The Heterogeneous Effects of Social Assistance and Unemployment Insurance: Evidence from a Life-Cycle Model of Family Labor Supply and Savings*

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Abstract

We empirically analyze the heterogeneous welfare effects of unemployment insurance and social assistance. We estimate a structural life-cycle model of singles' and married couples' labor supply and savings decisions. The model includes heterogeneity by age, education, wealth, sex and household composition. In aggregate, social assistance dominates unemployment insurance; however, the opposite holds true for married men, whose leisure time declines more than that of their spouses when unemployment insurance is reduced. A revenue-neutral rebalancing of social support away from unemployment insurance and toward social assistance increases aggregate welfare. Income pooling in married households decreases the welfare value of social assistance.

Key Words: Life-cycle labor supply; Family labor supply; Unemployment insurance; Social assistance; Household savings; Employment risk; Added worker effect; Intra-household insurance.

JEL Classification Codes: J18; J68; H21; I38.

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1 Introduction

In many countries, the 'social safety net' combines unemployment insurance with social assistance programs. Generally, unemployment insurance offers temporary earnings-related benefits to newly unemployed individuals, while social assistance programs ensure a permanent universal minimum income for households. Interestingly, the overall generosity of the social safety net and the relative importance of unemployment insurance and social assistance programs vary considerably across countries. In the United States, unemployment insurance provides income replacement related to earnings, but the benefits of assistance are notably less generous, which results in a significant decrease in social support once unemployment insurance expires. In the United Kingdom, social assistance serves as the main source of social support, providing universal, consistent, and moderately generous financial support to low-income households. Many continental European countries, including France and Germany, combine the two systems: unemployment insurance provides temporary earnings-related benefits, and social assistance programs guarantee a minimum income for all households.[1] These large differences in the design of the social safety net across counties suggest that there is little consensus on how to best combine unemployment insurance and social assistance.

In this paper, we provide an empirical comparison of the welfare effects of unemployment insurance and social assistance, including evidence on the underlying trade-off between insurance and incentives.[2] When studying the welfare effects of the social safety net, it is important to account for three critical features of the problem. First, the welfare effects of social assistance and unemployment insurance may vary across demographic groups, including by gender, marital status, education and wealth. Ignoring this heterogeneity by focusing on the aggregate welfare effects of unemployment insurance and social assistance will mask differences in the size and direction of policy preferences across demographic groups. For policymakers, it is necessary to decompose the aggregate welfare effects to understand who benefits and who loses from policy changes and by how much. Second, it is important to consider unemployment insurance and social assistance jointly, most obviously because social assistance provides an income floor that affects the insurance and incentive effects of unemployment insurance. Third, the insurance

[1]The OECD tax-benefit model calculates the net replacement rate (ratio of benefits to previous after-tax earnings) for those in the initial phase of unemployment and those in long-term unemployment (see OECD, 2015). In 2014, single individuals without children who previously earned the average wage and who qualified for social assistance had an initial replacement rate of 59% in Germany, 45% in the US, and 38% in the UK. In contrast, the long-term replacement rates for the same groups were 38% in the UK, 35% in Germany, and only 6% in the US. Differences between countries and by the duration of unemployment are similar for other household types (e.g., married households and households with children).

[2]The unemployment insurance and social assistance programs that we study interact to form a policy instrument that combines insurance and assistance. The distinction we draw in the presentation between unemployment insurance and social assistance is motivated by the institutional rules governing how the social safety net is organized in practice.

provided by the social safety net interacts with the intra-household insurance available from labor supply and savings. In married households, the welfare effects of unemployment insurance and social assistance interact with the insurance from the labor supplies of both spouses. Therefore, in addition to savings and the labor supply of singles, it is important to recognize that married households make labor supply choices for both spouses, a so-called family labor supply decision (Blundell et al., 2016b).

We explore the heterogeneous welfare effects of the social safety net by embedding a social insurance and assistance system in a dynamic structural model of the life-cycle labor supply and savings decisions of single and married households. The model includes: i) a labor supply choice for both members of a married household, which recognizes intra-household insurance from spousal earnings as a substitute for insurance from the social safety net; ii) social assistance and unemployment insurance claiming decisions; iii) a realistic schedule of progressive income taxation; iv) liquidity constraints that limit the ability of households to self-insure by dis-saving; v) heterogeneity in preferences and constraints, factoring in variables such as education, age, wealth, sex and household composition, which allows us to understand the heterogeneous welfare effects of the social safety net; and vi) search decisions and endogenous quits, both of which may be subject to moral hazard effects from social assistance and unemployment insurance. The model further includes wage risk and employment risk, which generate demand for insurance.

The parameters of the life-cycle model are estimated using indirect inference. Specifically, the estimation matches predictions from the life-cycle model to behavior in samples from the German Socio-Economic Panel (SOEP) and the German Survey of Income and Expenditure (EVS) and to existing evidence on the moral hazard effects of unemployment insurance from German social security records (as reported in Schmieder et al., 2012). The estimated life-cycle model has a good in-sample fit. Moreover, the estimated life-cycle model replicates causal reduced-form results from Lalive et al. (2006), Gruber (1997) and Halla et al. (2020), who study, respectively, the employment effect of unemployment insurance, the consumption smoothing effect of unemployment insurance and the added worker effect, i.e., the change in one spouse's labor supply induced by the partner's job loss. We take the consistency of the estimated life-cycle model with the results from previous causal reduced-form studies as evidence that the model is well-suited for analyzing social assistance and unemployment insurance.

We use the estimated life-cycle model to study the aggregate and heterogeneous effects of unemployment insurance and social assistance on welfare and household behavior. For this exercise, we define a baseline environment that closely resembles the year 2000 system in Germany. In particular, unemployment insurance replaces 60% of lost post-tax earnings for 12-30 months (depending on age), and social assistance provides an income floor to wealth-poor households, starting at around 600 euros per month for a single household without children and increasing with household size. We compare the effects of eliminating unemployment insurance and a

revenue-equivalent cut in social assistance. Although the policy changes have the same effect on the government's budget constraint, the revenue-equivalent cut in social assistance leads to a larger aggregate welfare loss than eliminating unemployment insurance (-2.0% versus -0.9% of baseline consumption). This result is driven by the difference between the insurance effects of the policy changes. In more detail, the insurance effect of the revenue-equivalent cut in social assistance is -2.3%, while the insurance effect of eliminating unemployment insurance is only -0.3%. The revenue-equivalent reduction in social assistance leads to a larger increase in the employment rate compared to the elimination of unemployment insurance (1.4 versus 0.8 percentage points); however, more favorable incentive effects of the revenue-equivalent cut in social assistance are insufficient to counterbalance its larger insurance costs.

We find heterogeneity in the welfare effects of unemployment insurance and social assistance by sex and marital status. Contrary to the aggregate outcome, the welfare of married men is more severely impacted by the elimination of unemployment insurance than by a revenue-equivalent reduction in social assistance. Meanwhile, the welfare effects for single women, single men, and married women align with the aggregate results. In quantitative terms, the difference between the overall welfare impacts of the revenue-equivalent reduction in social assistance and the elimination of unemployment insurance consists of negative contributions of -0.7%, -0.7%, and -0.1% from single women, single men, and married women, respectively. In contrast, married men contribute a positive 0.5%. The heterogeneity in the welfare effects of social assistance and unemployment insurance by sex and marital status is not due to differences in unemployment insurance and social assistance transfers, nor is it due to differences in wealth or education. Instead, it reflects the heterogeneity in the insurance-incentive trade-off by sex and marital status, in particular, heterogeneity in the employment and incentive effects of unemployment insurance within married households. Specifically, in married households, cuts in unemployment insurance lead to a larger increase in the employment rate for husbands than for wives. Following this pattern, in married households, the burden of the incentive effect (in terms of welfare) resulting from a cut in unemployment insurance is primarily borne by husbands, not wives.

We extend the welfare analysis by exploring the effects of a revenue-neutral rebalancing reform that eliminates unemployment insurance while increasing the generosity of social assistance. Following our earlier finding that social assistance dominates unemployment in terms of aggregate welfare, we find that the rebalancing reform increases aggregate welfare by 0.5% of baseline consumption. The rebalancing reform benefits single women, single men and married women, while married men lose out. Again, this result is not driven by differences in wealth or education across these groups but reflects that the incentive costs of eliminating unemployment insurance fall on husbands, not wives.

Finally, we highlight how conclusions about the welfare effects of reforming the social safety

net depend on intra-household insurance from income pooling in married households. For this exercise, we continue to consider revenue-neutral rebalancing reforms that eliminate unemployment insurance while increasing social assistance. Compared to our baseline model, which includes single and married households, the welfare benefit from a revenue-neutral rebalancing of the social safety net is 45% larger in a restricted model that includes only single households. We also find that the insurance benefit of rebalancing the social safety net is much larger in the model with only single households. By exploring the mechanisms that contribute to the difference between the welfare predictions of the two models, we show that income pooling in married households explains the effect of married households on the welfare gains from rebalancing the social safety net, with parameter differences and joint taxation being unimportant.

This paper builds on previous work that has linked welfare effects and optimal program design to empirical estimates of the effects of social insurance and assistance programs on consumption smoothing, search, and savings decisions. Gruber (1997) explores how the optimal unemployment insurance replacement rate depends on the effect of unemployment insurance on consumption smoothing and search. More recent studies have used similar approaches to derive the optimal design of other aspects of unemployment insurance (e.g., Schmieder et al., 2012, Kroft and Notowidigdo, 2016, Kolsrud et al., 2018, and Ganong and Noel, 2019). Chetty (2008) emphasizes the role of liquidity constraints in driving the optimal provision of unemployment insurance, Lentz (2009) shows that the optimal unemployment insurance replacement rate decreases with household wealth, and Ferey (2022) finds that interactions between redistribution and unemployment insurance have important quantitative implications for the optimal design of tax-benefit systems.[3]

Several studies have analyzed unemployment insurance or social assistance programs in isolation, e.g., Gruber (1997), Hopenhayn and Nicolini (1997), Saez (2002), Lalive et al. (2006), Chetty (2006), Shimer and Werning (2008), Schmieder et al. (2012), Kroft and Notowidigdo (2016), Mankart and Oikonomou (2017) and Birinci and See (forthcoming). Of particular relevance given our focus on heterogeneity, the recent study by Birinci and See (forthcoming) demonstrates that acknowledging heterogeneity in labor market risk and unemployment

[3]Several papers provide theoretical insights into the optimal design of unemployment insurance: Flemming (1978) analyzes optimal unemployment insurance with perfect and imperfect capital markets; Shavell and Weiss (1979), Hopenhayn and Nicolini (1997), Shimer and Werning (2008), and Pavoni (2009) derive the optimal time path of unemployment insurance benefits; Pavoni et al. (2013) consider the optimal time path of insurance and assistance benefits when mandatory work and assisted search are policy instruments; Acemoglu and Shimer (1999) show that the optimal generosity of unemployment insurance depends on workers' willingness to accept employment risk; and Shimer and Werning (2007) propose an approach that is complementary to Baily (1978) and Chetty (2006) and relies on the reservation wage. Michelacci and Ruffo (2015) derive the optimal age-profile of unemployment insurance benefits and, among others, Krusell et al. (2010), Nakajima (2012), Hagedorn et al. (2013), Mitman and Rabinovich (2015) and Braxton et al. (2020) study optimal unemployment insurance with general equilibrium effects in the labor market. Paserman (2008) and Spinnewijn (2015) study the optimal design of unemployment insurance with, respectively, hyperbolic discounting and biased beliefs.

insurance eligibility status among individuals increases the insurance value of unemployment insurance while simultaneously decreasing its incentive costs. We extend this literature by jointly studying unemployment insurance and social assistance and accounting for program interdependencies. In this respect, we also add to research that emphasizes program interdependencies (see Keane and Moffitt, 1998, and Chan, 2013), and to a growing literature that makes comparisons between insurance-based and assistance-based social programs (see Low et al., 2010, Saporta-Eksten, 2014, and Low and Pistaferri, 2015).

Our decision to study the welfare effects of the social safety net in the presence of family labor supply is motivated by research showing married couples obtain insurance by adjusting one spouse's labor supply in response to employment and wage shocks affecting the other spouse (e.g., Lundberg, l985, Mankart and Oikonomou, 2017, and Halla et al., 2020) and by studies showing the size of this insurance effect interacts with the generosity of unemployment insurance (Cullen and Gruber, 2000, and Birinci, 2021).[4] Birinci (2021) also studies the insurance-incentive tradeoff of both unemployment insurance and social assistance policies, as well as their interactions with spousal labor supply, but does not include the individual heterogeneity by marital status and education that is central to our study. Instead, Birinci (2021) focuses on the cyclical variation in the relative advantages of unemployment insurance and social assistance policies.

Our life-cycle model shares some features with other studies based on structural life-cycle models. Our joint modeling of labor supply, savings, and wage determination, along with exogenous marriage and divorce, broadly follows van der Klaauw and Wolpin (2008) and Adda et al. (2017). Our model follows the literature in how it captures interactions between the contemporaneous incentives presented by social insurance and assistance programs and the intertemporal incentives to accumulate human capital (e.g., Keane and Wolpin, 1997, Imai and Keane, 2004, Keane, 2016, Blundell et al., 2016a, and Adda et al., 2017). We also follow the literature in how we model incentives to accumulate entitlement to social insurance programs (e.g., French, 2005, Attanasio et al., 2008, De Nardi et al., 2010, Low et al., 2010, Heathcote et al., 2014, and Low and Pistaferri, 2015).[5]

This paper proceeds as follows. Section 2 introduces our life-cycle model and Section 3

[4]Added worker effects may be driven by nonseparability between the spouses' leisure times (Goux et al., 2014) or a preference for income replacement. Both leisure-driven and income-driven added worker effects imply that the family labor supply decision of married households is relevant to the welfare effects of the social safety net. Fadlon and Nielsen (2019) formalize this intuition and propose using the labor supply response of a spouse who is indirectly affected by a shock to evaluate the welfare gains from increasing the generosity of government benefits.

[5]Blau and Gilleskie (2006) and van der Klaauw and Wolpin (2008) analyze, respectively, health insurance and pension reforms with two-earner households. While these papers model couples, they focus on older populations, they do not include employment risk, and they do not compare insurance and assistance programs or explore the importance of the family unit for policy design.

describes the empirical specification of the model. Section 4 describes the SOEP and EVS datasets and samples. Section 5 outlines the estimation method. Section 6 presents our parameter estimates and explores the model's fit. Section 7 reports our results on the aggregate and heterogeneous effects of unemployment insurance and social assistance and discusses several robustness checks. Section 8 concludes.

2 Life-cycle Model

We propose a discrete-time dynamic model of the job search, labor supply, savings, and benefit-claiming decisions of single and married households over the life cycle. One period in the model is a quarter of a year. The decision problem starts when an individual enters the labor force after completing education. Education is completed at age 18 years for individuals without a university degree (low education) or age 23 years for individuals with a university degree (high education). When they enter the labor force, individuals are single, childless, and have zero wealth. Once in the labor force, individuals may marry and divorce, and women may have children (we do not distinguish between cohabitation and marriage). The decision problem ends when all household members have reached the compulsory retirement age of 65. Individuals live until their sex-specific life expectancies of 79.5 years for women and 73.25 years for men (see the German Human Mortality Database).

Each period proceeds as follows: i) a single individual might marry, and a married individual might divorce, and a woman might give birth to a child; ii) wage and preference shocks are realized; iii) an individual who was employed in the previous period is either subject to a job destruction, which precludes them from working in any job in the current period, or receives one job offer (which, implicitly, could be an offer from the individual's current employer or a different employer); iv) the household chooses a search intensity for each household member who was non-employed (or in education) in the previous period, and then each such individual receives at most one job offer (each individual's probability of receiving a job offer is proportional to their search intensity); vi) the household then makes job-offer acceptance, retirement, savings, and benefit claiming decisions (this includes a job-offer acceptance decision for all individuals who receive job offers, including previously employed individuals; job-offer acceptance and retirement decisions translate into a labor supply outcome for each individual); vii) the household may be taxed and may receive income from social insurance and assistance programs; viii) each household member enjoys utility that depends on their labor supply outcome, search intensity and preference shocks, and their household's consumption and benefit-claiming decisions.

2.1 Choice Set

The household's choice problem is subject to the following constraints. Consumption, equivalently savings, is constrained by a borrowing constraint and an intertemporal budget constraint. For each benefit available to the household, i.e., social assistance and each household member's unemployment insurance, the household claims either all or none of the available benefit.[6] Labor supply choices (at the individual level) are limited to non-employment (NE); full-time employment (FT, 40 hours of work per week); retirement (RT); and, for women only, part-time employment (PT, 20 hours of work per week). Labor supply choices are further constrained by job destructions and job offers, as outlined above and described in Section 3.2. Note, we allow an employed individual to reject job offers because productivity and preference shocks may mean it is no longer optimal for them to remain in employment.

Retirement is feasible from age 60 years for women and age 63 years for men and is compulsory at age 65 years for women and men. Retirement is permanent for everyone. Once all household members have reached age 65, there are no further search or labor supply decisions. From this point onward, a household's consumption is equal to its income from pensions and social assistance plus the annuity value of the household's wealth.[7]

Marital status is determined by an exogenous process that allows education-based assortative mating. Reflecting the average male-female age difference for newly formed couples in our SOEP sample, the husband is assumed to be 2.5 years older than the wife in married households. We only model marriage and divorce before the man reaches age 65 years (which corresponds to age 62.5 years for his wife or potential wife). We do not attempt to model the response of marriage or divorce to changes in the design of social insurance and assistance programs. This aspect of our approach is consistent with existing empirical evidence showing that welfare programs and in-work benefits have little or no effect on marital status (see, e.g.,

[6]Throughout our sample period from 1991 to 2004, individuals who exhausted their unemployment insurance benefits became eligible for unemployment assistance. However, due to the abolition of unemployment assistance in Germany in 2005 as a component of the Hartz reforms, and the rarity of analogous programs in other nations, our analysis consistently excludes unemployment assistance. See Haan and Prowse (2019) for a life-cycle labor supply model with unemployment assistance.

[7]Our assumptions about individuals' employment and retirement options are based on Germany's legal rules and empirical regularities during the sample period. In particular, our assumption about forced retirement at the age of 65 years reflects that the compulsory retirement age was 65 years during the sample period (at this age, all employment contracts ended by default). While not prohibited, working beyond age 65 was rare in practice (the employment rate for individuals aged 65–70 years in the SOEP data from 1991–2004 is less than 0.3%). Our assumption that women have the option of retirement at a younger age than men reflects that women were allowed to retire at age 60 years through the "pensions for women" retirement pathway. At age 63 years, all individuals could retire using the pathway for long-term insured workers. Regarding the choice set for men, we note that if we extended the model to include part-time work for men, we would estimate a strong distaste for part-time work for men because only 5% of men work part-time. Moreover, since the counterfactual policy reforms that we consider do not particularly affect the relative attractiveness of part-time and full-time work, we would not expect the rate of part-time work by men to change with the policy environment.

Eissa and Hoynes, 1998, Ellwood, 2000, and Bitler et al., 2004). For similar reasons, we assume that fertility is exogenous.[8]

We also emphasize that the equilibrium effects of unemployment insurance and social assistance are absent from our model. Specifically, while our framework captures the effects of unemployment insurance and social assistance on accepted wages and job-offer rates due to changes in reservation wages and search effort at the individual level, it omits effects arising from equilibrium conditions in the labor market that affect market wages or an individual's job-offer rate, given their search effort. In Web Appendix H, we introduce two straightforward model extensions designed to capture the equilibrium effects of unemployment insurance and social assistance on job-offer rates and market wages. Through these extensions, we show the robustness of our main results to equilibrium effects in the labor market.

2.2 Preferences

The per-period utility function is given by:

$$\begin{aligned} &U^F(m_{i,j,t}, d_{i,t}, s_{i,t}, \text{SAClaim}_{i,j,t}, \text{UIClaim}_{i,t}) \qquad \text{for women, and} \\ &U^M(m_{i,j,t}, d_{j,t}, s_{j,t}, \text{SAClaim}_{i,j,t}, \text{UIClaim}_{j,t}) \qquad \text{for men.} \end{aligned} \tag{1}$$

In the above, t denotes time, i denotes the identity of the woman in the household and j denotes the identity of the man in the household (with $i = \emptyset$ for a male-headed single household and $j = \emptyset$ for a female-headed single household). $m_{i,j,t}$ denotes the household's consumption. $d_{i,t} \in \{FT, PT, NE, RT\}$ denotes woman i's labor supply state and $d_{j,t} \in \{FT, NE, RT\}$ denotes man j's labor supply state. $s_{i,t}$ and $s_{j,t}$ denote the search intensity of, respectively, woman i and man j. $\text{SAClaim}_{i,j,t} \in \{0, 1\}$ denotes the household's social assistance claiming decision, and $\text{UIClaim}_{i,t} \in \{0, 1\}$ and $\text{UIClaim}_{j,t} \in \{0, 1\}$ denote the unemployment insurance claiming decisions for, respectively, woman i and man j. While omitted from our notation, preferences are also affected by observed and unobserved individual characteristics (see Section 3).[9]

At every point in time, a single woman chooses her search intensity, labor supply, savings, and benefit-claiming behavior to maximize the expected discounted value of her lifetime utility,

[8] We specify a flexible process for the arrival probability for a woman's first child (see Section 5). We then assume that a second and final child arrives three years after the first child. Children reside in their mother's household until they reach 18 years of age.

[9] Once all household members have reached age 65 years, each individual also enjoys 'bequest utility' of $\bar{W}_{i,j}$ if female or $\bar{W}_{i,j}$ if male, where $\bar{W}_{i,j}$ denotes the value of the household's wealth in 100,000s of euros when the youngest household member turns 65.

which is given by:

$$\mathbb{E}\left[\sum_{\tau=t}^{T^F}\delta^{\tau-t}U^F(m_{i,j,\tau},d_{i,\tau},s_{i,\tau},\text{SAClaim}_{i,j,\tau},\text{UIClaim}_{i,\tau})\middle|\Phi_{i,t}\right]. \tag{2}$$

In the above, δ is the quarterly discount factor, T^F denotes the last period of the woman's life, and $\Phi_{i,t}$ denotes the woman's information set at time t. We set δ equal to 0.9950, implying an annualized discount factor of 0.98. Likewise, at every point in time, a single man chooses his search intensity, labor supply, savings, and benefit-claiming behavior to maximize the expected discounted value of his lifetime utility. A married household chooses each spouse's search intensity and labor supply and the household's savings and benefit-claiming behavior to maximize the expected discounted value of a constant-weighted average of the spouses' discounted lifetime utilities:

$$\begin{aligned}\mathbb{E}\Bigg[&\alpha\sum_{\tau=t}^{T^F}\delta^{\tau-t}U^F(m_{i,j,\tau},d_{i,\tau},s_{i,\tau},\text{SAClaim}_{i,j,\tau},\text{UIClaim}_{i,\tau})+\\&(1-\alpha)\sum_{\tau=t}^{T^M}\delta^{\tau-t}U^M(m_{i,j,\tau},d_{j,\tau},s_{j,\tau},\text{SAClaim}_{i,j,\tau},\text{UIClaim}_{j,\tau})\Bigg|\Phi_{i,t},\Phi_{j,t}\Bigg],\end{aligned} \tag{3}$$

where T^M denotes the last period of the man's life and $\Phi_{j,t}$ denotes the man's information set at time t. We estimate the weight, $\alpha \in [0,1]$, attached to the woman's utility in the married household's objective function.

2.3 Borrowing and Intertemporal Budget Constraints

Consumption choices are subject to a borrowing constraint that requires that household wealth, $A_{i,j,t}$, is non-negative at all times.[10] This constraint prevents a household from borrowing against its future earnings or future income from social insurance and assistance programs.

[10]This modeling assumption is motivated by three factors. First, our asset measure includes housing wealth and other durable assets. Therefore, the non-negativity constraint on household assets does not prevent households from borrowing against collateral, meaning that households may dissave from accumulated wealth to smooth consumption. Second, the non-negativity constraint on household wealth is consistent with regulations for Germany (§24 SGB II). Specifically, households receiving social assistance need official permission to borrow and can only borrow for specific necessities. Third, our assumption follows much of the previous literature that uses life-cycle models to study social safety net and retirement programs, e.g., Low et al. (2010), French and Jones (2011), Saporta-Eksten (2014), Low and Pistaferri (2015), Blundell et al. (2018), Low et al. (2018), Borella et al. (2019) and Fonseca et al. (2021). Low et al. (2010) argue that the constraint is important because it precludes borrowing against unemployment insurance, disability insurance, Social Security, and means-tested programs It follows that relaxing this assumption might have implications for the design of unemployment insurance and social assistance payments, as borrowing through asset markets would provide households with an additional way of smoothing consumption.

Consumption choices are also subject to an intertemporal budget constraint. In the absence of a marriage or divorce in period t, the household's intertemporal budget constraint is given by:

$$A_{i,j,t} = A_{i,j,t-1} + y_{i,j,t} - m_{i,j,t} - \mathrm{CC}_{i,j,t} + \mathrm{PL}_{i,j,t}, \tag{4}$$

where $y_{i,j,t}$ denotes net household income, $\mathrm{CC}_{i,j,t}$ denotes childcare costs, and $\mathrm{PL}_{i,j,t}$ denotes parental leave benefits. Marriage augments household wealth by the wealth of the incoming spouse. In the event of divorce, the household's wealth is divided equally between the spouses.[11]

Based on the German tax and benefit system, the net household income for a married household is given by:

$$y_{i,j,t} = \sum_{g \in \{i,j\}} (W_{g,t} h_{g,t} + \mathrm{Pension}_{g,t} + \mathrm{UI}_{g,t}) + r A_{i,j,t-1} + \mathrm{CB}_{i,j,t} + \mathrm{SA}_{i,j,t} - \mathrm{Tax}_{i,j,t}. \tag{5}$$

In the above: W denotes the hourly wage; h denotes hours of work (and therefore $W \times h$ denotes earnings); r is the interest rate, assumed to be 3% annually ($rA_{i,j,t-1}$ thus denotes interest income); Pension denotes pension benefits; CB denotes child benefits; UI denotes unemployment insurance benefits. The net income for a single household is obtained by taking (5) and suppressing the earnings, pension, and unemployment insurance of the person of the opposite gender to that of the single household head.[12]

The key programs for this paper are unemployment insurance, social assistance, and income tax. Sections 2.3.1–2.3.3 describe how we model these programs based on the year 2000 legislative rules in Germany.[13] Our models of childcare costs, parental leave benefits, child benefits, and pensions are also respectful of the German setting and are described in Appendix Web Appendix A. Web Appendix C documents the changes to unemployment insurance, social assistance, and income tax that occurred during the sample period 1991–2004 and shows that the year 2000 rules provide a good approximation to the year-specific rules.[14]

[11] This assumption follows the legal default that applies to divorce proceedings, which stipulates equal division of wealth accumulated within the marriage.

[12] We do not model disability benefits (which are part of the pension system). In the model, non-employed individuals with work-limiting health conditions receive unemployment insurance or social assistance, or a combination thereof.

[13] The year 2000 rules for unemployment insurance and social assistance are described in Bundesministerium für Arbeit und Sozialordnug (2000). The rules for taxation and social security contributions are described in Bundesministerium für Finanzen (2001). We use the rules for west Germany.

[14] Labor market reforms starting in 2005, specifically the fourth stage of the so-called "Hartz reforms," considerably changed the design of unemployment insurance and social assistance. We, therefore, restrict the sample to the years 1991–2004. For further discussion of the Hartz reforms, see, e.g., Launov and Waelde (2013) and Dustmann et al. (2014).

2.3.1 Unemployment Insurance

Unemployment insurance offers partial income replacement to eligible and entitled non-employed individuals. We use the following formula for the unemployment insurance benefit that is available to individual $g \in \{i, j\}$:

$$\widetilde{\text{UI}}_{g,t} = \text{RR} \times \text{NW}_{g,t} \times \text{Elig}_{g,t} \times \mathbf{1}(\text{Ent}_{g,t} > 0), \tag{6}$$

where RR is the replacement rate, $\text{NW}_{g,t}$ is the individual's net earnings in previous employment (i.e., previous earnings after income tax), $\text{Elig}_{g,t}$ is an indicator of eligibility for unemployment insurance, and $\mathbf{1}(\text{Ent}_{g,t} > 0)$ is an indicator of the individual having remaining entitlement to unemployment insurance. The replacement rate is equal to 0.6 (0.67) if no (one or more) children reside in the individual's household.[15]

An individual's unemployment insurance entitlement period, $\text{Ent}_{g,t}$, is initialized at the time of entry to non-employment and is based on age: individuals who are under the age of 45 years at the start of their non-employment spell have an initial entitlement period of 12 months, while individuals who enter non-employment at age 45–46, 47–51, 52–56 and 57+ years have initial entitlement periods of 18, 21, 24 and 30 months, respectively.[16] For every period of non-employment, the entitlement period will be reduced by three months until it is completely exhausted.

The individual must satisfy two requirements to be eligible for unemployment insurance. First, they must satisfy an employment history requirement. In particular, the individual must have been employed in the two periods before the current non-employment spell or must have entered employment in the period immediately preceding the current non-employment spell with remaining entitlement to unemployment insurance. Second, they must satisfy a search requirement. Specifically, the individual must have a search intensity when receiving unemployment insurance of at least π. This job search requirement captures that the German unemployment regulations specify that unemployment insurance is for individuals who are available for work and willing to accept a job offer.[17,18]

[15]We only consider previous earnings below 51,765 euros per year when calculating available unemployment insurance. Empirically, this cap is largely irrelevant because only 2.9% of newly non-employed individuals in the SOEP sample earned more than 51,765 euros in the previous year.

[16]Note, we have rounded down the initial entitlement periods in the German system to the nearest integer multiple of three months.

[17]We make two further assumptions when modeling the search requirement for unemployment insurance. First, we assume the individual cannot manipulate their search intensity to become eligible for unemployment insurance. Second, since the model does not permit search by individuals who were employed in the previous period, we assume that new entrants to non-employment satisfy the search requirement if their optimal search intensity when receiving unemployment insurance would have been at least π if instead they were allowed to search.

