The taxation of couples*

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Abstract

Are reforms towards individual taxation politically feasible? Are they desirable from a welfare perspective? We develop a method to answer such questions and apply it to the US federal income tax since the 1960s. Main findings are: As of today, Pareto-improvements require a move away from joint taxation. Revenue-neutral reforms towards individual taxation are not Pareto-improving, but attract majority-support. Such reforms are rejected by Rawlsian welfare measures and supported by ones with weights that are increasing in the secondary earner's income share. Thus, there is a tension between the welfare of "the poor" and the welfare of "working women."

Keywords: Taxation of couples; Tax reforms; Optimal taxation; Political economy; Non-linear income taxation.
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1 Introduction

The tax treatment of couples is a recurrent theme in debates about tax policy. Levying taxes based on the couple's joint income implies that the primary and secondary earners face the same marginal tax rate. A welfare-maximizing policy would look different. The behavioral responses to changes in the tax rate tend to be stronger for secondary earners than for primary earners. A secondary earner is, for instance, more likely to reduce hours worked or even leave the labor market than a primary earner. The inverse elasticities logic of optimal tax theory, therefore, implies that the marginal tax rate on secondary earnings should be lower than the marginal tax rate on primary earnings, see e.g. Boskin and Sheshinski (1983). Moreover, empirical analyses have shown that, in many countries, the tax and transfer system is a hindrance to the labor market integration of women, see e.g. Bick and Fuchs-Schündeln (2017). Against this background, this paper is motivated by the following broad questions:

1. Can political economy forces explain the persistence of the traditional tax treatment of couples in the US? Germany and France also stick to the traditional system, provoking the same question.

2. Are reforms towards individual taxation in everybody's interest? Are they in the interest of secondary earners? Are they in the interest of "the poor"? Do they require an affirmative action rationale or can they be justified by an appeal to Pareto-efficiency or other conventional notions of social welfare?

3. Given that the inverse-elasticities-logic did not realise, what were the driving forces of the reforms that altered the tax treatment of couples relative to singles in the US in recent decades?

To make progress on these questions, we derive formulas for an evaluation of tax reforms and bring them to data using the Current Population Survey (CPS) and NBER's TAXSIM microsimulation model. The first set of formulas is tailored to the analysis of past reforms. We use these for an evaluation of US tax reforms that affected the size of marriage penalties and bonuses. We check whether these reforms were Pareto-improving, or, whether a majority of taxpayers preferred the reformed system over the status quo. We also check whether the reforms were desirable according to different welfare measures. The second set of formulas can be used to analyze reforms towards individual taxation that did not take place. Would such reforms have been Pareto-improving? Would there have been majority support? Would they have raised "Feminist welfare" and/ or Rawlsian welfare? We document how the answers to these questions have changed over time since the 1960s and hence with the drastic changes in the earning profiles of women, the increased number of singles relative to couples and the increased number of dual-earner couples relative to single-earner couples. This analysis gives a sense of reform options that have not been viable in the past but might become viable in the future.

1.1 A framework to analyze the taxation of singles and couples

The starting point of our analysis is an existing income tax system that has a tax function for singles and one for married couples. In the status quo, the tax base for married couples is the sum of their incomes, with the implication that the primary and the secondary earner face the same marginal tax rate. We develop a conceptual framework for an analysis of tax reforms in this setting.

We are interested in two classes of reforms. The first class contains reforms that alter the tax functions for singles or couples but do not break with the principle that the tax base for couples is the sum of the incomes of both spouses. These are reforms *in* the system. The tax reforms in the US since the 1960s belong to that class. The second class contains reforms that break with this principle. These are reforms *of* the system. They involve an increase of the marginal tax rates on primary earnings or a decrease of the marginal tax rates on secondary earnings. We also refer to reforms in this class as *reforms towards individual taxation*.

We assume that all individuals derive utility from consumption and incur an effort cost when generating earnings. The effort costs may entail both fixed and variable costs so that there are behavioral responses to taxation both at the intensive and the extensive margins. Singles simply maximize utility subject to a budget constraint that is shaped by the status quo tax system for singles. Couples engage in Nash bargaining, thereby determining who earns how much and who gets to consume what share of the couple's disposable income. The spouses bargain subject to a budget constraint that is shaped by the status quo tax function for couples.

We assume that the revenue generated by a reform, if any, is redistributed lump sum. By an application of the envelope theorem, see Milgrom and Segal (2002), individuals that belong to a tax unit are reform beneficiaries if and only if the tax unit's disposable income goes up. A corollary to this observation is that the preferences of the spouses in a couple are aligned. A reform either makes both spouses better off, or makes both spouses worse off. It cannot break the alignment of the primary and the secondary earner in a given couple.

The disposable income of a single or a couple is affected in two ways: (i) the tax unit's tax burden changes and (ii) there is a change of the lump sum transfer that reflects the reform's impact on overall tax revenue. When the combined effect is positive, the tax unit is a reform beneficiary. When it is negative, the tax unit is made worse off. Consequently, a reform is Pareto-improving if the extra tax revenue outweighs any reform-induced increase in the tax burden. A reform is politically feasible – in the sense of being preferred by a majority of individuals to the status quo – when the beneficiaries outnumber the losers. It is welfare improving – according to a weighted utilitarian welfare function – if the gains of the beneficiaries receive more weight than the losses of those who are worse off.

Revenue functions are the key ingredients of the formulas that we use to evaluate tax reforms according to their efficiency, political economy, and welfare implications. Any such function gives the change in tax revenue when marginal tax rates are increased over a narrow range of incomes. There are separate functions capturing, respectively, whether marginal tax rates are changed only for secondary earners, only for primary earners or simultaneously for primary and secondary earners. Our conceptual analysis is cast in terms of these revenue functions. It treats them as the primitives of the tax system. In consequence, our overall approach does not require specific assumptions on the utility functions that represent the preferences of singles, or of the spouses in a couple.

The revenue functions depend on the behavioral responses to taxation. In part B of the Appendix, we develop a *positive* theory of multidimensional screening that tells us "who does what" in the status quo. We then consider perturbations of the status quo to obtain characterizations of the revenue functions in terms of sufficient statistics that capture the behavioral responses to these perturbations. We use these sufficient statistics formulas in our empirical analysis of US tax reforms.

Our positive theory contrasts with the *normative* theory of multi-dimensional screening that looks at profit- or welfare-maximizing outcomes in models with multiple hidden characteristics. This approach has been used to study the optimal taxation of couples by Kleven, Kreiner and Saez (2009) and, more recently, by Golosov and Krasikov (2023). We consider couples that differ in the productive abilities of the primary and the secondary earner, in their respective fixed costs of labor market participation and in their weights in the couple's internal bargaining procedure. This framework is richer than what has previously been considered in papers that approach the optimal taxation of couples as a problem of multi-dimensional screening. Kleven et al. (2009) focus on a setting in which a primary earner only makes intensive margin choices and a secondary earner only makes an extensive margin choice. Golosov and Krasikov (2023) have spouses who both only make intensive margin choices.

In our setup, joint taxation gives rise to an interdependence of primary and secondary earnings: When primary earnings go up, secondary earnings go down. There is, moreover, an asymmetry in the extensive margin decisions: Whether the primary earner works or not does not depend on the type of the secondary earner. By contrast, a secondary earner who is married to a high earning spouse is less likely to work than a secondary earner married to a low-income spouse. Thus, the model is consistent with the findings in the empirical literature on how the traditional tax treatment of couples affects the earnings choices of women (e.g., Bick and Fuchs-Schündeln (2017)). The development of this theory is a contribution in itself. Moreover, it is an essential input for our empirical analysis. It is relegated to the Appendix only for a pragmatic reason, the length of the paper would otherwise be excessive.

In our calibrations of the revenue functions, we draw on vast empirical literature estimating these elasticities. Empirically, the primary earner's elasticities are found to be smaller than those of secondary earners. We present the implications of a baseline specification, but we also consider alternative scenarios. This is not only meant as a robustness check. The view on what the most plausible elasticity estimates are has changed over the years, see e.g.

Feldstein (1995) and Saez, Slemrod and Giertz (2012). Looking at the rationales of past reforms only using today's estimates would not do justice to the reasoning at the time.

1.2 The tax treatment of singles and couples in the US

For our analysis of what US tax policy has implied for singles and couples, we first set the stage by documenting how marriage bonuses and penalties have changed over time. We then analyze the extent to which these reforms can be justified with an appeal to Pareto-efficiency or social welfare. We also look at their political economy implications. The more interesting reforms are discussed in the body of the text. The supplementary material covers all major reforms of the US federal income tax since the 1960s.

The dynamics of marriage penalties and bonuses since the 1960s. In the early 1960s the tax functions for singles and couples were linked through income splitting; i.e. a couple was treated as if it consisted of two singles who each earned fifty percent of the couple's income. Given a progressive income tax function for singles, this implied a marriage bonus – relative to individual taxation – that was increasing in the primary earner's share in the couple's joint income. Some of the subsequent reforms have reduced these marriage bonuses across the board (Tax Reform Act of 1969, henceforth TRA69, Nixon administration), left the possibility of bonuses and penalties unchanged (Tax Reform Act of 1986, TRA86, Reagan administration), increased marriage bonuses for the upper middle class (Jobs and Growth Tax Relief Reconciliation Act of 2003, JGTRRA03, Bush Jr. administration), or the top 10 percent of the income distribution (Tax Cuts and Jobs Act of 2017, TCJA17, Trump administration). As of today, the pattern looks broadly similar to the one in the early 1960s.

Is there an efficiency rationale for the changes in marriage penalties and bonuses? For the years preceding the major reforms of the US federal income tax, we investigate the extent to which there were inefficiencies in the tax system for singles or in the tax system for couples. We then analyze whether reforms that changed the relative tax treatment of singles and couples can be viewed as a response to these inefficiencies.

For some reforms, we can give an affirmative answer. For instance, prior to the reform in 1969, it was the case that marginal tax rates for singles in the upper part of the income distribution were inefficiently high; i.e. tax cuts for singles with an income in this range would have been self-financing. There were no such inefficiencies in the corresponding income range for couples. Thus, lowering marginal tax rates for singles, and less so for couples – thereby downsizing marriage bonuses – can be viewed as an efficiency-enhancing reform that reduced distortions in the system. For the Reagan tax cuts in the mid-1980s, our analysis indicates that the efficiency gains from changing the size of marriage bonuses and penalties were limited. Marginal tax rates were inefficiently high both for singles and for married couples from the upper part of the income distribution. The same is true for the tax systems on the eve of the reforms by the Bush Jr. and Trump administrations. Consistent with this observation, the Reagan reform in the 1980s left the relative tax treatment of singles and couples untouched. Bush Jr. and Trump, by contrast, increased marriage bonuses in the upper part of the income distribution. Our analysis suggests that this reflected political priorities rather than efficiency concerns.

A political economy perspective on the tax treatment of singles and couples. We look at the extent to which singles and couples benefitted from these reforms. The reform in 1969 had a supermajority among singles and among couples. The Reagan and Bush Jr. reforms had a majority among couples, but lacked majority support among singles. The Trump reform was neither in the interest of a majority of singles nor in the interest of a majority of couples. All mentioned reforms have in common that there are cutoff levels of income so that all singles or couples with an income above the cutoff are reform beneficiaries. Thus, the support for these reforms came from the top percentiles of the income distribution and the opposition was from the complementary bottom percentiles.

Welfare implications: The tension between Rawlsian and Feminist welfare. We evaluate all these tax reforms according to various social welfare functions, including Rawlsian social welfare functions that concentrate weights on low-income singles and couples and *"Affirmative Feminist social welfare functions"* that concentrate weights on women with positive earnings. The following pattern stands out: Reforms that reduce distortions and shift the whole system towards lower marginal tax rates are typically welfare-damaging according to Rawlsian social welfare functions. This is true for the reforms by the Nixon, Reagan, Bush Jr. and Trump administrations mentioned above. At the same time, they might be welfare-improving with a Feminist notion of social welfare. While this result is more tentative and depends on the elasticities used, it shows that a conflict between the "welfare of the poor" and the "welfare of working women" is possible under empirically plausible assumptions about the strength of behavioral responses to taxation. This conflict appears to be even starker in the analysis of reforms towards individual taxation to which we now turn.

1.3 Reforms towards individual taxation

Pareto-improving reforms towards individual taxation. We derive an upper bound for the marginal tax rates faced by secondary earners. If tax rates exceed this upper bound, then lowering marginal tax rates for secondary earners is self-financing and hence Pareto-improving. In the data, we frequently find that marginal tax rates for high-income secondary earners are inefficiently high. It would, however, be premature to argue at this stage already that there is an efficiency rationale for a move towards individual taxation. It may be the case that tax rates are also too high for primary earners. In this case, a Pareto improvement could be realized by lowering marginal tax rates for everybody and hence within the traditional system that has equal tax rates for the primary and the secondary earner. In order to assess that there is an efficiency rationale for a move towards individual taxation, it must be the case, that (i) there is no Pareto-improving reform in the traditional system and (ii) that lowering marginal tax rates for secondary earners is Pareto-improving.

