com/site/kuhnecon/home/us-inequality>.

$\delta_{\mathcal{H},g}$, and the spread in the variability of the job search cost, a parameter which we label $\epsilon_{\mathcal{H},g}^\gamma$. We again follow [Krusell et al. \(2017\)](#) and parameterize the search cost variable as a three point distribution. More specifically, we set the distribution of the search disutility for each household type (\mathcal{H},g) to be

$$\left[\bar{\gamma}_{\mathcal{H},g} - \epsilon_{\mathcal{H},g}^\gamma, \bar{\gamma}_{\mathcal{H},g}, \bar{\gamma}_{\mathcal{H},g} + \epsilon_{\mathcal{H},g}^\gamma \right], \quad (14)$$

where $\bar{\gamma}_{\mathcal{H},g} = (3.5/40)\alpha_{\mathcal{H},g}$, which reflects time-use information from [Mukoyama, Patterson, and Şahin \(2018\)](#). Although these parameters determine mechanically transitions for different households, they interact with asset accumulation decisions, so the above parameters need to be calibrated jointly to match empirical moments.

For each type of agent, there are nine transition probabilities between employment, unemployment and non-participation. However, only six are independent since transitions from the same starting labor market state must add up to one. In the model, these six moments determine the fraction of agents in each state, that is, the labor market stocks, by a simple steady state argument.⁸ Our calibration exercise targets these twenty-four data moments (six transitions times four types of agents). More specifically, we choose parameter values to minimize the square difference between model simulated data and the empirical transitions moments. Given a set of parameter values, we solve the model, finding the equilibrium in both prices and taxes, and simulate a history of fifty thousand periods for a total of one hundred thousand agents. From the simulated data, we compute transition probabilities and other statistics.

We follow [Choi and Valladares-Esteban \(2017\)](#) to compute labor market transitions, by using monthly data from the Current Population Survey (CPS) and controlling for observables and other known empirical issues.⁹ We use a sub-sample from January 2000 to December 2005, because both the unemployment rate and the female labor supply were stable during that period. Since we consider a steady state framework for our model, this sample period suits us best: there were significant increases in the supply of labor by females (especially married) from the late 1970s, which stabilized during the early 2000s.

⁸In the data, this is a very good approximation, as noted for example by [Shimer \(2012\)](#).

⁹In [Choi and Valladares-Esteban \(2017\)](#) the data is adjusted for classification errors and time aggregation bias. The variables that are controlled for are: race, age, census division, education, and the number of children in the household.

Symbol	Description	Value
β	Discount factor	0.9950
Single Male Households		
$\alpha_{\mathcal{S},m}$	Disutility of work	0.5185
$\epsilon_{\mathcal{S},m}^{\gamma}$	S.d. search cost	0.0433
$\lambda_{\mathcal{S},m}^u$	Arrival probability unemployed	0.3178
$\lambda_{\mathcal{S},m}^n$	Arrival probability OLF	0.2602
$\sigma_{\mathcal{S},m}$	Losing probability	0.0210
Single Female Households		
$\alpha_{\mathcal{S},f}$	Disutility of work	0.5117
$\epsilon_{\mathcal{S},f}^{\gamma}$	S.d. search cost	0.0427
$\lambda_{\mathcal{S},f}^u$	Arrival probability unemployed	0.2875
$\lambda_{\mathcal{S},f}^n$	Arrival probability OLF	0.2375
$\sigma_{\mathcal{S},f}$	Losing probability	0.0143
Married Households		
$\alpha_{\mathcal{M},m}$	Disutility of work male	0.1716
$\alpha_{\mathcal{M},f}$	Disutility of work female	0.3620
$\alpha_{\mathcal{M}}$	Disutility of joint work	0.0260
\underline{c}	Consumption floor	1.7010
$\epsilon_{\mathcal{M},m}^{\gamma}$	S.d. search cost male	0.0140
$\epsilon_{\mathcal{M},f}^{\gamma}$	S.d. search cost female	0.0304
$\lambda_{\mathcal{M},m}^u$	Arrival probability unemployed male	0.7861
$\lambda_{\mathcal{M},f}^u$	Arrival probability unemployed female	0.4065
$\lambda_{\mathcal{M},m}^n$	Arrival probability OLF male	0.6982
$\lambda_{\mathcal{M},f}^n$	Arrival probability OLF female	0.3577
$\sigma_{\mathcal{M},m}$	Losing probability male	0.0266
$\sigma_{\mathcal{M},f}$	Losing probability female	0.0178

Table 1: Benchmark parameter values.

Table 1 presents all parameters values along with a brief description. We separate parameters by household type. For singles, the calibration exercise returns values which are in the ballpark of previous studies, especially for the job arrival and job destruction probabilities.¹⁰ As for married households, we find two non-standard results: the level of the consumption floor \underline{c} is significant at 1.7010, in an economy where transfers T are 1.75 and average wages are 3.02. Secondly, the job arrival probability for males inside married households is calibrated to a high value, at 0.7886 when unemployed and 0.7007 when inactive. This parameterization reflects that married men have high

¹⁰See Krusell et al. (2017).

participation rates in the US economy. In the model, job arrival rates for married males need to be relatively high to match the empirical UE and NE transitions for this group. In the model, they have incentives not to work, given the insurance provided inside the household, both because relatively high level of assets (with respect to singles) and the added worker effect.

4 Results

Table 2 compares the performance of the simulated model with the data for single females while Table 3 does it for single males. On the other hand, Table 4 compares the performance of the model with the data for married females while Table 5 does it for married males.

Data				Model			
From / To	E	U	N	From / To	E	U	N
E	96.29	1.55	2.16	E	95.93	1.62	2.45
U	25.86	57.33	16.81	U	22.08	62.50	15.42
N	3.58	1.93	94.50	N	3.04	1.91	95.05
Unemployment Rate			5.88	Unemployment Rate			7.52

Table 2: Data versus Model (%). Single Females. CPS 2000-2005.