[18]We assume that women who enter non-employment with a child aged under 24 months forgo their eligibility

Studies for the US report that around 25–40% of individuals do not take up unemployment insurance (see, e.g., Blank and Card, 1991, Currie, 2006, and reference therein). While we are not aware of any studies of unemployment insurance take-up for Germany, we include unemployment insurance claiming decisions in the model because claiming behavior is potentially an important margin for understanding the effects of changes in the generosity of unemployment insurance. After allowing for the claiming decision, the value of unemployment insurance that an individual receives is given by:

$$\mathrm{UI}_{g,t} = \widetilde{\mathrm{UI}}_{g,t} \times \mathrm{UIClaim}_{g,t} \quad \text{for} \quad g \in \{i, j\}, \tag{7}$$

where $\mathrm{UIClaim}_{g,t}$ is an indicator for the household choosing to claim unemployment insurance for individual g. Section 3.1 describes the costs of claiming unemployment insurance.

We note that unemployment insurance is paid without regard to the spouse's earnings, and benefits are not linked to the household's interest income; therefore, unemployment insurance may be received by a non-employed individual in a household with substantial earned or unearned income. Furthermore, since there is no wealth test, unemployment insurance eligibility does not depend on an individual's ability to smooth their marginal utility of consumption by dis-saving.

2.3.2 Social Assistance

Social assistance is a universal household benefit that tops up the net income of wealth-poor households to a level that we call the 'social assistance income floor' ($\mathrm{SAFloor}_{i,j,t}$). The social assistance that is available to a wealth-poor household is thus given by:

$$\widetilde{\mathrm{SA}}_{i,j,t} \;=\; \max\{\mathrm{SAFloor}_{i,j,t} - \widetilde{y}_{i,j,t}, 0\}, \tag{8}$$

f where $\widetilde{y}_{i,j,t}$ is net household income before social assistance is included.[19] The social assistance income floor can be written as:

$$\mathrm{SAFloor}_{i,j,t} \;=\; G \times E_{i,j,t}, \tag{9}$$

for unemployment insurance during that spell of non-employment. Similarly, women who give birth while receiving unemployment insurance are assumed to forgo any remaining entitlement to unemployment insurance during that spell of non-employment. Non-employed women who have a child aged under 24 months may instead receive parental leave benefits (see Appendix Web Appendix A).

[19] Our empirical analysis includes one further detail that, for simplicity, is omitted from the discussion in the main text: the net income variable used to calculate social assistance considers earnings and interest income in excess of the tax-free allowances (while actual net income before social assistance depends on all earnings and all interest income). The notes to Figure 1 describe the tax-free allowances.

where $E_{i,j,t}$ is a household equivalence scale and G is the 'social assistance generosity parameter'. The equivalence scale, $E_{i,j,t}$, is equal to one for a single household without children and increases with the number of adults and children in the household.[20] The social assistance generosity parameter, G, is equal to 605 euros per month.[21] Combining the generosity parameter and the equivalence scale, the social assistance income floor is equal to, e.g., 605 euros per month for a single household without children, 906 euros per month for a married household without children, 1,540 euros per month for a married household with two children aged between 7 and 13 years, and 1,198 euros per month for a single woman with a fifteen-year-old child.

The legislation stipulates that social assistance is only available to households with little or no wealth. We operationalize this by assuming that only single households with wealth below 4,090 euros and married households with wealth below 8,181 euros are eligible for social assistance.[22]

Previous studies have documented substantial non-take-up of social assistance in Germany (see, e.g., Riphahn, 2001). This finding mirrors welfare benefit-claiming behavior internationally. To ensure that the model captures the pattern of social assistance receipt, we allow eligible households to decide whether or not to claim social assistance. The social assistance that a household receives is thus given by:

$$\mathrm{SA}_{i,j,t} = \widetilde{\mathrm{SA}}_{i,j,t} \times \mathrm{SAClaim}_{i,j,t}, \tag{11}$$

where $\mathrm{SAClaim}_{i,j,t}$ is an indicator for the household choosing to claim social assistance. Section 3.1 describes the costs of claiming social assistance.

Columns 1 and 3 in Table 15 in Appendix A show the characteristics of unemployment insurance and social assistance recipients in our SOEP sample. Compared to social assistance

[20] We derive the equivalence scale $E_{i,j,t}$ by taking a weighted average of the equivalence scale that is used to calculate non-housing social assistance and the implicit equivalence scale used to guide the calculation of housing benefits (which we recover from the examples given in Bundesministerium für Arbeit und Sozialordnug, 2000), with a weight of 0.463 attached to the non-housing equivalence scale (corresponding to the share of total assistance for a single household without children that is due to non-housing assistance). For single households:

$$E_{i,j,t} = 1 + 0.25\ \mathrm{C0\text{–}6}_{i,j,t} + 0.30\ \mathrm{C7\text{–}13}_{i,j,t} + 0.42\mathrm{C14\text{–}17}_{i,j,t} + 0.39\ \mathrm{OneC}_{i,j,t} + 0.56\ \mathrm{TwoC}_{i,j,t}, \tag{10}$$

where $\mathrm{C}x\text{–}y_{i,j,t}$ denotes the number of children aged between x and y years inclusive in the household, $\mathrm{OneC}_{i,j,t}$ is an indicator for exactly one child aged 17 years or younger in the household and $\mathrm{TwoC}_{i,j,t}$ is an indicator for exactly two children aged 17 years or younger in the household. The equivalence scale for married households takes the same form as (10) but with the parameters replaced by 1.59, 0.23, 0.30, 0.42, 0.16 and 0.30, respectively.

[21] This figure represents the sum of 280 euros per month for non-housing assistance and 325 euros per month for housing (both figures are averages over the states in west Germany).

[22] A household cannot claim social assistance before claiming all entitlements to unemployment insurance. However, suppose the net income of a household that is receiving unemployment insurance is below the household-specific social assistance income floor, e.g., because there are children in the household. In that case, the household may also receive social assistance to raise the household's net income up to the level of the social assistance income floor.

recipients, unemployment insurance recipients are older, more likely to be married men, less likely to be single women, and less likely to have children.

2.3.3 Income Tax

Figure 1 illustrates the progressive income tax schedules for a single individual without children and a married household with one earner. A single individual with full-time earnings of 30,608 euros per year (the mean in our sample) faces an average tax rate (including social security contributions) of 41.9%. Note, income tax (excluding social security contributions) is based on household income, i.e., taxation is joint: a single household with taxable income of x and a married household with taxable income of $2x$ face the same average tax rate on taxable income.

3 Empirical Specification

In this section, we describe the empirical specifications of preferences, the job offer and destruction probabilities, and wages (Section 5 provides the specifications of the marriage, divorce, and fertility processes).

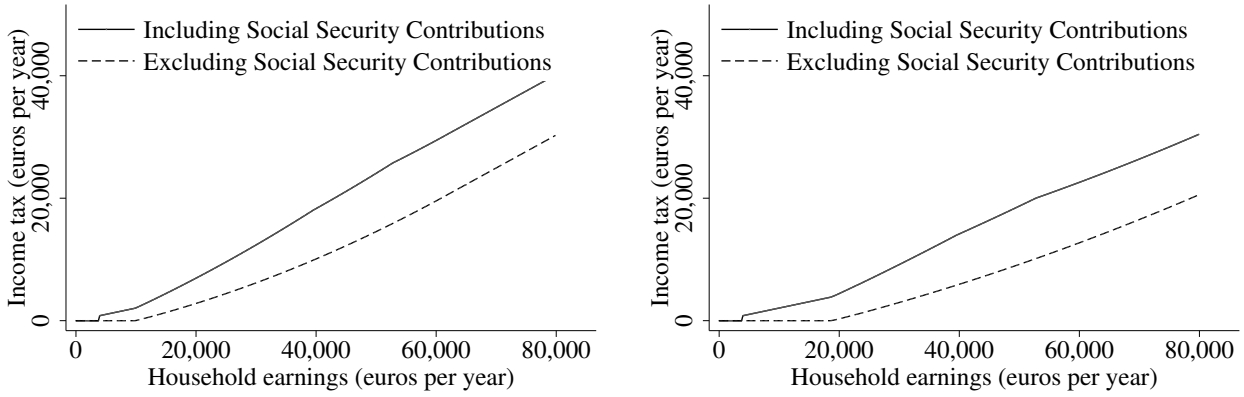
3.1 Preferences

We adopt the following specification for a woman's preferences:

$$\begin{aligned} U^F(m_{i,j,t}, d_{i,t}, s_{i,t}, \text{SAClaim}_{i,j,t}, \text{UIClaim}_{i,t}) &= u^F(m_{i,j,t}, d_{i,t}) - \varphi^F_{i,SA}\text{SAClaim}_{i,j,t} \\ &\quad -\varphi^F_{UI}\text{UIClaim}_{i,t} - \frac{s^2_{i,t}}{2} + \varepsilon_{i,t}(d_{i,t}). \end{aligned} \quad (12)$$

The sub-utility function, u^F, captures the systematic component of the woman's preference for consumption and leisure. Following Moffitt (1983), the woman faces a fixed cost, $\varphi^F_{i,SA}$, of claiming social assistance. This claiming cost includes social stigma, which might be lower for employed individuals. For this reason, we allow the social assistance claiming cost to vary by employment status with $\varphi^F_{i,SA} = \varphi^F_{SA}$ if the woman is not working (i.e., non-employed or retired) and $\varphi^F_{i,SA} = \iota_{SA} \times \varphi^F_{SA}$, if the woman is working either full-time or part-time. Search costs are quadratic. $\varepsilon_{i,t}(d_{i,t})$ denotes unobserved preference shocks that are specific to the woman's labor supply state. The unobserved preference shocks are assumed to be independent over time, and contemporaneous preference shocks are assumed to be mutually independent and normally distributed with mean zero and standard deviation ς_F.

Our specification of the sub-utility function is motivated by evidence of important nonseparability between consumption and leisure (see, e.g., Browning and Meghir, 1991, and Attanasio



(a) Single individual without children

(b) Married household with one earner

Notes: We use the west German rules for the year 2000. Income tax, excluding social security contributions, is based on taxable household income, which is equal to the taxable earnings of all household members plus the household's taxable interest income minus the household's tax-deductible social security contributions. Individual earnings above 1,022 euros per year are taxable. Interest income above 1,585 euros per year for a single household or 3,170 euros per year for a married household is taxable. Social security contributions up to 2,001 euros per year for a single household or 4,002 euros per year for a married household may be deducted (even if only one spouse is working). Single parents receive an additional tax-free earnings allowance of 2,871 euros per year. The solidarity surcharge (Solidaritatszuschlag) is included in income tax and equals 5.5% of the household's tax liability, excluding social security contributions. Earnings are subject to social security contributions at rates of 7.75%, 9.65%, and 3.25% for health, retirement, and unemployment benefits. Individuals with earnings below 3,865 euros per year are exempt from social security contributions. Individual earnings above 52,765 euros per year are exempt from social security contributions for retirement and unemployment benefits, and individual earnings above 75% of this amount (i.e., 39,574 euros per year) are exempt from social security contributions for health benefits. The illustrated tax schedules are for households with zero interest income.

Figure 1: Income tax schedule

and Weber, 1995). In particular, we follow, e.g., French and Jones (2011) and specify that:

$$u^F(m_{i,j,t}, d_{i,t}) = \frac{\left(\eta^F(d_{i,t}) m_{i,j,t}/E_{i,j,t}\right)^{1-\rho^F}}{1-\rho^F}, \tag{13}$$

where ρ^F is the coefficient of relative risk aversion for women and $E_{i,j,t}$ is the household equivalence scale that is implicit in the German social assistance system (see footnote 20). Consumption, therefore, is a household public good subject to congestion as household size increases. The woman's effective consumption, represented by $\eta^F(d_{i,t})m_{i,j,t}$, is her consumption adjusted for the disutility of working or, alternatively, adjusted according to her employment state-specific preference for consumption, denoted by $\eta^F(d_{i,t})$. This is expressed as follows:

$$\begin{aligned}\log \eta^F(d_{i,t}) = X_{i,t} \, (&\eta^F_{FT,S} FT_{i,t} \times \text{Single}_{i,t} + \eta^F_{PT,S} PT_{i,t} \times \text{Single}_{i,t} + \\ &\eta^F_{FT,C} FT_{i,t} \times \text{Married}_{i,t} + \eta^F_{PT,C} PT_{i,t} \times \text{Married}_{i,t}).\end{aligned} \tag{14}$$

In the above, $FT_{i,t}$ is an indicator for the woman working full-time, $PT_{i,t}$ is an indicator for

the woman working part-time, $\text{Single}_{i,t}$ is an indicator for the woman being single, $\text{Married}_{i,t}$ is an indicator for the woman being married, and $X_{i,t}$ is a vector of demographics that may shift consumption and leisure preferences. Specifically,

$$X_{i,t} = [1 - \text{AgeG50}_{i,t}, \text{AgeG50}_{i,t}, \text{Child 0-3}_{i,t}, \text{Child 3-6}_{i,t}],$$

where $\text{AgeG50}_{i,t}$ is an indicator for the woman being aged 50 years or older, Child $0\text{-}3_{i,t}$ is an indicator for the youngest child in the household being aged under 3 years, Child $3\text{-}6_{i,t}$ is an indicator for the youngest child in the household being aged between 3 and 6 years. $\eta^F_{FT,S}$ and $\eta^F_{PT,S}$ measure a single woman's taste for consumption when working full-time and part-time, respectively, relative to her taste for consumption when not working. $\eta^F_{FT,M}$ and $\eta^F_{PT,M}$ are the corresponding preference parameters for a married woman. The utility function for men takes the same form as for women, except that child-related variables are omitted from men's preferences.

3.2 Job Offer and Job Destruction Probabilities

Recall, an individual who was employed in the previous period may be subject to a job destruction, which precludes them from working in any job in the current period. Job destructions occur with a probability that depends fully flexibly on the individual's gender, age category (younger than 50 years or 50 years older), education category (high or low), and marital status. Job destructions are assumed to be independent across spouses, conditional on age and education. An individual who was employed in the previous period and who is not subject to a job destruction remains employed, if the individual decides to do so.

An individual who was non-employed in the previous period receives a job offer with a probability that depends on their endogenous search intensity. In particular, a woman who was non-employed in the previous period and searches with intensity $s_{i,t} \in \left[0, \frac{1}{\chi_{i,t}}\right]$ receives a job offer with probability:

$$P^F_{i,t} = \chi_{i,t} s_{i,t}, \tag{15}$$

where $\chi_{i,t}$ denotes the woman's search productivity. Search productivity is given by:

$$\log(\chi_{i,t}) \;=\; \chi^F_1 + \chi^F_2 \text{AgeG50}_{i,t} + \chi^F_3 \text{HiEduc}_i + \chi^F_4 \text{Married}_{i,t}, \tag{16}$$

where HiEduc_i is an indicator of the woman having high education. The corresponding job-offer probability for a man is obtained by replacing F with M and i with j in (15) and (16).[23]

[23]Depending on the parameter values, non-employed individuals may be more or less likely to receive job

3.3 Wages

An individual's market wages depend on their experience, education, and unobserved productivity. Sample wage observations are mismeasured variants of market wages. Since we only observe wages for individuals in employment, the distribution of accepted wages will differ from that of market wages. As explained in Section 5, we obtain estimates of the parameters of the market wage process by jointly modeling wages and labor supply and using exclusion variables that affect labor supply but not market wages to separate the selection process.

In more detail, the sampled log real market wage of woman i at time t is given by:

$$\begin{aligned} \log \widetilde{W}_{i,t} &= \log W_{i,t} + \nu_{i,t}, & (17) \\ &= \beta_1^F + \beta_2^F \text{Exp}_{i,t} + \beta_3^F \text{HiEduc}_i + \beta_4^F \kappa_{i,t} + \nu_{i,t}, & (18) \end{aligned}$$

where $\text{Exp}_{i,t}$ denotes the woman's experience (in years), $\kappa_{i,t}$ denotes the woman's unobserved productivity, and $\nu_{i,t}$ is measurement error. Experience is zero at the time of entry into the labor force from education and increases by 0.25 for each period of full-time work and 0.125 for each period of part-time work. Unobserved productivity, $\kappa_{i,t}$, may be transitory, persistent or permanent. In particular, we assume that individuals are subject to productivity shocks leading $\kappa_{i,t} \in \{0, 1\}$ to evolve according to:

$$\kappa_{i,t} = \mathbf{1}(\theta^F(1 - \kappa_{i,t-1}) - \theta^F \kappa_{i,t-1} + \epsilon_{i,t} \geq 0), \quad (19)$$

where $\epsilon_{i,t}$ is assumed to be serially independent at the individual level with $\epsilon_{i,t} \sim N(0, 1)$. Note, this implies that a woman experiences a productivity shock with probability $\Phi(\theta^F)$, where $\Phi()$ denotes the standard normal distribution function.[24]

The wage process for men is obtained by replacing F with M and i with j in (17), (18), and (19). Note that all parameters of the wage process may vary by gender. This aspect of the specification captures gender differences in labor market conditions and labor market-related behaviors. A difference in the probability of a positive wage shock by gender, for example, may result from gender differences in risk-taking, competitiveness, or occupational

offers than otherwise identical employed individuals. However, given the observed persistence of employment and non-employment, we expect to estimate parameters that imply the job offer rate increases with employment. However, the model does impose that the cost of obtaining a job offer is higher for non-employed individuals than for those in employment. This seems unproblematic, given that many employed individuals have stable relationships with their employers. Additionally, generalizing this aspect of the model would require data on search effort or job-to-job transitions, neither of which are measured well in our data.

[24] An individual's initial unobserved productivity is drawn from the steady-state distribution of unobserved productivity. In the steady-state, half of the women have high unobserved productivity ($\kappa = 1$). Measurement error, $\nu_{i,t}$, affects the sampled wage but not the market wage. Measurement errors are assumed to occur independently over time and over spouses with $\nu_{i,t} \sim N(0, \sigma^2_{\nu F})$.

choice, among other mechanisms. In addition, in the spirit of Attanasio et al. (2008) and Blundell et al. (2016b), a correlation between spouses' contemporaneous productivity shocks is allowed. Specifically, we assume $\text{corr}(\epsilon_{i,t}, \epsilon_{j,t}) = \varrho$. Non-contemporaneous shocks to unobserved productivity are assumed to be independent across spouses.[25]

4 Data and Sample

Estimation is based on the German Socio-Economic Panel (SOEP) and the German Survey of Income and Expenditure (Einkommens- und Verbrauchsstichprobe, EVS).[26] Both data sources are designed to be representative of the German population. The SOEP provides panel data on household and individual characteristics, including employment, marriage and cohabitation, age, experience, education, wages, children, and benefit receipt. The SOEP also includes information about wealth; however, it lacks detailed information on savings. We, therefore, follow Adda et al. (2017) and supplement the SOEP with information on savings from the EVS. The EVS is a repeated cross-sectional survey that includes information on household savings, wealth, employment, and demographic characteristics.[27] In the remainder of this section, we describe the SOEP and EVS samples. Table A.3 in Web Appendix E establishes the comparability of the SOEP and EVS samples by showing that demographic characteristics, wealth, and employment behavior are similar in the two samples.

From the annual SOEP datasets, we construct a quarterly panel sample of west German households covering the years 1991–2004.[28] Following the life-cycle model, the SOEP sample comprises female-headed single households, male-headed single households, and married households. For married households, we randomly designate one spouse as the household head. We restrict the SOEP sample to household-quarter observations where the household head is aged 18–65 years. Additionally, we exclude household-quarter observations where the household head or head's spouse is: in education; a university graduate aged under 23 years; self-employed; or employed by the Civil Service. Finally, to avoid extreme outliers, we exclude the households with wealth in the top or bottom 1% of the surveyed values of wealth. The SOEP sample contains 10,217 unique households and 359,013 individual-quarter-year observations. Table 1 provides descriptive statistics on the variables that we use in the indirect inference estimation

[25]The household is assumed to have no information, beyond that given above, about the values of future market wage shocks. Blundell et al. (2016b) find little evidence of anticipation of wage shocks; for further discussion see Blundell and Preston (1998), Pistaferri (2001, 2003) and Guvenen (2007).

[26]Estimation also uses information on the employment effects of unemployment insurance from German social security records. Section 5 explains how we take the required information from the literature.

[27]See Wagner et al. (2007) for a description of the SOEP and Statistisches Bundesamt (2008) for further details about the EVS.

[28]As discussed in footnote 14, the sample ends before the fourth stage of the Hartz reforms.

	All	Single women	Single men	Married women	Married men
Share		0.16	0.12	0.36	0.36
Age (years)	44.30	43.07	40.49	43.84	46.57
High education	0.12	0.13	0.19	0.07	0.15
Experience	16.69	14.01	15.52	12.19	22.80
Child 0–3	0.08	0.03	–	0.10	0.10
Child 3–6	0.07	0.04	–	0.09	0.09
Part-time employed	0.13	0.14	–	0.30	–
Full-time employed	0.54	0.51	0.79	0.25	0.75
Retired	0.08	0.12	0.04	0.06	0.09
Non-employed	0.25	0.23	0.17	0.39	0.16
Non-employed households	0.11	0.23	0.17	0.08	0.08
Wage (Euros per hour)	14.72	13.19	15.66	11.60	17.13
Social Assistance receipt rate:					
Non-employed households	0.13	0.23	0.07	0.09	0.09
Working households	0.01	0.02	0.01	0.01	0.01
Unemployment Ins. receipt rate:					
Non-employed individuals	0.17	0.27	0.45	0.06	0.35
Unique household observations	10,217	2,753	2,209	6,882	6,882
Individual-quarter observations	359,004	42,005	28,461	144,269	144,269
Observations of wage	43,049	4,736	3,842	14,029	20,442

Notes: Share represents the (weighted) proportion of single women, single men, married women, or married men in the sample. High education is defined as having a university degree. Child 0-3 is an indicator for the youngest child in the household being under 3 years old. Child 3-6 is an indicator for the youngest child in the household being between 3 and 6 years old. Labor force status (full-time employed, part-time employed, non-employed, retired) is determined by an individual's situation in the first month of the quarter. A non-employed household is one where all individuals are non-employed. The hourly wage is calculated as gross earnings, inclusive of overtime pay, in the month before the survey, divided by contractual working hours, including hours of paid overtime, during the same period. Consequently, wages are observed only for individuals employed in the month prior to the survey. Wages are expressed in year 2000 prices using the Consumer Price Index. Non-employed households are those where all adult household members were non-employed in at least one common quarter during the past year. Working households are those where at least one adult household member was employed in each quarter of the previous year. Social assistance receipt encompasses the receipt of social assistance and unemployment assistance benefits. The unemployment insurance receipt rate is the fraction of newly non-employed individuals without work-limiting health problems who receive unemployment insurance (where non-employed individuals are those who were non-employed for at least one quarter during the past year). All statistics are weighted using the household weights provided by the SOEP.

Table 1: Descriptive statistics for the SOEP sample

of the structural model.

From the EVS data, we construct a repeated cross-sectional sample of quarterly household saving rates for the years 1998 and 2003.[29] We form the EVS sample using the same selection

[29]Although the 1993 EVS also falls within the period covered by the SOEP sample, we do not use this dataset because the 1993 survey asked about savings during a year instead of the quarterly period used in the 1998 and 2003 surveys.

criteria as we used to construct the SOEP sample, also excluding households with extreme levels of wealth. In addition, we exclude households with quarterly savings or net income in the bottom or top 1% of the surveyed values of the respective variable. Savings rates range from 9% for single women age 50 and above to 17% for high educated single men. Table A.4 in Web Appendix E provides further descriptive statistics on the savings rates in the EVS sample.

5 Estimation Method

Estimation proceeds in two stages. In the first stage, we use the SOEP sample to estimate the strength of education-based assortative mating, the rates of marriage, divorce, and births over the life cycle, and job destruction probabilities.[30]

In the second stage of the estimation, we use indirect inference to estimate the parameters in preferences, search productivity, wages, and the search requirement for unemployment insurance. Intuitively, we specify an auxiliary model that summarizes important aspects of observed (i.e., actual) behavior and behavior in a sample that we simulate using the decision rules and other equations of motion given by the life-cycle model.[31] Parameter values then are chosen to maximize the similarity between the observed and simulated behaviors, as viewed from the perspective of the auxiliary model. Formally, let ω denote the collection of parameters to be estimated in the second stage. The indirect inference estimator of ω is given by:

$$\widehat{\omega} = \underset{\omega}{\operatorname{argmin}} \left(\widehat{\psi} - \widehat{\psi}(\omega)\right)' \Sigma \left(\widehat{\psi} - \widehat{\psi}(\omega)\right), \tag{20}$$

where $\widehat{\psi}$ denotes the auxiliary model parameter estimates based on observed behavior, including estimates that we obtain from our SOEP and EVS samples and estimates from German social security records reported in the literature, $\widehat{\psi}(\omega)$ denotes the auxiliary model parameter estimates obtained using a sample simulated from the life-cycle model with parameter values ω, and Σ is a diagonal weighting matrix.[32] We obtain standard errors using the formula provided

[30] We estimate the strength of education-based assortative mating by calculating the empirical probability that an individual's spouse has a university degree, conditional on the individual's education. We use Lowess regressions to estimate marriage rates by age, gender and education, divorce rates by age and the spouses' education, and birth rates by age, education and marital status. We estimate job destruction probabilities based on the definition of a job destruction in the model. In the model, a job destruction forces the individual to transition from employment to non-employment (with or without job search) or retirement. Matching this, we estimate job destruction probabilities by calculating the fraction of employed individuals who make an involuntary transition from employment to non-employment or retirement. We define involuntary transitions as transitions due to layoff, plant closure, or the termination of a temporary contract.

[31] When simulating samples from the life-cycle model, we plug in our estimates of the marriage, divorce, and birth rates, strength of assortative mating, and job destruction probabilities.

[32] The weighting matrix has diagonal elements that are inversely proportional to the variances of the auxiliary model parameters. Variances for the auxiliary model parameter that we obtain from our SOEP and EVS samples

by Gourieroux et al. (1993). See Smith, Jr (1993), Gourieroux et al. (1993), and Gallant and Tauchen (1996) for more general discussions of Indirect Inference.

We estimate the 54 parameters that appear in preferences, search productivity, and wages by matching 75 auxiliary model parameters. Each auxiliary model parameter summarizes a feature of labor supply, savings, benefit receipt, or wages. Table 2 describes the auxiliary model parameters and lists the model parameters that each group of auxiliary model parameters primarily identifies.

We discuss two important aspects of the auxiliary model. First, since wages are observed only for individuals in employment, the auxiliary model should include information that separates selection effects from wage determinants. Specifically, the auxiliary model should summarize how observed wages vary with at least one exclusion variable that affects employment but does not enter the wage process. In our setting, children, marital status, spousal education, and spousal experience satisfy the criteria for exclusion variables. We use all of these exclusion variables, along with education and experience, to predict the probability of employment for each observation, separating the estimation by gender. We then include in the auxiliary model the correlation between the predicted probability of employment and the residualized wage.[33]

Second, given the focus of this paper on the design of unemployment insurance, it is important that the auxiliary model is formulated to ensure a strong empirical foundation for the employment effect of unemployment insurance predicted by the estimated life-cycle model. In the life-cycle model, the employment effect of unemployment insurance depends on the effect of unemployment insurance on utility and the productivity of job search. The effect of unemployment insurance on utility, in turn, depends on risk aversion, the employment-state-specific taste for consumption, and the scale of the preference shocks (note, the scale of the preference shocks controls the importance of consumption in utility compared to the preference shocks).

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are estimated using bootstrapping with household-level clustering. Variances for the auxiliary model parameters that we take from the literature are calculated from the standard errors accompanying the published estimates. We apply two adjustments to the weighting matrix. First, we adjust the weighting matrix to ensure that moment groups containing more moments do not automatically impact more on the criterion function. In particular, we re-weight each block of auxiliary model parameters in Table 2 by the ratio of the number of structural parameters identified by the moment group to the number of moments in the group. The asymptotically efficient weight matrix would also mitigate this concern; however, we use a diagonal weighting matrix to avoid finite sample biases that are introduced by using the optimal weighting matrix (see, e.g., Altonji and Segal, 1996). Second, we adjust the weighting matrix to offset differences in observation numbers related to different reporting frequencies. In particular, information on wages and benefit receipt is only available annually, while our sample contains quarterly information on employment. Since benefit receipt, wages, and employment are arguably of comparable economic importance in our setting, we up weight the auxiliary model parameters summarizing wages and benefit receipt by a factor of four; this ensures comparable weights for auxiliary model parameters summarizing the quarterly employment information and the annual information on wages and benefit receipt. Einav et al. (2020) also re-weight their auxiliary model parameters to increase the weight given to the most economically important information.

[33]The wage exclusions are strongly statistically significant: the p-value for the correlation between predicted employment and the residualized wage in the SOEP sample is equal to 0.001 for women and 0.000 for men.