In our analysis, we find that, on the eve of the Reagan tax cuts, marginal tax rates on high incomes were too high both for primary and secondary earners. By contrast, as of 2019, (i) and (ii) both hold. This suggests that, as of today, and in contrast to the mid-1980s, sticking to the traditional tax treatment of couples is a genuine source of inefficiency.

Revenue-neutral reforms: Political feasibility. Revenue-neutral reforms toward individual taxation create winners and losers. Losers are couples with the lion's share of the joint income being due to the primary earner. For such couples, the increase of the tax rates on primary earnings is the dominant effect. The lower rates on secondary earnings can mitigate, but not offset, this effect. Winners, by contrast, are couples with secondary earnings close to primary earnings.

We study how the political support for such reforms has evolved since the 1960s and hence with the increased number of dual-earner couples. In the 1960s, about 20 percent of all couples would have benefited from such a reform. This share was rising over the years and passed the 50 percent threshold only recently. This suggests that revenue-neutral reforms toward individual taxation might not have been politically feasible in the past, but might attract sufficient political support today.

Revenue-neutral reforms: Welfare implications. Single-earner couples are more concentrated in the bottom deciles of the couples' income distribution. Consequently, a Rawlsian social welfare function would not approve a revenue-neutral reform towards individual taxation. By contrast, an Affirmative Feminist social welfare function – one that gives extra weights to couples with positive secondary earnings – would approve it. Again, there is a conflict between Rawlsian and Feminist notions of social welfare.

We also show that there is a means of overcoming this conflict. Specifically, we evaluate a reform so that marginal tax rates on primary earnings are increased only for couples from the upper half of the income distribution. While this does not raise as much revenue as a reform that raises tax rates on all primary earnings, it avoids making single-earner couples from the bottom of the income distribution worse off. The revenue is then used to finance a tax cut for all secondary earnings. Our analysis shows that such a reform raises both Rawlsian and Feminist welfare. Moreover, it is politically feasible in the sense that a majority of individuals would be made better off.

Outline. The remainder is organized as follows. The next section discusses related literature. Section 3 introduces a conceptual framework for the analysis of reforms that change the taxation of singles and couples. It is complemented by part B of the Appendix, in which we develop a more detailed theory of how couples choose in the status quo and obtain sufficient statistics formulas for the revenue implications of tax reforms. We then turn to tax reforms in the US. We document the changes to marriage penalties and bonuses since the 1960s in Section 4. Our evaluation of these tax reforms can be found in Section 5. Section 6 contains our analysis of reforms towards individual taxation. Concluding remarks can be found in Section 7. All formal proofs, additional empirical findings and robustness checks are relegated to Appendices.

2 Related literature

There is a rich literature that studies the optimal taxation of couples. A key finding is that tax rates on primary earnings should be higher than those on secondary earnings. The seminal reference is Boskin and Sheshinski (1983).[1] The subsequent literature has branched out in numerous ways: Non-linear taxes have been considered, labor supply responses at the intensive and the extensive margin have been taken into account, marital status has been treated as endogenous, see e.g. Schroyen (2003), Brett (2009), Kleven et al. (2009), Immervoll, Kleven, Kreiner and Verdelin (2011), Cremer, Lozachmeur and Pestieau (2012), Gayle and Shephard (2019), Malkov (2020), Alves, da Costa, Lobel and Moreira (2021), or Ales and Sleet (2022). Our approach differs in that we analyze reform directions in a neighborhood of a status quo tax system that has been inherited from the past.

Our theoretical analysis is based on a model with multiple hidden characteristics: Couples differ in the productive abilities of the primary and the secondary earner, in their respective fixed costs of labor market participation and in their weights in the couple's internal bargaining procedure. This framework is richer than what has previously been considered in papers that approach the optimal taxation of couples as a problem of multi-dimensional screening.[2] Kleven et al. (2009) focus on a setting in which a primary earner only makes intensive margin choices and a secondary earner only makes an extensive margin choice. Golosov and Krasikov (2023) have spouses who both only make intensive margin choices: They give conditions under which the "traditional" tax treatment of couples with taxes levied on the joint income is welfare-maximizing. Thus, one cannot criticize the traditional system as being per se unjustifiable. To examine whether a traditional system that has been inherited from the past is well-designed or leaves room for further improvements, one must come up with an explicit analysis of reform options. This is what we do in this paper.

Our positive theory of multi-dimensional screening yields comparative statics predictions on how the status quo tax system shapes the earnings incentives of the spouses in a couple. A complementary literature in macroeconomics embeds the joint labor supply decisions of

[1]For a related discussion of gender-based taxation, see Alesina, Ichino and Karabarbounis (2011).

[2]The literature on multi-dimensional screening characterizes welfare- or profit-maximizing outcomes settings with multiple hidden characteristics, see Rochet and Choné (1998), and, more recently, Boerma, Tsyvinski and Zimin (2022).

couples into quantitative dynamic models. It then traces out the tax and transfer system's implications for the labor market outcomes and the savings decisions of men and women; see, e.g., Guner, Kaygusuz and Ventura (2012), Guner, Kaygusuz and Ventura (2014), Bick and Fuchs-Schündeln (2017), Borella, De Nardi, Pak, Russo and Yang (2022), Borella, De Nardi and Yang (2023). Holter, Krüger and Stepancuk (2023) use such a framework to show that the transition from joint to individual taxation comes with an increase in the government's ability to generate tax revenue.

We use perturbation techniques to identify reform directions that are efficiency-enhancing, welfare-improving, or politically feasible, starting from a given status quo that has been inherited from the past. The perturbation approach is frequently used in optimal tax theory.[3] Bierbrauer, Boyer and Hansen (2023) use it for a characterization of Pareto-improving tax reforms, and Bierbrauer, Boyer and Peichl (2021) for a characterization of tax reforms that receive majority support.

There is a rich literature on the political economy of taxation.[4] To the best of our knowledge, there is no previous work that looks at the taxation of couples from a political economy perspective. This paper covers new ground by studying what the changes of inequality between men and women since the 1960s imply for the political feasibility of reforms towards individual taxation.

We combine our theoretical analysis with an empirical approach that employs the TAXSIM microsimulation model and CPS micro data.[5] The microsimulation model uses rich data on individual characteristics so that we can elicit, at the level of an individual tax unit, what implications a tax reform would have on individual welfare. Our evaluation of tax reforms rests on empirical estimates of the behavioral responses to taxation. Those are captured by various elasticities: of taxable income, of hours worked, of labor market participation with respect to marginal or average tax rates, and all that separately for primary and secondary earners (e.g., Gustafsson (1992), Blundell and MaCurdy (1999), Blau and Kahn (2007), Eissa and Hoynes (2004), LaLumia (2008), Kaygusuz (2010), Bargain, Orsini and Peichl (2014), Neisser (2021)). Our assumptions on behavioral responses are informed by this literature. We also present a new perspective on the evolution of marriage penalties and bonuses from the 1960s onward. Earlier studies of this such as Alm and Whittington (1996) and Brozovsky and Cataldo (1994) are reviewed in Alm, Dickert-Conlin and Whittington (1999).

[3]References include Piketty (1997), Saez (2001), Golosov, Tsyvinski and Werquin (2014), Saez and Stantcheva (2016), Lorenz and Sachs (2016), Sachs, Tsyvinski and Werquin (2020), Jacquet and Lehmann (2021b), Jacquet and Lehmann (2021a), Spiritus, Lehmann, Renes and Zoutman (2022).

[4]The key question in this literature is how changes in inequality transmit via the political process into changes in redistributive taxation. A seminal references is Meltzer and Richard (1981), see Bierbrauer, Tsyvinski and Werquin (2022) for additional references.

[5]Our empirical approach builds on and extends work by Eissa, Kleven and Kreiner (2008), Bargain, Dolls, Immervoll, Neumann, Peichl, Pestel and Siegloch (2015) and Bierbrauer et al. (2021). Similar approaches have also been used for the purpose of *ex ante* policy evaluation, see Immervoll, Kleven, Kreiner and Saez (2007) for a prominent example.

3 Conceptual framework

We consider a status quo tax system in which married couples are taxed according to their joint income. We then distinguish reforms *in* this system and reforms *of* this system. Reforms *in* the system yield changes of tax rates while the tax base for married couples does not change. It is the joint income. Consequently, the primary and the secondary earner face the same marginal tax rate both before and after the reform. Reforms *of* the system, by contrast, drive a wedge between the marginal tax rates on primary earnings and the marginal tax rates on secondary earnings.

In this section, the focus is on reforms that are "small"; i.e. we focus on reform directions and look into the welfare implications and the political feasibility of small steps into such directions. Technically, it is a focus on marginal effects. When we evaluate past reforms, we have to move beyond the analysis of marginal effects. In part C of the Appendix, we explain how the approach laid out here can be extended to cover "large" reforms.

The formal propositions in this section extend results from Bierbrauer et al. (2021) and Bierbrauer et al. (2023). The novelty here is that we do not only consider reforms that alter the relevant tax functions but also reforms that alter the tax base. This distinction between reforms *in* the system and reforms *of* the system is without precedent in the literature on the taxation of couples. We can still draw on earlier findings and therefore omit formal proofs of the Propositions stated in this section. All these Propositions refer to the revenue implications of reforms *in* and *of* the system. Those depend on the behavioral responses of the primary and the secondary earner and the characterization requires a stand-alone theoretical analysis, also with formal proofs. It can be found in part B of the Appendix.

The model. We assume that there is a status quo tax system that consists of two tax functions. The tax function that applies to singles is denoted by $T_{s0} : y_s \mapsto T_{s0}(y_s)$, where y_s is a single's before-tax income. Married couples are taxed according to the function $T_{m0} : y_m \mapsto T_{m0}(y_m)$, where $y_m = y_1 + y_2$ is the couple's joint income, y_1 is the income of the primary earner and y_2 is the income of the secondary earner. We assume that T_{0s} and T_{0m} are increasing, continuous and convex. This allows for both linear and for progressive non-linear taxation. We do not assume that the tax functions are everywhere differentiable, i.e. the status quo might have income levels at which the marginal tax rates jump. A tax reform replaces this system by new tax functions (T_{s1}, T_{m1}) so that

$$T_{s1}(y_s) = T_{s0}(y_s) + \tau_s \; h_s(y_s) \; ,$$

and

$$T_{m1}(y_1, y_2) = T_{m0}(y_m) + \tau_m \; h_m(y_1, y_2) \; .$$

We refer to the functions $h_s : y_s \mapsto h_s(y_s)$ and $h_m : (y_1, y_2) \mapsto h_m(y_1, y_2)$ as reform directions, whereas the scalars $\tau_s \geq 0$ and $\tau_m \geq 0$ are measures of reform intensity. For some of our analysis, we focus on reforms that stay in the vicinity of the status quo. Then, τ_s and τ_m are close to zero.

A reform *in* the system is such that h_m is a function of $y_m = y_1 + y_2$. In Section 4 we document the changes in marriage penalties and bonuses that occurred in the US since the 1960s. All these changes were implied by reforms *in* the system. A reform *of* the system, by contrast, leads to changes in tax liabilities that depend on the composition of the joint income. To give an example, let

$$h_m(y_1, y_2) = \tau_1 \, y_1 + \tau_2 \, y_2 \; ,$$

with $\tau_1 > 0$ and $\tau_2 < 0$. Then, after the reform, the marginal tax rate on primary earnings is higher than in the status quo, and the marginal tax rate on secondary earnings is lower:

$$\frac{\partial T_{m1}(y_1, y_2)}{\partial y_1} \quad = \quad T'_{m0}(y_1 + y_2) + \tau_m \, \tau_1 \quad > \quad T'_{m0}(y_1 + y_2) \; ,$$

and

$$\frac{\partial T_{m1}(y_1, y_2)}{\partial y_2} \quad = \quad T'_{m0}(y_1 + y_2) + \tau_m \, \tau_2 \quad < \quad T'_{m0}(y_1 + y_2) \; .$$

Implications for tax revenue. Tax reforms lead to changes in tax revenue. We denote the change due to married couples by $R_m(\tau_m, h_m)$ and the change due to singles by $R_s(\tau_s, h_s)$. These are endogenous objects which depend on the status quo tax system and the behavioral responses to the tax reforms. We let $R(\tau, h) = R_s(\tau_s, h_s) + R_m(\tau_m, h_m)$ be the overall change in tax revenue, where we use the shorthand notation $\tau = (\tau_s, \tau_m)$ and $h = (h_s, h_m)$. We assume that the revenue change is rebated lump sum, so that, after the reform, every single receives an additional transfer of $\rho_s R(\tau, h)$ and every couple receives an additional transfer of $\rho_m R(\tau, h)$.[6]

Marriage penalties and bonuses. The above formalism with separate tax functions for singles and married couples nests the possibility that there is only taxation at the individual level. In this case $T_m(y_1, y_2) = T_s(y_1) + T_s(y_2)$. Another possibility is income splitting, as practiced, for instance, in Germany. In this case, the joint income is split equally between the partners, and then each partner is taxed according to the tax schedule for singles:

$$T_m(y_m) = 2 \, T_s \left(\frac{y_m}{2} \right) \; .$$

We say that a tax system gives rise to a *marriage bonus* if

$$T_m(y_1, y_2) < T_s(y_1) + T_s(y_2) \; ,$$

so that the couple's tax burden is lower than in the case where both partners are taxed as singles. With the reverse inequality, there is a *marriage penalty.*

[6]This way of closing the model is convenient. A more detailed analysis of government expenditures would be a conceivable alternative. Here, we suppress preferences over expenditure policies. Heterogeneity in preferences over tax reforms is then entirely due to heterogeneity in how individual tax burdens change.