Data				Model			
From / To	E	U	N	From / To	E	U	N
E	96.81	1.10	2.09	E	96.61	1.13	2.27
U	24.72	53.61	21.67	U	21.11	60.45	18.44
N	3.10	1.74	95.16	N	2.92	1.72	95.36
Unemployment Rate			4.87	Unemployment Rate			5.67

Table 3: Data versus Model (%). Single Males. CPS 2000-2005.

Data				Model			
From / To	<i>E</i>	<i>U</i>	<i>N</i>	From / To	<i>E</i>	<i>U</i>	<i>N</i>
<i>E</i>	97.60	0.92	1.48	<i>E</i>	98.08	0.84	1.08
<i>U</i>	29.88	56.58	13.53	<i>U</i>	30.00	57.03	12.97
<i>N</i>	3.37	1.16	95.47	<i>N</i>	3.67	1.10	95.23
Unemployment Rate			2.96	Unemployment Rate			2.65

Table 4: Data versus Model (%). Married Females. CPS 2000-2005.

Data				Model			
From / To	<i>E</i>	<i>U</i>	<i>N</i>	From / To	<i>E</i>	<i>U</i>	<i>N</i>
<i>E</i>	96.18	0.77	3.05	<i>E</i>	96.45	0.83	2.73
<i>U</i>	26.78	47.02	26.20	<i>U</i>	23.58	53.42	23.00
<i>N</i>	3.30	1.13	95.57	<i>N</i>	3.27	1.26	95.47
Unemployment Rate			3.24	Unemployment Rate			3.79

Table 5: Data versus Model (%). Married Males. CPS 2000-2005.

The model does a good job of replicating the data, in terms of matching the transitions between labor market states for different types of household. The model has a especially good fit for both males and females in married households, and some difficulty to match some moments for single females, where the model over estimates the unemployment rate. Since in our model labor supply and job search decisions are intertwined with consumption-savings decisions (which are non-linear) there is no mechanical link between parameters λ and δ and transition probabilities. Thus, the fact that we can match relatively well all these moments is no minor feat. This is of special relevance when we think of the problem of married households, where two sets of employment shocks must be considered, along with a joint asset allocation decision with a fixed consumption floor.

	Data	Model
Average	2.8481	2.4137
Coefficient of Variation	0.7575	0.9019
Gini Index	0.9512	0.9612

Table 6: Wealth ratios

In Table 6, we show model results for the ratio of average assets in married households over

assets in single households. The model gets close to the data average of 2.8481, taken from the companion website to [Kuhn and Ríos-Rull \(2016\)](#). The model can also replicate qualitatively the actual ratio between the coefficient of variation of assets in married households versus the same coefficient for single households (0.7575 in the data versus 0.9019 in the model). The model gets quite close to the empirical ratio between Gini indexes of married versus singles, which is 0.9512 in the data, and indicates that overall asset inequality in the married population is lower than in the single one. The number from our model is 0.9612. Note that the latter two moments (ratios of coefficients of variation and Gini indexes) are not targeted in the calibration.

	Data	Model
Gini Assets	0.95	0.96
Duration of unemployment benefits (months)	3.82	3.06
Share of unemployed workers covered by UI (%)	39.16	63.35
Added Worker Effect	0.076	0.075

Table 7: Non-targeted moments.

Table 7 shows a comparison between predictions from our model and the data with respect to some additionally non-targeted statistics. The first statistic is the overall Gini index for assets in the entire economy. Our model gets close to the data (0.95 in the data versus 0.96 in the model), in part because of the existence of more heterogeneous types of households in our model than those in standard incomplete markets models (where only single households exist). Figure 1 shows the asset distribution in the baseline economy, by marital status. The figure shows that single households are slightly more concentrated towards zero assets, while the dispersion in the married group is higher.

The next two statistics of interest in Table 7 are related to coverage of unemployment benefits. In the US economy, average duration of unemployment benefits amounts to 3.82 months, while in the model, the number is 3.06.¹¹ On the other hand, 39.16% of the unemployed are covered by unemployment insurance in the data, number which comes from the US Department of Labor, Employment and Training Administration; the model predicts that 63.35% of those looking for a job take up unemployment benefits.

¹¹The data on unemployment duration comes from the FRED database (Saint Louis FED).

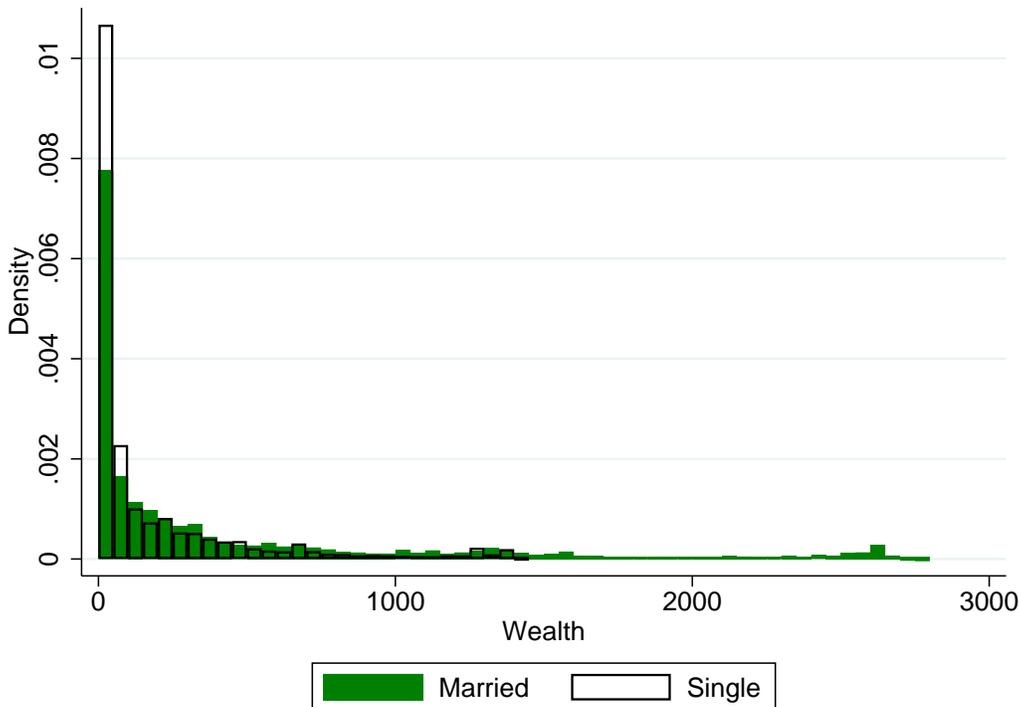


Figure 1: Asset distribution in the baseline economy by marital status.