Description (Source)	Auxiliary model parameters	For	#	Primarily identifying
Voluntary quit rate (SOEP)	Coefficients from logit regressions of voluntary quits on demographics.	SF CF SM CM	16	$\eta^F_{FT,S}$ $\eta^F_{FT,C}$ $\eta^M_{FT,S}$ $\eta^M_{FT,C}$
Transition rate into employment (SOEP)	Coefficients from logit regressions of transitions into employment on demographics.	SF CF SM CM	16	χ^F χ^M
Part-time employment rate for the previously employed women (SOEP)	Coefficients from logit regressions of part-time employment on demographics.	SF CF	10	$\eta^F_{PT,S}$ $\eta^F_{PT,C}$
Joint leisure time (SOEP)	Log odds ratio of the proportion of childless married households with wife non-employed and husband employed.	C	1	α
Saving rates (EVS)	Quarterly saving rate for households where the head is: i) aged under 50; ii) age 50 or older; iii) highly educated.	SF SM	6	ρ^F ρ^M b^F b^M
Receipt and employment effects of benefits (German social security records and SOEP)	i) Effect of a 6 month extension of unemployment insurance benefits on time until reemployment (as reported by Schmieder et al., 2012); ii) Log odds ratio of the social assistance receipt rate (by employment status for SF and C); iii) Log odds ratio of the unemployment insurance receipt rate for non-employed individuals.	i) F M; ii) SF SM C; iii) SF SM CF CM	11	ς_F ς_M φ^F_{SA} φ^M_{SA} ι_{SA} φ^F_{UI} φ^M_{UI} π
Wage regressions (SOEP)	Coefficients from OLS regressions of log wage on an intercept, high education, and experience.	F M	6	β^F_1 β^F_2 β^F_3 β^M_1 β^M_2 β^M_3
Summary of wage residuals (SOEP)	i) Standard deviation of wage residuals, correlation between wage residuals one year apart, and correlation of wage residuals two years apart; correlation between predicted employment and the wage residual; ii) between-spouse correlation of wage residuals.	i) F M; ii) C	9	β^F_4 θ^F $\sigma_{\nu F}$ β^M_4 θ^M $\sigma_{\nu M}$ ϱ

Notes: Demographic variables are indicators for age<50 years, age≥50 years, high education, and (for women) indicators for the age category of the youngest child. High education is a university degree. S, C, F, and M denote, respectively, single, married, female, and male.

Table 2: Description of the auxiliary model

We identify risk aversion from the saving rate. We identify the employment-state-specific taste from the labor supply choices of individuals who were employed in the previous period and are not subject to a job destruction. These individuals face an unconstrained labor supply problem, and therefore their behavior maps directly to preferences.

We use two further empirical quantities to jointly identify job search productivity and the scale of the preference shocks. First, the auxiliary model includes the transition rate from non-employment into employment, split by the variables that affect search productivity (age, education, gender, and marital status). Second, the auxiliary model includes estimates of the employment effects of unemployment insurance from German social security records. We take these estimates from Schmieder et al. (2012), who find that a 6-month extension in the initial entitlement period for unemployment insurance benefits increases the average duration

until reemployment by 0.94 months for women and 0.64 months for men. These estimates of unemployment insurance's employment effect directly inform the importance of unemployment insurance in utility and, therefore, distinguish the determinants of search productivity from preference parameters.

6 Estimation Results

In this section, we present our estimates of the parameters of the life-cycle model, demonstrate the estimated model's good in-sample fit, and show that the implications of the estimated model are consistent with previous studies.

6.1 Parameter Estimates

Table 3 presents our estimates of the job destruction probabilities. The probability of a job destruction falls with education, increases with age, and tends to be higher for women than for men. Marital status has no systematic effect on the probability of a job destruction.

	Single individuals		Married individuals	
	Women	Men	Women	Men
High education and age≥50 years	0.004	0.005	0.016	0.011
High education and age<50 years	0.007	0.003	0.010	0.002
Low education and age≥50 years	0.017	0.015	0.015	0.013
Low education and age<50 years	0.010	0.009	0.010	0.005

Table 3: Quarterly job destruction probabilities

Table 4 presents our estimates of the parameters in the wage equation. We find that the market wage increases with education and experience. The unobserved component of the market wage is persistent, with wage shocks being large, infrequent, and correlated between spouses. Based on our estimates, we calculate that the standard deviation of (annualized) wage shocks is equal to 0.0433 log points for women and 0.0607 log points for men; these figures are in line with the results for Germany reported by Krueger et al. (2010) and Fuchs-Schuendeln et al. (2010).

Table 5 presents our estimates of the preference parameters. Panel I reports the estimates of the taste for consumption when employed. Given the empirical specification of preferences in Section 3.1, a taste for consumption when employed of η translates into a disutility of working of $100 \times (1 - \exp(\eta))$ percent of consumption. The negative estimates for individuals aged below 50 years and 50 years and older, therefore, imply disutility from working for individuals without children, irrespective of hours, gender, age, or marital status. For women, young

	Women		Men
Intercept (β_1^F, β_1^M)	2.268		2.566
	(0.045)		(0.025)
Experience/40 (β_2^F, β_2^M)	0.195		0.197
	(0.049)		(0.046)
High education (β_3^F, β_3^M)	0.583		0.427
	(0.036)		(0.025)
Wage shock probability ($\Phi(\theta^F), \Phi(\theta^M)$)	0.003		0.003
	(0.001)		(0.002)
Loading on persistent unobservable (β_4^F, β_4^M)	0.636		0.562
	(0.020)		(0.017)
Standard deviation of measurement error ($\sigma_{\nu F}, \sigma_{\nu M}$)	0.188		0.151
	(0.013)		(0.006)
Between-spouse correlation of persistent wage shocks (ϱ)		0.843	
		(0.115)	

Notes: Standard errors in parentheses. $\Phi()$ denotes the standard normal distribution function.

Table 4: Wage equation

children increase the disutility of full-time work but decrease the disutility of part-time work.[34] Panel II shows that the CRRA is estimated to be 1.783 for women and 2.500 for men. These figures are in line with previous studies, which typically report estimates of the CRRA in the range of 1–3 (see, e.g., Attanasio and Weber, 1995). We also see that women and men receive approximately equal weight in married households.

Panel II further shows that individuals experience significant disutility if they claim social assistance or unemployment insurance. Employment reduces the cost of claiming social assistance: the utility cost of claiming if employed is 65.2% of the cost of claiming if not employed. To aid interpretability, we express the claiming costs in consumption equivalents. The disutility of claiming unemployment insurance is equivalent to 54% of consumption for women and 13% of consumption for men. The disutility of claiming social assistance if not working (working) is equivalent to 79% (40%) of consumption for women and 56% (27%) of consumption for men.[35] The search requirement for unemployment insurance is statistically significant but quantitively modest. In more detail, recalling the quarterly job offer probability is given by the product of the search intensity and the search productivity, we calculate that, e.g., a married woman aged under 50 satisfies the search requirement if her annualized job offer probability is at least

[34]Quantitatively, the disutility of full-time work represents 32% of consumption for single men aged 50 years or older, while for married women aged under 50 years whose youngest child is aged 0-3 years, it accounts for 92% of consumption. The disutility of part-time work ranges from 14% of consumption for married women aged under 50 years whose youngest child is aged 0-3 years to 90% for single women aged under 50 years without young children.

[35]These figures were calculated using the specification of preferences given in Section 3.1. Consumption equivalents of the costs of claiming unemployment insurance and social assistance if not working are for childless married individuals aged under 50 with a household consumption level of 1,000 euros per month. Consumption equivalents of the costs of claiming social assistance if working are for full-time working childless married individuals aged under 50 with a household consumption level of 1,500 euros per month.

I: Taste for consumption when employed	Single women	Married women	Single men	Married men
Full-time employment ($\eta^F_{FT,S}, \eta^F_{FT,C}, \eta^M_{FT,S}, \eta^M_{FT,C}$):				
Age<50	−1.633 (0.132)	−1.902 (0.149)	−0.844 (0.142)	−1.040 (0.131)
Age≥50	−1.534 (0.096)	−2.312 (0.146)	−0.393 (0.178)	−1.356 (0.244)
Youngest child aged < 3	−0.199 (0.167)	−0.649 (0.101)	–	–
3 ≤ Youngest child aged < 6	−0.623 (0.170)	−0.649 (0.136)	–	–
Part-time employment ($\eta^F_{PT,S}, \eta^F_{PT,C}$):				
Age<50	−2.320 (0.137)	−1.514 (0.129)	–	–
Age≥50	−2.347 (0.157)	−1.446 (0.169)	–	–
Youngest child aged < 3	1.003 (0.210)	1.366 (0.173)	–	–
3 ≤ Youngest child aged <6	1.132 (0.388)	1.230 (0.340)	–	–

II: Further preference parameters	Women	Men	All
CRRA (ρ^F, ρ^M)	1.738 (0.071)	2.500 (0.290)	
Scale of preference shocks (ς_F, ς_M)	4.654 (0.864)	6.411 (0.479)	
Social assistance stigma ($\varphi^F_{SA}, \varphi^M_{SA}$)	−4.117 (0.861)	−3.249 (0.705)	
Unemployment insurance claiming cost ($\varphi^F_{UI}, \varphi^M_{UI}$)	−1.512 (0.295)	−0.320 (0.209)	
Bequest utility (b^F, b^M)	5.638 (1.120)	4.225 (2.944)	
Search requirement (π)			0.471 (0.103)
Weight on female spouse (α)			0.509 (0.063)
Social assistance stigma for working relative to non-working individuals (ι_{sa})			0.652 (0.125)

Notes: Standard errors in parentheses.

Table 5: Preference parameters

4.2%. Table 6 shows that search productivity decreases with age, increases with education, and is lower for married individuals than for singles.

Figure A.1 in Web Appendix B illustrates the estimated rates of marriages, divorces, and births over the life cycle. In line with the previous literature, we find that women tend to marry younger than men, and the risk of divorce falls with age. The estimated birth probabilities are higher for married women than for single women and, conditional on marital status, decrease with education. Table A.1 in Web Appendix B presents our estimates of the assortative mating process. We find strong education-based assortative mating.

	Women	Men
Intercept (χ_1^F, χ_1^M)	−2.418	−2.626
	(0.114)	(0.086)
Age ≥ 50 (χ_2^F, χ_2^M)	−0.962	−1.224
	(0.095)	(0.135)
High education (χ_3^F, χ_3^M)	0.203	0.012
	(0.056)	(0.130)
Married (χ_4^F, χ_4^M)	−0.257	−0.235
	(0.059)	(0.082)

Notes: Standard errors in parentheses.

Table 6: Search productivity

6.2 In-Sample Goodness of Fit

Table 14 in Appendix A shows that the estimated model obtains a close fit to the features of labor supply, benefit receipt, savings, and wages that we targeted in the estimation. In terms of labor supply, the estimated model fits the patterns of voluntary quits, transitions into employment, and part-time work by age, gender, education, and children that we observe in the SOEP sample. The estimated model closely replicates married couples' joint labor supply behavior: the proportion of childless married households with the wife non-employed and husband employed is 0.21 in the SOEP sample, while the estimated model implies a figure of 0.23. The estimated model also does a good job at fitting savings behavior and wages; for instance, the saving rate for single men aged under 50 years or older is 13% in the EVS sample and 12% and according to the estimated model, and the partial effect of high education on the log wage is 0.34 for women and 0.42 for men both in the SOEP sample and according to the estimated model. Finally, the estimated model fits the rates of social assistance and unemployment insurance receipt and the effect of the unemployment insurance entitlement period on time until reemployment for women and men (see Section 6.3 for further discussion of the estimated model's predictions about the employment effects of unemployment insurance).

When we dig deeper into the pattern of benefit take-up, we find that the estimated model predicts that 47% of households eligible for social assistance choose not to claim the benefit. Since the SOEP does not include information on benefit eligibility, we do not have a sample analog for this prediction. However, a non-take-up rate of 47% is slightly lower but still broadly consistent with the non-take-up rates found by previous studies for Germany, including Kayser and Frick (2000) and Riphahn (2001) who estimate non-take-up rates of 63.1% and 62.6%, respectively.[36] Due to the fixed cost of claiming social assistance, the estimated model predicts

[36]The difference in the estimated take-up rates between the prediction of the estimated model and the literature might be due to measurement error in the eligibility measures used in the previous studies. Specifically, errors in establishing eligibility could lead some ineligible households to be classified as eligible, thereby artificially inflating the non-take-up rate. Harnisch (2019) discusses assumptions and measurement errors when simulating non-take-up rates and shows that the estimates of Kayser and Frick (2000) and Riphahn (2001) are

that forgone benefits tend to be lower than claimed benefits. Specifically, households who claim social assistance receive an average benefit of 637 euros per month, while eligible households who do not claim social assistance forgo an average benefit of 406 euros per month. Overall, 36% of the value of potential social assistance goes unclaimed. The latter implication of the model aligns with the unclaimed benefit rate of 45.3% found by Kayser and Frick (2000).

The estimated model predicts a lower non-take-up rate for unemployment insurance than for social assistance. Specifically, the estimated model predicts that 30% of individuals eligible for unemployment insurance do not claim the benefit. Forgone unemployment insurance benefits are on average lower than claimed benefits (445 versus 867 euros per month), and 18% of the value of potential unemployment insurance goes unclaimed. We are not aware of any papers that estimate non-take-up rates for unemployment insurance in Germany. Still, the estimated model's non-take-up rate of 30% for unemployment insurance is comparable to the take-up rates of 25%-40% found in studies of the US (e.g., Blank and Card, 1991, Currie, 2006).

We move beyond the quantities matched in the estimation to show that the estimated model targets benefit receipt consistent with the behavior in the SOEP sample. Table 15 in Appendix A compares the characteristics of social assistance and unemployment insurance recipients in the SOEP sample with the characteristics of individuals predicted to receive social assistance or unemployment insurance based on the estimated model. The estimated model fits the observed concentration of social assistance on single women and the observed higher rates of unemployment insurance receipt among married individuals compared to singles. The estimated model also fits the observation that unemployment insurance recipients are, on average, older than social assistance recipients.

6.3 Consistency with Previous Studies

In the spirit of, e.g., Todd and Wolpin (2006) and Low and Pistaferri (2015), we assess the validity of the estimated life-cycle model by comparing the model's implications with findings from reduced-form studies. We perform model validation on three dimensions: the employment effects of unemployment insurance (compared to Lalive et al., 2006); the consumption smoothing effect of unemployment insurance (compared to Gruber, 1997); and the added worker effect (compared to Halla et al., 2020). We focus our model validation exercise on three specific papers from the broader literature because this allows us to generate model predictions for subpopulations and policy changes that match the focus of the comparison studies. We note that the results of the three comparison studies are similar to other reduced-form studies that look at different subpopulations and policy changes (see footnotes 37, 39, and 41).

at the higher end of studies for Germany. We note that Kayser and Frick (2000) and Riphahn (2001) do not estimate non-take-up rates for unemployment insurance.

6.3.1 The Effect of Unemployment Insurance on Employment

Lalive et al. (2006) exploit plausibly exogenous variation in benefit rules in Austria to show that the average duration of unemployment increased by 1.13 weeks in response to a 13.5 week increase in the initial entitlement period and increased by 0.96 weeks in response to a 4.6 percentage point increase in the replacement rate.[37] In this section, we show that the employment effects of the initial entitlement period and the replacement rate that are predicted by the estimated life-cycle model are consistent with Lalive et al. (2006)'s reduced-form findings.

	Model prediction	Estimate from Lalive et al. (2006) (95% confidence intervals in brackets)
Effect of a 13.5 week increase in the initial entitlement period	0.90	1.13 [0.78,1.48]
Effect of a 4.6 percentage point increase in the replacement rate	0.63	0.96 [0.47,1.45]

Notes: Model predictions based on 343,620 simulated job losses. Unemployment spells are right-censored at 24 months. To calculate the model's prediction of the effect of a 13.5-week increase in the initial entitlement period, we rescale the predicted effect of a 13-week (one quarter) increase by a factor of 1.038 (i.e., 13.5/13). The replacement rate in Lalive et al. (2006) represents the fraction of before-tax earnings replaced by unemployment insurance, whereas in our model, the replacement rate refers to the fraction of after-tax earnings replaced by unemployment insurance. Taking an average tax rate of 0.418, we compute a comparable replacement rate effect to that of Lalive et al. (2006) by rescaling the model's predicted effect of a 4.6 percentage point increase in the after-tax replacement rate by a factor of 1.718 (i.e., 1/(1-0.418)). To ensure a common baseline across our model predictions and the setting of Lalive et al. (2006), we rescale the effect of the increase in the entitlement period implied by our model by the exit rate at the average time of unemployment exit in Lalive et al. (2006) relative to the model prediction of the same exit rate. For the same reason, we rescale the replacement rate effect implied by our model by the fraction of individuals exiting during unemployment-insurance-covered employment in Lalive et al. (2006) relative to the model prediction of the same fraction.

Table 7: Effect of unemployment insurance on the average duration of unemployment

We proceed as follows. First, we simulate a representative sample of individuals who leave employment due to job loss, using the estimated model as the basis, except that individuals face initial entitlement periods of 3, 6, 9, or 12 months irrespective of age, with equal proportions of each. This setup generally aligns with the setting described by Lalive et al. (2006), where the

[37]For further evidence on the employment effects of unemployment insurance see, e.g., Moffitt and Nicholson (1982), Ham and Rea (1987), Katz and Meyer (1990), Atkinson and Micklewright (1991), Schmieder et al. (2012) (whose estimates we target in the estimation, see Section 5), Tatsiramos and van Ours (2014) and Card et al. (2015).

initial entitlement period ranged from 20 weeks to 12 months, and for most individuals, was not age-dependent. We then simulate the subsequent employment behavior in three environments. In the baseline environment, the unemployment insurance system faced by each individual is unchanged. In the first counterfactual environment, there is a permanent unanticipated increase of 3 months (one quarter) in the initial entitlement period, occurring at the time of the job loss. In the second counterfactual environment, following the policy variation in Lalive et al. (2006), there is a permanent unanticipated increase of 4.6 percentage points in the replacement rate, again occurring at the time of the job loss. We calculate the effects of the initial entitlement period and the replacement rate on the duration of unemployment by comparing the time until reemployment in each counterfactual environment with the time until reemployment in the baseline environment. When making these comparisons, we restrict the simulated samples to match Lalive et al. (2006)'s sample selection criteria: we include only individuals who are aged 35-54 years at the time of job loss, worked for at least twelve months during the two years before job loss, and claim unemployment insurance at the time of job loss.[38] Note that the permanent nature of the policy changes we simulate aligns with the context of Lalive et al. (2006), where changes to benefit levels resulted from modifications to the unemployment insurance regulations.

The first column of Table 7 summarizes the predictions of the estimated model about the effects of the initial entitlement period and the replacement rate. The estimated model predicts that a 13.5-week increase in the initial entitlement period increases the average duration of unemployment by 0.90 weeks. The estimated model also predicts that a 4.6 percentage point increase in the replacement rate increases the average duration of unemployment by 0.63 weeks. Comparing to the second column of Table 7, we see that the predictions of the estimated model are similar to Lalive et al. (2006)'s estimates.

6.3.2 The Effect of Unemployment Insurance on Consumption Smoothing

Gruber (1997) shows that unemployment insurance reduces the consumption fall associated with job loss. In particular, using variation in the replacement rate for unemployment insurance across states and within states over time, Gruber (1997) finds that a 10 percentage point increase in the (after-tax) unemployment insurance replacement rate reduces the average consumption fall associated with job loss by 2.6 percentage points (with a 95% confidence interval of 0.9 to 4.4 percentage points).[39] In this section, we show that the consumption smoothing effect of unemployment insurance predicted by the estimated model is consistent with Gruber (1997)'s reduced-form findings.

Similar to our approach in Section 6.3.1, we use the estimated model to simulate a repre-

[38]The latter restriction matches Lalive et al. (2006)'s focus on individuals who register as unemployed.

[39]Kroft and Notowidigdo (2016), and Ganong and Noel (2019) find similar consumption smoothing effects of unemployment insurance.

sentative sample of individuals leaving employment due to job loss, focusing here on a baseline scenario in which the unemployment insurance replacement rate is 60% and the initial entitlement period is 12 months. We follow Gruber (1997) by not imposing any restrictions based on age or unemployment insurance claiming or eligibility status. We then simulate each individual's employment behavior in two different post-job-loss policy environments. The first environment is identical to the pre-job-loss setting, while the second is identical to the first except for an unexpected, permanent 10 percentage point increase in the UI replacement rate at the time of job loss. For each of these environments, we calculate the average fall in consumption between the period before the job loss and the period of the job loss (we follow Gruber, 1997, by excluding observations with more than a three-fold change in consumption). In these simulations, the average consumption drop associated with job loss amounts to 31.3% in the first post-job-loss environment and 27.6% in the second.[40] Since the only difference across the post-job-loss environments is an anticipated increase in the unemployment insurance replacement rate in the second environment, the estimated model predicts that a 10 percentage point increase in the unemployment insurance replacement rate reduces the consumption fall associated with job loss by 3.7 percentage points, which is within the 95% confidence interval for Gruber (1997)'s estimate.

6.3.3 The Added Worker Effect

The added worker effect is a labor supply pattern in married households where the wife adjusts her labor supply when her husband loses his job. Halla et al. (2020) use administrative data on displacements (i.e., plant closures and mass layoffs) in Austria to estimate the effect of the husbands' displacement on the labor supply of husbands and wives. Halla et al. (2020) compare the behavior of husbands and wives across a 'treatment group' of households where the husband was subject to a displacement and a synthetic control group comprised of households where the husband was not subject to a displacement. The results show that the husbands' displacement decreased the employment probability of husbands by 30 percentage points one quarter after the displacement and by an average of 17 percentage points during the five years following the

[40]These figures are notably larger than the 19% consumption drop in the US reported by Aguiar and Hurst (2005), and also exceed the 14% consumption drop in Canada found by Browning and Crossley (2001). These differences are likely attributable to the more persistent effects of job loss in Germany (for example, OECD, 2023, reports that only 12.2% of unemployed individuals in the U.S. and 9.5% in Canada had been jobless for over a year while 51.8% of unemployed workers in Germany had been unemployed for at least one year). However, since job loss is relatively uncommon in Germany, the welfare value of unemployment insurance in our model aligns with Low et al. (2010)'s results for the US. In particular, Low et al. (2010) report that channeling a 1% increase in social benefit spending into unemployment insurance increases welfare by 0.19–0.24% of baseline consumption while our model suggests a corresponding welfare effect of 0.18% (in more detail, we calculate this implication of our model by dividing the 0.9% welfare decrease owing to a cut in unemployment insurance that we report in Table 8 by the associated 5% decrease in net government revenue).

displacement.[41] Meanwhile, the husbands' displacement increased the employment probability of wives by an average of 1.1 percentage points during the five years following the displacement. Halla et al. (2020) further show that this added worker effect was driven by wives who were non-employed at the time of their husband's displacement. For this group of wives, the husbands' displacement increased the employment probability of wives by an average of 1.9 percentage points during the five years following the husbands' displacement.

We compare the effects of the job displacement that are predicted by the estimated model with Halla et al. (2020)'s reduced-form findings.[42] To ensure that we isolate the effect of the husbands' displacement that is predicted by the model, we compare the simulated behavior of the *same set of husbands and wives* in two different scenarios, namely a control scenario and a displacement scenario. In the control scenario, all individuals face the job destruction risk given by the estimated model. The displacement scenario is identical to the control scenario, except that each married man is subject to one additional unanticipated job displacement over the life cycle. We simulate the additional displacements to match the initial effect of the husband's displacement on the husband's employment in Halla et al. (2020). Specifically, since Halla et al. (2020) find that displacement decreased the employment probability of husbands by 30 percentage points one quarter after the displacement, the additional job displacement in our simulation forces a transition out of employment for 30% of husbands while the remaining 70% of husbands remain in employment. By construction, the simulated behavior of wives and husbands is identical across the two scenarios in all periods before the displacement. Furthermore, since the only change across the two scenarios is the introduction of an additional displacement for husbands, any difference in behavior across the scenarios is due solely to the additional displacement.

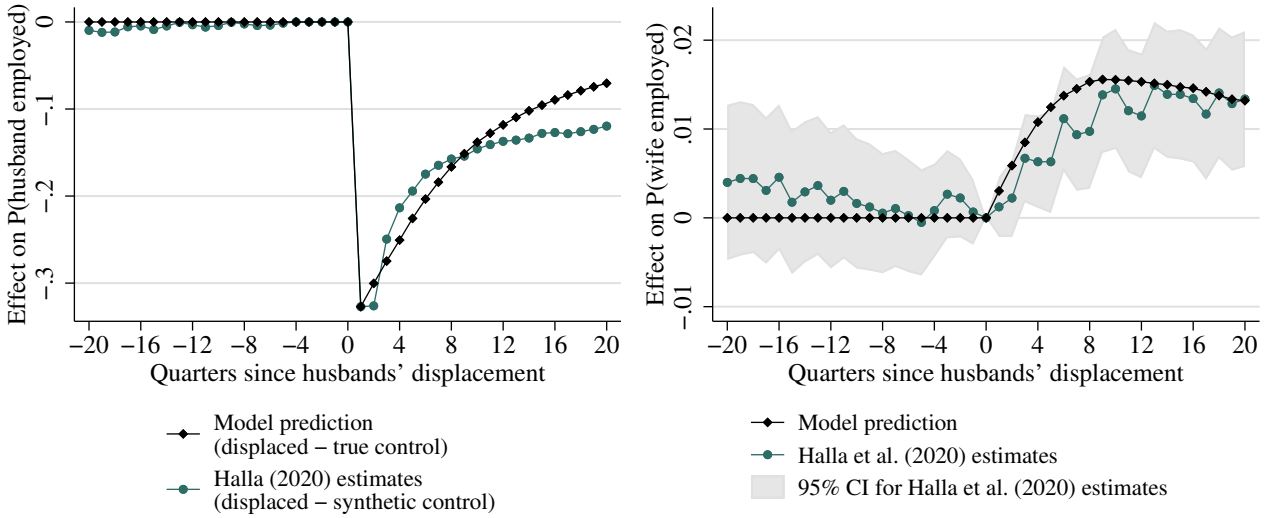
We take two further steps to ensure that the predictions from the estimated model are comparable to Halla et al. (2020)'s findings: i) we follow Halla et al. (2020)'s sample selection criteria by restricting the simulated samples to households where the wife is aged 25–50 years at the time of the husband's additional displacement, and the husband was employed for one year before the additional displacement; and ii) we re-weight the simulated samples using the job destruction probabilities in Table 3 (this ensures that the husbands in the simulated sample match the characteristics of married men who experience job loss). Note, we follow Halla et al. (2020) by not imposing any restrictions based on unemployment insurance claiming or eligibility

[41] The magnitude of the shock is comparable to other studies of the labor market effects of plant closures, e.g., Lachowska et al. (2020) and the literature surveyed by Halla et al. (2020).

[42] Our life-cycle model provides a micro-foundation for the added worker effect. The added worker effect predicted by the model depends on the taxation of married individuals based on household income (i.e., joint taxation), which we base on the prevailing tax rules, the strength of risk aversion, which we estimate, and our assumption about income pooling in married households. In Section 7.5 we show that income pooling in married households is the most important mechanism behind the effect of married households on the welfare effects of social assistance.

status when calculating the implications of the estimated model.

Based on a comparison of simulated behavior in the control and displacement scenarios, we find that the estimated model predicts that the husbands' displacement affects the employment rates of husbands and wives in ways that are consistent with the findings of Halla et al. (2020). Figure 2(a) shows the model-predicted effect of the husbands' displacement on the probability of the husband being employed. In summary, the estimated model predicts that job displacement decreases the employment rate of husbands by an average of 15.9 percentage points during the five years following the husbands' displacement, which is similar to the 17 percentage point decrease found by Halla et al. (2020). The model is also successful in matching the persistence of the decline in the husbands' employment rate: the model predicts that the husbands' displacement decreases the employment rate of husbands by 7.0 percentage points five years after the displacement, which compares well to the 12 percentage point drop in the employment rate of husbands found by Halla et al. (2020).



(a) Husbands (b) Wives

Notes: Model predictions based on 138,762 simulated displacements.

Figure 2: Employment effects of husbands' displacement

Figure 2(b) shows the added worker effect that the estimated model predicts. Over the five years following the husbands' displacement, the employment rate of wives is predicted to increase by an average of 0.7 percentage points due to the husbands' displacement, which is similar to the 1.3 percentage point effect found by Halla et al. (2020). For women who were non-employed at the time of their husband's displacement, the model predicts that the husbands' displacement increases the employment probability for wives by an average of 2.4 percentage points during the five years following the husbands' displacement. This prediction is close to the 1.9 percentage point increase found by Halla et al. (2020). Overall, the similarity

between the added worker effect predicted by the estimated model and the findings of Halla et al. (2020) suggests that the estimated model provides a satisfactory micro-foundation for the added worker effect.

7 Policy analysis

This section uses the estimated life-cycle model to explore how unemployment insurance and social assistance affect welfare and behavior. In Section 7.1 we describe the environment for our policy analysis and the welfare metric. In Section 7.2 we compare the aggregate effects of social assistance and unemployment insurance. In section 7.3 we explore heterogeneity in the effects of these policies by sex, marital status, wealth, and education. In Section 7.4 we study a revenue-neutral rebalancing reform that increases the importance of social assistance in the social safety net. Finally, in Section 7.5 we explore how the presence of married households in the population affects conclusions about the welfare effects of reforming the social safety net.

7.1 Preliminaries: Baseline environment and welfare metric

We study behavior and welfare in a baseline environment and in several alternative policy environments. The baseline environment is as described above in Section 2.3 (except, for simplicity, we use an unemployment insurance replacement rate of 60% for all individuals).[43] The alternative policy environments modify the baseline environment by changing unemployment insurance and social assistance. We summarize the aggregate welfare implications of policy changes using an equivalent-variation-based welfare metric and a utilitarian social welfare function. In particular, the overall welfare effect of transitioning from the baseline policy environment to an alternative environment is measured by the proportional adjustment in baseline consumption required to equalize ex-ante expected utility between the alternative and baseline environments.

To better understand the mechanisms driving the total welfare effects, we perform a decomposition similar to the approaches used by, for example, Floden (2001), Benabou (2002), Koehne and Kuhn (2015), and Michelacci and Ruffo (2015). Our decomposition separates the total welfare effect of a policy change into four components, three of which relate to changes in consumption: an insurance (volatility) effect, an incentive (level) effect, and a redistributive (inequality) effect. For this part of the decomposition, it is important to recall that utility depends on equivalized household consumption, which is non-separable from leisure in preferences. The insurance, incentive, and redistributive effects, therefore, are driven by changes

[43] Although all individuals face the same unemployment insurance replacement rate in the baseline environment, available unemployment insurance is heterogeneous across individuals because benefits depend on past earnings (see equation (6)). Available social assistance in the baseline environment is also heterogeneous because benefits depend on a household equivalence scale (see equation (9)).

in 'effective consumption,' that is, equivalized household consumption adjusted for the disutility of work, as described in equation (13).[44] In particular, the insurance effect measures the welfare value of individual-level changes in the variability of effective consumption over the life cycle. The incentive effect measures the welfare impact of changes in the overall level of effective consumption in the economy. The incentive effect is predominantly driven by changes in the employment rate. However, changes in the timing of employment also contribute due to non-separabilities between equivalized household consumption and leisure. The redistributive effect captures the welfare value of shifts in the inequality of lifetime effective consumption across individuals. The fourth component of our welfare decomposition is a cost effect, which quantifies the welfare implications of changes in search costs and benefit-claiming costs for unemployment insurance and social assistance. Since all costs appear additively in preferences, the cost effect is straightforward to calculate. The four welfare components are formally defined in Appendix B.