Preferences. The economy consists of singles and couples. The mass of tax units is normalized to 1, with the shares of singles and married couples denoted respectively by ν_s and $\nu_m = 1 - \nu_s$. The mass of individuals is therefore $\nu_s + 2\ \nu_m$. Singles' preferences are represented by a utility function

$$u_s : (c_s, y_s, \theta_s) \mapsto u_s(c_s, y_s, \theta_s)\ .$$

This function is continuously differentiable and increasing in the first argument. It is decreasing in the second argument. We do not impose an assumption of continuity or differentiability in y. The vector of characteristics $\theta_s \in \Theta \subset \mathbb{R}^n$ is referred to as the taxpayer's type. The cross-section distribution of θ_s is assumed to be atomless and represented by a cumulative distribution function F_s. A single chooses consumption c_s and earnings y_s to maximize utility subject to $c_s = b_s + y_s - T_s(y_s)$, where b_s is a government transfer to singles with no income, and $y_s - T_s(y_s)$ is the extra consumption that is available to singles with earnings of y_s.

For technical reasons, discussed in Bierbrauer et al. (2023), we assume that there is a bounded set of feasible earnings levels $\mathcal{Y} = [0, \bar{y}]$, where $\bar{y}$ can be arbitrarily large. We assume, moreover, that a single-crossing condition holds in one dimension of the type space, Θ: If type (θ_j, θ_{-j}) weakly prefers a bundle (c, y) to another bundle $(c', y') < (c, y)$, then type (θ'_j, θ_{-j}) with $\theta'_j > \theta_j$ strictly prefers (c, y) to (c', y'). This assumption implies that the individuals' earnings are increasing in θ_j.

A married couple consists of two individuals, labelled 1 for the primary and 2 for the secondary earner. Thus, $y_1 \geq y_2$. With joint earnings of $y_m = y_1 + y_2$, the disposable income of the couple is $c_m = b_m + y_m - T_m(y_m)$. Given y_1 and y_2, spouse $i = 1, 2$ realizes utility

$$u_i(\alpha_i(c_m, \cdot), y_i, \theta_i)\ .$$

The utility functions u_i are similar to a single's utility function u_s, with one important difference: We allow for the possibility that spouse i derives consumption utility only from a fraction of the couple's disposable income that we denote by $\alpha_i(c_m, \cdot)$. Possibly, this fraction depends on arguments such as the spouses' bargaining weights or their respective contributions to the couple's earnings. All this is summarized under the place-marker "$\cdot$". Each spouse i has a type $\theta_i \in \Theta \subset \mathbb{R}^n$. The cross-section distribution of married couples with characteristics $\theta_m = (\theta_1, \theta_2)$ is assumed to be atomless and represented by a cumulative distribution function F_m.

We assume that primary and secondary earnings are determined by Nash bargaining over who works and consumes how much. These earnings levels admit a characterization as the solution to

$$\begin{aligned} \max_{y_1, y_2 \in \mathcal{Y}} \quad & \gamma_1\ u_1(\alpha_1(c_m, \cdot), y_1, \theta_1) + \gamma_2\ u_2(\alpha_2(c_m, \cdot), y_2, \theta_2)\ , \\ \text{s.t.} \quad & c_m = b_m + y_m - T_m(y_m)\ , \end{aligned}$$

where γ_1 and $\gamma_2 = 1 - \gamma_1$ are the spouse's bargaining weights. The distribution of the bargaining weights $\gamma_m = (\gamma_1, \gamma_2)$ in the population is assumed to be atomless and represented by a cumulative distribution function Γ_m.

We show in part A of the Appendix that our formulation based on the functions α_i is consistent with household consumption being a public good or individual consumption being a private good. Furthermore, it can also be extended to include bargaining over family duties without affecting the conclusions from the analysis below.

Preferences over tax reforms. We derive preferences over tax reforms from indirect utility functions. Let $V_s(\tau, h, \rho_s, \theta_s)$ be the indirect utility realized by a single of type θ_s after a tax reform (τ, h) has taken place. We denote the pre-reform level by $V_{0s}(\rho_s, \theta_s)$. Then

$$V_s(\tau, h, \rho_s, \theta_s) - V_{0s}(\rho_s, \theta_s)$$

is the reform-induced change in indirect utility for a single with characteristics θ_s. Analogously,

$$V_i(\tau, h, \rho_m, \theta_m, \gamma_m) - V_{0i}(\rho_m, \theta_m, \gamma_m)$$

is the reform-induced change in indirect utility for spouse $i \in \{1, 2\}$ in a married couple with characteristics $\theta_m = (\theta_1, \theta_2)$ and bargaining weights $\gamma_m = (\gamma_1, \gamma_2)$. The derivatives of V_s and V_i with respect to τ, evaluated at $\tau = 0$, indicate how these individuals are affected if reforms in direction h are undertaken. By the envelope theorem (see Milgrom and Segal (2002)):

$$\frac{\partial}{\partial \tau} V_s(0, h, \rho_s, \theta_s) = u^0_{s1}(\theta_s) \Big[\rho_s R^0_1(h) - h_s(y_s) \Big] \ , \tag{1}$$

and

$$\frac{\partial}{\partial \tau} V_i(0, h, \rho_m, \theta_m, \gamma_m) = u^0_{i1}(\theta_m, \gamma_m) \alpha^0_{i1}(\theta_m, \gamma_m) \Big[\rho_m R^0_1(h) - h_m(y_1, y_2) \Big] \ . \tag{2}$$

These equations make use of the following shorthand notation: The subscript 1 indicates the derivative of a function with respect to its first argument, and the superscript 0 indicates that the derivative is evaluated at the status quo. Thus, $u^0_{s1}(\theta_s)$ is the marginal utility of consumption for a type θ_s-single in the status quo, and similarly for $u^0_{i1}(\theta_m, \gamma_m)$; $\alpha^0_{i1}(\theta_m, \gamma_m)$ is the marginal gain in consumption for spouse i when the couple's disposable income goes up, and, finally, $R^0_1(h)$ is the reform's marginal impact on tax revenue, evaluated at the status quo.

These equations show that whether a tax unit benefits from a reform simply depends on how the change of transfers compares to the change in the tax obligation due to the reform. A single benefits when $\rho_s R^0_1(h) - h(y_s) > 0$ and is made worse off otherwise. When $\alpha^0_{i1}(\theta_m, \gamma_m) > 0$, for $i = 1, 2$ – in words, every spouse realizes additional consumption utility when the couple's disposable income goes up – the preferences of the spouses in a married couple are aligned. They both benefit if $\rho_m R^0_1(h) - h(y_m) > 0$ and both lose otherwise. As we show in the Appendix, $\alpha^0_{i1}(\theta_m, \gamma_m) > 0$, for $i = 1, 2$, holds both when the disposable income c_m is treated as a public good and when it is treated as a budget that needs to be split between the spouses.

One-bracket reforms. A particular class of reforms plays a significant role in our analysis, namely reforms in which marginal tax rates are increased for incomes in only one bracket $[y, y + \ell]$, where ℓ is the length of the bracket. The more general tax reforms that we are interested in can be interpreted as combinations of several such reforms. So, as a preliminary step, we introduce this class of reforms.

A one-bracket reform of the tax function T_s for singles can be represented by a pair (τ_s, h_s) with

$$\tau_s\, h_s(\hat{y}) = \begin{cases} 0, & \text{for} \quad \hat{y} \leq y \ , \\ \tau_s(\hat{y} - y), & \text{for} \quad \hat{y} \in (y, y + \ell) \ , \\ \tau_s\, \ell, & \text{for} \quad \hat{y} \geq y + \ell \ . \end{cases}$$

When $\tau_s > 0$, the reform implies that the marginal tax rates for singles who have an income in the relevant bracket increases by τ_s. A "small" one-bracket reform has τ_s and ℓ close to zero. We denote by $\mathcal{R}_s : y \mapsto \mathcal{R}_s(y)$ the revenue implications of such a reform. This function gives the marginal change in tax revenue as both τ_s and ℓ vanish.[7]

A one-bracket reform of the tax schedule for married couples T_m that stays *in* the system can be represented by a pair (τ_m, h_m) with

$$\tau_m\, h_m(\hat{y}_m) = \begin{cases} 0, & \text{for} \quad \hat{y}_m \leq y_m \ , \\ \tau_m(\hat{y}_m - y_m), & \text{for} \quad \hat{y}_m \in (y_m, y_m + \ell) \ , \\ \tau_m\, \ell, & \text{for} \quad \hat{y}_m \geq y_m + \ell \ , \end{cases}$$

where $y_m = y_1 + y_2$ is the couple's joint income. The function $\mathcal{R}_m : y_m \mapsto \mathcal{R}_m(y_m)$ gives the revenue implications of a "small" reform *in* the system.

To study reforms *of* the system we also introduce one-bracket reforms that alter marginal tax rates only for primary earnings or only for secondary earnings. The former are represented by a pair (τ_1, h_1) with

$$\tau_1\, h_1(\hat{y}_1) = \begin{cases} 0, & \text{for} \quad \hat{y}_1 \leq y_1 \ , \\ \tau_1(\hat{y}_1 - y_1), & \text{for} \quad \hat{y}_1 \in (y_1, y_1 + \ell) \ , \\ \tau_1\, \ell, & \text{for} \quad \hat{y}_1 \geq y_1 + \ell \ . \end{cases}$$

The corresponding revenue function is denoted by $\mathcal{R}_1 : y_1 \mapsto \mathcal{R}_1(y_1)$. One bracket reforms that alter marginal tax rates only for secondary earnings are denoted by (τ_2, h_2) and defined in the analogous way. Their revenue implications are captured by the function $\mathcal{R}_2 : y_2 \mapsto \mathcal{R}_2(y_2)$.

[7]More formally, let $R_s(\tau_s, \ell, y)$ be the revenue from a one-bracket reform, as a function of y where the relevant bracket starts, the length ℓ of the bracket, and the change of marginal tax rates within the bracket, τ_s. Then,

$$\mathcal{R}_s(y) \quad := \quad \lim_{\ell \to 0} \frac{\partial}{\partial \ell} \lim_{\tau_s \to 0} \frac{\partial}{\partial \tau_s} R_s(\tau_s, \ell, y) \ .$$

Revenue implications of tax reforms. When the functions $\mathcal{R}_s$, $\mathcal{R}_m$, $\mathcal{R}_1$ and $\mathcal{R}_2$ are known, the revenue implication of any continuous reform direction can be computed using the following formulas (see Proposition 3 in Bierbrauer et al. (2023)): Consider a reform direction for the singles' tax schedule $h_s : y_s \mapsto h_s(y)$. The revenue effect of going a "small" step into this direction is given by

$$R_s^0(h_s) = \int_{\mathcal{Y}} h_s'(y_s)\mathcal{R}_s(y_s)\ dy_s\ ,$$

where $R_s^0(h_s)$ is the derivative of $R_s(\tau_s, h_s)$ with respect to its first argument evaluated at the status quo, i.e. for $\tau_s = 0$. Analogously, for any continuous reform direction *in* the system $h_m : y_m \mapsto h_m(y_m)$,

$$R_m^0(h_m) = \int_{\mathcal{Y}} h_m'(y_m)\mathcal{R}_m(y_m)\ dy_m\ .$$

For reforms *of* the system as represented by continuous functions $h_1 : y_1 \mapsto h_1(y_1)$ and $h_2 : y_2 \mapsto h_2(y_2)$, we have

$$R_1^0(h_1) = \textstyle\int_{\mathcal{Y}} h_1'(y_1)\mathcal{R}_1(y_1)\ dy_1 \quad \text{and} \quad R_2^0(h_s) = \int_{\mathcal{Y}} h_2'(y_2)\mathcal{R}_2(y_2)\ dy_2\ .$$

Different models of taxation and of intra-family bargaining differ with respect to the assumptions on preferences and behavioral responses that are explicitly taken into account. For instance, a model may or may not include fixed costs of labor market participation and thus behavioral responses at the extensive margin. Different specifications of preferences and of the spouses' choice sets give rise to different functions $\mathcal{R}_s$, $\mathcal{R}_m$, $\mathcal{R}_1$ and $\mathcal{R}_2$. Our analysis is general in the sense that it encompasses any such framework.