The last moment of the table is related to the *added worker effect* literature.¹² We take the statistic from [Mankart and Oikonomou \(2016\)](#), who run a linear probability model using transition probabilities of married females from inactivity to either unemployment or employment as a dependent variable on a number of controls. Using data from the Panel Study of Income Dynamics, they find that the coefficient associated to an employment to unemployment transition for the male of the household is 0.077. From our simulated data, we run a probit regression on the same two variables and report the average marginal effect which is remarkably close, at 0.075. The fact that the added worker effect found in our model is consistent with the one measured in the data is relevant for two reasons. First, it shows that the parametrization of the model is accurate enough to be consistent with conditional transitions that are not targeted. Second, it indicates that the assumption of a unitary household and the particular implementation chosen to model household decisions is consistent with one of the most important margins considered by the literature regarding joint labor force supply. The added worker effect when the female is the one transiting from

¹²See [Lundberg \(1985\)](#).

employment to unemployment is 0.013.¹³

	Data						Model				
	Q1	Q2	Q3	Q4	Q5		Q1	Q2	Q3	Q4	Q5
EU	1.82	1.15	0.87	0.70	0.54	EU	1.20	1.03	1.00	0.94	0.93
EN	1.15	0.92	0.91	0.97	1.09	EN	2.03	2.77	0.27	0.28	0.31
UE	0.88	1.08	1.04	1.10	1.06	UE	1.08	1.02	0.89	1.04	0.91
UN	1.06	0.94	0.99	0.94	1.04	UN	1.42	0.75	0.78	0.81	0.95
NE	1.05	1.34	0.99	0.89	0.84	NE	1.13	2.95	0.50	0.30	0.32
NU	1.79	1.37	0.86	0.63	0.47	NU	1.84	0.75	0.78	0.55	0.58

Table 8: Transitions by quintiles (Q) of the asset distribution

Besides predictions on average asset allocations and labor market transitions, our model has implications for the joint determination of savings and labor supply decisions. The performance of our model when compared to the data is observed on Table 8. The first five columns are taken directly from [Krusell et al. \(2017\)](#), who use information from the Survey of Income and Program Participation (SIPP) in order to compute joint statistics of labor market transitions by quintiles of the asset distribution. The numbers in each quintile Q are relative to the overall transition rate in the economy. For example, the employment to unemployment (EU) transition rate for those households in the first quintile ($Q1$) of the asset distribution is 82% higher than the average EU rate for the economy. As seen from the table, the model does a fair job matching the data moments. As in [Krusell et al. \(2017\)](#), the model replicates qualitatively the declining job separation rate EU with respect to assets in the household. It also matches the non-monotonic relationship between assets and household decisions to become inactive (EN and UN transitions): as we move from $Q1$ to $Q5$, these transitions decline and then go up.

5 Implications of Unemployment Insurance

In this section, we use the calibrated model to compute different counterfactual experiments to understand the effects of changes in UI. All our experiments focus on the same policy question: we ask what happens if the generosity of the UI system changes. Our baseline experiment consists

¹³To the best of our knowledge, there is no literature measuring the added worker effect when the man is the second earner, the outcome of our model is consistent with priors based on the general role of men and women in the labor market.

of computing the steady state equilibrium of several alternative economies defined over a grid of values of the replacement rate b in $[0, 1]$.¹⁴ For each value of the replacement rate, we modify \bar{b} proportionally, in order to obtain the same ratio b/\bar{b} as in the benchmark economy. In order to have a reference point, we make sure that the set of replacement rates over which we iterate contain the value of the replacement ratio of the benchmark calibration ($b = 0.24$). Additionally, we maintain the level of unconditional transfers T to its equilibrium level in the benchmark economy of Section 4.

5.1 The role of the family

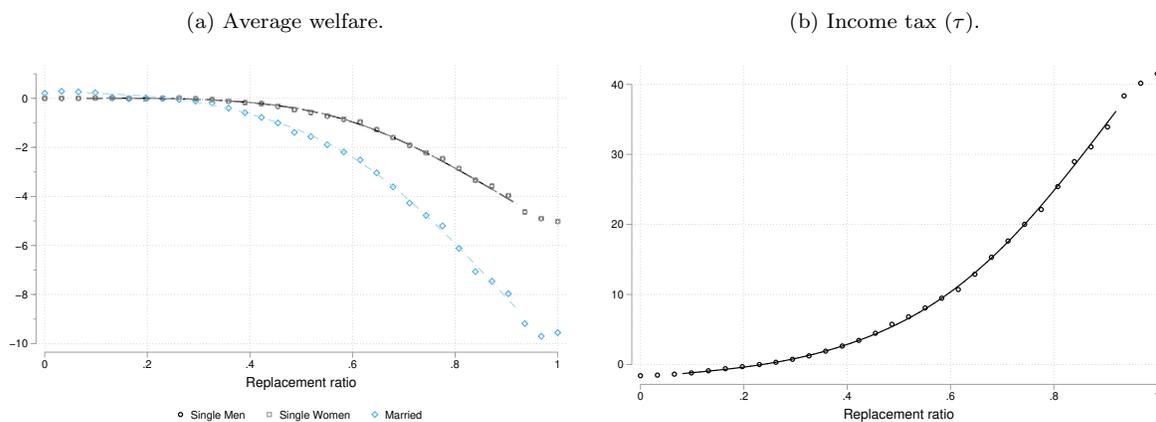


Figure 2: Changes with respect to the benchmark UI generosity ($b = 0.24$) of welfare and the income tax in the baseline experiment (in %). Lines fit a cubic spline.