7.2 Aggregate effects of social assistance & unemployment insurance

We compare the aggregate effects of social assistance and unemployment insurance by exploring the effects of two alternative changes to the baseline environment. To ensure comparability, the policy changes are calibrated to have identical effects on government revenue. The first policy change modifies the baseline environment by eliminating unemployment insurance. This policy change decreases the average net-of-tax transfer income by 37 euros per person-quarter.[45] The second policy change modifies the baseline environment by cutting the generosity of social assistance to 62.7% of the baseline generosity and also decreases the average net-of-tax transfer income by 37 euros per person-quarter (we adjust the generosity of social assistance by scaling the generosity parameter, G). We refer to the second policy change as *the revenue-equivalent cut in social assistance*. Note that, since the policy changes entail benefit cuts, in the aggregate, the policy changes will have negative total welfare and insurance effects and ambiguous incentive, redistributive, and cost effects.

Table 8 compares the aggregate welfare and behavioral effects of social assistance and unemployment insurance: column (1) shows the effects of the revenue-equivalent cut in social assistance, column (2) shows the effects of eliminating unemployment insurance, and column (3) shows the difference between the effects of the revenue-equivalent cut in social assistance and eliminating unemployment insurance. We first focus on the employment and welfare effects of the policy changes, shown in Panel I. The revenue-equivalent cut in social assistance generates a larger increase in the employment rate than eliminating unemployment insurance (1.4 versus

[44]Similarly, Floden (2001)'s decomposition uses consumption-leisure bundles.

[45]Net-of-tax transfer income equals the present value of all transfers and benefits (i.e., unemployment insurance, social assistance, pension benefits, child benefits, and parental leave benefits) minus taxes.

0.8 percentage points).[46] Following this pattern, the incentive effect of the revenue-equivalent cut in social assistance is positive and equal to 1.0%, while eliminating unemployment insurance has an adverse incentive effect of -0.4% (recall that welfare effects are measured as percentages of baseline consumption).

Although the revenue-equivalent cut in social assistance leads to more favorable employment and incentive effects compared to the elimination of unemployment insurance, the total welfare loss from the revenue-equivalent cut in social assistance surpasses the welfare loss from eliminating unemployment insurance by 1.0% of baseline consumption. This result is driven by the insurance effects of the policy changes: the insurance effect of the revenue-equivalent cut in social assistance is -2.3%, while the insurance effect of eliminating unemployment insurance is only -0.3%. The difference in the insurance effects of unemployment insurance and social assistance aligns with the targeted program rules. By providing a means-tested minimum income to wealth-poor households, social assistance is paid to households with relatively low consumption in the absence of social assistance. Therefore, social assistance recipients are individuals whose utility is most sensitive to changes in income. In contrast, individuals who can fund their consumption using savings or spousal earnings may receive unemployment insurance. As a result, compared to social assistance recipients, unemployment insurance recipients are typically individuals whose utility is less sensitive to changes in income.

The decrease in social assistance has a more detrimental redistributive effect compared to the removal of unemployment insurance (-0.8% versus -0.4%). This again reflects that social assistance is primarily targeted at supporting households which would otherwise have low consumption, while unemployment insurance is distributed more evenly across households. The two policy changes have similar cost effects, but the contributions from search costs, unemployment insurance claiming costs, and social assistance claiming costs differ. We discuss the composition of the cost effects in the final paragraph of this section, in the context of the changes in search and benefit-claiming behaviors.

Panel II of Table 8 offers additional insights into the distinct roles of unemployment insurance and social assistance. First, the revenue-equivalent cut in social assistance leads to a larger increase in average wealth compared to the elimination of unemployment insurance. Similarly, the proportion of individuals with low wealth rises when unemployment insurance is eliminated but declines after implementing the revenue-equivalent cut in social assistance. These responses indicate that the cut in social assistance elicits a larger increase in precautionary savings compared to the elimination of unemployment insurance. Second, unemployment insurance and social assistance have opposite effects on reemployment wages: reemployment

[46]Panel II of Table 8 shows that the revenue-equivalent reduction in social assistance leads to a more substantial increase in the search costs of non-employed individuals compared to the elimination of unemployment insurance. This suggests that the difference in employment responses across these policy changes might be more pronounced if individuals were able to adjust their employment status without having to search.

	Revenue-equivalent policy changes		
	Cut social assistance to 62.7% of baseline	Eliminate unemployment insurance	Difference
I: Employment and welfare effects			
Change in the employment rate	1.4	0.8	0.6
Total welfare effect	-2.0	-0.9	-1.0
... Incentive	1.0	-0.4	1.4
... Insurance	-2.3	-0.3	-2.0
... Redistribution	-0.8	-0.4	-0.4
... Costs	0.1	0.2	-0.1
... Search costs	-0.7	0.2	-0.9
... Social assistance claiming costs	0.8	-0.6	1.4
... Unemployment insurance claiming costs	0.0	0.5	-0.5
Change in transfer income (€/person-quarter)	-37	-37	0
II: Changes in additional behaviors			
Wealth (1000s€)	3.1	0.6	2.5
Low wealth rate (wealth<5,000€)	-2.3	0.6	-3.0
Unemployment insurance receipt rate	0.0	-2.4	2.4
Social assistance receipt rate	-0.8	0.5	-1.3
Social assistance take-up rate	20.1	5.1	15.0
Employment rate of social assistance recipients	-7.7	-0.2	-7.5
Log reemployment wage ×100	-0.3	0.1	-0.5
Search costs (non-emp. individuals)	1.1	0.1	0.9
Search costs (non-emp. with emp. spouse)	0.1	0.1	0.1
Search costs (non-emp. with non-emp. spouse)	0.6	0.8	-0.2

Notes: In Panel I, the change in the employment rate refers to the percentage point change in the employment rate, the welfare effects are expressed as percentages of baseline consumption, and the change in transfer income refers to the change in the present value of net-of-tax transfer income (as defined in footnote 45). In Panel II, all changes are differences in levels, rate variables expressed in percentage points, and wealth is defined as household wealth per adult household member. Net transfer income in the baseline environment is 165,798 euros per person, and both policies decrease this by 8,453 euros or 5.1%.

Table 8: Aggregate effects of revenue-equivalent cuts in social assistance and unemployment insurance

wages increase following the elimination of unemployment insurance, indicating that the increases in offered wages due to individuals becoming more experienced outweigh the decrease in reservation wages. In contrast, the reservation wage effect dominates when considering the revenue-equivalent cut in social assistance.

Third, social assistance partially substitutes for lost unemployment insurance: following the cut in unemployment insurance, the receipt and take-up rates for social assistance increase. Additionally, as social assistance becomes less generous, the employment rate among social assistance recipients decreases (as fewer employed individuals are eligible for the benefit), and the take-up rate increases. These changes in benefit receipt explain the differences in the claiming

cost effects of the policy changes, shown in Panel I of Table 8. The elimination of unemployment insurance generates an increase in social assistance claiming costs, which approximately matches the reduction in unemployment insurance claiming costs, reflecting the substitution of social assistance for unemployment insurance. In contrast, since the revenue-equivalent cut in social assistance reduces social assistance receipt with no substitution to unemployment insurance, this policy change reduces social assistance claiming costs with no offsetting increase in unemployment insurance claiming costs. Lastly, eliminating unemployment insurance leads to a modest increase in search by non-employed individuals, but due to the increase in employment, total search costs decrease, leading to a positive search cost effect in the welfare decomposition in Panel I of Table 8. In contrast, the revenue-equivalent cut in social assistance leads to a large welfare loss from increased search costs, as the increase in the search costs of non-employed individuals translates into overall search costs, despite the increase in employment.

7.3 Heterogeneous effects of social assistance and unemployment insurance

In Section 7.2 we showed that, in the aggregate, eliminating unemployment insurance is less detrimental to welfare than a revenue-equivalent cut in social assistance. However, the aggregate analysis masks any heterogeneity across demographic groups. Conceptually, two channels may contribute to differences across demographic groups in the effects of changes in social assistance and unemployment insurance: i) heterogeneity across demographic groups in the fiscal impacts of the policy changes and ii) cross-group differences in the effects of policy changes that have the same fiscal impact on all demographic groups. In this section, we unpack these channels and, thereby, show how the heterogeneous welfare effects of social assistance and unemployment insurance combine into the aggregate effects reported in Section 7.2.

7.3.1 Concepts

We partition the population into demographic groups based on sex, marital status, education, and wealth (in the baseline environment). Each individual-by-quarter observation is assigned to a demographic group, with a single (married) individual categorized as 'low wealth' if their household wealth in the baseline environment, averaged over all the periods before age 65 in which they are single (married), is less than 10,000 (20,000) euros. We then calculate the group-level welfare and behavioral effects of the social assistance and unemployment insurance cuts discussed in Section 7.2, which are revenue-equivalent in the aggregate.[47] To determine

[47]Formally, we index groups by $s = 1, ..., S$, and calculate group-level welfare effects by finding the proportional adjustment to baseline consumption that renders individuals ex-ante indifferent between the baseline environment and an alternative policy environment, wherein the policy change impacts only subgroups with

each group's contribution to an aggregate welfare or behavioral effect, we multiply the group's welfare or behavioral effect by the group's population share.

To understand differences between demographic groups in the fiscal impacts of the policy changes, we calculate the *relative change in transfer income* for each group. This metric is defined as the ratio of the average change in quarterly net-of-tax transfer income for the group's members to the average change in quarterly net-of-tax transfer income across all individuals (i.e., 37 euros per person-quarter). Finally, we calculate the welfare and behavioral effects of reductions in social assistance and unemployment insurance while ensuring the same fiscal impact on all demographic groups, a concept we refer to as *fiscally-equalized effects*. To do this, we divide the group-level welfare and behavioral effects of the policy changes by the group's relative change transfer income.[48]

The demographic groups in our study are based on two categories of characteristics. The first category includes sex and education, which are determined before an individual enters the labor force and remain fixed throughout the part of the life cycle that we examine. The second category includes marital status and wealth, characteristics that vary over the life cycle. In defining our demographic groups, we take into consideration marital status and wealth for two primary reasons. Firstly, the benefits of social assistance are directly linked to wealth and household size (and, therefore, marital status). Secondly, married individuals have greater access to intra-household insurance compared to singles. The reader should bear in mind that when discussing a welfare effect for a group, we are referring to a welfare effect for individuals when they are in that group, e.g., a welfare effect for single women refers to an effect for women when they are single. As a complement to our main heterogeneity analysis, we also present welfare effects with groups based solely on the predetermined characteristics of sex and education in Tables A.9 and A.10 in Web Appendix F. Furthermore, in Section 7.5, we address the difference between single and married individuals by making comparisons across different models instead of comparing the same individual at different points in their life cycles.

7.3.2 Fiscally-equalized effects

Table 9 reports the fiscally-equalized employment and welfare effects obtained from the exercise described in Section 7.3.1. Recall, the fiscally-equalized effects represent the effects of cuts in social assistance and unemployment insurance that have the same fiscal impact across all demographic groups. In terms of welfare effects, we present both the fiscally-equalized total

$s \leq n$ for $n = 0, ..., S$. We denote these consumption adjustments by λ_s for $s = 1, ..., S$. Subsequently, we compute the welfare effect for each subgroup by dividing the incremental consumption adjustment for subgroup s, i.e., $\lambda_s - \lambda_{s-1}$, by the population share of subgroup s.

[48] An alternative approach would calibrate policies that obtain the target changes in transfer income. Our approach has the advantage of allowing us to perform an exact decomposition of the aggregate results in Section 7.2.

welfare effect for each demographic group and its decomposition into incentive, insurance, redistribution and cost effects. In Panel I we define demographic groups based on sex, marital status and wealth. In Panel II we replace wealth with education. In Panel III, we move toward the aggregate results by showing fiscally-equalized welfare effects for demographic groups based only on sex and marital status.[49]

The fiscally-equalized total welfare effects reveal substantial variations across demographic groups in the impacts of social assistance and unemployment insurance. Specifically, for all groups of single and married women, the fiscally-equalized total welfare effects align with the aggregate result, indicating more substantial total welfare losses from cuts in social assistance compared to unemployment insurance. Similarly, most groups of single men exhibit fiscally-equalized total welfare effects that match the aggregate pattern. However, contrary to the aggregate result, all groups of married men experience more adverse fiscally-equalized total welfare losses from the cut in unemployment insurance than from the cut in social assistance.

To better understand these results, we turn to the fiscally-equalized employment, incentive, and insurance effects (with minor exceptions, the insurance and incentive effects drive the direction of the total welfare effect; hence, we do not discuss the other welfare components). In summary, the differences between the fiscally-equalized insurance effects of social assistance and unemployment insurance are relatively uniform across groups, as are the fiscally-equalized employment and incentive effects of social assistance. This leaves cross-group heterogeneity in the employment and incentive effects of unemployment insurance to explain our earlier finding that, unlike the aggregate pattern, married men experience more adverse fiscally-equalized total welfare losses from unemployment insurance cuts than from social assistance cuts.

Looking more closely, in married households, the cut in unemployment insurance leads to a larger increase in the fiscally-equalized employment rate for husbands than for wives, both overall and within all subgroups defined by wealth or education. Following this pattern, in married households, the burden of the incentive effect of the fiscally-equalized cut in unemployment insurance falls primarily on husbands rather than on wives. The distribution of the employment and incentive effects within married households can be attributed to a combination of benefit receipt patterns and the underlying program rules. In terms of benefit receipt, husbands are much more likely than wives to receive unemployment insurance when they leave employment (33% versus 6%, see Table 14 in Appendix A). Additionally, since unemployment insurance benefits are tied to the recipient's employment status rather than their spouse's, a cut in the husband's unemployment insurance increases the household's return to the husband's labor supply, while the return to the wife's labor supply is largely unaffected.

[49]Table A.5 in Web Appendix F reports additional results on the heterogeneous behavioral effects of social assistance and unemployment insurance.

	Social assistance				Unemployment insurance				Difference			
	Single		Married		Single		Married		Single		Married	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
I. Demographic groups based on sex, marital status and wealth												
Low wealth:												
Change in the emp. rate	1.4	0.8	3.2	2.3	1.8	1.2	0.1	2.3	-0.4	-0.4	3.1	0.0
Total welfare effect	-3.3	-1.6	-1.0	0.4	-2.7	-2.3	-0.8	-2.7	-0.6	0.7	-0.2	3.1
... Incentive	0.1	-0.2	0.0	1.4	0.3	-0.5	0.0	-0.7	-0.2	0.2	0.0	2.0
... Insurance	-1.9	-0.5	-2.4	-1.7	-1.3	-0.1	-0.7	0.2	-0.7	-0.5	-1.6	-1.9
... Redistribution	-1.5	-0.9	-0.2	-0.3	-2.8	0.1	0.4	-2.1	1.4	-1.0	-0.6	1.7
... Costs	0.0	0.1	1.5	1.1	1.0	-1.9	-0.5	-0.2	-1.0	2.0	2.1	1.3
High wealth:												
Change in the emp. rate	1.5	0.7	4.4	1.3	1.1	0.6	-0.7	1.6	0.5	0.0	5.1	-0.4
Total welfare effect	-3.5	-1.7	-2.9	-0.3	-1.1	-0.1	0.0	-1.6	-2.4	-1.6	-2.9	1.3
... Incentive	1.6	0.8	1.7	8.4	-0.2	-0.5	0.4	-1.3	1.7	1.3	1.3	9.7
... Insurance	-5.3	-1.3	-5.8	-7.4	-0.7	0.0	-0.6	-0.2	-4.5	-1.3	-5.2	-7.2
... Redistribution	0.6	-0.9	0.8	-2.0	-1.5	0.2	0.1	-0.5	2.1	-1.1	0.7	-1.4
... Costs	-0.3	-0.3	0.4	0.6	1.3	0.2	0.0	0.4	-1.6	-0.4	0.3	0.3
II: Demographic groups based on sex, marital status and education												
Low education:												
Change in the emp. rate	1.5	0.7	3.9	2.0	1.3	0.7	-0.4	1.8	0.3	0.0	4.3	0.1
Total welfare effect	-3.6	-1.7	-2.1	-0.1	-1.6	-0.6	-0.3	-1.9	-2.0	-1.1	-1.8	1.9
... Incentive	0.6	0.2	0.8	4.6	-0.1	-0.6	0.3	-1.0	0.7	0.8	0.5	5.7
... Insurance	-3.4	-0.9	-4.2	-4.8	-0.7	0.0	-0.6	0.0	-2.7	-0.9	-3.5	-4.8
... Redistribution	-0.6	-0.9	0.3	-0.8	-2.0	0.2	0.2	-1.1	1.3	-1.2	0.1	0.3
... Costs	-0.2	0.0	1.0	0.9	1.2	-0.2	-0.1	0.2	-1.4	0.2	1.1	0.7
High education:												
Change in the emp. rate	0.9	0.5	2.1	0.5	1.1	0.7	-1.4	1.7	-0.1	-0.1	3.5	-1.2
Total welfare effect	-2.4	-1.8	-0.1	0.7	-0.8	0.3	0.8	-2.0	-1.7	-2.0	-0.8	2.7
... Incentive	1.2	0.5	3.3	7.9	0.3	0.1	1.3	-2.0	0.9	0.5	2.0	9.9
... Insurance	-1.8	-1.0	-3.4	-4.1	-1.8	-0.1	-0.6	-0.8	-0.0	-0.9	-2.8	-3.3
... Redistribution	-2.1	-0.9	-0.1	-4.0	-0.5	0.0	0.1	0.4	-1.6	-0.9	-0.2	-4.4
... Costs	0.3	-0.4	0.2	0.9	1.2	0.3	0.0	0.5	-1.0	-0.8	0.2	0.4
III: Demographic groups based on sex and marital status												
Change in the emp. rate	1.5	0.7	3.9	1.8	1.2	0.7	-0.5	1.8	0.3	0.0	4.3	0.0
Total welfare effect	-3.5	-1.7	-2.0	0.0	-1.5	-0.4	-0.2	-1.9	-2.0	-1.2	-1.7	2.0
... Incentive	0.7	0.3	0.9	5.1	-0.1	-0.5	0.3	-1.1	0.7	0.8	0.5	6.2
... Insurance	-3.3	-0.9	-4.1	-4.7	-0.8	0.0	-0.6	-0.1	-2.5	-0.9	-3.5	-4.6
... Redistribution	-0.7	-0.9	0.3	-1.2	-1.8	0.2	0.2	-1.0	1.1	-1.1	0.1	-0.2
... Costs	-0.1	-0.1	0.9	0.9	1.2	-0.1	-0.1	0.2	-1.4	0.0	1.1	0.7

Notes: These are the effects of cuts in unemployment insurance and social assistance that result in a decrease in the demographic-group-level average net-of-tax transfer income by 37 euros per person-quarter. The change in the employment (emp.) rate refers to the percentage point change in the employment rate, and the welfare effects are expressed as percentages of baseline consumption.

Table 9: Heterogeneous fiscally-equalized employment and welfare effects of cuts in social assistance and unemployment insurance

7.3.3 Distributional effects

Table 10 summarizes the heterogeneous fiscal, employment and total welfare effects of unemployment insurance and social assistance and shows how the fiscally-equalized total welfare effects in Table 9 combine into the aggregate total welfare effects in Table 8. Each sub-panel of Table 10 is organized as follows. The first line displays the fiscal impact of the policy change, measured by the relative change in transfer income, as defined above in Section 7.3.1. The second line shows the employment effect of the policy change, and the third line shows the total welfare effect of the policy change. The fourth line shows the group's population share. The last line shows the group's contribution to the aggregate total welfare effect. Note that for each policy change, the sum of the group contributions over the groups in each partition of the population equals the aggregate total welfare (i.e., -2.0% for the revenue-equivalent cut in social assistance, -0.9% for the elimination of unemployment insurance and -1.0% for the difference).[50]

The fiscal effects in Table 10 show the expected result that eliminating unemployment insurance and the revenue-equivalent cut in social assistance are not fiscally equivalent for specific demographic groups. Depending on the demographic group, eliminating unemployment insurance decreases the average net-of-tax transfer income by between 0.5 and 2.6 times the aggregate decrease. The fiscal effect of the revenue-equivalent cut in social assistance is much more heterogeneous. Depending on the demographic group, the revenue-equivalent cut in social assistance decreases average net-of-tax transfer income by between 0.2 and 4.6 times the aggregate decrease. The total welfare effects in Table 10 show a clear pattern that holds irrespective of wealth or education: in contrast to the aggregate result, the welfare of married men is more adversely affected by the elimination of unemployment insurance than by the revenue-equivalent cut in social assistance, while the welfare effects for single women, single men, and married women (with the marginal exception of those with low wealth) match the aggregate finding that eliminating unemployment insurance is less damaging for total welfare than the revenue-equivalent cut in social assistance.

Finally, we focus on the welfare contributions by sex and marital status in Panel III of Table 10 and explore how the fiscally equalized total welfare effects interact with the fiscal distributional effects to determine the aggregate total welfare effects. We calculate that the -1.0 percentage point difference between the aggregate total welfare effects of the revenue-equivalent cut in social assistance and the elimination of unemployment insurance is driven by single individuals. The difference between the welfare effects is the sum of negative contributions of -0.7%, -0.7%, and -0.1% from single men, single women, and married women, respectively,

[50]Table A.6 in Web Appendix F shows how the heterogeneous incentive, insurance, redistributive, and cost effects of social assistance and unemployment insurance combine into their aggregate counterparts.

	Cut social assistance to 62.7% of baseline				Eliminate unemployment insurance				Difference			
Aggregate total welfare effect	-2.0				-0.9				-1.0			
	Single		Married		Single		Married		Single		Married	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
I: Demographic groups based on sex, marital status and wealth												
Low wealth:												
Relative change in transfer inc.	2.7	4.6	0.5	0.6	0.6	0.8	0.8	0.8	2.1	3.8	-0.3	-0.2
Change in the employment rate	3.8	3.5	1.7	1.4	1.1	0.9	0.1	1.9	2.8	2.6	1.6	-0.5
Total welfare effect	-9.1	-7.3	-0.5	0.3	-1.6	-1.8	-0.7	-2.2	-7.5	-5.5	0.1	2.5
Population share	.06	.06	.09	.09	.06	.06	.09	.09				
Cont. to agg. total welfare eff.	-0.6	-0.4	-0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.5	-0.3	0.0	0.2
High wealth:												
Relative change in transfer inc.	0.8	2.3	0.2	0.3	0.9	2.5	0.8	0.8	-0.1	-0.3	-0.6	-0.6
Change in the employment rate	1.3	1.5	1.0	0.3	1.0	1.6	-0.6	1.3	0.3	-0.1	1.5	-1.0
Total welfare effect	-2.8	-3.9	-0.6	-0.1	-1.0	-0.3	0.0	-1.3	-1.8	-3.6	-0.6	1.3
Population share	.12	.12	.23	.23	.12	.12	.23	.23				
Cont. to agg. total welfare eff.	-0.4	-0.4	-0.1	-0.0	-0.1	-0.0	0.0	-0.3	-0.2	-0.4	-0.1	0.3
II: Demographic groups based on sex, marital status and education												
Low education:												
Relative change in transfer inc.	1.5	3.0	0.3	0.4	0.8	1.9	0.8	0.9	0.7	1.2	-0.5	-0.5
Change in the employment rate	2.3	2.2	1.2	0.7	1.0	1.3	-0.3	1.6	1.3	0.9	1.6	-0.9
Total welfare effect	-5.2	-5.0	-0.6	0.0	-1.2	-1.0	-0.3	-1.7	-4.0	-4.0	-0.4	1.7
Population share	.17	.15	.30	.27	.17	.15	.30	.27				
Cont. to agg. total welfare eff.	-0.9	-0.8	-0.2	0.0	-0.2	-0.2	-0.1	-0.5	-0.7	-0.6	-0.1	0.5
High education:												
Relative change in transfer inc.	0.8	3.0	0.2	0.3	0.9	2.6	0.8	0.5	-0.1	0.4	-0.6	-0.1
Change in the employment rate	2.3	2.2	1.2	0.7	1.0	1.3	-0.3	1.6	1.3	0.9	1.6	-0.9
Total welfare effect	-1.9	-5.3	0.0	0.2	-0.7	0.7	0.6	-0.9	-1.3	-6.0	-0.6	1.2
Population share	.02	.02	.02	.05	.02	.02	.02	.05				
Cont. to agg. total welfare eff.	-0.0	-0.1	0.0	0.0	-0.0	0.0	0.0	-0.0	0.0	-0.1	0.0	0.1
III: Demographic groups based on sex and marital status												
Relative change in transfer inc.	1.4	3.0	0.3	0.4	0.8	2.0	0.8	0.8	0.6	1.1	-0.5	-0.5
Change in the employment rate	2.1	2.2	1.2	0.6	1.0	1.4	-0.4	1.5	1.1	0.8	1.6	-0.9
Total welfare effect	-4.9	-5.0	-0.6	0.0	-1.2	-0.8	-0.2	-1.6	-3.7	-4.2	-0.4	1.6
Population share	.18	.17	.32	.32	.18	.17	.32	.32				
Cont. to agg. total welfare eff.	-0.9	-0.9	-0.2	0.0	-0.2	-0.1	-0.1	-0.5	-0.7	-0.7	-0.1	0.5

Notes: The relative change in transfer income is defined as the ratio of the average change in quarterly net-of-tax transfer income for the group's members to the average change in quarterly net-of-tax transfer income across all individuals (i.e., 37 euros per person-quarter). The change in the employment rate refers to the percentage point change in the employment rate, and the welfare effects are expressed as percentages of baseline consumption. A group's contribution to the aggregate total welfare effect is equal to the group's total welfare effect times the group's population share. See Section 7.3.1 for a description of the demographic groups.

Table 10: Heterogeneous fiscal, employment and total welfare effects of revenue-equivalent cuts in social assistance and unemployment insurance

and a positive contribution of 0.5% from married men. Panels I and II of Table 10 show that single individuals continue to drive the difference in the welfare effects of social assistance and unemployment insurance when we further disaggregate by wealth or education.

7.4 A revenue-neutral rebalancing reform

In this section, we build from our results in Sections 7.2 and 7.3 by exploring the welfare and behavioral effects of a revenue-neutral *rebalancing reform* to the social safety net that eliminates unemployment insurance while increasing the generosity of social assistance to 141% of the baseline generosity. This rebalancing reform is revenue neutral: aggregate net-of-tax transfer income (and therefore net government revenue) is the same in the baseline environment and following the rebalancing reform. We show that, although the rebalancing reform increases total welfare in the aggregate, some demographic groups benefit from the reform while others are made worse off.

Table 11 summarizes the employment and total welfare effects resulting from the revenue-neutral rebalancing reform. The reform results in an increase in aggregate total welfare, amounting to 0.5% of baseline consumption. The heterogeneous welfare effects of the rebalancing reform, divided by sex and marital status, are detailed in Panel III of Table 11. Our findings indicate that while the reform is advantageous for single men and women, as well as married women, it adversely affects the welfare of married men. Panels I and II of Table 11 show that the pattern is not driven by differences in education or wealth. Instead, it reflects the cross-group heterogeneity in the employment outcomes of the rebalancing reform; specifically, an increase in the employment rate is observed for married men, whereas a decrease is seen for singles and married women. This pattern of employment responses can be related to the findings presented in 7.3.2, particularly the result that within married households, husbands bear the burden of the incentive effect resulting from the elimination of unemployment insurance.[51,52]

[51] Additional tables in Web Appendix F report further details about the effects of the rebalancing reform: Table A.7 reports the heterogeneous insurance and incentive effects and Table A.8 shows the heterogeneous behavioral effects. Tables A.9 and A.10 in Web Appendix F show that the opposite-signed welfare effects experienced by married men are obscured when singles and married individuals are aggregated together. Specifically, without disaggregation by marital status, both genders are more adversely impacted by a revenue-equivalent cut in social assistance than by the elimination of unemployment insurance. Furthermore, both men and women benefit from the revenue-neutral rebalancing reform.

[52] In Web Appendix G, we show that our main results on unemployment insurance versus social assistance generalize to reductions in unemployment insurance that fall short of eliminating the program entirely. We also demonstrate that the effects of revenue neutrality are robust to revenue-neutral rebalancing reforms, such as increasing risk aversion, suppressing wage shocks, or introducing a correlation between spouses' employment shocks.

Aggregate total welfare effect	Revenue-neutral rebalancing reform (unemployment insurance eliminated and social assistance increased to 141% of baseline)			
	0.5			
	Single		Married	
	Women	Men	Women	Men
I: Demographic groups based on sex, marital status and wealth				
Low wealth:				
Change in the employment rate	-0.8	-2.1	-1.6	0.2
Total welfare effect	2.5	4.3	0.4	-1.7
Contribution to aggregate total welfare effect	0.2	0.2	0.0	-0.2
High wealth:				
Change in the employment rate	0.1	0.5	-1.6	0.9
Total welfare effect	1.0	1.9	0.7	-1.0
Contribution to aggregate total welfare effect	0.1	0.2	0.1	-0.2
II: Demographic groups based on sex, marital status and education				
Low education:				
Change in the employment rate	-0.2	-0.5	-1.6	0.7
Total welfare effect	1.4	2.7	0.6	-1.2
Contribution to aggregate total welfare effect	0.2	0.4	0.2	-0.3
High education:				
Change in the employment rate	-0.1	0.6	-1.7	0.5
Total welfare effect	1.9	2.7	0.8	-1.0
Contribution to aggregate total welfare effect	0.0	0.1	0.0	-0.0
III: Demographic groups based on sex and marital status				
Change in the employment rate	-0.2	-0.4	-1.6	0.7
Total welfare effect	1.5	2.7	0.6	-1.2
Contribution to aggregate total welfare effect	0.3	0.5	0.2	-0.4

Notes: The change in the employment rate refers to the percentage point change in the employment rate, and the welfare effects are expressed as percentages of baseline consumption. A group's contribution to the aggregate total welfare effect is equal to the group's total welfare effect times the group's population share (as shown in Table 10). See Section 7.3.1 for a description of the demographic groups.