A more specific framework. In part B of the Appendix, we derive the revenue functions $\mathcal{R}_s$, $\mathcal{R}_m$, $\mathcal{R}_1$ and $\mathcal{R}_2$ for the workhorse model of taxation which has only intensive margin responses, no income effects, and in which household consumption is a pure public good. We also include an extension that involves extensive margin responses both by the primary and the secondary earner. Here, we state the revenue functions under two further assumptions: First, the tax system is piecewise linear, as is the case in the US. Second, the primary and the secondary earners' effort costs are, respectively, represented by isoleastic functions and the Frisch elasticities governing the primary and secondary earners' intensive margin responses are denoted by ε_1 and ε_2. Under these assumptions, and without extensive margin responses, the function $\mathcal{R}_m$ takes the following form,

$$\mathcal{R}_m(y_m) = -\frac{T_{m0}'(y_m)}{1 - T_{m0}'(y_m)}\ y_m\ f_m^y(y_m)\ \bar{\mathcal{E}}_m(y_m) +\ 1 - F_m^y(y_m)\ , \tag{3}$$

where F_m^y is the (endogenous) *cdf* and f_m^y the density of the earnings distribution amongst married couples and

$$\bar{\mathcal{E}}_m(y_m) \quad = \quad \mathbf{E}_{(\theta_m,\gamma_m)}\left[\varepsilon_1\pi_1^0 + \varepsilon_2\pi_2^0 \mid y_m^0(\theta_m,\gamma_m) = y_m\right]$$

is a measure of the behavioral responses to a one-bracket tax reform affecting couples with a joint income close to y_m. In this expression, $\pi_1^0 = \frac{y_1^0}{y_m^0}$ and $\pi_2^0 = \frac{y_2^0}{y_m^0}$ are, respectively, the primary and the secondary earners' income shares. The revenue function $\mathcal{R}_2$, by contrast, looks as follows,

$$\begin{aligned} \mathcal{R}_2(y_2) &= -y_2\, f_2^y(y_2)\, \varepsilon_2\, \mathbf{E}_{(\theta_m,\gamma_m)} \left[\tfrac{T_m'(y_m^0(\theta_m,\gamma_m))}{1-T_m'(y_m^0(\theta_m,\gamma_m))} \mid y_2^0(\theta_m,\gamma_m) = y_2 \right] \\ &\quad +1 - F_2^y(y_2)\ , \end{aligned} \tag{4}$$

where F_2^y is the *cdf* and f_2^y the density characterizing the distribution of secondary earnings amongst married couples.

The revenue function $\mathcal{R}_m$ is shaped by the distribution of incomes amongst couples, the marginal tax rates that these couples are facing and behavioral responses that are captured by a convex combination of the primary and secondary earners' Frisch elasticities, with the weights equal to their shares in the couple's joint income. The revenue function $\mathcal{R}_2$, by contrast, is shaped by the marginal distribution of secondary earnings and the secondary earners' Frisch elasticities; that is, the primary earners' behavioral responses do not matter for $\mathcal{R}_2$. Primary earnings still matter as the marginal tax rates that secondary earners face in the status quo depend on the income of their spouse.[8]

With extensive margin responses, a tax reform affects the masses of single and dual earner couples. In this case, $\mathcal{R}_m$ is given by

$$\mathcal{R}_m(y) = \mathcal{X}_{sec}(y_m) + \mathcal{I}_{sec}(y) + \mathcal{X}_{dec}(y_m) + \mathcal{I}_{dec}(y)\ ,$$

where

$$\begin{aligned} \mathcal{I}_{sec}(y) &= \lambda_{sec}^0 \left(-\tfrac{T_{m0}'(y)}{1-T_{m0}'(y)}\ y\ f_{sec}^y(y)\ \bar{\mathcal{E}}_{sec}(y) + 1 - F_{sec}^y(y) \right)\ , \\ \mathcal{X}_{sec}(y) &= -\lambda_{sec}^0 \int_y^{\bar{y}} \tfrac{T_{m0}(y')}{y'-T_{m0}(y')}\ \bar{\pi}_{sec}(y')\ f_{sec}^y(y')\ dy'\ , \\ \mathcal{I}_{dec}(y) &= \lambda_{dec}^0 \left(-\tfrac{T_{m0}'(y)}{1-T_{m0}'(y)}\ y\ f_{dec}^y(y)\ \bar{\mathcal{E}}_{dec}(y) + 1 - F_{dec}^y(y) \right)\ , \end{aligned}$$

and

$$\mathcal{X}_{dec}(y) = -\lambda_{dec}^0 \int_y^{\bar{y}} \tfrac{T_{m0}(y')}{y'-T_{m0}(y')}\ \bar{\pi}_{dec}(y')\ f_{dec}^y(y')\ dy\ .$$

The mass of single earner couples with an income exceeding y is denoted by $\lambda_{sec}^0(1-F_{sec}^y(y))$, where λ_{sec}^0 is the share of single earner couples among all couples, and F_{sec}^y is the *cdf* of the income distribution among single earner couples, and f_{sec}^y is the density associated with this distribution. The terms for dual earner couples are analogously defined. The average intensive margin elasticity for single earners with an income of y is denoted by $\bar{\mathcal{E}}_{sec}(y)$ and analogously for $\bar{\mathcal{E}}_{dec}(y)$. Again, these are weighted averages of the primary and the secondary earners' Frisch elasticities where separate averages are computed for single and dual earner couples with an income close to y. The average extensive margin elasticity for single earner

[8]The formulas characterizing the revenue functions $\mathcal{R}_s$ and $\mathcal{R}_1$ can be found in part B of the Appendix.

couples with an income of y is denoted by $\bar{\pi}_{sec}(y)$ and analogously for $\bar{\pi}_{dec}(y)$. Any such elasticity measures the percentage of couples with an income close to y who opt out of being a single or dual earner couple after a one percent decrease of their after-tax income.[9]

Implications for social welfare. The social welfare that is realized after a tax reform (τ, h) has taken place is given by

$$\begin{aligned} \mathcal{W}(\tau, h) &= \mathbf{E}_{\theta_s}\left[g_s(\theta_s)V_s(\tau, h, \rho_s, \theta_s)\right] \\ &\quad + \mathbf{E}_{(\theta_m,\gamma_m)}\left[g_1(\theta_m, \gamma_m)V_1(\tau, h, \rho_m, \theta_m, \gamma_m)\right] \\ &\quad + \mathbf{E}_{(\theta_m,\gamma_m)}\left[g_2(\theta_m, \gamma_m)V_2(\tau, h, \rho_m, \theta_m, \gamma_m)\right] , \end{aligned} \tag{5}$$

where the operators $\mathbf{E}_{\theta_s}$ and $\mathbf{E}_{(\theta_m,\gamma_m)}$ indicate that expectations are taken with respect to the distribution of θ_s and the joint distribution of $\theta_m = (\theta_1, \theta_2)$ and γ_m, respectively. We allow for the possibilities that there are different welfare weights for singles and couples or different welfare weights for the primary and the secondary earner in a couple, as captured by the functions $g_s : \theta_s \mapsto g(\theta_s)$, $g_1 : (\theta_m, \gamma_m) \mapsto g_1(\theta_m, \gamma_m)$ and $g_2 : (\theta_m, \gamma_m) \mapsto g_2(\theta_m, \gamma_m)$. We leave these welfare weights unspecified for now, but will consider specific formulations below. The marginal change in social welfare due to a tax reform (τ, h), evaluated at the status quo, can be written as

$$\begin{aligned} \mathcal{W}(\tau, h) &= \mathbf{E}_{\theta_s}\left[g_s(\theta_s)\tfrac{\partial}{\partial\tau}V_s(0, h, \rho_s, \theta_s)\right] \\ &\quad + \mathbf{E}_{(\theta_m,\gamma_m)}\left[g_1(\theta_m, \gamma_m)\tfrac{\partial}{\partial\tau}V_1(0, h, \rho_m, \theta_m, \gamma_m)\right] \\ &\quad + \mathbf{E}_{(\theta_m,\gamma_m)}\left[g_2(\theta_m, \gamma_m)\tfrac{\partial}{\partial\tau}V_2(0, h, \rho_m, \theta_m, \gamma_m)\right] . \end{aligned} \tag{6}$$

Using the envelope theorem, see Equations (1) and (2), we can also write

$$\begin{aligned} \mathcal{W}_\tau(0, h) &= \Big(\nu_s\rho_s\mathbf{E}_{\theta_s}[\mathbf{g}_s(\theta_s)] + \nu_m\rho_m\mathbf{E}_{(\theta_m,\gamma_m)}[\mathbf{g}_m(\gamma_m, \theta_m)]\Big)R_1^0(h) \\ &\quad - \mathbf{E}_{\theta_s}[\mathbf{g}_s(\theta_s)h_s(y_s^0(\theta_s))] \\ &\quad - \mathbf{E}_{(\theta_m,\gamma_m)}\left[\mathbf{g}_m(\gamma_m, \theta_m)h(y_m^0(\theta_m, \gamma_m))\right] , \end{aligned} \tag{7}$$

where $R_1^0(h)$ is the reform's marginal impact on tax revenue evaluated at the status quo, and $\mathbf{g}_s(\theta_s) = g_s(\theta_s)u_{s1}^0(\theta_s)$ is the welfare-weighted marginal utility of consumption for a single of type θ_s. Likewise,

$$\begin{aligned} \mathbf{g}_m(\gamma_m, \theta_m) &= g_1(\theta_m, \gamma_m)u_{11}^0(\theta_m, \gamma_m)\alpha_{11}^0(\theta_m, \gamma_m) \\ &\quad + g_2(\theta_m, \gamma_m)u_{21}^0(\theta_m, \gamma_m)\alpha_{21}^0(\theta_m, \gamma_m) \end{aligned}$$

is a measure of the welfare gains that are realized when the disposable income of a couple of type (θ_m, γ_m) is slightly increased.

By Equation (7), the change in social welfare due to a tax reform (τ, h) has two drivers, changes in tax revenues, which are rebated lump sum with a fraction ρ_s going to singles and a fraction ρ_m going to couples, and changes in tax liabilities. Additional lump sum transfers

[9] In part B of the Appendix we explain what the revenue functions $\mathcal{R}_s$, $\mathcal{R}_1$ and $\mathcal{R}_2$ look like with extensive margin effects.

to singles or couples are, respectively, evaluated according to the average values of $\mathbf{g}_s(\theta_s)$ and $\mathbf{g}_m(\gamma_m, \theta_m)$. Changes in tax liabilities, as captured by h_s and h_m, will in general vary over the type/income distribution. Getting at the welfare consequences of these changes requires to apply the type-specific weights to them. The following Proposition summarizes this discussion.

Proposition 1 *A reform in direction h increases social welfare if and only if $\mathcal{W}_\tau(0, h) > 0$, where $\mathcal{W}_\tau(0, h)$ is defined in Equation (7).*

Below, we will use this approach to evaluate tax reforms. We will then focus on specific social welfare functions, such as Rawlsian social welfare functions or affirmative Feminist welfare functions which concentrate weights on women with positive earnings.

Pareto-improving reforms *in* the system. A reform is Pareto-improving if some tax units are made better off and none are made worse off. In the following we provide separate conditions for the possibility of Pareto-improving the tax schedule for singles, T_s, and the tax schedule for married couples, T_m.

Under what conditions does there exist a reform direction h_s that makes every single better off? According to the results in Bierbrauer et al. (2023), such a reform exists if and only if one of the following conditions is violated: the function $\mathcal{R}_s$ is (i) bounded from below by 0, (ii) bounded from above by 1, and (iii) non-increasing.

To interpret these conditions, note first that, when there exists y so that $\mathcal{R}_s(y) < 0$, then lowering marginal tax rates for incomes close to y yields a revenue gain. Hence, all taxpayers benefit from increased transfers and some benefit additionally from lower taxes. This logic is familiar from analyses of the Laffer curve. Second, when there exists y so that $\mathcal{R}_s(y) > 1$, then an increase of marginal tax rates for incomes close to y yields so much additional revenue that even those who face higher tax rates are compensated by the gain in revenue. In this case, marginal tax rates in the status quo are inefficiently low. Third, when there exist income levels y_a and $y_b > y_a$ so that $\mathcal{R}_s(y_a) < \mathcal{R}_s(y_b)$, then it is possible to lower marginal tax rates for incomes close to y_a and to increase them for incomes close to y_b, so that there is an overall revenue gain, and individuals with incomes between y_a and y_b benefit from lower taxes, whilst everyone else's tax burden remains unchanged.[10]

The same logic applies to reforms that affect only the schedule for married couples: Pareto-improving reform directions can be found if and only if one of the following conditions

[10]To see intuitively why such a non-monotonicity indicates an inefficiency, consider the following thought experiment. A local one-bracket reform at an annual income of, say, 70,000 implies that the tax burden increases by a small amount of $\tau_s\ \ell$ for everyone making more than 70,000 a year. A small one-bracket reform at an annual income of 80,000 has the same effect, it raises the tax burden by $\tau_s\ \ell$, albeit for a smaller group of people namely those making more than 80,000 a year. If the latter still raises more revenue than the former, it must be the case that the tax system creates perverse incentives for people with incomes between 70,000 and 80,000 a year.

is violated: (i) $\mathcal{R}_m(y_m) > 0$, (ii) $\mathcal{R}_m(y_m) < 1$, and (iii) the function $\mathcal{R}_m(y_m)$ is non-increasing. The following Proposition summarizes.