In Figure 2, we report changes in some endogenous variables given changes to the generosity of the UI and the implied change in the income tax (τ). Each marker in the graph reflects the percentage change in the variable of interest with respect to its level in an economy with the benchmark level of UI generosity ($b = 0.24$). We do this for average welfare (conditional on household type) and for the labor tax. Note that this is a comparison between steady states.

The figure shows that on average, single households are indifferent between the UI generosity of the benchmark and no UI at all ($b = 0$). Instead, if there is no UI ($b = 0$), married households would be slightly better off than in the benchmark (0.21%).

We interpret the results in Figure 2 as follows. First, the current level of UI is close to being

¹⁴That is, for each b we find the level of income taxes that balances the budget of the government and the prices that satisfy our equilibrium definition of Section 2.5.

optimal, that is, a reduction of the generosity of UI would lead to minor gains in welfare and an increase in the level of UI would imply a clear welfare loss. Secondly, single and married households present very different welfare responses to changes in UI benefits. A reduction in UI would modestly increase the welfare of married households and leave singles almost indifferent. While both types of households dislike increases in the UI, married households present much bigger losses than singles. At the limit, when the replacement rate is set to one ($b = 1$), the welfare loss of the average married household is almost twice as big as the welfare loss of the average single household (-5.02% for single men, -5.01% for single female, and -9.55% for married households).¹⁵

The main forces that determine the welfare response to a change in the generosity of UI are of the same nature both for married and single households. On the one hand, a more generous UI implies that it is easier to smooth consumption across time since in the event of unemployment, the drop in income is lower.¹⁶ On the other hand, a more generous UI implies higher income taxes to finance it.¹⁷ However, apart from the publicly provided UI, both single and married households can build insurance against unemployment risk privately. Hence, behind the welfare evaluation of each level of UI generosity there is an implicit comparison between the cost and the benefit of publicly providing a given level of UI versus the private alternative.

¹⁵Overall we find that changes in the UI generate a modest impact on welfare. This fact is consistent with the overall size of the unemployment coverage in the US economy and the period to which we calibrate the model. As it is common in the literature, our agents receive an unconditional transfer T that contributes to consumption smoothing and, hence, diminishes the magnitude of the welfare impact of UI in general. Moreover, we calibrate the model to a period in which there was an overall low unemployment rate (4.9%) which was driven by low job separation rates (δ 's in Table 1).

¹⁶In Figure 6, in Appendix A, we show the same exercise of changing the generosity of UI but in an economy in which the UI is not funded through taxes but simply falls from the sky. In that economy, taxes solely fund the unconditional transfer T but still change in the same direction as the change in the replacement ratio because a more generous UI implies a lower employment rate and, hence, less taxable income. When UI is a gift, all types of households welcome increases in the level of UI.

¹⁷Notice that the tax burden changes both because a higher replacement ratio means that each worker covered by UI is more costly and, because less workers are employed, there is less taxable income in the economy.

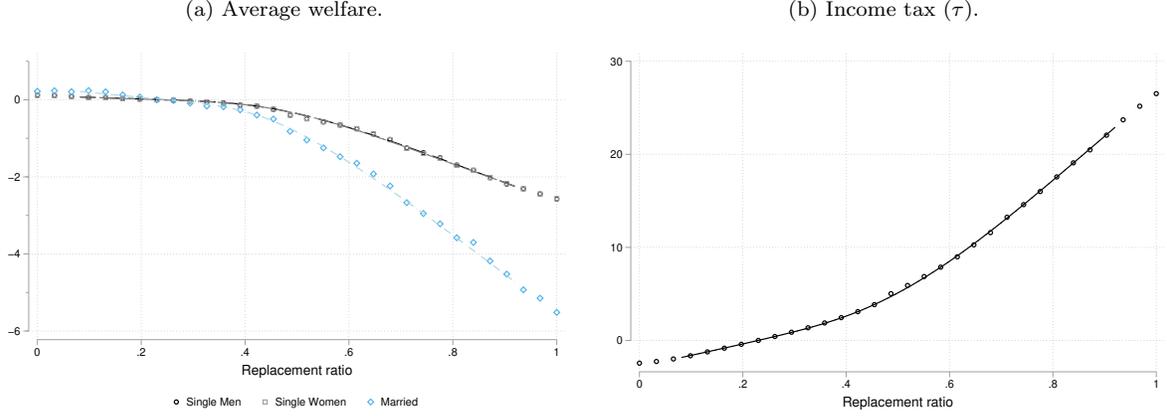


Figure 3: Changes with respect to the benchmark UI generosity ($b = 0.24$) of welfare and the income tax when all agents face the same arrival probabilities (λ^u and λ^n) and losing probability (σ) as single men (in %). Lines fit a cubic spline.

For single households, the only private mechanism available is the risk-free asset. On the other hand, married households have available an additional form of private insurance, in the form of the added worker effect (the family also provides insurance). Given the parametrization of the model, married agents are less likely to be unemployed than singles and the probability that a married household has both agents out of work is lower than the probability that a single agent is not employed. These two factors rise the question of whether the different response of single and married households to changes in the generosity of UI is due to these different private alternatives or to the fact that married agents have better labor market prospects than singles. To tackle this question we run another policy experiment in which we subject all agents in the economy to the same shocks regarding labor market opportunities. In particular, all agents face the same arrival probabilities (λ^u and λ^n) and losing probability (σ) as single men.

Figure 3, presents the results for this exercise. Qualitatively, the responses are the same as in the baseline. There are modest welfare improvements when UI is reduced (mainly for married households) and there is a significant disparity in the magnitude of the welfare loss between married and single households when UI becomes more generous. This experiment indicates that despite the fact that single agents face higher unemployment rates than their married counterparts quantitatively, insurance inside married households accounts for a significant part for their different welfare responses.