Table 11: Aggregate and heterogeneous employment and welfare effects of a revenue-neutral rebalancing reform of the social safety net

7.5 The social safety net, welfare, and the family

We explore how the presence of married households in the population affects conclusions about the welfare effects of the social safety net. In particular, we compare the welfare effect of the social safety net according to two models: a family model and a single model. The family model is the estimated life-cycle model that we used for the policy analysis in Sections 7.2-7.4 and includes the empirical mix of single and married households. The single model is obtained by

setting the marriage probabilities in the family model to zero, thereby generating a model of the life-cycle behavior of single households. For each model, we calculate the total welfare effect of a revenue-neutral rebalancing reform that eliminates unemployment insurance while increasing the generosity of social assistance. For each model, we also decompose the total welfare effect of the rebalancing reform into contributions from incentives, insurance, redistribution, and costs, as described in Section 7.1.

	Family model	Single model	Difference (Family effect on welfare gain)
Social assistance generosity in rebalancing reform (% of baseline)	141	129	
Total welfare effect	0.55	0.79	-0.24
... Incentive effect	-1.39	-1.30	-0.08
... Insurance effect	1.23	4.93	-3.70
... Redistribution effect	0.29	-0.24	0.53
... Cost effect	0.42	-2.59	3.00

Notes: For each model, unemployment insurance is eliminated and the generosity of social assistance is changed to make the rebalancing reform revenue neutral to the model's baseline. Welfare effects are expressed as percentages of baseline consumption.

Table 12: Effect of married households on the welfare gains from rebalancing the social safety net

Table 12 shows the results of this exercise. As described in Section 7.4, according to the family model, the revenue-neutral rebalancing reform that eliminates unemployment insurance while increasing the generosity of social assistance to 141% of its baseline generosity increases welfare by 0.55%. Meanwhile, in the single model, the revenue saved by eliminating unemployment insurance is only sufficient to fund an increase in social assistance to 129% of its baseline generosity. Despite this, the single model predicts that the rebalancing reform increases welfare by 0.79%, which is 0.24 percentage points or 45% larger than the welfare gain predicted by the family model. We see larger differences between the single and family models when we look at the composition of the total welfare effect. Most notably, the insurance benefit of rebalancing the social safety net is much larger in the single model compared to the family model (4.93% versus 1.23%). Acting in the opposite direction, in the single model, the rebalancing reform reduces welfare through its effect on search and benefit-claiming costs, while in the family model, these costs decline slightly.

Our finding that the insurance effect of rebalancing the social safety is larger in the single model compared to the family model suggests that the family provides intra-household insurance

that substitutes for the insurance provided by social assistance. In our final round of analysis, we confirm this is indeed the case by exploring the three mechanisms that contribute to the difference between the welfare predictions of the family and single models. First, in the family model, married individuals are taxed based on household income (joint taxation), whereas in the single model individuals are taxed on their individual income (individual taxation). Given that joint taxation offers tax advantages to one-earner married households, transitioning from joint to individual taxation prompts labor supply modifications that decrease the prevalence of one-earner married households. Second, in the family model, marital status affects the parameters of preferences and technology.[53] Replacing married individuals' parameters with those of singles affects behavior and welfare. Third, in the family model, income pooling in married households provides intra-household insurance from the endogenous labor supply response to a spousal income shock (the added worker effect), the income effect from spousal earnings, and child-care provided by the spouse. Table 13 shows how each mechanism contributes to the difference in the welfare predictions of the family and single models. In summary, we find that income pooling is the driving force behind the larger welfare gains from the rebalancing reform in the single model compared to the family model.

In more detail, we start with the family model and move step-by-step to the single model. Column (1) of Table 13 repeats the welfare effect from the family model from Section 7.4. In column (2), we switch from joint to individual taxation while maintaining all other features of the family model. In this case, the revenue saved from eliminating unemployment insurance funds a slightly larger increase in social assistance than in the family model. This reflects that the switch to individual taxation primarily incentivizes non-working married women to join their husbands in employment and, therefore, does not strongly affect social assistance eligibility but increases tax revenues. The welfare value of this rebalancing reform is slightly lower than the welfare value of the rebalancing reform in the family model. In column (3), we also replace married individuals' parameters with those of singles. Due to a decrease in the baseline employment rate (see the notes to Table 13), the revenue saved from eliminating unemployment insurance is sufficient to fund an increase in social assistance to only 132% of its baseline generosity and the welfare gain falls slightly further below those predicted by the family model.

Finally, in column(4) we additionally turn off income pooling in married households, bringing us to a model of single households. In this case, the revenue saved from eliminating unemployment insurance is sufficient to fund an increase in social assistance to 129% of its baseline

[53]The most notable parameter differences are observed in search productivity, where married individuals exhibit lower productivity compared to their single counterparts (see Table 6). Additionally, there are differences in the disutility of working full-time at age 50 and above, with married individuals displaying a greater distaste for work than their single counterparts (see Table 5). Furthermore, married women exhibit a higher disutility of part-time work compared to their single counterparts (see Table 5).

	(1) Family model	(2)	(3)	(4) Single model
Joint taxation of married households	✓	✗	✗	✗
Parameter differences by marital status	✓	✓	✗	✗
Income pooling in married households	✓	✓	✓	✗
Social assistance generosity in rebalancing reform (% of baseline)	141	144	132	129
Total welfare effect	0.55	0.34	0.23	0.79

Notes: Column (1) reports results for the family model, i.e., the model used for the policy analysis in Sections 7.2-7.4. Column (2) reports results from the family model but with joint taxation replaced by individual taxation. Column (3) reports results from the family model but with joint taxation replaced by individual taxation and with parameter differences between married and single households eliminated by changing married individuals' parameters to those of singles. Column (4) reports results for the single model obtained by setting the marriage probabilities in the family model to zero. Relative to the model in column (3), the single model removes income pooling in married households. For each model, we calculate the total welfare effect of a revenue-neutral rebalancing reform of the social safety net that eliminates unemployment insurance while increasing the generosity of social assistance. The total welfare effects are expressed as percentages of baseline consumption. The baseline employment rate is 74% in the family model, 78% in the family model without joint taxation (column 2), 71% in the family model without joint taxation and without parameter differences by marital status (column 3), and 77% in the single model.

Table 13: A decomposition of the mechanisms driving the effect of married households on the total welfare gain from rebalancing the social safety net

generosity, similar to the previous step of this exercise. This result reflects two opposing effects of removing income pooling on social assistance eligibility. Removing income pooling increases social assistance eligibility because the benefit is no longer means-tested against spousal income.[54] At the same time, removing income pooling reduces non-labor income, which increases employment and thereby decreases eligibility. Although the generosity of social assistance hardly changes with the removal of income pooling, the welfare gain from the rebalancing reform increases from 0.23% to 0.79%. This large effect of income pooling is consistent with the importance of intra-household insurance through family labor supply documented in Blundell et al. (2016b).

[54]We use a regression-based decomposition based on data simulated from the estimated life-cycle model to understand how spousal income affects social assistance receipt. Focusing on non-working married individuals, we find that having a working spouse reduces the rate of social assistance receipt for married individuals from 8.6% to 0.8%. If the same individuals were single, then 16.4% would receive social assistance.

8 Conclusion

There are large international differences in how social insurance and social assistance programs support households facing job loss and other adverse circumstances. For example, the US, Germany, and France combine temporary earnings-related benefits with permanent or long-term social assistance that is not based on previous earnings. In contrast, the UK provides social support primarily through universal social assistance. In this paper, we have analyzed the incentive-insurance trade-off and heterogeneous welfare effects of unemployment insurance and social assistance while recognizing program interdependencies and intra-household insurance from savings and family labor supply.

We document important heterogeneity in the welfare effects of unemployment insurance and social assistance: ignoring heterogeneity by focusing on the aggregate welfare effects of unemployment insurance and social assistance masks differences in the size and direction of policy preferences across demographic groups. For instance, a revenue-neutral rebalancing of social support away from unemployment insurance and toward social assistance increases aggregate welfare but makes married men worse off. Similarly, eliminating unemployment insurance leads to a smaller aggregate welfare loss than a revenue-equivalent cut in social assistance. While the welfare effects for single women, single men, and married women match the aggregate pattern, married men are more adversely affected by eliminating unemployment insurance than by a revenue-equivalent cut in social assistance.

Our analysis provides some more general insights that are relevant to future research. In particular, we find that marital status matters for the welfare effects of the social safety net: intra-household insurance from income pooling in married households, in particular, affects the value of social insurance and assistance programs. This result is pertinent to studies that rely on models of single adults to evaluate the social safety net.

References

Acemoglu, D. and **Shimer, R.** (1999). Efficient Unemployment Insurance. *Journal of Political Economy*, 107(5): 893–928

Adda, J., **Dustmann, C.**, and **Stevens, K.** (2017). The Career Costs of Children. *Journal of Political Economy*, 125(2): 293–337

Aguiar, M. and **Hurst, E.** (2005). Consumption Versus Expenditure. *Journal of Political Economy*, 113(5): 919–948

Altonji, J. and **Segal, L.** (1996). Small-Sample Bias in GMM Estimation of Covariance Structures. *Journal of Business and Economic Statistics*, 14(3): 353–366

Atkinson, A.B. and **Micklewright, J.** (1991). Unemployment Compensation and Labor Market Transitions: A Critical Review. *Journal of Economic Literature*, 29(4): 1679–1727

Attanasio, O., **Low, H.**, and **Sanchez-Marcos, V.** (2008). Explaining Changes in Female Labor Supply in a Life-cycle Model. *American Economic Review*, 98(4): 1517–1552

Attanasio, O.P. and **Weber, G.** (1995). Is Consumption Growth Consistent with Intertemporal Optimization? Evidence from the Consumer Expenditure Survey. *Journal of Political Economy*, 103(6): 1121–1157

Baily, M.N. (1978). Some Aspects of Optimal Unemployment Insurance. *Journal of Public Economics*, 10(3): 379–402

Benabou, R. (2002). Tax and Education Policy in a Heterogeneous-Agent Economy: What Levels of Redistribution Maximize Growth and Efficiency? *Econometrica*, 70(2): 481–517

Birinci, S. (2021). Spousal Labor Supply Response to Job Displacement and Implications for Optimal Transfers. Federal Reserve Bank of St. Louis

Birinci, S. and **See, K.** (forthcoming). Labor market Responses to Unemployment Insurance: The Role of Heterogeneity. *American Economic Journal: Macroeconomics*

Bitler, M.P., **Gelbach, J.B.**, **Hoynes, H.W.**, and **Zavodny, M.** (2004). The Impact of Welfare Reform on Marriage and Divorce. *Demography*, 41(2): 213–236

Blank, R.M. and **Card, D.E.** (1991). Recent Trends in Insured and Uninsured Unemployment: Is there an Explanation? *Quarterly Journal of Economics*, 106(4): 1157–1189

Blau, D.M. and **Gilleskie, D.B.** (2006). Health Insurance and Retirement of Married Couples. *Journal of Applied Econometrics*, 21(7): 935–953

Blundell, R. and **Preston, I.** (1998). Consumption Inequality and Income Uncertainty. *Quarterly Journal of Economics*, 113(2): 603–640

Blundell, R., **Costa Dias, M.**, **Meghir, C.**, and **Shaw, J.** (2016a). Female Labor Supply, Human Capital, and Welfare Reform. *Econometrica*, 84(5): 1705–1753

Blundell, R., **Pistaferri, L.**, and **Saporta-Eksten, I.** (2016b). Consumption Inequality and Family Labor Supply. *American Economic Review*, 106(2): 387–435

Blundell, R., **Pistaferri, L.**, and **Saporta-Eksten, I.** (2018). Children, Time Allocation, and Consumption Insurance. *Journal of Political Economy*, 126(S1): S73–S115

Borella, M., **De Nardi, M.**, and **Yang, F.** (2019). Are Marriage-Related Taxes and Social Security Benefits Holding Back Female Labor Supply? *National Bureau of Economic Research Working Paper 26097*

Braxton, J.C., **Herkenhoff, K.F.**, and **Phillips, G.M.** (2020). Can the Unemployed Borrow? Implications for Public Insurance. *National Bureau of Economic Research Working Paper 27026*

Browning, M. and **Crossley, T.F.** (2001). Unemployment Insurance Benefit Levels and Consumption Changes. *Journal of Public Economics*, 80(1): 1–23

Browning, M. and **Meghir, C.** (1991). The Effects of Male and Female Labor Supply on Commodity Demands. *Econometrica*, 59(4): 925–951

Bundesministerium für Arbeit und Sozialordnug (2000). *Übersicht über das Sozialrecht*. Bonn

Bundesministerium für Finanzen (2001). *Amtliches Einkommensteuer-Handbuch 2001*. Bonn

Card, D., **Lee, D.S.**, **Pei, Z.**, and **Weber, A.** (2015). Inference on Causal Effects in a Generalized Regression Kink Design. *Econometrica*, 83(6): 2453–2483

Chan, M.K. (2013). A Dynamic Model of Welfare Reform. *Econometrica*, 81(3): 941–1001

Chetty, R. (2006). A General Formula for the Optimal Level of Social Insurance. *Journal of Public Economics*, 90(10): 1879–1901

Chetty, R. (2008). Moral Hazard vs. Liquidity and Optimal Unemployment Insurance. *Journal of Political Economy*, 116(2): 173–234

Cullen, J. and **Gruber, J.** (2000). Does Unemployment Insurance Crowd Out Spousal Labor Supply? *Journal of Labor Economics*, 18(3): 546–572

Currie, J. (2006). The Take-Up of Social Benefits. In A.J. Auerbach, D. Card, and J.M. Quigley, editors, *Public Policy and the Income Distribution*, chapter 3. Russell Sage Foundation

De Nardi, M., **French, E.**, and **Jones, J.** (2010). Why do the Elderly Save? The Role of Medical Expenses. *Journal of Political Economy*, 118(1): 39–75

Dustmann, C., **Fitzenberger, B.**, **Schoenberg, U.**, and **Spitz-Oener, A.** (2014). From Sick Man of Europe to Economic Superstar: Germany's Resurgent Economy. *Journal of Economic Perspectives*, 28(1): 167–188

Eicher, W. and **Luik, S.** (2017). *Sozialgesetzbuch (SGB) Zweites Buch (II)*

Einav, L., **Finkelstein, A.**, **Oostrom, T.**, **Ostriker, A.**, and **Williams, H.** (2020). Screening and Selection: The Case of Mammograms. *American Economic Review*, 110(12): 3836–3870

Eissa, N. and **Hoynes, H.W.** (1998). The Earned Income Tax Credit and the Labor Supply of Married Couples. *NBER Working Paper 6856*

Ellwood, D.T. (2000). The Impact of the Earned Income Tax Credit and Social Policy Reforms on Work, Marriage, and Living Arrangements. *National Tax Journal*, 53(4): 1063–1105

Fadlon, I. and **Nielsen, T.H.** (2019). Household Labor Supply and the Gains from Social Insurance. *Journal of Public Economics*, 171: 18–28

Ferey, A. (2022). Redistribution and Unemployment Insurance. Technical Report 345, CRC TRR 190 Rationality and Competition

Flemming, J.S. (1978). Aspects of Optimal Unemployment Insurance: Search, Leisure, Savings and Capital Market Imperfections. *Journal of Public Economics*, 10(3): 403–425

Floden, M. (2001). The Effectiveness of Government Debt and Transfers as Insurance. *Journal of Monetary Economics*, 48(1): 81–108

Fonseca, R., **Michaud, P.C.**, **Galama, T.**, and **Kapteyn, A.** (2021). Accounting for the Rise of Health Spending and Longevity. *Journal of the European Economic Association*, 19(1): 536–579

French, E. (2005). The Effects of Health, Wealth, and Wages on Labour Supply and Retirement Behaviour. *Review of Economic Studies*, 72(2): 395–427

French, E. and **Jones, J.B.** (2011). The Effects of Health Insurance and Self-Insurance on Retirement Behavior. *Econometrica*, 79(3): 693–732

Fuchs-Schuendeln, N., **Krueger, D.**, and **Sommer, M.** (2010). Inequality Trends for Germany in the Last Two Decades: A Tale of Two Countries. *Review of Economic Dynamics*, 13(1): 103–132

Gallant, A.R. and **Tauchen, G.** (1996). Which Moments to Match? *Econometric Theory*, 12(4): 657–681

Ganong, P. and **Noel, P.** (2019). Consumer Spending During Unemployment: Positive and Normative Implications. *American Economic Review*, forthcoming

Gourieroux, C., **Monfort, A.**, and **Renault, E.** (1993). Indirect Inference. *Journal of Applied Econometrics*, 8(S1): S85–S118

Goux, D., **Maurin, E.**, and **Petrongolo, B.** (2014). Worktime Regulations and Spousal Labor Supply. *American Economic Review*, 104(1): 252–276

Gruber, J. (1997). The Consumption Smoothing Benefits of Unemployment Insurance. *American Economic Review*, 87(1): 192–205

Guvenen, F. (2007). Learning Your Earning: Are Labor Income Shocks Really Very Persistent? *American Economic Review*, 97(3): 687–712

Haan, P. and **Prowse, V.** (2019). Optimal social assistance and unemployment insurance in a life-cycle model of family labor supply and savings. Technical report, CRC TRR 190 Rationality and Competition

Hagedorn, M., **Karahan, F.**, **Manovskii, I.**, and **Mitman, K.** (2013). Unemployment Benefits and Unemployment in the Great Recession: The Role of Equilibrium Effects. *Federal Reserve Bank of New York Staff Reports Number 646*

Halla, M., **Schmieder, J.**, and **Weber, A.** (2020). Job Displacement, Family Dynamics, and Spousal Labor Supply. *American Economic Journal: Applied Economics*, 12(4): 253–287

Ham, J.C. and **Rea, S.A.** (1987). Unemployment Insurance and Male Unemployment Duration in Canada. *Journal of Labor Economics*, 5(3): 325–353

Harnisch, M. (2019). Non-Take-Up of Means-Tested Social Benefits in Germany. Technical Report

1793, DIW Berlin, German Institute for Economic Research

Heathcote, J., **Storesletten, K.**, and **Violante, G.** (2014). Consumption and Labor Supply with Partial Insurance: An Analytical Framework. *American Economic Review*, 104(7): 2075–2126

Hopenhayn, H. and **Nicolini, P.** (1997). Optimal Unemployment Insurance. *Journal of Political Economy*, 105(2): 412–438

Imai, S. and **Keane, M.P.** (2004). Intertemporal Labor Supply and Human Capital Accumulation. *International Economic Review*, 45(2): 601–641

Katz, L.F. and **Meyer, B.D.** (1990). The Impact of the Potential Duration of Unemployment Benefits on the Duration of Unemployment. *Journal of Public Economics*, 41(1): 45–72

Kayser, H.A. and **Frick, J.R.** (2000). Take It or Leave It:(Non-) Take-up Behavior of Social Assistance in Germany. Technical Report 210, DIW Berlin, German Institute for Economic Research

Keane, M.P. (2016). Life-cycle Labour Supply with Human Capital: Econometric and Behavioural Implications. *Economic Journal*, 126(592): 546–577

Keane, M.P. and **Moffitt, R.** (1998). A Structural Model of Multiple Welfare Program Participation and Labor Supply. *International Economic Review*, 39(3): 553–589

Keane, M.P. and **Wolpin, K.I.** (1997). The Career Decisions of Young Men. *Journal of Political Economy*, 105(3): 473–522

Koehne, S. and **Kuhn, M.** (2015). Should Unemployment Insurance be Asset Tested? *Review of Economic Dynamics*, 18(3): 575–592

Kolsrud, J., **Landais, C.**, **Nilsson, P.**, and **Spinnewijn, J.** (2018). The Optimal Timing of Unemployment Benefits: Theory and Evidence from Sweden. *American Economic Review*, 108(4-5): 985–1033

Kroft, K. and **Notowidigdo, M.** (2016). Should Unemployment Insurance Vary with the Unemployment Rate? Theory and Evidence. *Review of Economic Studies*, 83: 1092–1124

Krueger, D., **Perri, F.**, **Pistaferri, L.**, and **Violante, G.L.** (2010). Cross-Sectional Facts for Macroeconomists. *Review of Economic Dynamics*, 13(1): 1–14

Krusell, P., **Mukoyama, T.**, and **Şahin, A.** (2010). Labour-Market Matching with Precautionary Savings and Aggregate Fluctuations. *Review of Economic Studies*, 77(4): 1477–1507

Lachowska, M., **Mas, A.**, and **Woodbury, S.A.** (2020). Sources of Displaced Workers' Long-Term Earnings Losses. *American Economic Review*, 110(10): 3231–3266

Lalive, R., **Van Ours, J.**, and **Zweimüller, J.** (2006). How Changes in Financial Incentives Affect the Duration of Unemployment. *Review of Economic Studies*, 73(4): 1009–1038

Launov, A. and **Waelde, K.** (2013). Estimating Incentive and Welfare Effects of Nonstationary Unemployment Benefits. *International Economic Review*, 54(4): 1159–1198

Lentz, R. (2009). Optimal Unemployment Insurance in an Estimated Job Search Model with Savings. *Review of Economic Dynamics*, 12(1): 37–57

Low, H., **Meghir, C.**, and **Pistaferri, L.** (2010). Wage Risk and Employment Risk over the Life Cycle. *American Economic Review*, 100(4): 1432–1467

Low, H., **Meghir, C.**, **Pistaferri, L.**, and **Voena, A.** (2018). Marriage, Labor Supply and the Dynamics of the Social Safety Net. *National Bureau of Economic Research Working Paper 24356*

Low, H. and **Pistaferri, L.** (2015). Disability Insurance and the Dynamics of the Incentive Insurance Trade-Off. *American Economic Review*, 105(10): 2986–3029

Lundberg, S. (l985). The Added Worker Effect. *Journal of Labor Economics*, 3(1): 11–37

Mankart, J. and **Oikonomou, R.** (2017). Household Search and the Aggregate Labour Market. *Review of Economic Studies*, 84(4): 1735–1788

Michelacci, C. and **Ruffo, H.** (2015). Optimal Life Cycle Unemployment Insurance. *American Economic Review*, 105(2): 816–59

Mitman, K. and **Rabinovich, S.** (2015). Optimal Unemployment Insurance in an Equilibrium Business-Cycle Model. *Journal of Monetary Economics*, 71: 99–118

Moffitt, R. and **Nicholson, W.** (1982). The Effect of Unemployment Insurance on Unemployment: The case of Federal Supplemental Benefits. *Review of Economics and Statistics*, 64(1): 1–11

Moffitt, R. (1983). An Economic Model of Welfare Stigma. *American Economic Review*, 73(5): 1023–1035

Nakajima, M. (2012). A Quantitative Analysis of Unemployment Benefit Extensions. *Journal of Monetary Economics*, 59(7): 686–702

OECD (2015). Taxes and Benefits (Edition 2015). *Available from OECD webpage: http://www.oecd.org/els/benefits-and-wages-statistics.htm*

OECD (2023). Long-term unemployment rate (indicator). doi: 10.1787/76471ad5-en (Accessed on 05 April 2023)

Paserman, D. (2008). Job Search and Hyperbolic Discounting: Structural Estimation and Policy Evaluation. *Economic Journal*, 118(531): 1418–1452

Pavoni, N. (2009). Optimal Unemplyment Insurance with Human Capital Depreciation and Duration Dependence. *Internation Economic Review*, 50(2): 323–362

Pavoni, N., **Setty, O.**, and **Violante, G.L.** (2013). Search and Work in Optimal Welfare Programs. *NBER Working Paper 18666*

Pistaferri, L. (2001). Superior Information, Income Shocks, and the Permanent Income Hypothesis. *Review of Economics and Statistics*, 83(3): 465–476

Pistaferri, L. (2003). Anticipated and Unanticipated Wage Changes, Wage Risk, and Intertemporal Labor Supply. *Journal of Labor Economics*, 21(3): 729–754

Riphahn, R.T. (2001). Rational Poverty or Poor Rationality? The Take-up of Social Assistance Benefits. *Review of Income and Wealth*, 47(3): 379–398

Saez, E. (2002). Optimal Income Transfer Programs: Intensive versus Extensive Labor Supply Responses. *Quaterly Journal of Economics*, 117: 1039–1073

Saporta-Eksten, I. (2014). Job Loss, Consumption and Unemployment Insurance. *Mimeo*

Schmieder, J., **von Wachter, T.**, and **Bender, S.** (2012). The Effects of Extended Unemployment Insurance over the Business Cycle: Evidence from Regression Discontinuity Estimates Over 20 Years. *Quarterly Journal of Economics*, 127(2): 701–752

Shavell, S. and **Weiss, L.** (1979). The Optimal Payment of Unemployment Insurance Benefits over Time. *Journal of Political Economy*, 97(6): 1347–1362

Shimer, R. and **Werning, I.** (2007). Reservation Wages and Unemployment Insurance. *Quarterly Journal of Economics*, 122(3): 1145–1185

Shimer, R. and **Werning, I.** (2008). Liquidity and Insurance for the Unemployed. *American Economic Review*, 98(5): 1922–1942

Smith, Jr, A.A. (1993). Estimating Nonlinear Time-Series Models Using Simulated Vector Autoregressions. *Journal of Applied Econometrics*, 8(S1): S63–S84

Spinnewijn, J. (2015). Unemployed but Optimistic: Optimal Insurance Design with Biased Beliefs. *Journal of the European Economic Association*, 13(1): 130–167

Statistisches Bundesamt (2008). *Einkommens- und Verbrauchsstichprobe Aufgabe, Methode und Durchführung, 15(7)*

Tatsiramos, K. and **van Ours, J.C.** (2014). Labor Market Effects of Unemployment Insurance Design. *Journal of Economic Surveys*, 28(2): 284–311

Todd, P. and **Wolpin, K.** (2006). Using Experimental Data to Validate a Dynamic Behavioral Model of Child Schooling: Assessing the Impact of a School Subsidy Program in Mexico. *American Economic Review*, 96(5): 1384–1417

van der Klaauw, W. and **Wolpin, K.I.** (2008). Social Security and the Retirement and Savings Behavior of Low-Income Households. *Journal of Econometrics*, 145(1-2): 21–42

Wagner, G., **Frick, J.**, and **Schupp, J.** (2007). The German Socio-Economic Panel Study (SOEP) - Scope, Evolution and Enhancements. *Schmollers Jahrbuch*, 127(1): 139–169

Appendix

A Internal Goodness of Fit

	Obs. (SE)	Fitted	Obs. (SE)	Fitted	Obs. (SE)	Fitted	Obs. (SE)	Fitted
I: Voluntary quit rate								
	Single women		Married women		Single men		Married men	
Age<50 years	0.01 (.001)	0.01	0.01 (.001)	0.01	0.01 (.001)	0.01	0.00 (.000)	0.00
Age≥50 years	0.03 (.003)	0.02	0.03 (.002)	0.02	0.02 (.003)	0.02	0.02 (.001)	0.02
High education	0.01 (.003)	0.01	0.01 (.002)	0.01	0.01 (.001)	0.01	0.01 (.002)	0.00
Youngest child aged < 3	0.09 (.025)	0.06	0.05 (.005)	0.04				
3 ≤ Youngest child aged <6	0.02 (.005)	0.03	0.02 (.003)	0.02				
II: Transition rate into employment								
	Single women		Married women		Single men		Married men	
Age<50 years	0.08 (.007)	0.12	0.04 (.002)	0.06	0.11 (.012)	0.16	0.11 (.009)	0.10
Age≥50 years	0.01 (.002)	0.03	0.01 (.001)	0.01	0.01 (.004)	0.02	0.01 (.002)	0.01
High education	0.08 (.021)	0.19	0.04 (.006)	0.07	0.10 (.026)	0.12	0.06 (.023)	0.04
Youngest child aged < 3	0.06 (.012)	0.05	0.04 (.003)	0.05				
3 ≤ Youngest child aged <6	0.07 (.013)	0.09	0.04 (.004)	0.06				
III: Part-time employment rate for previously employed women								
	Single women		Married women					
Age<50 years	0.21 (.013)	0.22	0.52 (.011)	0.54				
Age≥50 years	0.21 (.024)	0.20	0.57 (.021)	0.56				
High education	0.19 (.023)	0.25	0.43 (.033)	0.53				
Youngest child aged < 3	0.50 (.079)	0.53	0.76 (.019)	0.79				
3 ≤ Youngest child aged <6	0.67 (.044)	0.69	0.79 (.018)	0.79				
IV: Joint leisure time								
	Married hhs							
Pr(Wife non-emp. & husband emp.)	0.21 (.010)	0.23						
V: Saving rates								
	Single women		Single men					
Saving rate: Age<50 years	0.10 (.004)	0.10	0.16 (.006)	0.16				
Saving rate: Age≥50 years	0.08 (.010)	0.07	0.13 (.013)	0.12				
Saving rate: High education	0.11 (.009)	0.11	0.17 (.011)	0.18				
VI: Receipt and employment effects of benefits								
	Women		Men					
Emp. effect of unemployment insurance	0.94 (.16)	0.50	0.64 (.11)	0.83				
	Single women		Single men		Married hhs			
Social assistance receipt rate (non-emp.)	0.21 (.022)	0.21	0.01 (.003)	0.03	0.09 (.014)	0.08		
Social assistance receipt rate (emp.)	0.01 (.003)	0.01			0.01 (.002)	0.01		
	Single women		Married women		Single men		Married men	
Unemployment insurance receipt rate	0.27 (.029)	0.31	0.06 (.006)	0.06	0.45 (.040)	0.44	0.35 (.020)	0.33
VII: Wage regressions								
	Women		Men					
Intercept	2.38 (.008)	2.38	2.67 (.007)	2.67				
Experience/40	0.37 (.032)	0.37	0.21 (.022)	0.21				
High education	0.34 (.026)	0.33	0.42 (.019)	0.42				
VIII: Summary of wage residuals								
	Women		Men					
Corr(predicted emp, residual)	0.13 (.020)	0.11	0.05 (.017)	0.05				
Standard deviation	0.36 (.008)	0.36	0.32 (.007)	0.32				
1-year correlation	0.72 (.024)	0.71	0.77 (.016)	0.76				
2-year correlation	0.68 (.024)	0.69	0.73 (.017)	0.74				
	Married hhs							
Between spouse correlation	0.16 (.022)	0.15						

Notes: See Table 2 for a description of the auxiliary model. Standard errors in parentheses.