Proposition 2 *Let H be the set of continuous functions with $h(0) = 0$. There is no Pareto-improving direction $h = (h_s, h_m) \in H^2$ iff the following conditions hold: The functions $\mathcal{R}_s$ and $\mathcal{R}_m$ are both non-increasing, bounded from below by 0 and from above by 1.*

In our empirical analysis we will investigate to what extent there have been inefficiencies in the US income tax schedules for singles and married couples since the 1960s. We will also analyze whether a removal of these inefficiencies made it necessary to change marriage penalties and bonuses.

Pareto-improving reforms *of* the system. A reform *of* the system lowers marginal tax rates for secondary earners or increases them for primary earners. Let

$$h_m(y_1, y_2) = \tau_1 \; h_1(y_1) + \tau_2 \; h_2(y_2) \; .$$

Then, the function $y_1 \mapsto \tau_1 \; h_1'(y_1)$ gives the change of marginal tax rates on primary earnings and the function $y_2 \mapsto \tau_2 \; h_2'(y_2)$ gives the change of marginal tax rates on secondary earnings. By the results of Bierbrauer et al. (2023), the marginal impact on overall tax revenue that is due to secondary earners is given by

$$\tau_2 \int_{\mathcal{Y}} h_2'(y_2)\mathcal{R}_2(y_2) \; dy_2 \; , \tag{8}$$

where $\mathcal{R}_2(y_2)$ is the revenue impact of a small one-bracket reform that changes the tax rate for secondary earnings close to y_2. Analogously, the revenue change due to primary earnings is given by

$$\tau_1 \int_{\mathcal{Y}} h_1'(y_1)\mathcal{R}_1(y_1) \; dy_1 \; , \tag{9}$$

where $\mathcal{R}_1(y_1)$ gives the marginal change in tax revenue when tax rates are increased for all primary earners with an income close to y_1.

The following Proposition is a Corollary to the characterization of Pareto-improving reform directions in Bierbrauer et al. (2023).

Proposition 3 *Let H be the set of continuous functions with $h(0) = 0$. There is no Pareto-improving direction $(h_1, h_2) \in H^2$ iff the following conditions hold: The functions $\mathcal{R}_1$ and $\mathcal{R}_2$ are both non-increasing, bounded from below by 0 and from above by 1.*

For instance, if $\mathcal{R}_2$ is negative for some range of secondary earnings, then a cut of the tax rates in this income range would be self-financing and hence Pareto-improving. Alternatively, if $\mathcal{R}_2$ is increasing over some range of secondary earnings then a reform that involves lower marginal tax rates for secondary earnings in a phase-in range and higher marginal tax rates in a phase out range would also be self-financing. Finally, if $\mathcal{R}_2$ lies, for some range of secondary earnings above 1, then an increase of marginal tax rates in this range would yield so much revenue that even those who are confronted with an increased tax burden can be compensated.

Inefficiency of joint taxation. When a tax system is inefficient, it may well be the case that Pareto improvements exist both in the system and away from the system. Which direction is taken is then a matter of political preferences. It may also be the case that there is no scope for Pareto improvements *in* the system, but that there is a Pareto-improving reform *of* the system.

Suppose, for instance, that $\mathcal{R}_m$ is close to, but above zero for a range of joint incomes, hence marginal tax rates on the couples' joint incomes are not beyond the Laffer bound. As we show more formally in Appendix B, the elasticities which shape $\mathcal{R}_m$ are a weighted average of the primary and secondary earner's behavioral responses, whereas $\mathcal{R}_2$ depends on the behavioral responses of the secondary earner. Thus, the elasticities that matter for $\mathcal{R}_2$ are larger than those that matter for $\mathcal{R}_m$. Consequently, $\mathcal{R}_2$ lies below zero when $\mathcal{R}_m$ lies just above. In this case, a tax cut just for secondary earnings is Pareto-improving, whereas a joint tax cut for primary and secondary earnings is not. In the empirical analysis below, we find that this constellation prevailed in the US in the recent past.

The following Corollary to Propositions 2 and 3 characterizes tax systems with an inefficiency that can only be cured by moving away from joint taxation. In our empirical analysis we will make use of this Corollary to identify situations in which *joint taxation is inefficient* in the sense that there is a Pareto-superior tax system without joint taxation, but no Pareto-superior tax system with joint taxation.

Corollary 1 *Joint taxation is inefficient when:*

(i) One of the following conditions is violated: The functions $\mathcal{R}_1$ and $\mathcal{R}_2$ are non-increasing, bounded from below by 0 *and from above by 1.*

(ii) The following conditions all hold: The function $\mathcal{R}_m$ is non-increasing, bounded from below by 0 *and from above by 1.*

Politically feasible reforms *in* the system. We call a reform politically feasible if the reformed system is preferred by a majority of individuals over the status quo. A characterization of politically feasible reforms is straightforward when the changes in tax liabilities for singles $h_s : y_s \mapsto h_s(y_s)$ and married couples $h_m : y_m \mapsto h_m(y_m)$ are monotonic functions. In this case, there exist cutoff levels of income that separate the reform winners and the reform losers. To see this, assume for specificity that both h_s and h_m are non-increasing functions, then it follows from Equations (1) and (2), that there are cutoff values $\hat{y}_s$ and $\hat{y}_m$, possibly equal to 0 or $\bar{y}$, so that the reform beneficiaries are all singles and couples with an income above the respective cutoff. Hence, the reform has majority support in the population at large if and only if

$$\nu_s \, (1 - F_s^y(\hat{y}_s)) + 2 \, \nu_m \, (1 - F_m^y(\hat{y}_m)) \quad \geq \quad \frac{1}{2} \, (\nu_s + 2\nu_m) \; ,$$

where F_m^y and F_s^y are, respectively, the *cdf*s that characterize the income distributions among married couples and singles in the status quo. This inequality can equivalently be written as

$$\nu_s \, \left(1 - F_s^y(\hat{y}_s) - \frac{1}{2}\right) + 2\nu_m \, \left(1 - F_m^y(\hat{y}_m) - \frac{1}{2}\right) \geq 0 \; .$$

Hence, we need to have majority support in at least one of the groups,

$$F_s^y(\hat{y}_s) \leq \frac{1}{2} \quad \text{or} \quad F_m^y(\hat{y}_m) \leq \frac{1}{2} \; ,$$

for politically feasibility, implying that, in at least one of the groups, the respective median voter must be among the reform beneficiaries. To the extent that there is even more support in one of the groups, i.e. when the cutoff is below the median, one can have less than majority support in the other group, i.e. a cutoff above the median, and still achieve majority support in the population at large.[11] The following Proposition summarizes this discussion.

Proposition 4 *Let h_s and h_m be non-increasing. Let $\hat{y}_s$ be the solution to $\rho_s R_1^0(h) - h_s(y_s) = 0$ and $\hat{y}_m$ be the solution to $\rho_m R_1^0(h) - h_m(y_m) = 0$. A reform in direction $h = (h_s, h_m)$ is politically feasible if and only if*

$$\nu_s \, \left(1 - F_s^y(\hat{y}_s) - \frac{1}{2}\right) + 2\nu_m \, \left(1 - F_m^y(\hat{y}_m) - \frac{1}{2}\right) \geq 0 \; .$$

In the empirical analysis below, we will use this result when we look into the tax reforms in the US that led to changes in marriage bonuses and penalties. Specifically, we will trace out how much support there was for these reforms among married couples and singles. In addition, we will ask whether reforms *of* the system and towards individual taxation would have been politically feasible and/ or desirable from a welfare perspective. We now describe the methodology that we use to answer these questions.

Revenue-neutral reforms towards individual taxation. A revenue-neutral reform towards individual taxation raises the marginal tax rates on primary earnings and lowers the marginal tax rates on secondary earnings. Moreover, the increased revenue from the higher taxes on primary earnings is used to finance the tax cuts for secondary earners. Revenue neutrality implies, in particular, that such a reform is without consequence for singles. It has distributive effects only among married couples. It tends to make couples with a rather equal within-couple distribution better off at the expense of couples with a dominant primary earner. Formally, we consider reform directions so that

$$h_m(y_1, y_2) = \tau_1 \; h_1(y_1) + \tau_2 \; h_2(y_2) \; .$$

[11] This logic applies, mutatis mutandis, also when h_s and h_m are both non-decreasing functions, or when one of these functions is non-increasing and the other one non-decreasing.

By Equations (8) and (9), revenue neutrality requires that

$$\frac{\tau^2}{\tau^1} = -\frac{\int_{\mathcal{Y}} h_1'(y_1)\mathcal{R}_1(y_1)\ dy_1}{\int_{\mathcal{Y}} h_2'(y_2)\mathcal{R}_2(y_2)\ dy_2}\ . \tag{10}$$

A special case of interest is that marginal tax rates are increased for all primary earners and decreased for all secondary earners. In this case $h_1(y_1) = y_1$, for all y_1 and $h_2(y_2) = y_2$, for all y_2. Such a reform is revenue neutral if

$$\frac{\tau^2}{\tau^1} \quad = \quad -\frac{\int_{\mathcal{Y}} \mathcal{R}^1(y_1)dy_1}{\int_{\mathcal{Y}} \mathcal{R}^2(y_2)dy_2} \quad =: \quad -r\ . \tag{11}$$

We will repeatedly refer to the ratio on the right hand side of (11) in the following. For ease of reference, we use r as a shorthand.

A married couple that has earnings of y_1^0 and y_2^0 in the status quo is made better off if $\tau_1\ y_1^0 + \tau_2\ y_2^0 < 0$ or, equivalently, if $y_1^0 < r\, y_2^0$. This inequality will prove useful for our analysis of whether reforms towards individual taxation would have had majority support at the eve of the major tax reforms in the US. Specifically, we will plot the line $y_1^0 = r\, y_2^0$ in a y_2^0-y_1^0-diagram. All couples with (y_2^0, y_1^0) below the line are reform winners, all couples with (y_2^0, y_1^0) above are reform losers. To determine political feasibility, we simply need to check whether the households above the line outnumber those below the line. To check how political feasibility has evolved, we look into how this line and the distribution of primary and secondary earnings has shifted over time.[12]

We also examine the implications of such reforms for social welfare, employing various social welfare functions. We will focus on determining whether "inequality aversion" and the "empowerment of women" are complementary or conflicting concepts. From the perspective of a generic social welfare function, a revenue neutral reform with $h_m(y_1, y_2) = \tau_1\ y_1 + \tau_2\ y_2$ is desirable if and only if $Y_1^g \ <\ r\ Y_2^g$, where $Y_1^g := \mathbf{E}_{(\theta_m,\gamma_m)}\left[\mathbf{g}_m(\gamma_m, \theta_m)\ y_1^0(\gamma_m, \theta_m)\right]$ and $Y_2^g := \mathbf{E}_{(\theta_m,\gamma_m)}\left[\mathbf{g}_m(\gamma_m, \theta_m)\ y_2^0(\gamma_m, \theta_m)\right]$. The following Proposition summarizes.

Proposition 5 *Consider a revenue-neutral reform direction $h_m(y_1, y_2) = \tau_1\ y_1 + \tau_2\ y_2$. A couple with status quo incomes of (y_1^0, y_2^0) benefits if $y_1^0 < \rho\, y_2^0$. The reform is politically feasible if the mass of couples for which this inequality holds is larger than the mass of couples for which the reverse inequality holds. The reform is welfare improving iff $Y_1^g \ <\ r\ Y_2^g$, where $Y_1^g := \mathbf{E}_{(\theta_m,\gamma_m)}\left[\mathbf{g}_m(\gamma_m, \theta_m)\ y_1^0(\gamma_m, \theta_m)\right]$ and $Y_2^g := \mathbf{E}_{(\theta_m,\gamma_m)}\left[\mathbf{g}_m(\gamma_m, \theta_m)\ y_2^0(\gamma_m, \theta_m)\right]$.*

4 Marriage penalties and bonuses in the US

We turn to the tax treatment of singles and couples in the US since the 1960s. We begin with a description of how marriage penalties and bonuses have changed over time. To aid this description, we first define a function, referred to as the *splitting function*, which relates the tax treatment of couples to the tax treatment of singles.

[12]Note that r shifts with the behavioral responses that shape the functions $\mathcal{R}^1 : y_1 \mapsto \mathcal{R}^1(y_1)$ and $\mathcal{R}^2 : y_2 \mapsto \mathcal{R}^2(y_2)$. The less elastic primary earnings are relative to secondary earnings, the larger is r.