The fact that single and married agents face different unemployment risks while both finance

the publicly provided UI raises the question of whether the response of each household is shaped by the implicit cross subsidy from married to single households. To answer this question, in Appendix B, we run our policy experiment in an economy with only single men. The welfare response in this bachelor economy is qualitatively identical to the baseline experiment. Another source of heterogeneity is the fact that the benchmark calibration, as it is the case in the data, imposes a higher level of assets for married households than for singles. In Appendix D, we compare the results of the baseline experiment in Figure 2a to a sub-sample of married households which has the same wealth distribution as singles. Even for these married households, the qualitative welfare response goes in the same direction as in the baseline experiment.

5.2 The heterogeneous responses of labor market stocks

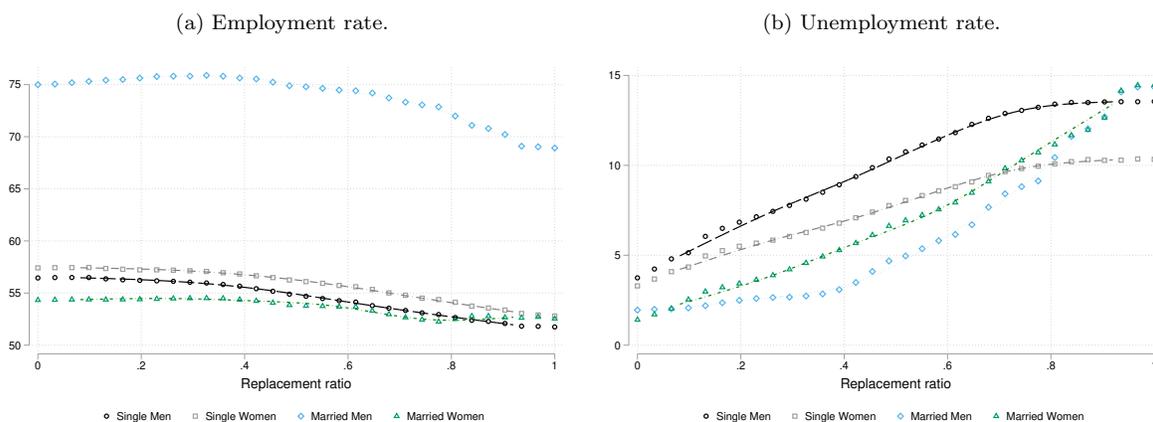


Figure 4: Labor market stocks levels in the baseline experiment. Lines fit a cubic spline.

In Figure 4, we plot the employment-to-population ratios and the unemployment rates under different values of the replacement rate b . As expected, overall employment levels decline, while unemployment increases when the generosity of the UI increases. An important implication of the patterns observed in the figure is that the responses of the employment and unemployment rates for each type of agent are remarkably heterogeneous. In Figure 5, we report the same data as in Figure 4 but as a percentage change from the benchmark steady state in which the UI is that of the benchmark calibration ($b = 0.24$).

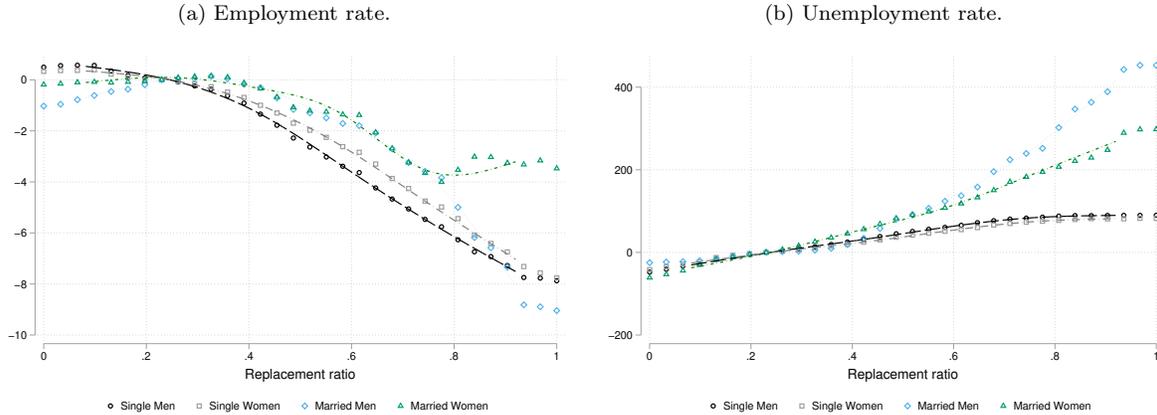


Figure 5: Changes with respect to the benchmark UI generosity ($b = 0.24$) of the labor market stocks in the baseline experiment (in %). Lines fit a cubic spline.

The patterns in Figure 5 show that focusing only on the aggregate employment or unemployment rate when evaluating changes in UI programs can mask relevant heterogeneous responses. Figure 5a shows that when the generosity of UI is decreased, the employment rate of singles increases while that of married agents decreases. This result reflects the different mechanisms that dominate the responses of single and married agents. For singles, a reduction of UI implies that the increase in disposable income due to lower taxes (see Figure 2b) does not compensate the lost income when unemployment hits. Hence, single agents respond by working more to accumulate more assets. Instead, married households respond by working less as their risk of non-employment is unchanged with respect to the benchmark economy but they can build the same level of assets (insurance) by working slightly less. When UI generosity increases, all types of agents respond by working less. However, the magnitude of the response is different for each type of agent. A similar pattern is observed in Figure 5b. The direction of the change of the unemployment rate with respect to changes to the generosity of UI is the same across the four types of agents but the slope of the change is remarkably different. In particular, married agents present a much higher change in unemployment rates than singles.¹⁸

¹⁸See Appendix E for additional figures on the changes in the wealth inequality, the ratio of wealth between married and single households, and the capital to labor ratio in our baseline experiment.

6 Conclusions

In this paper we propose a framework where we make explicit the coexistence of single and married workers in a labor market with frictions. Our quantitative model is an extension of a standard incomplete markets model with frictional labor markets and can replicate the differences in labor market dynamics observed in the US economy across marital status and gender. We use the model to study the welfare properties of the US unemployment insurance program and find that the program is valued very differently depending on marital status. First, married households experience welfare losses which almost double those experienced by single households when the unemployment insurance program becomes more generous. Secondly, married households have higher welfare if the generosity of the unemployment insurance is reduced while singles are almost indifferent.