Table 14: Internal goodness of fit

	(1)	(2)	(3)	(4)
	Unemployment insurance		Social assistance	
	Observed	Fitted	Observed	Fitted
Single woman	0.21	0.17	0.41	0.40
Single man	0.17	0.14	0.09	0.16
Married woman	0.21	0.19	0.25	0.22
Married man	0.41	0.50	0.25	0.22
Age (years)	46.80	45.41	41.09	41.24
High education	0.07	0.09	0.09	0.07
Youngest child aged < 3	0.04	0.08	0.21	0.05
$3 \leq$ Youngest child aged <6	0.07	0.04	0.14	0.04

Table 15: Characteristics of unemployment insurance and social assistance recipients

B Welfare Decomposition: Further Details

In this appendix, we provide formal definitions of the welfare measures outlined in Section 7.1. Let A denote the alternative policy environment, and let B denote the baseline environment. The total welfare effect of moving from environment B to environment A is denoted by γ and solves $V_B(\gamma) = V_A(0)$, where:

$$V_e(\gamma) = \mathbb{E}\left[\Upsilon \sum_{\tau=\underline{t}_i}^{T^F} \delta^{\tau-\underline{t}_i} U^F(m^e_{i,j,\tau}(1+\gamma), d^e_{i,\tau}, s^e_{i,\tau}, \text{SAClaim}^e_{i,j,\tau}, \text{UIClaim}^e_{i,\tau}) + (1-\Upsilon) \sum_{\tau=\underline{t}_j}^{T^M} \delta^{\tau-\underline{t}_j} U^M(m^e_{i,j,\tau}(1+\gamma), d^e_{j,\tau}, s^e_{j,\tau}, \text{SAClaim}^e_{i,j,\tau}, \text{UIClaim}^e_{j,\tau})\right] \text{ for } e \in \{A, B\}. \quad (21)$$

In the above, $\underline{t}_i$ and $\underline{t}_j$ denote the time of woman i's and man j's entry into the labor force, e superscripts denote variable realizations in environment e, $\Upsilon = 0.5$ denotes the social planner's weight on women. The expectation in (21) is with respect to education and all shocks, including wage shocks and job destructions. The consumption adjustment, γ, is implemented ex-post and, therefore, does not affect behavior.

Recall the decomposition into insurance, incentive, and redistributive effects is based on effective household consumption, i.e., equivalized household consumption adjusted for the disutility of work, as described in equation (13). The insurance effect is calculated as the welfare value of updating individuals' consumption and employment paths to their values in the alternative environment while holding each individual's effective lifetime consumption at its baseline

level. The insurance effect, $\gamma_{Insurance}$, solves:

$$V_B(\gamma_{Insurance}) = \mathbb{E}\left[\Upsilon \sum_{\tau=\underline{t}_i}^{T^F} \delta^{\tau-\underline{t}_i} U^F(m^A_{i,j,\tau}\mu^A_i, d^A_{i,\tau}, s^B_{i,\tau}, \text{SAClaim}^B_{i,j,\tau}, \text{UIClaim}^B_{i,\tau}) + (1-\Upsilon) \sum_{\tau=\underline{t}_j}^{T^M} \delta^{\tau-\underline{t}_j} U^M(m^A_{i,j,\tau}\mu^A_j, d^A_{j,\tau}, s^B_{j,\tau}, \text{SAClaim}^B_{i,j,\tau}, \text{UIClaim}^B_{j,\tau})\right], \quad (22)$$

where μ^A_i denotes the ratio of the woman i's lifetime effective consumption in the baseline environment to the value of her lifetime effective consumption in environment A, and μ^A_j is the corresponding quantity for man j.

Next, the incentive effect is calculated as the incremental change in welfare due to the change in the aggregate level of effective consumption in the economy. Letting α^A denotes the ratio of aggregate effective consumption in alternative environment A to its value in the baseline environment B, the incentive effect, $\gamma_{Incentive}$, solves:

$$V_B(\gamma_{Insurance}+\gamma_{Incentive}) = \mathbb{E}\left[\Upsilon \sum_{\tau=\underline{t}_i}^{T^F} \delta^{\tau-\underline{t}_i} U^F(m^A_{i,j,\tau}\mu^A_i\alpha^A, d^A_{i,\tau}, s^B_{i,\tau}, \text{SAClaim}^B_{i,j,\tau}, \text{UIClaim}^B_{i,\tau}) + (1-\Upsilon) \sum_{\tau=\underline{t}_j}^{T^M} \delta^{\tau-\underline{t}_j} U^M(m^A_{i,j,\tau}\mu^A_j\alpha^A, d^A_{j,\tau}, s^B_{j,\tau}, \text{SAClaim}^B_{i,j,\tau}, \text{UIClaim}^B_{j,\tau})\right], \quad (23)$$

The redistributive effect is calculated as the incremental change in welfare due to cross-individual differences in how lifetime effective consumption changes with the move to the alternative environment. The redistributive effect, $\gamma_{Redist.}$ solves:

$$V_B(\gamma_{Insurance}+\gamma_{Incentive}+\gamma_{Redist.}) = \mathbb{E}\left[\Upsilon \sum_{\tau=\underline{t}_i}^{T^F} \delta^{\tau-\underline{t}_i} U^F(m^A_{i,j,\tau}, d^A_{i,\tau}, s^B_{i,\tau}, \text{SAClaim}^B_{i,j,\tau}, \text{UIClaim}^B_{i,\tau}) + (1-\Upsilon) \sum_{\tau=\underline{t}_j}^{T^M} \delta^{\tau-\underline{t}_j} U^M(m^A_{i,j,\tau}, d^A_{j,\tau}, s^B_{j,\tau}, \text{SAClaim}^B_{i,j,\tau}, \text{UIClaim}^B_{j,\tau})\right], \quad (24)$$

Finally, the search and benefit claiming cost effect can then be calculated as the difference between the total welfare effect, γ and the sum of the insurance, incentive and redistributive effects.

The Heterogeneous Effects of Social Assistance and Unemployment Insurance: Evidence from a Life-Cycle Model of Family Labor Supply and Savings

Web Appendix

(intended for online publication only)

Peter Haan and Victoria Prowse

May 30th, 2023

In this web appendix, we provide further details that were omitted from the main text to conserve space. Web Appendix A describes the additional transfer programs that are included in the model. Web Appendix B shows the parameters of the marriage, divorce, fertility and assortative mating process. Web Appendix C describes how taxes and benefits changed during the sample period 1991–2004 and shows that the behavioral effects of these changes are modest. Web Appendix D describes how we solve the model to derive optimal behavior over the life cycle. Web Appendix E demonstrates the comparability of our SOEP and EVS samples. Web Appendix F includes tables that provide further details about results in the main text. Web Appendix G reports robustness checks where we vary ancillary policy parameters or modify the life-cycle model. Web Appendix H shows that our main findings on unemployment insurance and social assistance are robust to including equilibrium effects.

Web Appendix A Additional Programs

Child-care Costs

We assume that a married household with one or more pre-school-aged children must pay for full-time childcare if both spouses work full-time. A married household incurs part-time childcare costs if the wife works part-time and the husband works full-time. A single woman with one or more pre-school-aged children must pay childcare costs reflecting her hours of work. Based on Wrohlich (2011), we estimate monthly childcare costs for a child younger than 3 years of 183 euros for part-time care and 397 euros for full-time care. The corresponding figures for a child aged between 3 and 6 years are 90 euros and 167 euros.

Child Benefits and Parental Leave Benefits

A household receives child benefits of 138 euros per month for each dependent child. A household also receives parental leave benefits of 306 euros per month if the youngest child in the household is aged under 24 months and the mother is not employed. Parental leave benefits are restricted to households whose net annual income, excluding social assistance, is below a threshold that depends on marital status and the number of children in the household. Additionally, if the youngest child is older than 6 months then the monthly parental leave benefit is withdrawn at a rate of 3.3% against the household's net annual income, excluding social assistance, above an allowance.[55]

Pensions

A retired individual's annual pension is proportional to his or her lifetime earnings:

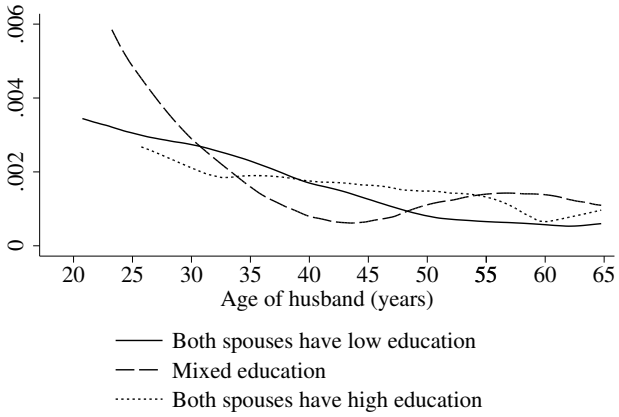
$$\text{Pension}_{g,t} = \Xi \times \text{Exp}_{g,t} \times W_g(\text{HiEduc}_g, 0.5 \times \text{Exp}_{g,t}, \overline{\kappa}) \quad \text{for} \quad g \in \{i, j\}. \tag{A1}$$

In the above, $W_g()$ denotes the gender-specific market wage function (18) evaluated at the individual's education, average experience over the life-cycle, and the population average of the wage unobservable, $\overline{\kappa}$. Reflecting the pension system that was effective during the sample period, we set Ξ to 20.

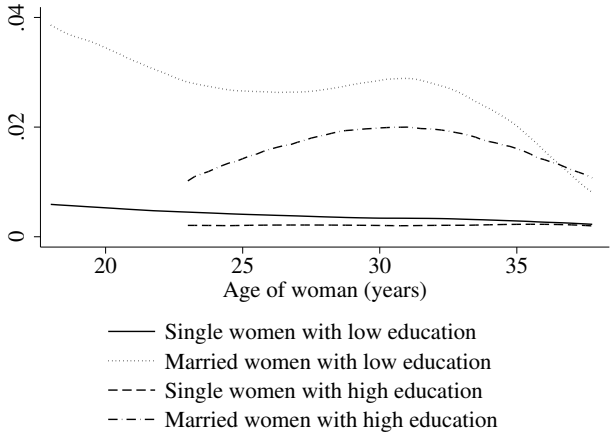
[55] The net annual income thresholds for the first means test are as follows: 51,129 euros for a married household with one child; 53,277 euros for a married household with two children; 38,347 euros for a single household with one child; and 40,494 euros for a single household with two children. The annual allowances for the second means test are equal to: 15,032 euros for a married household with one child; 17,179 euros for a married household with two children; 12,118 euros for a single household with one child; and 14,265 for a single household with two children.

Web Appendix B Marriage, Divorce, Fertility, & Assortative Mating

(a) Marriage



(b) Divorce



(c) Birth

Figure A.1: Quarterly marriage, divorce, and birth probabilities

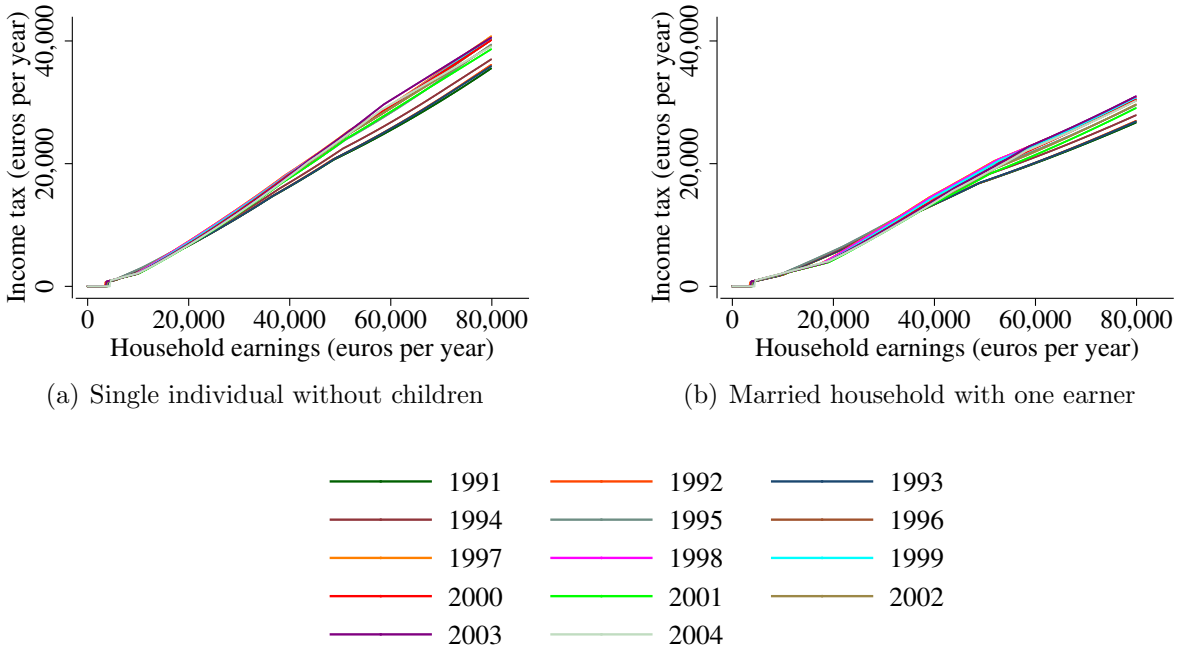
Women		Men	
Low education	High education	Low education	High education
0.118	0.627	0.069	0.412

Table A.1: Probability that an individual's spouse has high education

Web Appendix C Taxes and Benefits 1991–2004

Web Appendix C.I Income Tax

Figure A.2 shows the income tax schedules for single households without children and married households over the sample period 1991–2004. Income tax varied little across years for individuals earning below the average level of individual earnings of 30,608 euros per year. At high levels of earnings, there were larger changes in taxation. Five factors account for the illustrated changes. First, an income tax reform in 1996 reduced the average income tax rates faced by very low-earning households. Second, an income tax reform in 2000 reduced average income tax rates for high-earning households. Third, the solidarity surcharge fluctuated between 0% and 7.5% of income tax (excluding social security contributions). Fourth, the contribution rates for health and retirement benefits increased and the threshold above which earnings are exempt from social security contributions also increased (these increases partly offset the effects of the year 2000 tax reform). Fifth, there were incremental changes in the parameters of the tax system that did not match exactly the rate of inflation.



(a) Single individual without children

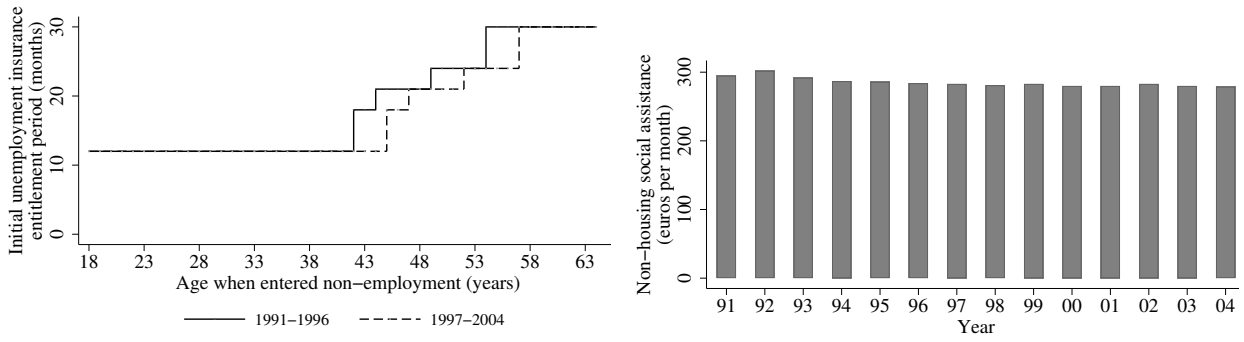
(b) Married household with one earner

Notes: Income tax and household earnings are in year 2000 prices. Income tax includes social security contributions.

Figure A.2: Income tax schedules 1991–2004

Web Appendix C.II Unemployment Insurance & Social Assistance

From 1994 onwards, the unemployment insurance replacement rate from the year 2000 was in effect, and the year 2000 unemployment insurance entitlement period was implemented starting in 1997. Between 1991 and 1993, marginally higher replacement rates were in effect: 63% for individuals with no children in their household and 68% for those with one or more children residing in their household. Before 1997, the initial unemployment insurance entitlement period was somewhat longer for individuals who began employment at ages 42–46, 49–52, and 54–57 years (see Figure A.3(a)).



(a) (b)

Notes: Initial entitlement periods are rounded down to the nearest integer multiple of three months. Social assistance benefits are expressed in year 2000 prices.

Figure A.3: Initial unemployment insurance entitlement period and non-housing social assistance 1991–2004

Regarding social assistance, recall from Section 2.3.2 that the social assistance income floor is equal to the product of a generosity parameter and a household equivalence scale. The generosity parameter, in turn, comprises a component for non-housing assistance and a component for housing (see footnote 20). The policy on support for housing costs did not change during the sample period and, therefore, we assume that this component of the social assistance income floor increased with inflation. Figure A.3(b) illustrates the evolution of the non-housing component of the social assistance income floor during the sample period. The changes in non-housing benefits were modest, reflecting that throughout the sample period, non-housing benefits were calculated to ensure that all households could obtain a basic standard of living. Furthermore, the equivalence scale did not change during the sample period. In summary, during the sample period, there were no major changes to social assistance and only modest changes to unemployment insurance.

Web Appendix C.III Behavioral Effects of Tax & Benefit Changes

We explore the behavioral effects of the changes in taxes and benefits that occurred during the sample period by simulating behavior from the life-cycle model under each of the fourteen year-specific tax and benefit systems. Throughout this exercise, we use the parameter estimates reported in Section 6.1. Table A.2 shows that the predicted voluntary quit rate, transition rate into employment, saving rate, and social assistance receipt rate vary little with the year-specific rules. This supports using the year 2000 rules for the entire sample period.

	Year													
	91	92	93	94	95	96	97	98	99	00	01	02	03	04
Voluntary quit rate at age<50 years														
Single women	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Single men	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Married women	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
Married men	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transition rate into employment at age<50 years														
Single women	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Single men	0.15	0.15	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Married women	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Married Men	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10
Saving rate at age<50 years														
Single women	0.10	0.10	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.10	0.11	0.10	0.10	0.10
Single men	0.17	0.17	0.20	0.19	0.19	0.16	0.16	0.16	0.17	0.16	0.17	0.16	0.16	0.17
Social assistance receipt rate														
Single women (non-emp.)	0.24	0.24	0.21	0.22	0.23	0.24	0.25	0.24	0.23	0.23	0.20	0.22	0.22	0.21
Single women (emp)	0.09	0.08	0.07	0.07	0.07	0.04	0.03	0.03	0.03	0.02	0.01	0.01	0.01	0.01
Single men	0.03	0.03	0.02	0.02	0.02	0.03	0.04	0.03	0.03	0.03	0.02	0.03	0.03	0.03
Married households (non-emp.)	0.07	0.07	0.05	0.05	0.06	0.08	0.09	0.09	0.08	0.08	0.05	0.08	0.08	0.06
Married households (emp)	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.00

Notes: Each column summarizes behavior simulated from the life-cycle model with the year-specific tax and benefit rules and the parameter estimates reported in Section 6.1.

Table A.2: Robustness of behavior to changes in the tax and benefit rules

Web Appendix D Optimal Life-cycle Behavior

We solve the model by characterizing optimal life-cycle behavior using the value functions for single and married women and men. Recall a household's choice problem ends when the

youngest household member reaches the compulsory retirement age of 65 years. From this time onward, the household members cannot search or work, and the household consumes pension and social assistance benefits plus the actuarially fair annuity value of household wealth at the compulsory retirement age. In each period prior to the compulsory retirement age, a household's optimization problem proceeds in two stages. First, the search intensity of each household member is optimized. Second, job offers arrive and the household optimizes household consumption, household social assistance claiming behavior, and labor supply behavior and unemployment insurance claiming behavior of each household member. This within-period problem is solved backwards: we determine optimal consumption, unemployment insurance and social assistance claiming, and labor supply behavior for each possible set of feasible labor supply choices, and then solve for the optimal search intensity, taking into account the effect of search on the probability of employment constraints.

Before proceeding, we define the state variables for women and men. A woman's state space, $\Phi_{i,t}$, contains the following individual characteristics: age; education; experience; persistent wage type; unemployment insurance eligibility; unemployment insurance entitlement period; hours of work in previous employment; labor supply state in the previous period; job destruction status; household wealth; current period preference shocks; and the age of the first-born child. A man's state space, $\Phi_{j,t}$, contains the same variables that appear in a woman's state space except for hours of work in previous employment and the age of the first-born child.

Web Appendix D.I Single Households

We first consider the problem facing a single woman. A single woman's choice problem ends when she reaches the compulsory retirement age of 65 years. We denote this time by $\widetilde{T}$. The terminal value function for single woman i is given by:

$$V^{Fs}_{\widetilde{T}}(\Phi_{i,\widetilde{T}}) = \mathbb{E}\left[\sum_{\tau=\widetilde{T}}^{T^F} \delta^{\tau-t} U^F(m_{i,\emptyset,\widetilde{T}}, d_{i,\widetilde{T}}, s_{i,\widetilde{T}}, \text{SAClaim}^*_{i,\emptyset,\widetilde{T}}) \middle| \Phi_{i,\widetilde{T}}\right]. \tag{A2}$$

In (A2), $m_{i,\emptyset,\widetilde{T}}$ denotes the woman's consumption in retirement, $d_{i,\widetilde{T}}$ takes the value RT, indicating that the woman is retired, $s_{i,\widetilde{T}}$ is equal to zero, reflecting that retired individuals cannot search, $\text{SAClaim}^*_{i,\emptyset,\widetilde{T}}$ denotes the social assistance claiming choice that maximizes the woman's remaining lifetime utility (unemployment benefits are not available in retirement), $\Phi_{i,\widetilde{T}}$ denotes the values of the woman's state variables at the compulsory retirement age, and T^F denotes the last period of the woman's life.

Prior to the compulsory retirement age, the labor supply-specific value functions for single

woman i at time t are given by:

$$V_t^{Fs}(d|s,\Phi_{i,t}) = \max_{m,\text{SAClaim},\text{UIClaim}} \Big\{ U^F(m,d,s,\text{SAClaim},\text{UIClaim}) + \\ \delta \mathbb{E}\left[(1-\phi_{i,t+1}^{Fs}) V_{t+1}^{Fs}(\Phi_{i,t+1}) + \phi_{i,t+1}^{Fs} V_{t+1}^{Fc}(\Phi_{i,t+1},\Phi_{j,t+1}) \Big| \Phi_{i,t}, d \right] \Big\} \quad \text{for} \quad d \in \mathcal{D}^F. \quad \text{(A3)}$$

In the above, $\phi_{i,t+1}^{Fs}$ is the woman's probability of marrying at time $t+1$, and $V_{t+1}^{Fc}(\Phi_{i,t+1},\Phi_{j,t+1})$ is woman's value function in the next period if she marries (the value functions for married individuals are defined below in Web Appendix D.II). Note, for each labor supply-specific value function, consumption, m, and social assistance claiming, SAClaim, are optimized conditional on the woman's labor supply state. The optimization of consumption is subject to the intertemporal budget constraint and the non-negativity constraint on household wealth. The expectation in (A3) is evaluated assuming that individuals' expectations about the observable characteristics of future spouses reflect the modal in-sample pattern of marriage-matching: an individual expects that his or her future spouse will enter the marriage with the same education, employment status, and unemployment insurance entitlement and eligibility as him or herself; individuals expect that the husband will enter the marriage with 7% more experience and 5% more wealth than the wife. We also assume individuals expect any future spouse to enter the marriage with the same wage unobservable as themself.

We now characterize a single woman's optimal labor supply behavior given the set of feasible choices, as determined by the outcome of search activities, job destructions, and the age-based restrictions on retirement eligibility. Let D_k^F for $k = 1, ..., K^F$ denote all possible sets of feasible labor supply choices. Given the set of feasible choices D_k^F, the single woman chooses the labor supply alternative with the highest choice-specific value function:

$$d_{i,t}^*(D_k^F) = \underset{d \in D_k^F}{\text{argmax}} \big\{ V_t^{Fs}(d|s,\Phi_{i,t}) \big\}. \quad \text{(A4)}$$

The single woman's optimal search intensity, $s_{i,t}^*$, is given by:

$$s_{i,t}^* = \underset{s \in [0,1/\chi_{i,t}]}{\text{argmax}} \left\{ \sum_{k=1}^{K^F} P(D_k^F|s,\Phi_{i,t}) V_t^{Fs}\left(d_{i,t}^*\left(D_k^F\right) \big| \, s, \Phi_{i,t} \right) \right\}, \quad \text{(A5)}$$

where $P(D_k^F|s,\Phi_{i,t})$ is the probability of the set D_k^F of feasible labor supply choices given search intensity s. Note, as search intensity, s, varies $P(D_k^F|s,\Phi_{i,t})$ changes according to the effect of search on the probability of receiving a job offer as described by (15). Evaluating the term in braces in (A5) at the optimal search intensity, $s_{i,t}^*$, obtains the single woman's value function, $V_t^{Fs}(\Phi_{i,t})$.

A single man's value function, $V_t^{Ms}(\Phi_{j,t})$, is obtained in the same way as shown here for a single woman. We assume than a single man expects his any future wife to enter the marriage without preexisting children.

Web Appendix D.II Married Households

We now turn to the problem facing a married household. A married household's choice problem ends when the wife reaches the compulsory retirement age, i.e., at time $\widetilde{T}$. The terminal value function for woman i in married household (i,j) is given by:

$$V_{\widetilde{T}}^{Fc}(\Phi_{i,\widetilde{T}},\Phi_{j,\widetilde{T}}) = \mathbb{E}\left[\sum_{\tau=\widetilde{T}}^{T^F}\delta^{\tau-\widetilde{T}}U^F(m_{i,j,\widetilde{T}},d_{i,\widetilde{T}},s_{i,\widetilde{T}},\text{SAClaim}^*_{i,j,\widetilde{T}})\middle|\Phi_{i,\widetilde{T}},\Phi_{j,\widetilde{T}}\right], \quad \text{(A6)}$$

and the terminal value function for man j in married household (i,j) is given by:

$$V_{\widetilde{T}}^{Mc}(\Phi_{i,\widetilde{T}},\Phi_{j,\widetilde{T}}) = \mathbb{E}\left[\sum_{\tau=\widetilde{T}}^{T^M}\delta^{\tau-\widetilde{T}}U^M(m_{i,j,\widetilde{T}},d_{j,\widetilde{T}},s_{j,\widetilde{T}},\text{SAClaim}^*_{i,j,\widetilde{T}})\middle|\Phi_{i,\widetilde{T}},\Phi_{j,\widetilde{T}}\right]. \quad \text{(A7)}$$

In the two above equations, $m_{i,j,\widetilde{T}}$ denotes the household's consumption in retirement, $d_{i,\widetilde{T}}$ and $d_{j,\widetilde{T}}$ take the value RT, indicating that both spouses are retired, $s_{i,\widetilde{T}}$ and $s_{j,\widetilde{T}}$ are equal to zero, reflecting that retired individuals do not search, and $\text{SAClaim}^*_{i,j,\widetilde{T}}$ denotes the social assistance claiming choice that maximizes the household's remaining lifetime utility (unemployment benefits are not available in retirement). The married household's objective function is an α-weighted average of the spouses' payoffs and, therefore, the terminal value function for the married household is given by:

$$V^{FM}(\Phi_{i,\widetilde{T}},\Phi_{j,\widetilde{T}}) = \alpha V_{\widetilde{T}}^{Fc}(\Phi_{i,\widetilde{T}},\Phi_{j,\widetilde{T}}) + (1-\alpha)V_{\widetilde{T}}^{Mc}(\Phi_{i,\widetilde{T}},\Phi_{j,\widetilde{T}}). \quad \text{(A8)}$$

The labor supply-specific value functions for the married household prior to the wife reaching the compulsory retirement age are given by:

$$\begin{aligned}
V_t^{FM}(d^F,d^M|s^F,s^M,\Phi_{i,t},\Phi_{j,t}) = \max_{\substack{m,\,\text{SAClaim},\\ \text{UIClaim}^F,\,\text{UIClaim}^M}} & \Big\{\alpha U^F(m,d^F,d^M,s^F,\text{SAClaim},\text{UIClaim}^F) \\
& +(1-\alpha)U^M(m,d^F,d^M,s^M,\text{SAClaim},\text{UIClaim}^M) \\
& +\delta\mathbb{E}\Big[(1-\phi^c_{i,j,t+1})\left(\alpha V^{Fs}_{t+1}(\Phi_{i,t+1})+(1-\alpha)V^{Ms}_{t+1}(\Phi_{j,t+1})\right) \\
& +\phi^c_{i,j,t+1}V^{FM}_{t+1}(\Phi_{i,t+1},\Phi_{j,t+1})\Big|\Phi_{i,t},\Phi_{j,t},d^F,d^M\Big]\Big\} \\
& \text{for } d^F\in\mathcal{D}^F \text{ and } d^M\in\mathcal{D}^M. \quad \text{(A9)}
\end{aligned}$$

In the above, $\phi^c_{i,j,t+1}$ is the probability that the spouses remain married between periods t and $t+1$. Similar to single households, consumption, m, and social assistance claiming, SAClaim, are optimized conditional on household labor supply. $V^{Fs}_{t+1}(\Phi_{i,t+1})$ and $V^{Ms}_{t+1}(\Phi_{j,t+1})$ are the wife's and husband's value functions in the next period if they divorce (the value function for single individuals were defined above in Web Appendix D.I). van der Klaauw and Wolpin (2008) and Fernández and Wong (2014) use similar preference specifications for couples in studies of, respectively, the effect of Social Security on household retirement behavior and the effect of divorce risk on female labor force participation.