The splitting function. Given a tax system (T_s, T_m) we define the splitting function $\sigma : y_m \mapsto \sigma(y_m)$ so that $\sigma(y_m)$ is the solution to

$$\sigma(y_m)\ T_s\left(\frac{y_m}{\sigma(y_m)}\right) = T_m(y_m)\ . \tag{12}$$

For instance, the tax system in Germany has $\sigma(y_m) = 2$, for all y_m. That is, couples are taxed as if they consisted of two singles who each contribute fifty percent to the joint income. The splitting function $\sigma : y_m \mapsto \sigma(y_m)$ allows for more general forms of income splitting. We will use it as a descriptive tool, i.e. we take the tax functions T_m and T_s as given and then estimate the splitting function using the TAXSIM microsimulation model. The interpretation is that married couples are taxed as if each partner was assigned a fraction $\frac{1}{\sigma(y_m)}$ of the couple's joint income, and then the couple is treated as if it had a number of $\sigma(y_m)$ individuals who are all taxed according to the schedule for singles. We can then say that a couple with joint income y_m benefits from a marriage bonus if

$$\sigma(y_m)\ T_s\left(\frac{y_m}{\sigma(y_m)}\right) < T_s(y_1) + T_s(y_2)\ ,$$

and suffers from a marriage penalty with the reverse inequality. With progressive taxation and $y_1 > y_2$, $\sigma(y_m) \geq 2$ implies a marriage bonus and $\sigma(y_m) \leq 1$ implies a marriage penalty, for all possible triplets (y_m, y_1, y_2). When $\sigma(y_m) \in (1, 2)$, there is an intermediate value $\bar{\sigma}(y_m)$ which solves

$$\bar{\sigma}(y_m)\ T_s\left(\frac{y_m}{\bar{\sigma}(y_m)}\right) = T_s(y_1) + T_s(y_2)\ ,$$

so that there is neither a bonus nor a penalty. The intermediate value not only depends on the married couple's total income but also on the income share of the primary earner. Specifically, for given y_m, $\bar{\sigma}(y_m)$ decreases in the income share of the primary earner.[13] Thus, given y_m and $\sigma(y_m) \in (1, 2)$, spouses with rather unequal incomes benefit from a marriage bonus and spouses with more equal incomes suffer from a marriage penalty. Below, we document how the US splitting function shifted over time, with upward shifts implying that more couples benefitted from marriage bonuses and downward shifts implying that more couples suffered from marriage penalties.

Demographics. Since the 1960s, the share of singles relative to couples has increased in the US. Also, the share of dual earner couples has increased relative to single-earner couples. These changes have taken place in a continuous fashion. Figure 1 documents these changes using data from the Annual Social and Economic Supplement of the Current Population

[13] To see this, let $\pi = \frac{y_1}{y_m}$ be the income share of the primary earner and write

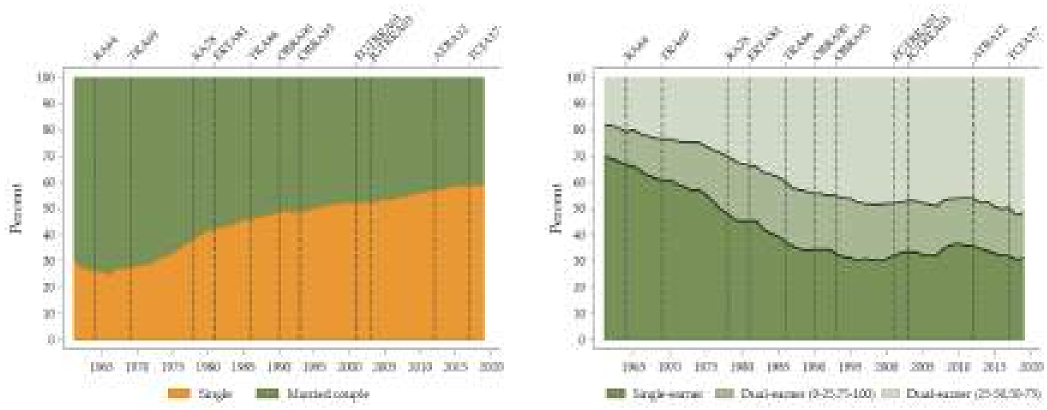
$$\bar{\sigma}(y_m)\ T_s\left(\frac{y_m}{\bar{\sigma}(y_m)}\right) = T_s(\pi\ y_m) + T_s((1-\pi)y_m)\ .$$

Employing the implicit function theorem and using the convexity of T_s makes it possible to verify that $\bar{\sigma}(y_m)$ is decreasing in π.

Survey (CPS-ASEC).[14] If the tax system had stayed the same, the share of individuals benefiting from marriage bonuses would have gone down since the 1960s.[15]

Figure 1: Demographic change over time

(a) Tax unit types (b) Couple types



Notes: This figure shows the distribution of tax unit types over time. Figure 1a displays the share of single tax units (orange area) and the share of couple tax units (green area). Figure 1b displays the share of single-earner and dual-earner couples. A single-earner couple refers to a married couple, in which one spouse is not employed (dark green area). The figure further displays the share of dual-earner couples in which both spouses are employed and (i) one spouse earns between 0 and 25 percent (mid green area) and (ii) between 25 and 50 percent of total earnings (light green area). Earnings shares are computed on the basis of wage, business and farm income. Reforms of the federal income tax code as described in Table D.4 are displayed as vertical lines. All estimates are based on tax units with strictly positive gross income in which both spouses are between 25 and 55 years old. Figure G.45 replicates this figure for the full adult population.
Source: Authors' calculations based on CPS-ASEC.

Changes of the splitting function. We combine CPS data with the TAXSIM (v32) microsimulation model to obtain an estimate of the splitting function σ.[16] Figure 2 shows the splitting-function σ in selected years – those close to reforms that had a significant impact on marriage penalties and bonuses – to give an indication of how marriage bonuses and penalties have evolved over time due to changes in the tax system.[17] The fact that σ is nowhere below one indicates that, throughout, couples with very unequal incomes benefited

[14]See Flood, King, Rodgers, Ruggles, Warren and Westberry (2021) and `https://cps.ipums.org` for a detailed description of CPS data. Appendix D.1 provides details on the data preparation. We use CPS data because it provides separate demographic and earnings information for both spouses. In contrast, the tax return microdata (SOI-PUF) from the Internal Revenue Service (IRS) used in Bierbrauer et al. (2021) does not contain this information (except for the year 1974; see Figure D.5 for a comparison). Moreover, Bargain et al. (2015) compare inequality measures as well as the direct policy effect, ΔT, based on CPS and SOI-PUF data and show that results are very similar (except for the very top of the distribution).

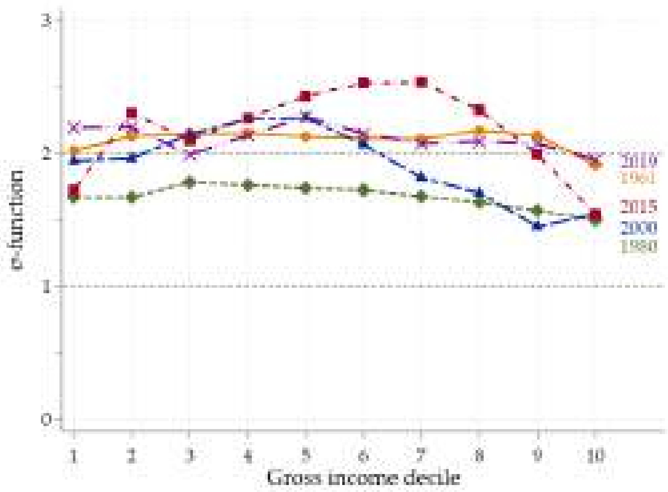
[15]How the distribution of penalties and bonuses, as well as the magnitude measured in constant USD, has actually changed over time is shown in Figure D.9 and Figure D.10 in the Appendix.

[16]See Feenberg and Coutts (1993) and `https://users.nber.org/~taxsim/` for detailed information on the TAXSIM microsimulation model, and Appendix D.1 for details on its combination with the CPS data.

[17]The estimated σ-function relates the mean average tax rates across *all* singles (baseline) to the mean average tax rates across all couples (comparison). However, average tax rates can vary within the group of couples and singles, most notably due to the presence of children. Figure D.15 explicitly differentiates

from a marriage bonus, irrespective of whether they belonged to the upper or the lower part of the income distribution. Interestingly, the splitting function in the recent past looks similar to the one from the early 1960s: it is, by and large, close to 2 for all levels of income, indicating that the occurrence of penalties and bonuses does not systematically vary with income. In between, there have been pronounced departures from this pattern. For instance, in 2015 there were larger marriage bonuses in the upper middle class. In 2000, there were marriage penalties for "rich" dual earner couples with high secondary earnings. In Appendix D.3.1, we look more deeply into how marriage penalties and bonuses evolved. Here we focus on a subset of tax reforms, those with the largest impact on marriage bonuses and penalties.

Figure 2: The splitting function σ over time



Notes: This figure shows estimates of the splitting function σ for selected years. The σ-function is calculated for tax units by estimating mean average tax rates of couples and singles (see Figure D.14). Mean average tax rates are used to solve numerically for σ (see Appendix D.3.2). Deciles refer to the gross income distribution of couples in the respective year. All estimates are based on tax units with strictly positive gross income in which both spouses are between 25 and 55 years old. Figure G.46 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

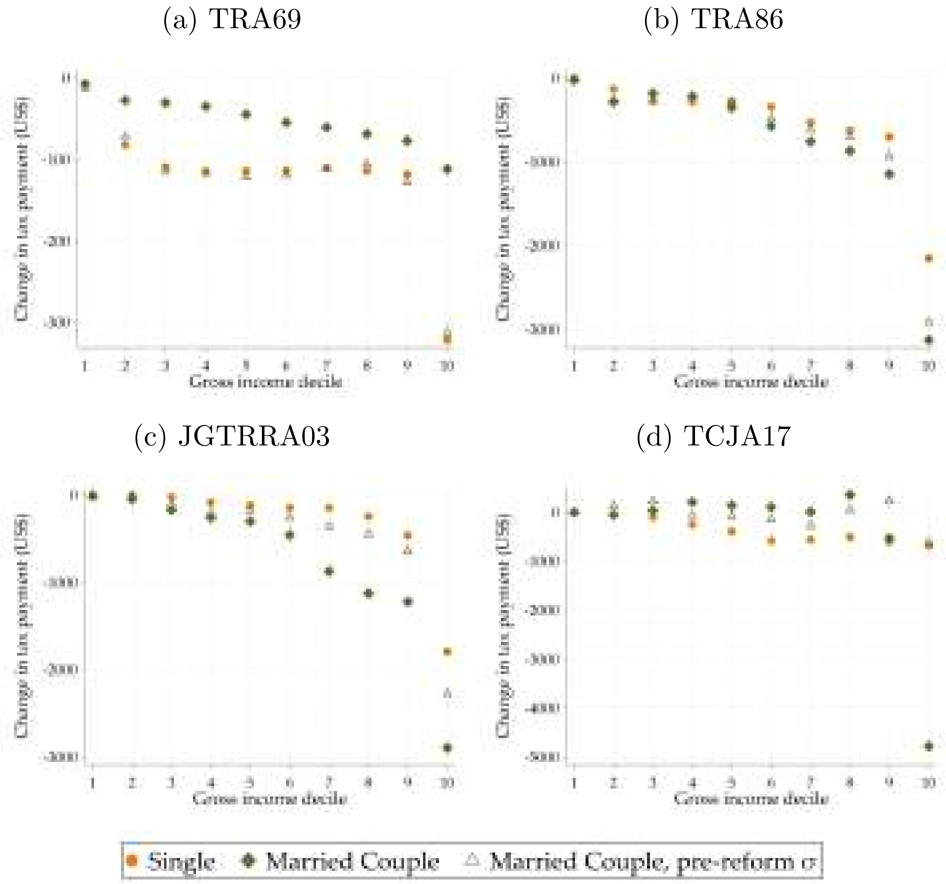
Selected tax reforms and their implications for singles and couples. We take a closer look at tax reforms that implied significant changes in the tax treatment of couples relative to the tax treatment of singles.[18] Figure 3 shows how these reforms affected the tax payments of singles and couples. It also shows a counterfactual: what would have happened to the couples' tax schedule when the function $\sigma : y \mapsto \sigma(y)$ had not been adjusted while the tax schedule for singles was reformed. For instance, Panel (a) shows that the tax cuts for couples would have been much larger in this case.

between different baseline and comparison groups by estimating σ while varying the number of children in the baseline and comparison group.

[18] An analysis of all major tax reforms since the 1960s is relegated to Appendix E. There, we document that there were various tax reforms that hardly affected the function $\sigma : y \mapsto \sigma(y)$. In Appendix H we use a textual analysis to show that the discussions about marriage bonuses and penalties played an important role in the narratives about selected reforms.