We show that the fact that married individuals face lower unemployment risk than their single counterparts does not drive our result. Instead, the fact that married agents can rely on the family as an insurance mechanism is what shapes their welfare response. In our model, the insurance provided by the family is mainly composed by the pooling of resources between spouses, joint savings, and the added worker effect. We also show that the responses of the employment and the unemployment rate to changes in the unemployment insurance are heterogeneous with respect to marital status and gender.

Our results show the importance of studying the interplay between government provided and private (self) insurance in environments in which the source of private insurance is of heterogeneous nature across agents.

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Appendix

A Unfunded changes in UI generosity

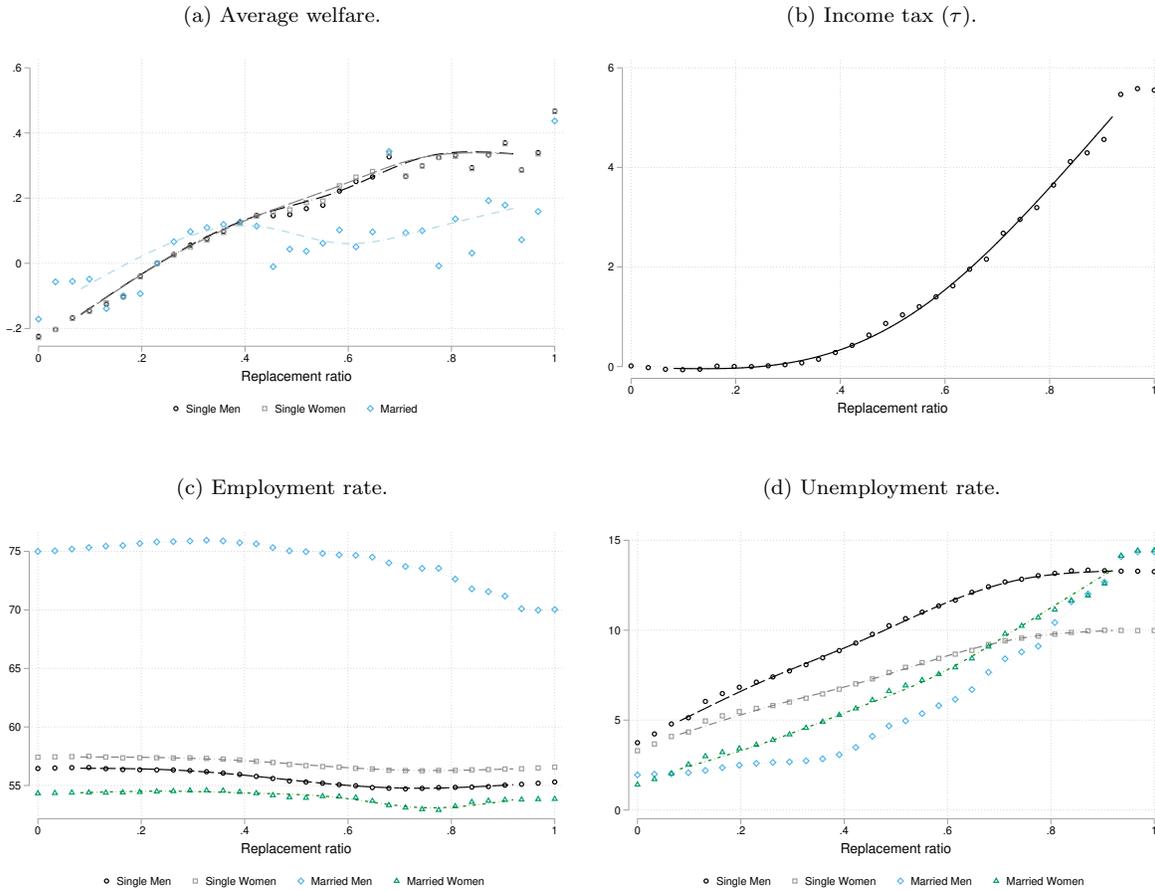


Figure 6: Changes with respect to the benchmark UI generosity ($b = 0.24$) when the UI is not founded through income taxes but falls from the sky (in %). Lines fit a cubic spline.

In this section we run an experiment in which we use the same parametrization as in our baseline experiment but we change the source of founding of the UI. In this experiment, the burden of UI does not appear in the budget constraint of the government but UI payments are transferred to the agents that fulfill the eligibility criteria. An alternative interpretation is that b is a backyard technology which provides extra consumption goods to individuals in the case of unemployment.

The tax rate (τ) in this economy changes nevertheless with changes in UI because, as in the baseline experiment, the government needs to finance a fixed level of unconditional transfers (T) of the benchmark economy, but the overall taxable income changes due to changes in the number

of workers employed. In other words, although the tax burden of the UI is not existent in this economy, its effects regarding the (dis)incentives to work are still present.

B The single-agent (bachelor) economy

In this section we perform the same policy analysis as in our baseline experiment, but we focus on an economy populated only by single men. We take their calibrated parameters from our benchmark calibration and keep the equilibrium conditions of our benchmark economy. That is, the unconditional transfer (T) and equilibrium prices are set to the same level as the benchmark economy while the income tax (τ) changes throughout the different levels of the UI level to balance the budget of the government.