Let D^c_k for $k = 1, ..., K^c$ denote all possible sets of feasible labor supply choices for a married household. Given the set of feasible labor supply choices D^c_k, the household chooses the labor supply alternative with the highest choice-specific value function:

$$(d^*_{i,t}(D^c_k), d^*_{j,t}(D^c_k)) = \underset{(d^F,d^M)\in D^c_k}{\operatorname{argmax}} V^{FM}_t \left(d^F, d^M | s^F, s^M, \Phi_{i,t}, \Phi_{j,t}\right). \tag{A10}$$

The wife's and husband's optimal search intensities are given by:

$$(s^*_{i,t}, s^*_{j,t}) = \underset{\substack{s^F \in [0,\, 1/\chi_{i,t}] \\ s^M \in [0,\, 1/\chi_{j,t}]}}{\operatorname{argmax}} \left\{ \sum_{k=1}^{K^c} P(D^c_k | s^F, s^M) V^{FM}_t (d^*_{i,t}(D^c_k), d^*_{j,t}(D^c_k) \mid s^F, s^M, \Phi_{i,t}, \Phi_{j,t}) \right\}, \tag{A11}$$

where $P(D^c_k|s^F, s^M)$ is the probability of choice set D^c_k, given search intensities s^F for the wife and s^M for the husband. Last, we split the married household's value function into the value functions for the wife and husband that appear in the single household's optimization problem. For a married woman:

$$V^{Fc}_t(\Phi_{i,t}, \Phi_{j,t}) = \sum_{k=1}^{K^c} P(D^c_k | s^*_{i,t}, s^*_{j,t}) V^{Fc}_t \left(d^*_{i,t}(D^c_k), d^*_{j,t}(D^c_k) \middle| s^*_{i,t}, s^*_{j,t}, \Phi_{i,t}, \Phi_{j,t}\right), \tag{A12}$$

where

$$\begin{aligned} V^{Fc}_t \left(d^*_{i,t}(D^c_k), d^*_{j,t}(D^c_k) \middle| s^*_{i,t}, s^*_{j,t}, \Phi_{i,t}, \Phi_{j,t}\right) &= U^F(m^*, d^*_{i,t}(D^c_k), d^*_{j,t}(D^c_k), s^*_{i,t}, \text{SAClaim}^*) \\ &+\delta \mathbb{E}\Big[(1-\phi^c_{t+1}) V^{Fs}_{t+1}(\Phi_{i,t+1}) + \phi^c_{t+1} V^{Fc}_{t+1}(\Phi_{i,t+1}, \Phi_{j,t+1}) \Big| \Phi_{i,t}, \Phi_{j,t}, d^*_{i,t}(D^c_k), d^*_{j,t}(D^c_k)\Big] \end{aligned} \tag{A13}$$

and m^* and SAClaim^* denote optimal household consumption and optimal social assistance claiming from (A9). The value function for a married man is derived in the same way as shown here for a married woman.

Web Appendix E Sample Comparability & Savings Rates

We examine the comparability of the SOEP and EVS samples described in Section 4 by comparing the average values of demographic characteristics, employment and retirement outcomes, and wealth across the two samples. Table A.3 shows that the EVS and SOEP samples are highly comparable. In particular, the rates of employment, non-employment, and retirement are similar across the two samples, both overall and when we split by gender and marital status. The same is true for age, education, the age category of the youngest child, and wealth. Table A.4 summarizes savings rates in the EVS sample.

Variable	All individuals		Single women		Single men		Married women		Married men	
	SOEP	EVS	SOEP	EVS	SOEP	EVS	SOEP	EVS	SOEP	EVS
Share			0.17	0.17	0.12	0.10	0.35	0.37	0.35	0.37
Age (years)	44.71	44.09	43.38	43.64	41.18	40.64	44.28	43.30	47.03	46.01
High education	0.14	0.15	0.13	0.18	0.22	0.22	0.08	0.11	0.16	0.17
Child 0–3	0.07	0.09	0.04	0.02	-	-	0.09	0.11	0.09	0.11
Child 3–6	0.06	0.08	0.04	0.03	-	-	0.08	0.10	0.08	0.10
Wealth (Euros)	119,986	126,147	52,775	59,579	56,445	70,826	147,955	149,845	147,955	149,845
Part-time employed	0.15	0.15	0.18	0.21	-	-	0.33	0.33	-	-
Full-time employed	0.53	0.54	0.51	0.50	0.78	0.79	0.26	0.24	0.74	0.78
Retired	0.08	0.06	0.12	0.10	0.04	0.03	0.07	0.04	0.09	0.07
Non Employed	0.24	0.25	0.19	0.19	0.18	0.18	0.35	0.40	0.17	0.15

Notes: For all variables except wealth, we use the full EVS sample, which covers the years 1998 and 2003, and a SOEP sub-sample that includes only observations from the years 1998 and 2003. For wealth, we use the EVS sub-sample that includes only observations from the year 2003 and a SOEP sub-sample that includes only observations from the year 2002 (since wealth was only observed in the SOEP in 2002). Wealth comprises financial, housing, and durable assets, is measured at the household level, and is expressed in year 2000 prices using the Consumer Price Index. See the notes to Table 1 for further variable definitions. All statistics are weighted using the household weights supplied by the SOEP or EVS.

Table A.3: Comparison of the SOEP and EVS samples

	Single women	Single men	Married households
All	0.09	0.16	0.14
Age<50 years	0.10	0.16	0.15
Age≥50 years	0.08	0.13	0.11
High education	0.11	0.17	0.15
Low education	0.09	0.15	0.13
Number of households	8,748	4,033	26,512

Notes: The saving rate is defined as household savings during a quarter divided by net household income during the same quarter. Household saving is the difference between a household's spending on financial and tangible assets (including housing) and its revenue from sales of the same asset classes (household saving includes loan repayments and revenue from new loans). Net household income is reported in the EVS and accounts for all components of household income, including transfers, social security contributions, and income taxation. All statistics are for non-retired households. Statistics by age and education for married households are based on the characteristics of the husband.

Table A.4: Saving rates in the EVS sample

Web Appendix F Further Policy Analysis Tables

This Appendix includes tables that provide further details about results in Section 7. Table A.5 reports the fiscally-equalized effects of the cuts in social assistance and unemployment insurance on search costs and reemployment wages. Table A.6 and Table A.7 show how heterogeneous incentive, insurance, redistributive, and cost effects of social assistance and unemployment insurance. Table A.8 shows the heterogeneous behavioral effects of the revenue-neutral rebalancing reform. Table A.9 and Table A.10 show the heterogeneous effects of social assistance and unemployment insurance and the heterogeneous effects of a revenue neutral rebalancing reform for demographic groups defined by characteristics determined before labor force entry (i.e., sex and education).

	Social assistance				Unemployment insurance				Difference			
	Single		Married		Single		Married		Single		Married	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
I: Demographic groups based on sex, marital status and wealth												
Low wealth:												
Wealth (1000s€)	0.6	0.2	1.8	1.6	1.1	-0.1	0.0	0.0	-0.5	0.3	1.8	1.6
Low wealth rate (wealth<5,000€)	-3.0	-0.7	-11.1	-9.9	-4.4	1.6	1.6	1.6	1.4	-2.3	-12.7	-11.5
Unemployment insurance receipt rate	-0.1	0.0	0.1	0.0	-5.8	-4.2	-2.1	-4.1	5.8	4.2	2.2	4.1
Social assistance receipt rate	-1.0	-0.8	-2.0	-1.8	2.0	3.0	1.4	1.4	-3.0	-3.8	-3.3	-3.1
Log reemployment wage ×100	-0.1	0.1	-0.5	0.4	0.0	0.2	0.1	0.1	-0.1	-0.1	-0.6	0.3
Search costs (non-emp. individuals)	1.5	1.9	0.6	2.1	0.1	0.5	0.2	1.2	1.4	1.4	0.5	0.8
Search costs (non-emp. w/ emp. spouse)			0.3	1.6			0.1	1.1			0.2	0.6
Search costs (non-emp. w/ non-emp. sp.)			5.3	5.5			1.1	2.3			4.2	3.2
High wealth:												
Wealth (1000s€)	4.7	1.9	18.3	15.0	1.0	0.2	0.9	0.9	3.6	1.7	17.3	14.1
Low wealth rate (wealth<5,000€)	-0.9	-0.5	-3.4	-2.8	0.7	0.4	0.8	0.8	-1.6	-0.9	-4.2	-3.6
Unemployment insurance receipt rate	-0.1	0.0	0.3	0.0	-3.3	-1.5	-0.9	-3.4	3.3	1.4	1.1	3.3
Social assistance receipt rate	-0.7	-0.5	-0.3	-0.3	0.3	0.2	0.1	0.1	-1.0	-0.7	-0.4	-0.4
Log reemployment wage ×100	-0.5	0.0	-1.9	0.0	-0.1	0.1	0.3	-0.2	-0.4	-0.1	-2.2	0.2
Search costs (non-emp. individuals)	1.9	1.4	0.4	0.1	0.3	0.3	0.2	0.6	1.6	1.2	0.3	-0.5
Search costs (non-emp. w/ emp. spouse)			0.2	0.0			0.1	0.5			0.1	-0.5
Search costs (non-emp. w/ non-emp. sp.)			2.1	0.3			0.5	1.3			1.6	-1.0
II: Demographic groups based on sex, marital status and education												
Low educaiton:												
Wealth (1000s€)	2.2	1.0	9.9	8.3	0.9	0.1	0.6	0.4	1.3	0.9	9.2	7.9
Low wealth rate (wealth<5,000€)	-2.4	-0.7	-7.3	-5.9	-0.6	0.6	1.1	1.4	-1.7	-1.3	-8.4	-7.3
Unemployment insurance receipt rate	-0.1	0.0	0.2	0.0	-4.1	-2.0	-1.2	-3.5	4.1	2.0	1.4	3.5
Social assistance receipt rate	-0.9	-0.7	-1.2	-1.1	0.7	0.7	0.5	0.5	-1.7	-1.3	-1.7	-1.6
Log reemployment wage ×100	-0.4	0.0	-1.3	-0.1	-0.1	0.1	0.2	-0.1	-0.3	-0.2	-1.5	0.1
Search costs (non-emp. individuals)	1.7	1.6	0.5	1.1	0.2	0.3	0.1	0.8	1.4	1.3	0.3	0.3
Search costs (non-emp. w/ emp. spouse)			0.3	0.9			0.1	0.7			0.1	0.3
Search costs (non-emp. w/ non-emp. sp.)			2.5	1.7			0.6	1.4			2.0	0.3
High education:												
Wealth (1000s€)	3.3	1.3	15.2	10.9	2.1	0.3	1.6	3.4	1.2	1.0	13.6	7.5
Low wealth rate (wealth<5,000€)	-1.1	-0.5	-6.9	-8.5	0.4	0.0	-0.2	-3.5	-1.4	-0.5	-6.7	-5.1
Unemployment insurance receipt rate	-0.1	-0.1	0.3	0.0	-1.8	-0.8	-1.3	-4.1	1.8	0.8	1.6	4.0
Social assistance receipt rate	-0.6	-0.4	-0.2	-0.4	0.1	0.1	0.1	0.2	-0.7	-0.4	-0.3	-0.6
Log reemployment wage ×100	-0.1	0.0	0.0	0.3	-0.1	0.1	0.1	0.0	-0.1	-0.1	-0.1	0.3
Search costs (non-emp. individuals)	2.7	1.7	0.3	-0.6	0.7	0.4	0.2	0.7	2.0	1.2	0.1	-1.3
Search costs (non-emp. w/ emp. spouse)			0.0	-1.1			0.0	0.4			0.0	-1.6
Search costs (non-emp. w/ non-emp. sp.)			2.2	-0.1			1.2	1.7			1.0	-1.8
III: Demographic groups based on sex and marital status												
Wealth (1000s€)	2.2	1.0	10.1	8.6	1.0	0.2	0.7	0.7	1.2	0.9	9.4	8.0
Low wealth rate (wealth<5,000€)	-2.3	-0.6	-7.3	-6.2	-0.5	0.5	1.0	1.0	-1.8	-1.1	-8.3	-7.2
Unemployment insurance receipt rate	-0.1	0.0	0.2	0.0	-3.9	-1.8	-1.2	-3.6	3.8	1.8	1.4	3.6
Social assistance receipt rate	-0.9	-0.6	-1.1	-1.0	0.7	0.6	0.5	0.5	-1.6	-1.2	-1.6	-1.4
Log reemployment wage ×100	-0.4	-0.1	-1.3	-0.1	-0.1	0.1	0.2	-0.2	-0.3	-0.2	-1.5	0.1
Search costs (non-emp. individuals)	1.7	1.6	0.5	0.9	0.2	0.3	0.2	0.8	1.5	1.3	0.3	0.1
Search costs (non-emp. w/ emp. spouse)			0.3	0.8			0.1	0.7			0.1	0.1
Search costs (non-emp. w/ non-emp. sp.)			2.5	1.4			0.6	1.4			1.9	-0.1

Notes: Effects on behaviors of cuts in unemployment insurance and social assistance that decrease demographic-group-level average net-of-tax transfer income by 37 euros per person-quarter. All behavioral effects are differences in levels, rate variables expressed in percentage points, and wealth is defined as household wealth per adult household member. See Section 7.3.1 for a description of the demographic groups.

Table A.5: Additional results on the heterogeneous fiscally-equalized behavioral effects of cuts in social assistance and unemployment insurance

	Cut social assistance to 62.7% of baseline				Eliminate unemployment insurance				Difference			
Aggregate incentive effect	1.0				-0.4				1.4			
Aggregate insurance effect	-2.3				-0.3				-2.0			
Aggregate redistribution effect	-0.8				-0.4				-0.4			
Aggregate cost effect	0.1				0.2				-0.1			
	Single		Married		Single		Married		Single		Married	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
I: Demographic groups based on sex, marital status and wealth												
Low wealth:												
Incentive effect	0.2	-1.1	0.0	0.8	0.2	-0.4	0.0	-0.5	0.0	-0.7	0.0	1.3
Insurance effect	-5.3	-2.4	-1.3	-1.0	-0.7	0.0	-0.6	0.2	-4.5	-2.4	-0.7	-1.2
Redistribution effect	-4.0	-4.1	-0.1	-0.2	-1.6	0.1	0.3	-1.7	-2.3	-4.3	-0.4	1.5
Cost effect	-0.1	0.4	0.8	0.7	0.6	-1.5	-0.4	-0.2	-0.7	1.9	1.2	0.8
Group cont. to agg. incentive eff.	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Group cont. to agg. insurance eff.	-0.3	-0.1	-0.1	-0.1	0.0	0.0	-0.1	0.0	-0.3	-0.1	-0.1	-0.1
Group cont. to agg. redistribution eff.	-0.2	-0.2	0.0	0.0	-0.1	0.0	0.0	-0.2	-0.1	-0.2	0.0	0.1
Group cont. to agg. cost eff.	0.0	0.0	0.1	0.1	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.1
High wealth:												
Incentive effect	1.3	1.8	0.4	2.2	-0.2	-1.3	0.4	-1.1	1.4	3.1	0.0	3.3
Insurance effect	-4.3	-3.0	-1.3	-1.9	-0.6	0.0	-0.5	-0.1	-3.7	-3.0	-0.8	-1.8
Redistribution effect	0.5	-2.1	0.2	-0.5	-1.3	0.5	0.1	-0.4	1.8	-2.6	0.1	-0.1
Cost effect	-0.3	-0.6	0.1	0.2	1.2	0.4	0.0	0.3	-1.4	-1.0	0.1	-0.1
Group cont. to agg. incentive eff.	0.2	0.2	0.1	0.5	0.0	-0.1	0.1	-0.2	0.2	0.4	0.0	0.7
Group cont. to agg. insurance eff.	-0.5	-0.3	-0.3	-0.4	-0.1	0.0	-0.1	0.0	-0.5	-0.3	-0.2	-0.4
Group cont. to agg. redistribution eff.	0.1	-0.2	0.0	-0.1	-0.2	0.1	0.0	-0.1	0.2	-0.3	0.0	0.0
Group cont. to agg. cost eff.	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	0.1	-0.2	-0.1	0.0	0.0
II: Demographic groups based on sex, marital status and education												
Low education:												
Incentive effect	0.9	0.7	0.2	1.7	-0.1	-1.1	0.2	-0.9	1.0	1.9	0.0	2.6
Insurance effect	-5.0	-2.8	-1.3	-1.7	-0.6	0.0	-0.5	0.0	-4.4	-2.8	-0.8	-1.7
Redistribution effect	-0.9	-2.8	0.1	-0.3	-1.5	0.4	0.2	-1.0	0.6	-3.3	-0.1	0.7
Cost effect	-0.2	-0.1	0.3	0.3	0.9	-0.4	-0.1	0.2	-1.2	0.2	0.4	0.2
Group cont. to agg. incentive eff.	0.2	0.1	0.1	0.5	0.0	-0.2	0.1	-0.2	0.2	0.3	0.0	0.7
Group cont. to agg. insurance eff.	-0.8	-0.4	-0.4	-0.5	-0.1	0.0	-0.2	0.0	-0.7	-0.4	-0.2	-0.5
Group cont. to agg. redistribution eff.	-0.2	-0.4	0.0	-0.1	-0.3	0.1	0.0	-0.3	0.1	-0.5	0.0	0.2
Group cont. to agg. cost eff.	0.0	0.0	0.1	0.1	0.2	-0.1	0.0	0.0	-0.2	0.0	0.1	0.0
High education:												
Incentive effect	0.9	1.6	0.7	2.7	0.3	0.1	1.0	-1.0	0.7	1.5	-0.3	3.6
Insurance effect	-1.5	-3.0	-0.7	-1.4	-1.6	-0.3	-0.5	-0.4	0.2	-2.7	-0.2	-1.0
Redistribution effect	-1.6	-2.7	0.0	-1.4	-0.4	0.0	0.1	0.2	-1.2	-2.6	-0.1	-1.6
Cost effect	0.2	-1.3	0.0	0.3	1.1	0.9	0.0	0.2	-0.9	-2.2	0.0	0.1
Group cont. to agg. incentive eff.	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Group cont. to agg. insurance eff.	0.0	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Group cont. to agg. redistribution eff.	0.0	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1
Group cont. to agg. cost eff.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
III: Demographic groups based on sex and marital status												
Incentive effect	0.9	0.8	0.3	1.8	-0.1	-1.0	0.3	-0.9	1.0	1.8	0.0	2.7
Insurance effect	-4.6	-2.8	-1.3	-1.7	-0.7	0.0	-0.5	0.0	-3.9	-2.8	-0.7	-1.6
Redistribution effect	-1.0	-2.8	0.1	-0.4	-1.4	0.4	0.2	-0.8	0.4	-3.2	-0.1	0.4
Cost effect	-0.2	-0.3	0.3	0.3	1.0	-0.2	-0.1	0.2	-1.2	-0.1	0.4	0.1
Group cont. to agg. incentive eff.	0.2	0.1	0.1	0.6	0.0	-0.2	0.1	-0.3	0.2	0.3	0.0	0.9
Group cont. to agg. insurance eff.	-0.9	-0.5	-0.4	-0.5	-0.1	0.0	-0.2	0.0	-0.7	-0.5	-0.2	-0.5
Group cont. to agg. redistribution eff.	-0.2	-0.5	0.0	-0.1	-0.3	0.1	0.0	-0.3	0.1	-0.6	0.0	0.1
Group cont. to agg. cost eff.	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0.1	-0.2	0.0	0.1	0.0

Notes: Welfare effects are expressed as percentages of baseline consumption. A group's contribution to the aggregate total welfare effect is equal to the group's total welfare effect times the group's population share (as shown in Table 10). See Section 7.3.1 for a description of the demographic groups.

Table A.6: Heterogeneous incentive, insurance, redistribution and cost effects of social assistance and unemployment insurance

	Revenue-neutral rebalancing reform (eliminate unemployment insurance and increase social assistance to 141% of baseline)			
Aggregate incentive effect	-1.4			
Aggregate insurance effect	1.2			
Aggregate redistribution effect	0.3			
Aggregate cost effect	0.4			
	Single		Married	
	Women	Men	Women	Men
I: Demographic groups based on sex, marital status and wealth				
Low wealth:				
Incentive effect	0.6	-1.1	0.0	-1.0
Insurance effect	-0.2	-0.1	0.7	0.3
Redistribution effect	5.8	1.0	0.4	-0.8
Cost effect	-3.8	4.3	-0.8	-0.2
Contribution to aggregate incentive effect	0.0	-0.1	0.0	-0.1
Contribution to aggregate insurance effect	0.0	0.0	0.1	0.0
Contribution to aggregate redistribution effect	0.4	0.1	0.0	-0.1
Contribution to aggregate cost effect	-0.2	0.3	-0.1	0.0
High wealth:				
Incentive effect	-1.7	-3.5	0.1	-3.0
Insurance effect	4.1	0.7	0.7	1.7
Redistribution effect	-2.9	2.3	0.0	0.0
Cost effect	1.4	2.4	-0.1	0.2
Contribution to aggregate incentive effect	-0.2	-0.4	0.0	-0.7
Contribution to aggregate insurance effect	0.5	0.1	0.2	0.4
Contribution to aggregate redistribution effect	-0.4	0.3	0.0	0.0
Contribution to aggregate cost effect	0.2	0.3	0.0	0.0
II: Demographic groups based on sex, marital status and education				
Low education:				
Incentive effect	-0.9	-3.0	0.0	-2.3
Insurance effect	2.9	0.4	0.7	1.5
Redistribution effect	0.1	1.9	0.1	-0.5
Cost effect	-0.6	3.4	-0.3	0.1
Contribution to aggregate incentive effect	-0.1	-0.5	0.0	-0.6
Contribution to aggregate insurance effect	0.5	0.1	0.2	0.4
Contribution to aggregate redistribution effect	0.0	0.3	0.0	-0.1
Contribution to aggregate cost effect	-0.1	0.5	-0.1	0.0
High education:				
Incentive effect	-1.1	-0.3	0.6	-3.1
Insurance effect	1.0	0.6	0.0	0.7
Redistribution effect	-1.0	1.6	0.2	1.4
Cost effect	3.1	0.7	0.0	0.1
Contribution to aggregate incentive effect	0.0	0.0	0.0	-0.1
Contribution to aggregate insurance effect	0.0	0.0	0.0	0.0
Contribution to aggregate redistribution effect	0.0	0.0	0.0	0.1
Contribution to aggregate cost effect	0.1	0.0	0.0	0.0
III: Demographic groups based on sex and marital status				
Incentive effect	-0.9	-2.7	0.1	-2.4
Insurance effect	2.7	0.4	0.7	1.3
Redistribution effect	0.0	1.9	0.1	-0.2
Cost effect	-0.3	3.1	-0.3	0.1
Contribution to aggregate incentive effect	-0.2	-0.5	0.0	-0.8
Contribution to aggregate insurance effect	0.5	0.1	0.2	0.4
Contribution to aggregate redistribution effect	0.0	0.3	0.0	-0.1
Contribution to aggregate cost effect	-0.1	0.5	-0.1	0.0

Notes: See the Notes to Table A.6.

Table A.7: Aggregate and heterogeneous incentive, insurance, redistributive and cost effects of a revenue-neutral rebalancing reform of the social safety net

	Revenue-neutral rebalancing reform (eliminate unemployment insurance and increase social assistance to 141% of it baseline generosity)			
	Single		Married	
	Women	Men	Women	Men
I: Demographic groups based on sex, marital status and wealth				
Low wealth:				
Employment rate	-0.8	-2.1	-1.6	0.2
Wealth (1000s€)	-0.2	0.2	-0.2	-0.2
Low wealth rate (wealth<5,000€)	3.1	1.7	4.6	4.6
Unemployment insurance receipt rate	-3.4	-3.4	-1.7	-3.3
Social assistance receipt rate	7.9	0.6	1.5	1.5
Log reemployment wage ×100	-0.3	0.1	0.2	-0.2
Search costs (non-emp. individuals)	-2.0	-4.9	-0.1	-1.0
Search costs (non-emp. w/ emp. spouse)			-0.1	-0.9
Search costs (non-emp. w/ non-emp. spouse)			-1.3	-2.0
High wealth:				
Employment rate	0.1	0.5	-1.6	0.9
Wealth (1000s€)	-4.2	-2.2	-2.9	-2.9
Low wealth rate (wealth<5,000€)	4.3	1.6	1.8	1.8
Unemployment insurance receipt rate	-3.0	-3.7	-0.7	-2.7
Social assistance receipt rate	1.2	0.0	0.2	0.2
Log reemployment wage ×100	-0.1	0.3	0.5	-0.1
Search costs (non-emp. individuals)	-0.8	-1.3	0.0	0.3
Search costs (non-emp. w/ emp. spouse)			0.1	0.2
Search costs (non-emp. w/ non-emp. spouse)			0.0	0.7
II: Demographic groups based on sex, marital status and age				
Low education:				
Employment rate	-0.2	-0.5	-1.6	0.7
Wealth (1000s€)	-3.1	-1.4	-2.2	-2.2
Low wealth rate (wealth<5,000€)	4.2	1.7	2.7	2.8
Unemployment insurance receipt rate	-3.3	-3.8	-1.0	-3.1
Social assistance receipt rate	3.8	0.1	0.6	0.6
Log reemployment wage ×100	0.0	0.5	0.4	0.0
Search costs (non-emp. individuals)	-1.2	-2.6	0.0	-0.1
Search costs (non-emp. w/ emp. spouse)			0.0	-0.2
Search costs (non-emp. w/ non-emp. spouse)			-0.2	0.2
High education:				
Employment rate	-0.1	0.6	-1.7	0.5
Wealth (1000s€)	-0.6	-1.4	-0.7	-1.3
Low wealth rate (wealth<5,000€)	1.3	1.3	0.8	1.4
Unemployment insurance receipt rate	-1.7	-2.2	-1.0	-1.9
Social assistance receipt rate	-0.4	1.1	0.1	0.2
Log reemployment wage ×100	0.0	0.3	0.0	0.0
Search costs (non-emp. individuals)	-1.7	-1.4	0.0	0.2
Search costs (non-emp. w/ emp. spouse)			0.0	0.2
Search costs (non-emp. w/ non-emp. spouse)			0.0	0.6
III: Demographic groups based on sex and marital status				
Employment rate	-0.2	-0.4	-1.6	0.7
Wealth (1000s€)	-2.9	-1.4	-2.1	-2.1
Low wealth rate (wealth<5,000€)	3.9	1.6	2.6	2.6
Unemployment insurance receipt rate	-3.1	-3.6	-1.0	-2.9
Social assistance receipt rate	3.4	0.2	0.6	0.6
Log reemployment wage ×100	0.0	0.5	0.4	-0.1
Search costs (non-emp. individuals)	-1.2	-2.5	0.0	-0.1
Search costs (non-emp. w/ emp. spouse)			0.0	-0.2
Search costs (non-emp. w/ non-emp. spouse)			-0.2	0.3

Notes: Effects on behaviors of a revenue-neutral rebalancing reform that eliminates unemployment insurance and increases social assistance to 141% of its baseline generosity. All behavioral effects are differences in levels, rate variables expressed in percentage points, and wealth is defined as household wealth per adult household member. See Section 7.3.1 for a description of the demographic groups.

Table A.8: Heterogeneous behavioral effects of the revenue-neutral rebalancing reform

	Social assistance				Unemployment insurance				Difference			
Aggregate total welfare effect	-2.0				-0.9				-1.0			
	Low Educ.		High Educ.		Low Educ.		High Educ.		Low Educ.		High Educ.	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
I. Fiscally-equalized employment and welfare effects												
Change in the employment rate	2.1	1.0	1.2	0.5	0.2	1.2	-0.2	1.0	1.9	-0.2	1.3	-0.4
Total welfare effect	-3.0	-1.4	-1.8	-1.3	-0.8	-1.2	0.0	-0.3	-2.2	-0.2	-1.8	-0.9
... Incentive	0.6	1.0	2.1	2.1	0.1	-0.8	1.0	-0.7	0.5	1.8	1.1	2.8
... Insurance	-3.4	-1.6	-2.1	-1.6	-0.7	0.0	-1.2	-0.3	-2.8	-1.6	-0.9	-1.3
... Redistribution	-0.3	-0.9	-2.0	-1.6	-0.5	-0.4	-0.4	0.3	0.2	-0.5	-1.7	-1.9
... Costs	0.1	0.1	0.2	-0.2	0.3	0.0	0.6	0.4	-0.2	0.1	-0.4	-0.5
II: Actual Employment and welfare effects												
Change in the employment rate	1.6	1.3	0.6	0.6	0.1	1.5	-0.2	1.1	1.4	-0.2	0.7	-0.5
Total welfare effect	-2.3	-1.8	-0.9	-1.5	-0.6	-1.5	0.0	-0.4	-1.7	-0.3	-0.9	-1.1
... Incentive	0.5	1.3	1.1	2.5	0.1	-1.0	0.8	-0.8	0.4	2.2	0.2	3.3
... Insurance	-2.6	-2.1	-1.1	-1.9	-0.5	0.0	-1.0	-0.4	-2.1	-2.1	0.0	-1.5
... Redistribution	-0.2	-1.2	-1.0	-2.0	-0.4	-0.5	-0.3	0.3	0.2	-0.7	-0.7	-2.3
... Costs	0.1	0.2	0.1	-0.2	0.3	0.0	0.5	0.4	-0.2	0.2	-0.4	-0.6
Relative change in transfer inc.	0.8	1.3	0.5	1.2	0.8	1.2	0.8	1.2	0.0	0.1	-0.3	0.0
Population share	0.47	0.43	0.04	0.07	0.47	0.43	0.04	0.07				
Cont. to agg. total welfare eff.	-1.1	-0.8	0.0	-0.1	-0.3	-0.6	0.0	0.0	-0.8	-0.1	0.0	-0.1

Notes: The table shows the heterogeneous effects of social assistance and unemployment insurance for demographic groups defined by characteristics determined before labor force entry. Panel I shows the effects of cuts in unemployment insurance and social assistance that decrease demographic-group-level average net-of-tax transfer income by 37 euros per person-quarter. Panel II shows the actual effects of the fiscal and welfare effects of eliminating unemployment insurance and a revenue equivalent cut in the generosity of social assistance to 62.7% of its baseline generosity. A group's contribution to the aggregate total welfare effect is equal to the group's total welfare effect times the group's population share. The change in the employment rate refers to the percentage point change in the employment rate, and the welfare effects are expressed as percentages of baseline consumption.