Prior to TRA69, there was income splitting with σ close to 2, for all levels of income (see Figure 2). TRA69 involved tax cuts both for singles and for couples, but those for singles were larger, as reflected by a downward shift of $\sigma : y \mapsto \sigma(y)$ (see Figure 4). By contrast, TRA86 and, in particular, JGTRRA03 had larger tax cuts for couples which led to an upward shift of the σ-function. TCJA17 was different in that σ decreased for intermediate levels of income and increased in the top decile.[19]

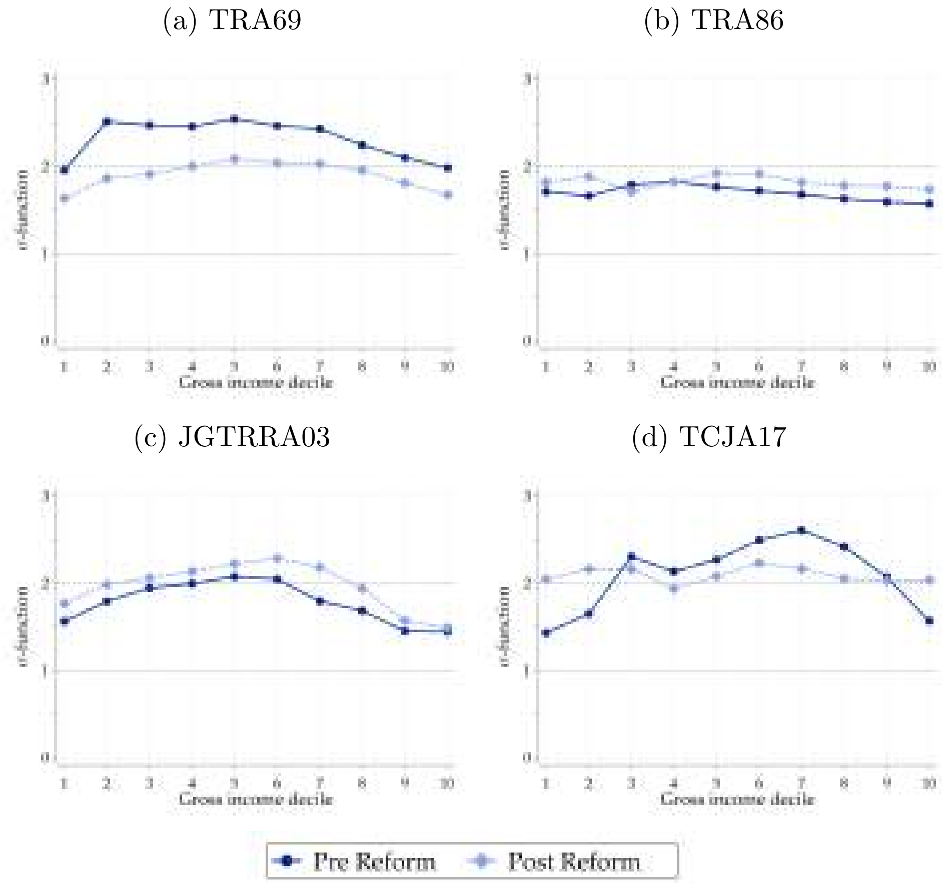
Figure 3: Reform induced changes of the tax burden



Notes: This figure shows how tax reforms affected the per-capita tax burden of singles (orange circles) and couples (green diamonds), holding their income fixed at the pre-reform level, by deciles of the per capita gross income distribution. At the tax unit level, the change is equal to $T_{s1}(\hat{y}_{s0}) - T_{s0}(y_{s0})$ for singles and $T_{m1}(\hat{y}_{m0}) - T_{m0}(y_{m0})$ for couples. Post-reform tax payments $T_1(\hat{y}_0)$ are calculated based on the inflation-adjusted pre-reform income $\hat{y}_0$ using the CPI-U-RS deflator as uprating factor. In addition, the figure displays the hypothetical change in tax liability for couples under the assumption that observed tax changes of singles would have translated according to the empirical pre-reform splitting function σ to couples, i.e. $\sigma_0 \; T_{s1}\left(\frac{\hat{y}_{m0}}{\sigma_0}\right) - T_{m0}(y_{m0})$ (grey triangles). For details on the methodology on the analysis of actual and hypothetical tax reforms, see Appendix D.4.1. Figures for all reforms are displayed in Appendix Figure E.28. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.47 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

[19]Figure E.30 in part E of the Appendix contains more detailed information on how tax reforms affected marriage penalties and bonuses across the income distribution.

Figure 4: Change of the splitting function σ



Notes: This figure shows the effects of selected tax reforms on the splitting function σ, holding incomes fixed at the pre-reform level. Pre-reform (dark blue circles) and post-reform (light blue diamonds) splitting functions are calculated by estimating mean average tax rates of couples and singles in the respective year. Mean average tax rates are used to solve numerically for σ (see Appendix D.3.2)). Deciles refer to the gross income distribution of couples in the respective year. Figures for all reforms are displayed in Appendix Figure E.29. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.48 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

5 Reforms *in* the system

In this section, we first analyze the extent to which the changes in marriage bonuses and penalties documented above can be rationalized as Pareto improvements. Subsequently, we check how much political support there was for these reforms, both among singles and among couples. Finally, we look into welfare implications.

Methodology. Again, we make use of the TAXSIM microsimulation model in combination with CPS data. We thereby obtain detailed information on the characteristics of tax units, such as their sources of income or their number of children. This detailed information enables us to compute what taxes a single or a married couple must pay under a given tax system T_0. It also makes it possible to compute what taxes they would have to pay under an alternative tax system T_1 and hence, the change in the tax burden associated with a reform that replaces T_0 by T_1. For the purpose of documenting how the tax system changes when T_0 is replaced by T_1, we focus on mechanical effects.[20] That is, we keep the tax unit's income constant and compute how the tax burden changes when the new tax system is applied to the old income. By contrast, for our political economy and welfare analyses of tax reforms, we take behavioral responses into account to get a more appropriate assessment of the extent to which individuals were made better or worse off. In Section D.4 of the Appendix, we describe in detail how we adapt the framework developed in Sections 3 and Appendix C for our purpose in this section, the evaluation of "large" reforms.

5.1 Pareto-improving reforms *in* the system

Calibration. By Proposition 2, a status quo tax system is Pareto-efficient if and only if the revenue functions $\mathcal{R}_s$ and $\mathcal{R}_m$ are both non-increasing, bounded from below by 0 and bounded from above by 1. Any violation of these conditions implies the existence of a Pareto-improving reform *in* the system. In the following, we present an empirical analysis of whether these conditions were satisfied in years that preceded selected tax reforms in the US.[21] If the answer is "yes", this implies that the reforms cannot be justified as having been Pareto-improving. By contrast, if the answer is "no", there is potentially an efficiency rationale and it is therefore interesting to see whether the actual reform had a Pareto-improving direction.

In Appendix D.4.2, we explain in detail how we calibrate the revenue functions $\mathcal{R}_s$ and $\mathcal{R}_m$. Here we elaborate on what we assume about the elasticities that capture the behavioral responses to taxation. Our assumptions shown in Table 1 are guided by the empirical literature that finds stronger behavioral responses to taxation for secondary earners (see, e.g., Eissa and Hoynes (2004) and Bargain et al. (2014)) while acknowledging the variation of estimates (see, e.g., Blau and Kahn (2007), Saez et al. (2012), Neisser (2021)).

In our baseline scenario, we assume that intensive margin elasticities are constant over time and equal 0.5 for single individuals, 0.25 for primary earners in couples, and 0.75 for secondary earners.[22] We also consider a scenario with elasticities that are higher than the ones in the baseline, and one with lower elasticities. We finally assume that the extensive margin elasticities decrease with income from 0.65 to 0.25 until the 90th percentile of the gross income distribution, and stays constant in the top decile (see Figure D.23).

Results. Figure 5 displays pre-reform revenue functions for couples and singles based on different assumptions regarding the intensity of behavioral responses at the intensive margin (see Table 1). The revenue functions satisfy all efficiency conditions in the lower half of the

[20] The computation of mechanical effects requires an adjustment for inflation, see Appendix D.4.1.

[21] The analysis of all additional major reforms – defined in Table D.4 – is relegated to the Appendix.

[22] Note that even though elasticities are constant for primary and secondary earners, the average elasticity for couples can vary across the income distribution and across years since it is a weighted average based on the income shares of the primary and secondary earner (see Appendix Figure D.19).

Table 1: Assumptions about Labor Supply Elasticities

	Single	Couples	
		Prim. Earner	Sec. Earner
Low Elasticity Scenario	0.25	0.15	0.35
Baseline Elasticity Scenario	0.5	0.25	0.75
High Elasticity Scenario	1	0.5	1.5

Notes: This table displays our assumptions about the labor supply elasticities for singles, as well as for primary and secondary earners in couples. Assumptions are guided by the range of estimates found in the literature, e.g. Gustafsson (1992), Blundell and MaCurdy (1999), Blau and Kahn (2007), Eissa and Hoynes (2004), LaLumia (2008), Kaygusuz (2010), Saez et al. (2012), Bargain et al. (2014), and Neisser (2021).

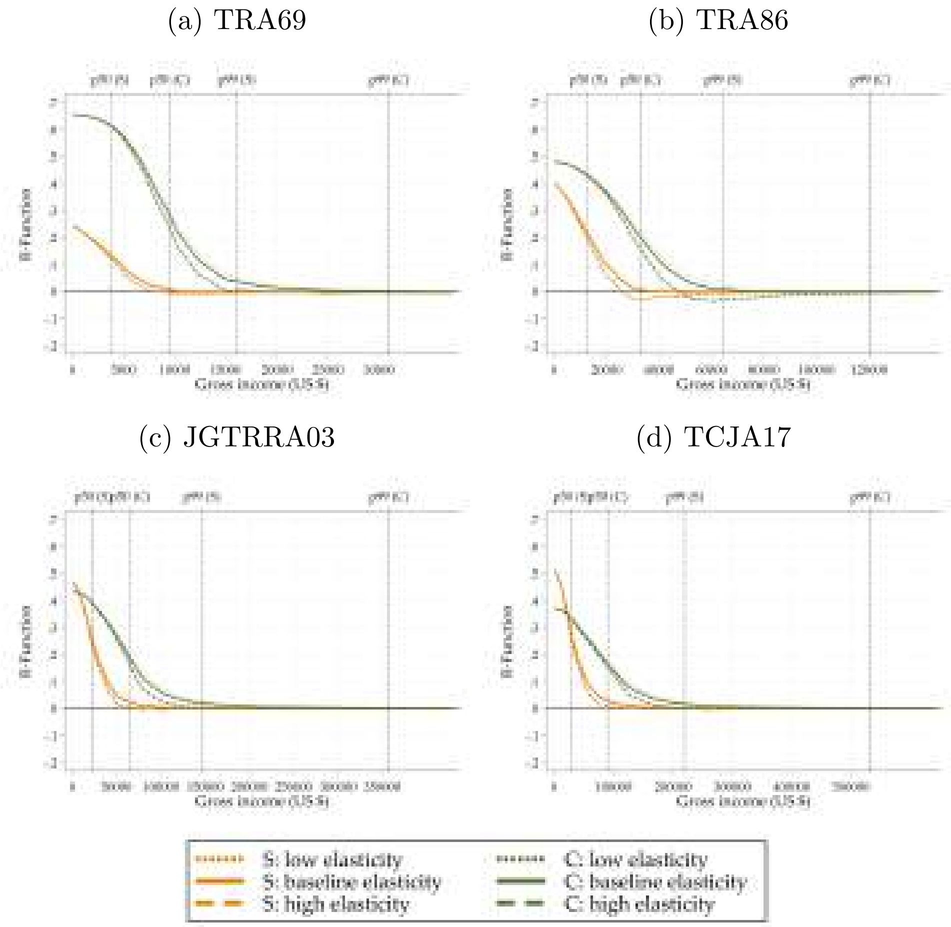
income distribution. In the upper half, some cross the horizontal line at zero, indicating that marginal tax rates are inefficiently high with the implication that a reduction of these tax rates would have been self-financing. Figure 5 shows the revenue functions over their full range. Figure 6 complements it by showing the extent to which marginal tax rates in the pre-reform years exceeded an upper bound that is implied by the conditions $\mathcal{R}_s(y) = 0$ and $\mathcal{R}_m(y) = 0$. More specifically, the figure shows the ratios $\frac{T'_s(y)}{1-T'_s(y)}$ and $\frac{T'_m(y)}{1-T'_m(y)}$ in pre-reform years and relates them to upper bounds for these expressions.[23]

We now provide an interpretation of these figures using the baseline assumptions on intensive margin elasticities. The figures then show that the pre-reform tax systems in 1968 had excessive marginal tax rates for singles, but not for couples. In line with this observation, the reform lowered the marginal tax rates for singles with an income in the relevant range, and did not change the marginal tax rates for couples (see Figure 6). This reform can therefore be interpreted as efficiency enhancing. In contrast, marginal tax rates were inefficiently high both for singles and for married couples prior to 1986 reform. Indeed, both tax rates were lowered. Again, the reform can be interpreted as having had a Pareto-improving direction. By contrast, the reform in 2003 and 2017 does not admit such an interpretation. Pre-reform tax rates were not inefficiently high.