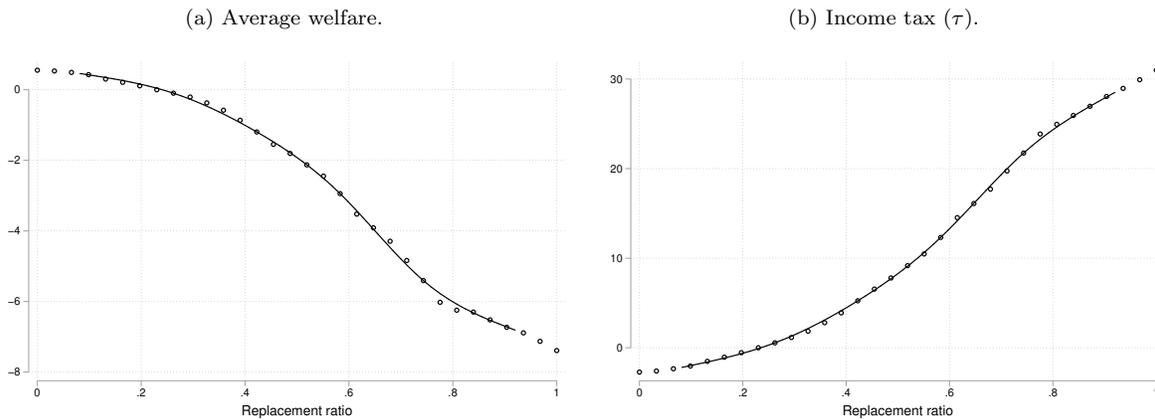


Figure 7: Changes with respect to the benchmark UI generosity ($b = 0.24$) when the economy is only populated by single men (in %). Lines fit a cubic spline.

As seen in Figure 7, welfare changes from increasing replacement rates b are similar but not identical to our main exercise in Figure 2 in the main text.

C General versus Partial Equilibrium

In this section, we compare results of performing the same policy analysis as in the main body of the text, but focusing on general equilibrium effects. In Figures 8 and 9 we compare how welfare changes when replacement rates b change, when we abstract or not from general equilibrium considerations.

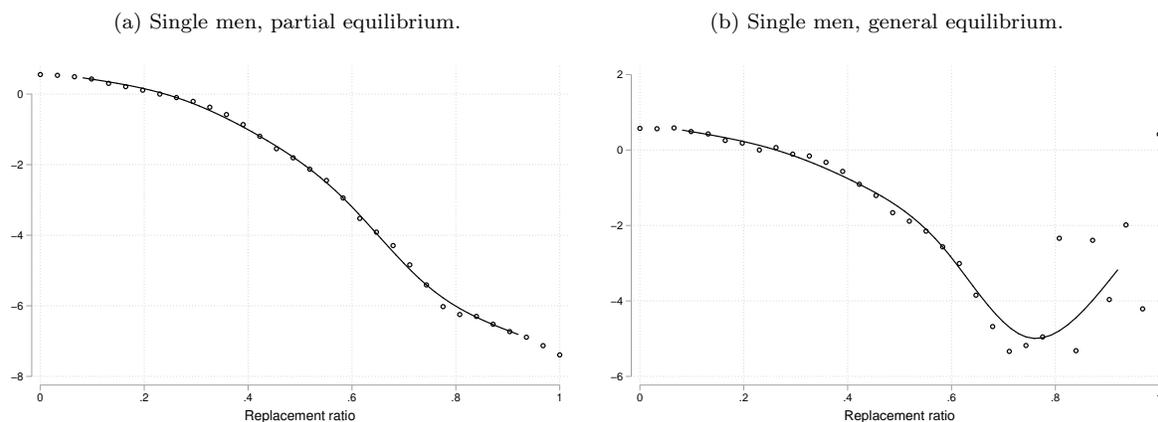


Figure 8: Changes with respect to the benchmark UI generosity ($b = 0.24$) when the economy is only populated by single men (in %). Lines fit a cubic spline.

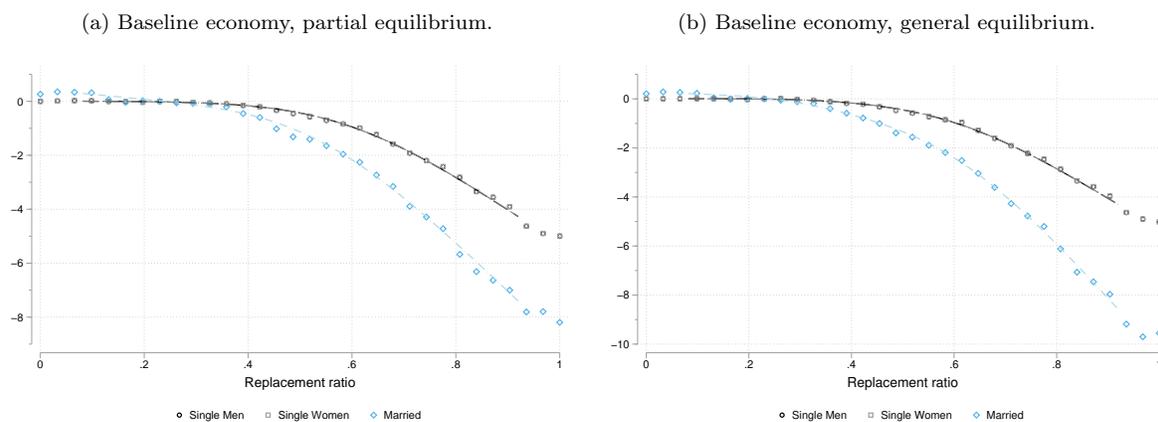


Figure 9: Changes with respect to the benchmark UI generosity ($b = 0.24$) for the baseline economy (in %). Lines fit a cubic spline.

In both figures, the left panel has the "partial equilibrium" case, where we maintain equilibrium prices (wages w and the interest rate r) as in the benchmark economy with $b = 0.24$. Panels on the right show what happens when equilibrium prices are allowed to move to equilibrate labor and asset markets.

As seen in Figure 9, the qualitative results for the baseline experiments for our proposed model

do not change with the introduction of general equilibrium effects, while the quantitative effects are increased by movements in equilibrium prices: the welfare losses become bigger than in the case with partial equilibrium.

For the case of the bachelor economy in Figure 8, welfare loses with general equilibrium effects are not monotonic with respect to changes in b , showing a reversal at around $b = 0.8$. Equilibrium effects in the bachelor economy kick in when a sufficiently high fraction of individuals decides to stop working: the scarcity of workers pushes up real wages which increases UI payments to those eligible (given the dependence of the benefit cap \bar{b} on average wages), increasing average welfare for high levels of b . This reversal in average welfare changes is not present for our benchmark economy, given the smoother movement in aggregate employment, given heterogeneous labor supply.