Table A.9: Heterogeneous effects of social assistance and unemployment insurance by sex and education

	Revenue-neutral rebalancing reform (unemployment insurance eliminated and social assistance increased to 141% of baseline)			
Aggregate total welfare effect	0.5			
Aggregate incentive effect	-1.4			
Aggregate insurance effect	1.2			
Aggregate redistribution effect	0.3			
Aggregate cost effect	0.4			
	Low Educ.		High Educ.	
	Women	Men	Women	Men
Change in the employment rate	-1.1	0.3	-1.0	0.6
Total welfare effect	0.9	0.2	1.3	0.2
... Incentive	-0.3	-2.5	-0.2	-2.6
... Insurance	1.5	1.1	0.4	0.6
... Redistribution	0.1	0.3	-0.3	1.9
... Costs	-0.4	1.3	1.4	0.3
Contribution to aggregate total welfare effect	0.4	0.1	0.0	0.0
Contribution to aggregate incentive effect	-0.1	-1.1	0.0	-0.2
Contribution to aggregate insurance effect	0.7	0.5	0.0	0.0
Contribution to aggregate redistribution effect	0.0	0.1	0.0	0.1
Contribution to aggregate cost effect	-0.2	0.5	0.1	0.0

Notes: The table shows the heterogeneous effects of a revenue-neutral rebalancing reform of the social safety net for demographic groups defined by characteristics determined before labor force entry. A group's contribution to the aggregate total welfare effect is equal to the group's total welfare effect times the group's population share (as shown in Table A.9). The change in the employment rate refers to the percentage point change in the employment rate, and the welfare effects are expressed as percentages of baseline consumption.

Table A.10: Heterogeneous welfare effects of a revenue-neutral rebalancing reform of the social safety net by sex and education

Web Appendix G Robustness

Web Appendix G.I Ancillary Policy Parameters

The results in Panel I and Panel II of Table A.11 show that our main results on unemployment insurance versus social assistance in Sections 7.2-7.3 continue to hold when we consider cuts in the generosity of unemployment insurance that fall short of eliminating the program. Panel I reports the welfare effects of various cuts in unemployment insurance and is organized as follows. Column (1) repeats our results from the main text where unemployment insurance is eliminated. In columns (2), (3) and (4), the maximum duration of benefits is capped at, respectively, 18, 12 and 6 months. In columns (5) and (6), the replacement rate is lowered to, respectively, 40% and 20%. In column (7) maximum monthly benefit is capped at 2,500 euros. In column (8), unemployment insurance is changed to a flat benefit worth 60% of (population) average after-tax earnings (which is lower than the average earnings of individuals who receive unemployment insurance). In column (9), unemployment insurance is subject to the same wealth test as social assistance. Column (10) combines the cuts from columns (3), (8) and (9). In each column of Panel II, unemployment insurance is as in the baseline environment, while the generosity of social assistance is adjusted to match the aggregate change in transfer income arising from the cut in unemployment insurance in Panel I. Irrespective of how unemployment insurance is cut, the aggregate welfare loss from the revenue-equivalent cut in social assistance is larger than the aggregate welfare loss induced by the cut in unemployment insurance. Also, in contrast to the aggregate pattern and matching our results in the main text, married men consistently experience larger welfare losses from the cut in unemployment insurance than from the revenue-equivalent cut in social assistance.

In Section 7.4 we showed that a revenue-neutral rebalancing reform that eliminates unemployment insurance while increasing the generosity of social assistance increases aggregate welfare by 0.5% of baseline consumption. Each column of Panel III in Table A.11 shows the welfare effect of a revenue-neutral rebalancing reform that combines the cut in unemployment insurance in Panel I with the increase in the generosity of social assistance that makes reform revenue-equivalent to the baseline environment. Among all the rebalancing reforms that we consider, welfare gains are highest under the rebalancing reform we consider in the main text, which eliminates unemployment insurance and increases the generosity of social assistance to 142.2% of its baseline generosity. Aggregate total aggregate welfare increases under the rebalancing reforms that cut unemployment insurance by limiting benefits to 6 months, lowering the replacement rate, placing a monthly cap on benefits, switching to a flat-rate benefit or introducing a wealth test; however, these rebalancing reforms deliver lower welfare gains than the rebalancing reform that eliminates unemployment insurance. Meanwhile, rebalancing reforms

that combine cuts in the maximum duration of unemployment insurance benefits to 12 or 18 months decreases aggregate total welfare. These findings indicate the incremental welfare value of increases in benefit durations beyond 6 months exceeds that of an increase in the generosity of social assistance with the same fiscal cost.

Table A.12 shows the welfare effects of additional changes in the design of social assistance. Column (1) repeats our results from the main text, where social assistance is withdrawn one-for-one against household income above a modest tax-free allowance (see footnote 19). In columns (2)-(4), the social assistance income exemption is increased by, respectively, 2,000, 4,000 and 6,000 euros per year, thereby increasing the social assistance available to working households. Panel III of Table A.12 shows the welfare effect of revenue-neutral rebalancing reforms that eliminate unemployment insurance and change the social assistance income exemption as described in Panel II while increasing the generosity of social assistance to make the rebalancing reform revenue-equivalent to the baseline environment. The welfare gain from a revenue-neutral rebalancing reform decreases with the social assistance income exemption and falls just below zero when the social assistance income exemption is increased by 4,000 euros per year. These results indicate inefficiencies in making social assistance available to working households.

Similarly, column (4) in Table A.12 shows that a rebalancing reform that eliminates unemployment insurance and replaces the household-size-dependent social assistance income floor with the income floor for single adults without children while adjusting the generosity of social assistance delivers an aggregate welfare gain of 0.6% of baseline consumption. This result indicates welfare inefficiencies in providing more generous social assistance to larger households. As such, this is consistent with our results in Section 7.5, where we show that the presence of married households in the population reduces the welfare gains from rebalancing the social safety net away from unemployment insurance and towards social assistance.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
I. Cut unemployment insurance:										
Total welfare effect (% of baseline consumption):										
All individuals	-0.9	-0.1	-0.3	-0.4	-0.5	-1.0	-0.1	-0.3	-0.6	-0.8
Single women	-1.2	-0.1	-0.2	-0.7	-0.6	-0.9	0.0	-0.3	-0.8	-1.0
Single men	-0.8	-0.1	-0.3	-0.3	-0.3	-0.8	-0.1	-0.3	-0.2	-0.5
Married women	-0.2	-0.1	-0.2	0.2	-0.5	-1.3	-0.1	-0.2	-0.6	-0.2
Married men	-1.6	-0.1	-0.3	-1.0	-0.4	-0.7	-0.1	-0.5	-0.7	-1.4
Ancillary unemployment insurance parameters (if different from the baseline policy environment)										
Replacement rate	n.a.				40	20		n.a.		
Maximum duration (months)	0	18	12	6						6
Flat benefit based on average earnings								Yes		Yes
Unemp. ins. wealth test									Yes	Yes
Earnings cap (euros/month)							2,500			
Change in transfer income	-37	-3	-7	-24	-18	-35	-5	-16	-24	-35
II: Revenue-equivalent cut in social assistance:										
Total welfare effect (% of baseline consumption):										
All individuals	-2.0	-0.1	-0.5	-1.2	-1.0	-1.8	-0.2	-0.9	-1.3	-1.8
Single women	-4.9	-0.3	-1.6	-3.3	-2.6	-4.6	-0.4	-2.5	-3.4	-4.6
Single men	-5.0	-0.2	-0.8	-2.9	-2.2	-4.6	-0.3	-1.9	-3.0	-4.6
Married women	-0.6	0.0	-0.2	-0.4	-0.3	-0.6	-0.1	-0.3	-0.4	-0.6
Married men	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Social assistance generosity (% of baseline)	62.7	97.5	91.2	74.7	79.8	64.7	96.1	81.7	73.9	64.7
Change in transfer income	-37	-3	-7	-24	-18	-35	-5	-16	-24	-35
III. Revenue-neutral rebalancing reform with cut in unemployment insurance from Panel I:										
Total welfare effect (% of baseline consumption):										
All individuals	0.5	-0.0	-0.1	0.5	0.2	0.3	0.1	0.3	0.2	0.4
Single women	1.5	0.2	0.3	1.6	1.3	1.7	0.4	1.7	1.3	1.6
Single men	2.7	0.1	0.2	1.6	1.0	2.2	0.2	0.9	1.3	2.1
Married women	0.6	-0.1	-0.1	0.7	-0.2	-0.7	0.0	0.0	-0.3	0.5
Married men	-1.2	-0.1	-0.3	-0.9	-0.3	-0.4	-0.1	-0.5	-0.7	-1.1
Social assistance generosity (% of baseline)	141.2	102.6	106.2	126.2	119.0	137.7	104.3	117.0	122.9	136.2

Notes: Change in transfer income is expressed in euros per person per quarter. Panel I shows the total welfare effects of the cuts in unemployment insurance listed under 'ancillary unemployment insurance parameters'. Panel II shows the total welfare effects of the cut in the generosity of social assistance that is revenue-equivalent to the cuts in unemployment insurance from Panel I. Panel III shows the total welfare effects of a revenue-neutral rebalance reform that combines the cut in unemployment insurance from Panel I with the increase in the generosity of social assistance that makes the reform revenue equivalent to the baseline. Changes in the duration of unemployment insurance are implemented as cuts to the baseline entitlement. The flat unemployment insurance benefit is worth 60% of (population) average after-tax earnings. Individuals are allowed to claim social assistance before unemployment insurance when the unemployment insurance is cut (so individuals do not have to claim a small amount of unemployment insurance before claiming social assistance). Column (1) repeats results from Section 7.

Table A.11: Welfare effects with additional changes in the design of unemployment insurance

	(1)	(2)	(3)	(4)	(5)
I. Eliminate unemployment insurance:					
Total welfare effect (% of baseline consumption):					
All individuals	-0.9	-0.9	-0.9	-0.9	-0.9
Single women	-1.2	-1.2	-1.2	-1.2	-1.2
Single men	-0.8	-0.8	-0.8	-0.8	-0.8
Married women	-0.2	-0.2	-0.2	-0.2	-0.2
Married men	-1.6	-1.6	-1.6	-1.6	-1.6
Change in transfer income	-37	-37	-37	-37	-37
II: Revenue-equivalent cut in social assistance:					
Total welfare effect (% of baseline consumption):					
All individuals	-2.0	-2.0	-2.2	-2.3	-2.0
Single women	-4.9	-4.6	-5.0	-5.5	-4.8
Single men	-5.0	-6.1	-7.3	-8.0	-4.8
Married women	-0.6	-0.5	-0.5	-0.4	-0.7
Married men	0.0	0.3	0.5	0.6	0.0
Ancillary social assistance parameters (if different from the baseline policy environment)					
Additional income exemption (euros per year)		2,000	4,000	6,000	
Homogeneous income floor					Yes
Social assistance generosity (% of baseline)	62.7	60.9	58.0	56.9	63.9
Change in transfer income	-37	-37	-37	-37	-37
III. Revenue-neutral rebalancing reform:					
(No unemployment insurance & ancillary social assistance parameters from Panel II)					
Total welfare effect (% of baseline consumption):					
All individuals	0.5	0.1	-0.1	-0.3	0.6
Single women	1.5	0.3	-0.7	-1.3	1.5
Single men	2.7	1.8	1.5	1.3	3.5
Married women	0.6	0.1	-0.3	-0.5	0.5
Married men	-1.2	-0.8	-0.5	-0.4	-1.6
Social assistance generosity (% of baseline)	141.2	134.6	131.2	129.1	151.3

Notes: The change in transfer income is expressed in euros per person per quarter. Panel I shows the total welfare effects of eliminating unemployment (the five columns are identical). Panel II shows the total welfare effects of the cut in the generosity of social assistance that is revenue-equivalent to the cuts in unemployment insurance from Panel I when combined with the changes in social assistance listed under 'ancillary social assistance parameters'. Panel III shows the total welfare effects of a revenue-neutral rebalance reform that eliminates unemployment insurance, implements the changes in social assistance listed under 'ancillary social assistance parameters' in Panel II and increases the generosity of social assistance to make the reform revenue-equivalent to the baseline. The additional income exemption for social assistance is an increase in the pre-social-assistance household income that is disregarded when calculating the household's entitlement to social assistance (see footnote 19). Under the homogeneous social assistance income floor, the income floor for a single adult without children applies to all households. Column (1) repeats results from Section 7.

Table A.12: Welfare effects with additional changes in the design of social assistance

Web Appendix G.II Model Specification

Table A.13 shows the welfare effects of the revenue-neutral rebalancing reform when we modify the estimated life-cycle model by suppressing saving, increasing risk aversion, suppressing wage shocks, or introducing a correlation between spouses' employment shocks. The findings presented in column (1) indicate that if households are unable to save, a revenue-neutral reform that eliminates unemployment insurance while increasing social assistance decreases overall welfare. Without the capacity to save, the complete removal of unemployment insurance forces households to resort to claiming social assistance, therefore incurring higher benefit-claiming costs. The results in columns (2)–(4) show that under each of the other changes in the model, we continue to find that the revenue-neutral rebalancing reform increases the welfare of single women, single men, and married women and decreases the welfare of married men.

	(1)	(2)	(3)	(4)
Total welfare effect (% of baseline consumption):				
All individuals	-1.5	-0.1	0.5	0.5
Single women	-2.0	1.5	1.2	1.5
Single men	-1.5	0.9	2.5	2.7
Married women	-1.1	0.0	0.6	0.6
Married men	-1.5	-1.6	-1.1	-1.2
Policy parameters:				
Social assistance generosity (% of baseline)	110.8	120.7	139.9	141.2
Change in model specification compared to the baseline model:				
Suppress saving	Yes			
Increase in risk aversion by 10%		Yes		
Suppress wage shocks			Yes	
Introduce a of correlation of 0.7 between spouses' employment shocks				Yes

Notes: For each model specification, unemployment insurance is eliminated and the generosity of social assistance is changed to make the rebalancing reform revenue neutral. Table 11 in Section 7.4 shows the total welfare effects of the rebalancing reform from the baseline model.

Table A.13: Welfare effects of the revenue-neutral rebalancing reform under alternative model specifications

Web Appendix H Equilibrium Effects

Web Appendix H.I Overview

Recent works in macroeconomics have studied optimal unemployment insurance with general equilibrium effects in the labor market (see, among others, Krusell et al., 2010, Nakajima, 2012, Mitman and Rabinovich, 2015, Braxton et al., 2020). As summarized by Lalive et al. (2015), the total effect, or macro effect, of a change in unemployment insurance is the sum of a micro effect and an equilibrium (or externality) effect. The micro effect arises from changes in accepted wages and job-offer rates due to changes in reservation wages and search effort at the individual level. In contrast, the equilibrium effect arises from changes in the equilibrium conditions in the labor market that affect market wages or an individual's job-offer rate, given their search effort. An increase in the generosity of benefits creates equilibrium effects through two channels. First, it decreases competition for jobs, which increases an individual's probability of receiving a job offer at any given search effort. Second, it increases workers' bargaining power, driving up market wages. Therefore, firms scale back job creation, which then decreases an individual's probability of receiving a job offer at any given search effort.

Our baseline model includes the micro effects of unemployment insurance and social assistance. Specifically, in the baseline model, accepted wages and job-offer rates respond to changes in benefits because households optimally base their reservation wages and search effort on the benefits system. Furthermore, in the baseline model, a household's optimal response to a benefit change depends on (i) whether the change involves unemployment insurance or social assistance and (ii) the household's demographic characteristics, including sex, marital status, age, wealth, and education. However, the equilibrium effects of unemployment insurance and social assistance are absent from the baseline model. We explore the sensitivity of our main results to equilibrium effects by implementing two relatively simple extensions to the baseline model that are intended to capture the equilibrium effects of unemployment insurance and social assistance on job-offer rates and market wages.[56]

In more detail, in Web Appendix H.II, we explore the equilibrium effects of unemployment insurance and social assistance on job-offer rates using an extension to the baseline model that allows an individual's probability of receiving a job offer at any given search effort to depend on the benefits system. In particular, we allow search productivity to depend on the support provided by the social assistance and unemployment insurance benefits system. We draw on the literature to calibrate values for the social assistance elasticity of search productivity and the unemployment insurance elasticity of search productivity. Based on this extended model,

[56]Given the extensive heterogeneity in the baseline model, both across individuals and over the life cycle, it is infeasible to include a grounded equilibrium labor market concept in the model.

we find that our results in Sections 7.2-7.4 on the aggregate and heterogeneous welfare effects of social assistance and unemployment insurance are robust to equilibrium effects of benefits on search productivity. We also show that these results are robust to allowing different benefit elasticities for women and men.

Similarly, in Web Appendix H.III, we explore the equilibrium effects of unemployment insurance and social assistance on market wages using an extension to the baseline model that allows market wages to depend on the support provided by the social assistance and unemployment insurance benefit systems. We draw on the literature to calibrate values for the social assistance elasticity of market wages and the unemployment insurance elasticity of market wages. Based on this extended model, we find that the welfare effects reported in Sections 7.2-7.4 are qualitatively robust to equilibrium effects of benefits on market wages. This robustness check may also be interpreted as evidence that our results are robust to more generous benefits improving match quality.

Web Appendix H.II Equilibrium effects on search productivity

We extend equation (16) in Section 3.2 by allowing search productivity to depend on the support provided by the social assistance benefits system and on the support provided by the unemployment insurance benefits system. The extended (log) search productivity for women i in alternative policy environment A is given by:

$$\begin{aligned} \log(\chi_{i,t}) &= \chi_1^F + \chi_2^F \text{AgeG50}_{i,t} + \chi_3^F \text{HiEduc}_i + \chi_4^F \text{Married}_{i,t} + \\ &\quad \mu_{SA}^s \log\left(\text{SASupport}_A\right) + \mu_{UI}^s \log(\text{UISupport}_A), \end{aligned} \tag{A14}$$

where SASupport_A (UISupport_A) denotes the support provided by the social assistance (unemployment insurance) benefit system in policy environment A and μ_{SA}^s (μ_{UI}^s) is the social assistance (unemployment insurance) elasticity of search productivity. SASupport_A and UISupport_A are given by:

$$\text{SASupport}_A = \frac{G_A/G_B + RR_B}{1 + RR_B} \quad \text{and} \quad \text{UISupport}_A = \frac{1 + RR_A}{1 + RR_B}, \tag{A15}$$

where RR_A (RR_B) denotes the unemployment insurance replacement rate in the alternative (baseline) policy environment and G_A/G_B denotes the ratio of the social assistance generosity parameter in the alternative policy environment to its value in the baseline environment (recall the social assistance generosity parameter, G, was introduced in Section 2.3.2 and is equal to 605 euros per month in the baseline environment). The corresponding extended search productivity for men is obtained by replacing F with M and i with j in (A14). We calibrate values for the

unemployment insurance elasticity of search productivity and the social assistance elasticity of search productivity to match Lalive et al. (2015)'s finding that the macro employment effect of a change in an unemployment benefit is 21% smaller than the employment effect in the absence of equilibrium effects (recall, without equilibrium effects, we find that eliminating unemployment insurance increases employment by 0.8 percentage points and revenue-equivalent cut in social assistance increases employment by 1.4 percentage points, see Table 8 in Section 7.2).[57] The calibrated benefit elasticities of search productivity are 0.70 for social assistance and 0.14 for unemployment insurance.

We then use the extended model described in this section, including the calibrated equilibrium effects of social assistance and unemployment insurance on search productivity, to calculate the welfare effects of (i) eliminating unemployment insurance, (ii) a cut in social assistance that is revenue equivalent to eliminating unemployment insurance and (iii) a revenue-neutral rebalancing reform that eliminates unemployment insurance while increasing social assistance to keep net-of-tax transfer income constant. The results of this exercise are reported in Panel I of Table A.14, and can be summarized as follows. First, when we aggregate welfare effects across all individuals, we continue to find that eliminating unemployment insurance is less damaging for welfare than a revenue-equivalent cut in social assistance. In more detail, equilibrium effects increase the welfare loss from the revenue-equivalent cut in social assistance by more than they increase the welfare loss from eliminating unemployment insurance. This finding reflects that without equilibrium effects, the employment effect of social assistance is larger than that of unemployment insurance. Second, when we disaggregate by sex and marital status, we continue to find that single individuals and married women experience smaller welfare losses from the elimination of unemployment insurance than from the revenue-equivalent cut in social assistance, with the pattern reversed for married men. Third, we continue to find that the revenue-neutral rebalancing reform increases aggregate welfare.

Panel II of Table A.14 repeats the robustness checks described in the previous paragraph but with benefit elasticities of search productivity that vary by sex. In particular, we calibrate elasticities to make each benefit's sex-specific macro employment effect 21% smaller than the benefit's sex-specific employment effect in the absence of equilibrium effects. Without equilibrium effects, eliminating unemployment insurance increases employment by 0.1 percentage points for women and 1.4 percentage points for men, while the revenue-equivalent cut in social assistance increases employment by 1.5 percentage points for women and 1.2 percentage points

[57] Lalive et al. (2015) study the equilibrium effects of the Regional Extension Benefit Program in Austria, which gave eligible unemployed workers an additional three years of benefits. They find that unemployment durations for ineligible workers decreased by 6–8 weeks. The equilibrium effect of the unemployment benefits extension on ineligible workers made the macro effect of the benefit extension on unemployment durations 21% smaller than the micro effect. Marinescu (2017) reports a similar difference between the micro and macro effects of unemployment insurance.

	Revenue-equivalent policies			Revenue-neutral rebalancing reform
	Cut social assistance	Eliminate unemp. insurance	Diff.	
Panel I: Same benefit elasticities for women and men				
Total welfare effect (% of baseline consumption):				
All individuals	-3.9	-1.4	-2.5	0.9
Single women	-7.7	-1.7	-5.9	2.1
Single men	-10.7	-2.1	-8.6	3.4
Married women	-0.8	-0.4	-0.4	0.6
Married men	-1.1	-1.9	0.8	-1.0
Percentage point change in employment from baseline:				
All individuals	1.1	0.6	0.5	-0.5
Single women	1.2	0.5	0.7	-0.2
Single men	1.1	0.8	0.2	-0.3
Married women	1.2	-0.2	1.4	-1.8
Married men	0.9	1.4	-0.5	0.5
Policy parameters:				
Change in net transfer income (€/person-quarter)	-34	-34		0
Social assistance generosity (% of baseline)	60.7	100		143.7
Unemployment insurance replacement rate (×100)	60	0		0
Panel II: Different benefit elasticities for women and men				
Total welfare effect (% of baseline consumption):				
All individuals	-3.8	-1.5	-2.3	0.8
Single women	-7.4	-1.8	-5.7	2.1
Single men	-10.3	-2.4	-7.9	3.3
Married women	-0.8	-0.5	-0.3	0.5
Married men	-1.1	-1.9	0.8	-1.0
Percentage point change in employment from baseline:				
All individuals	1.1	0.6	0.5	-0.5
Single women	1.2	0.6	0.6	-0.1
Single men	1.0	0.7	0.3	-0.3
Married women	1.2	-0.2	1.4	-1.8
Married men	0.9	1.4	-0.5	0.6
Policy parameters:				
Change in net transfer income (€/person-quarter)	-31	-31		0
Social assistance generosity (% of baseline)	61.7	100		143.5
Unemployment insurance replacement rate (×100)	60	0		0

Table A.14: Robustness of policy comparisons to equilibrium effects of social assistance and unemployment insurance benefits on search productivity

for men. The calibrated social assistance elasticity of search productivity is 0.69 for women and 0.70 for men, and the calibrated unemployment insurance elasticity of search productivity is 0.13 for women and 0.16 for men. The results discussed in the previous paragraph are robust to this generalization.

Web Appendix H.III Equilibrium effects on market wages

We extend equation (18) in Section 3.3 by allowing market wages to depend on the support provided by the social assistance and unemployment insurance benefit systems. The extended (log) market wage (including measurement error) for women i in alternative policy environment A is given by:

$$\begin{aligned} \log \widetilde{W}_{i,t} &= \beta_1^F + \beta_2^F \text{Exp}_{i,t} + \beta_3^F \text{HiEduc}_i + \beta_4^F \kappa_{i,t} + \nu_{i,t} + \\ &\quad \mu_{SA}^w \log\left(\text{SASupport}_A\right) + \mu_{UI}^w \log(\text{UISupport}_A), \end{aligned} \tag{A16}$$

where SASupport_A (UISupport_A) denotes the support provided by the social assistance (unemployment insurance) benefit system in policy environment A and μ_{SA}^w (μ_{UI}^w) is the social assistance (unemployment insurance) elasticity of wages. SASupport_A and UISupport_A are defined above in Web Appendix H.II. The corresponding extended wage equation for men is obtained by replacing F with M and i with j in (A16). We set the unemployment insurance elasticity of wages equal to 0.0232. We take this figure from Hagedorn et al. (2013), who find an unemployment insurance elasticity of wages of 0.0232 for job stayers, indicating that unemployment insurance is an outside option available to workers when they bargain on the job.[58] Since, without equilibrium effects, eliminating unemployment insurance increase employment by 28.57% less than a revenue-equivalent cut in social assistance (1 versus 1.4 percentage points, see Table 8 in Section 7.2), we set the social assistance elasticity of wages equal to $0.0325 = 0.0232 \times (1 - 0.2857)^{-1}$.

We then use the extended model described in this section, including the calibrated equilibrium effects of social assistance and unemployment insurance on market wages, to calculate the welfare effects of (i) eliminating unemployment insurance, (ii) a cut in social assistance that is revenue equivalent to eliminating unemployment insurance, and (iii) a revenue-neutral rebalancing reform that eliminates unemployment insurance while increasing social assistance to keep net-of-tax transfer income constant. Table A.15 summarizes the findings of this exercise. Welfare losses increase due to the equilibrium effects of eliminating unemployment insurance and the revenue-equivalent cut in social assistance on market wages. However, across all in-

[58] Lalive et al. (2015) find no equilibrium effects on reemployment wages of workers. Marinescu (2017) finds no equilibrium effects on posted wages on an online job posting board.

dividuals, we continue to find that eliminating unemployment insurance is less damaging for welfare than a revenue-equivalent cut in social assistance. We also continue to find that the pattern of welfare effects by sex and marital status is the same as in the baseline model. Finally, we note that equilibrium effects on market wages reduce the welfare gains for a revenue-neutral rebalancing reform to close to zero, but this reform still yields welfare gains for single women and men and married women.

	Revenue-equivalent policies			Revenue-neutral rebalancing reform
	Cut social assistance	Eliminate unemp. insurance	Diff.	
Total welfare effect (% of baseline consumption):				
All individuals	-2.1	-1.6	-0.5	0.0
Single women	-4.6	-1.9	-2.8	1.0
Single men	-4.4	-1.4	-3.0	1.4
Married women	-0.8	-0.6	-0.2	0.3
Married men	-0.6	-2.5	1.9	-1.7
Policy parameters:				
Change in net transfer income (€/person-quarter))	-22	-22		0
Social assistance generosity (% of baseline)	67.8	100		132.0
Unemployment insurance replacement rate (×100)	60	0		0

Table A.15: Robustness of policy comparisons to equilibrium effects of social assistance and unemployment insurance benefits on market wages

References (Web Appendix)

Braxton, J.C., **Herkenhoff, K.F.**, and **Phillips, G.M.** (2020). Can the Unemployed Borrow? Implications for Public Insurance. *National Bureau of Economic Research Working Paper 27026*

Fernández, R. and **Wong, J.C.** (2014). Divorce Risk, Wages and Working Wives: A Quantitative Life-Cycle Analysis of Female Labour Force Participation. *Economic Journal*, 124(576): 319–358

Hagedorn, M., **Karahan, F.**, **Manovskii, I.**, and **Mitman, K.** (2013). Unemployment Benefits and Unemployment in the Great Recession: The Role of Equilibrium Effects. *Federal Reserve Bank of New York Staff Reports Number 646*

Krusell, P., **Mukoyama, T.**, and **Şahin, A.** (2010). Labour-Market Matching with Precautionary Savings and Aggregate Fluctuations. *Review of Economic Studies*, 77(4): 1477–1507

Lalive, R., **Landais, C.**, and **Zweimüller, J.** (2015). Market Externalities of Large Unemployment Insurance Extension Programs. *American Economic Review*, 105(12): 3564–3596

Marinescu, I. (2017). The General Equilibrium Impacts of Unemployment Insurance: Evidence from a Large Online Job Board. *Journal of Public Economics*, 150: 14–29

Mitman, K. and **Rabinovich, S.** (2015). Optimal Unemployment Insurance in an Equilibrium Business-Cycle Model. *Journal of Monetary Economics*, 71: 99–118

Nakajima, M. (2012). A Quantitative Analysis of Unemployment Benefit Extensions. *Journal of Monetary Economics*, 59(7): 686–702

van der Klaauw, W. and **Wolpin, K.I.** (2008). Social Security and the Retirement and Savings Behavior of Low-Income Households. *Journal of Econometrics*, 145(1-2): 21–42

Wrohlich, K. (2011). Labor Supply and Child Care Choices in a Rationed Child Care Market. *DIW Discussion Paper 1169*