D Changes in UI benefits, controlling for assets

Our baseline economy is designed to replicate the ratio of assets between married and single households. This is clearly depicted in Figure 1. The higher level of savings inside married households allows them to be better insured if one of the members becomes unemployed.

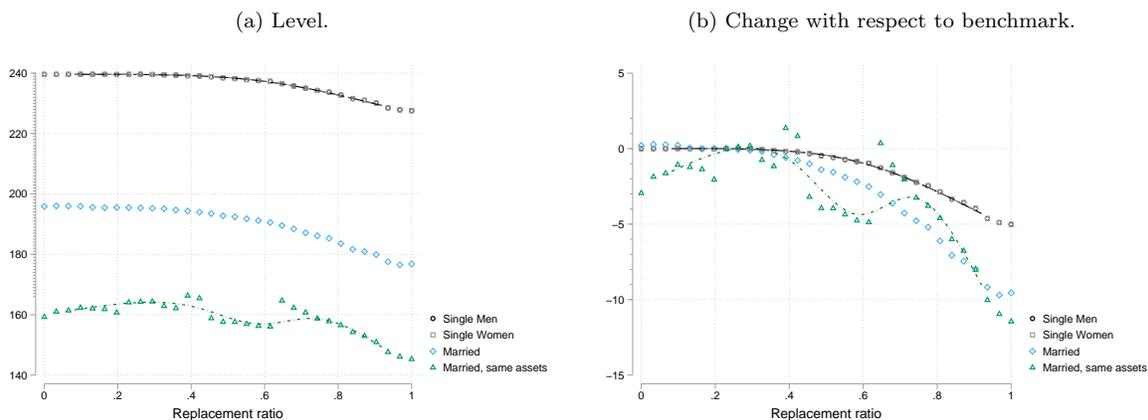


Figure 10: Average wellfear levels and changes (in %) with respect to the benchmark UI generosity ($b = 0.24$) in the baseline experiments. Lines fit a cubic spline.

Figure 10 depicts an exercise where we control for the amount of household assets when making comparisons between single and married households. Following the procedure in Angrist (1998), for each steady state of our baseline experiment, we compute average welfare for singles and married individuals by deciles of the asset distribution of their own groups. We then reweigh the sample of singles and married agents in each decile in order to equalize the average asset in the decile across marital groups. Afterwards, we compute the group average using the reweighed sample and perform our comparisons.

E Additional Figures

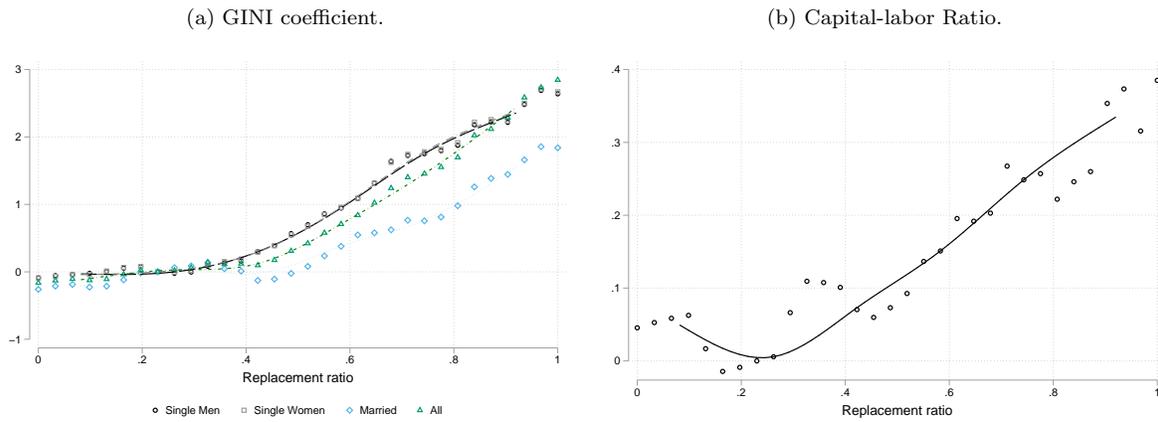


Figure 11: Changes with respect to the benchmark UI generosity ($b = 0.24$). Lines fit a cubic spline.

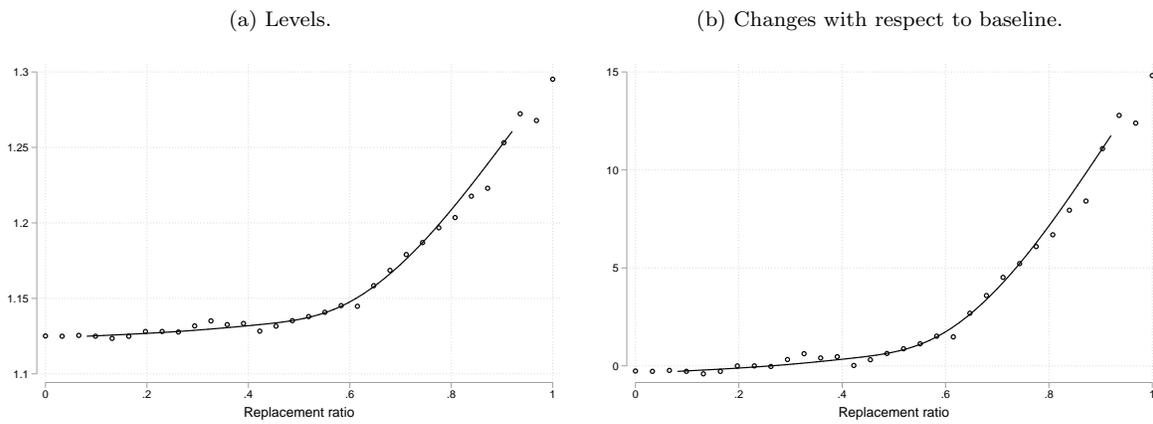


Figure 12: Ratio between married and single households' asset levels.