Efficiency rationales for the changes in marriage penalties and bonuses. Figure 7 plots the revenue functions for singles and couples in pre-reform years. Note that, in those figures, if there is an inefficiency, then there is a cutoff value of income so that marginal tax rates are inefficiently high for incomes above the cutoff.

[23]Note that the ratio $\frac{T'(y)}{1-T'(y)}$ is an increasing function of $T'(y)$. Expressing upper bounds using this ratio is convenient: when there are only behavioral responses at the intensive margin, the upper bound is simply the product of the income distribution's inverse hazard rate and an inverse elasticities term, see Proposition 6. Appendix D.4 contains a more detailed discussion of how the conditions $\mathcal{R}_s(y) = 0$ and $\mathcal{R}_m(y) = 0$ translate into upper bounds for $\frac{T'_s(y)}{1-T'_s(y)}$ and $\frac{T'_m(y)}{1-T'_m(y)}$.

Figure 5: Revenue functions

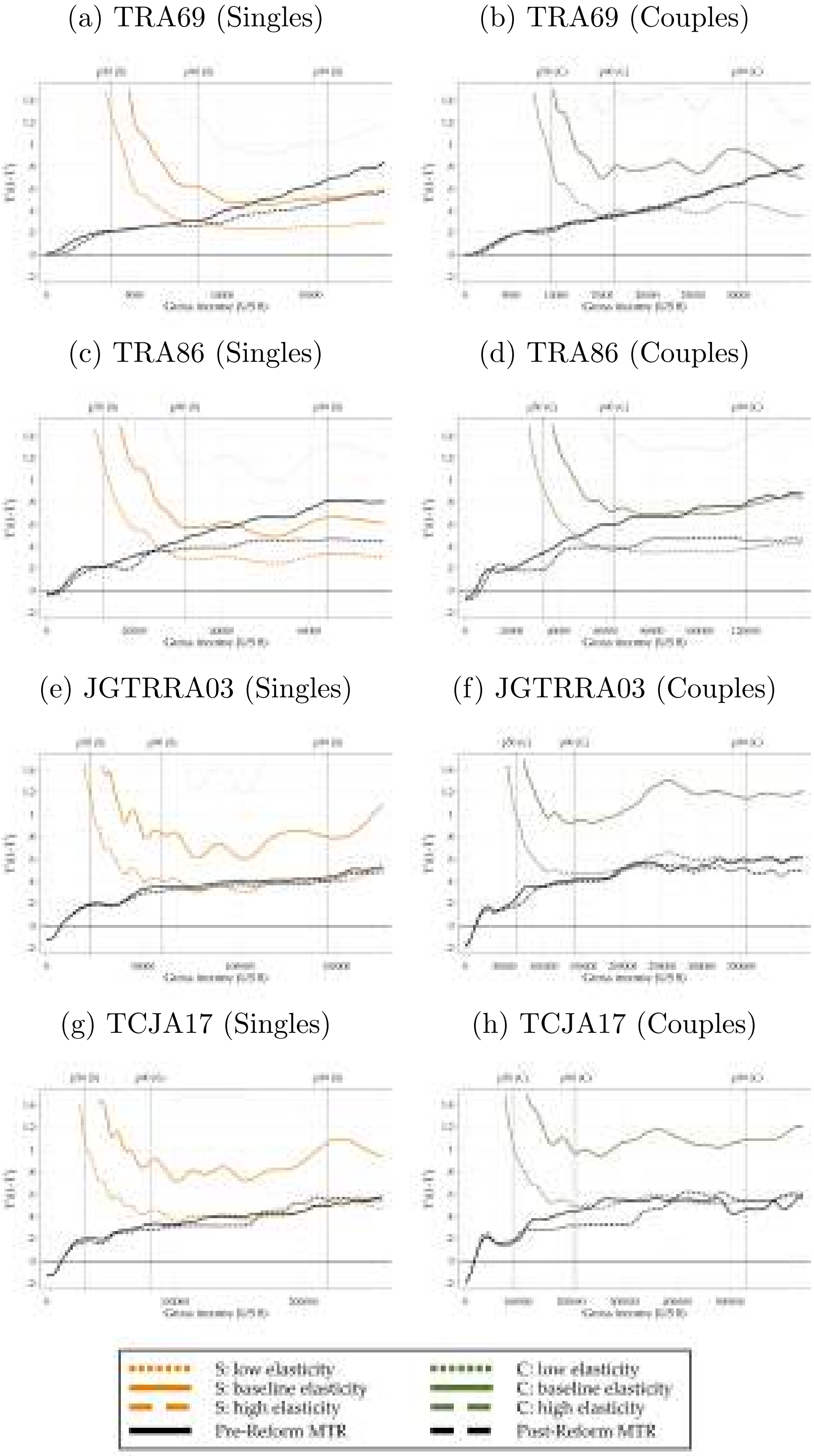


Notes: This figure shows revenue functions $\mathcal{R}$ in the respective pre-reform year. The revenue functions are shown separately for singles ($\mathcal{R}_s$, orange line) and married couples ($\mathcal{R}_m$, green line). All revenue functions are based on behavioral responses at the intensive and extensive margin using low (dotted line), baseline (solid line), and high (dashed line) elasticity scenarios described in Table 1. Figures for all reforms are displayed in Appendix Figure E.32. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.50 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

We now discuss whether marriage penalties and bonuses might have changed for efficiency reasons. We approach this as follows: Let $\hat{y}_s$ and $\hat{y}_m$ be the cutoffs for singles and couples, respectively. Let $\sigma : y_m \mapsto \sigma(y_m)$ be the pre-reform splitting function and let g be the inverse of the function $y_m \mapsto \frac{y_m}{\sigma(y_m)}$. Thus, given an income level for singles y_s, $g(y_s)$ is the "corresponding" income level for married couples: When marginal tax rates change for singles with an income close to y_s and the splitting function is fixed, then there also has to be a change in marginal tax rates for married couples with a joint income close to $g(y_s)$.

Now, addressing inefficiencies in T_s requires lowering marginal tax rates for singles with an income above $\hat{y}_s$. If the splitting function is fixed, the consequence will be that marginal tax rates are lowered for all married couples with an income exceeding $g(\hat{y}_s)$. How close $g(\hat{y}_s)$ comes to $\hat{y}_m$ is our measure of how easy it is to realize Pareto improvements subject to a fixed splitting function: When the two coincide, any Pareto improvement of T_s

Figure 6: Upper Pareto bounds



Notes: This figure shows the upper Pareto bounds UB (see Appendix D.4 and especially equations D.57–D.60) in the respective pre-reform year and the ratio $\frac{T'}{1-T'}$ of the effective marginal tax rates before (solid black line) and after (dashed black line) the reform. The bounds are shown separately for singles (orange lines) and couples (green lines). All upper bounds are conditional on extensive margin responses and displayed for low (dotted line), baseline (solid line), and high (dashed line) intensive margin elasticity scenarios described in Table 1. Figures for all reforms are displayed in Appendix Figure E.33 and E.34. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.51 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

implies a Pareto improvement of T_m, and vice versa. When $g(\hat{y}_s)$ exceeds $\hat{y}_m$, any Pareto improvement of T_s implies a Pareto improvement of T_m, but the converse implication does not hold.[24] Analogously, when $\hat{y}_m$ exceeds $g(\hat{y}_s)$, any Pareto improvement of T_m implies a Pareto improvement of T_s, but the converse implication does not hold.

With our baseline assumptions about the behavioral responses to taxation, Figure 7 presents empirical examples for some of these possibilities. In the year preceding TRA69, a cut of marginal tax rates for singles with an annual income above \$12,000 was self-financing. By contrast, the corresponding tax cut for couples at around \$24,000 was not self-financing. Thus, there was an efficiency rationale for tax cuts that applied only to singles, with the implication that the splitting function shifted downwards. The actual reform had these properties (see Figure 3a and 4a).

For TRA86, $g(\hat{y}_s)$ and $\hat{y}_m$ are very close, and there were inefficiencies both in the tax schedule for singles and in the one for couples (see Figure 7b). Thus, there was an efficiency rationale for tax cuts, but not for changes of the splitting function. The reform indeed involved such tax cuts and no changes of the splitting function (see Figures 3b and 4b).

For both JGTRRA03 and TCJA17, there was neither an inefficiency in the schedule for singles nor in the schedules for couples. Hence, there was neither an efficiency rationale for tax cuts nor for changes of the splitting function. The reforms, however, involved tax cuts and changes of the splitting function (see Figures 3c, 3d and 4c, 4d).

5.2 Majority support

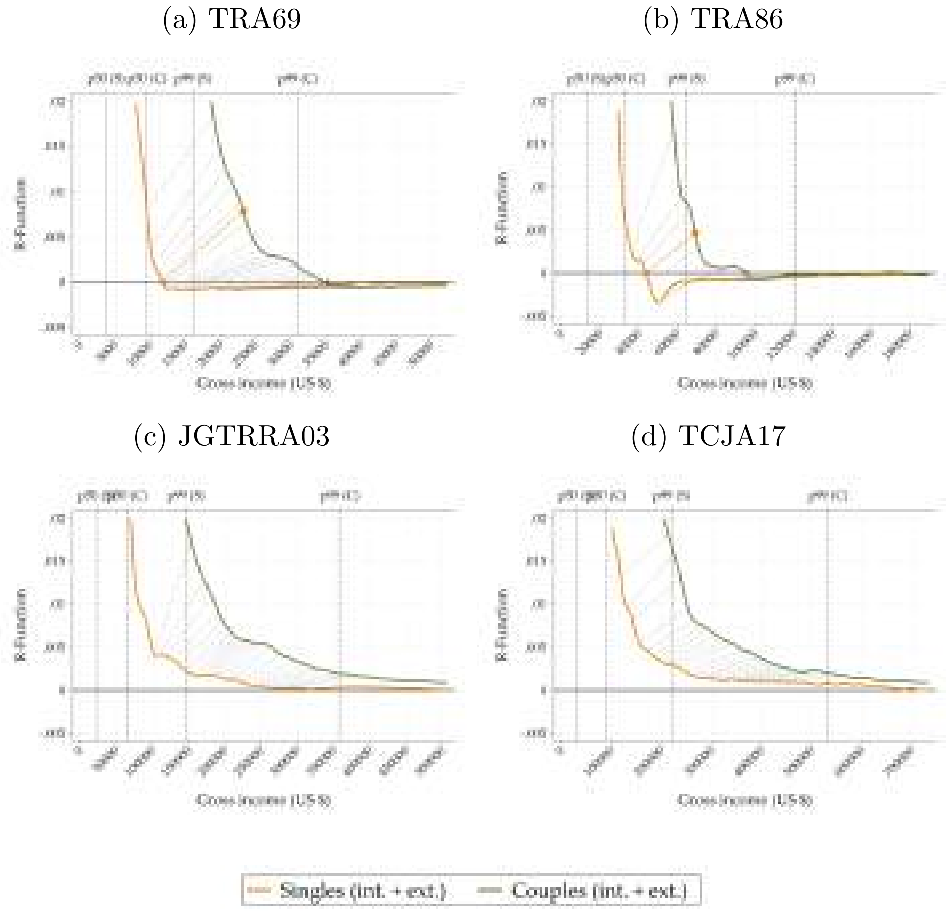
Figure 8 documents, respectively, the shares of singles and couples who benefited from various tax reforms.[25] Additionally, the Figure illustrates the positions of the reform winners and losers in the income distribution. Broadly, the reforms under consideration are *monotonic tax cuts*, i.e. the richer the tax unit the larger the reduction of the tax burden. Consequently, for any such reform, there are cutoff values of $\hat{y}_s$ for singles and $\hat{y}_m$ for married couples, so that tax units with an income below the cutoff are reform losers and tax units with an income above the cutoff are reform winners.

Any such tax reform has majority support among singles if $\hat{y}_s$ is below the median y_s^M in the income distribution of singles. Analogously, majority support among couples requires that $\hat{y}_m$ is below the median y_m^M in the income distribution of married couples. As documented above, the share of individuals living in married couples was falling over the years. In 1969, having a bare majority among individuals living in married couples

[24] Lowering marginal tax rates for married couples with an income between $\hat{y}_m$ and $g(\hat{y}_s)$ and is a self-financing tax cut. With a fixed splitting function, this requires to lower marginal tax rates for singles with an income below y_s. This tax cut for singles is not self-financing. It comes with a loss of tax revenue.

[25] The conceptual framework developed in Section 3 focussed on "small" reforms, i.e. reforms that stay in a vicinity of the status quo. In part C of the Appendix we extend this analysis. In particular, we move from an analysis of marginal effects to an analysis of discrete changes of the tax system. The analyses in the current section 5.2 and also in the subsequent section 5.3 on welfare implications employ this methodology.

Figure 7: Relationship between revenue functions of singles and couples with fixed splitting function σ

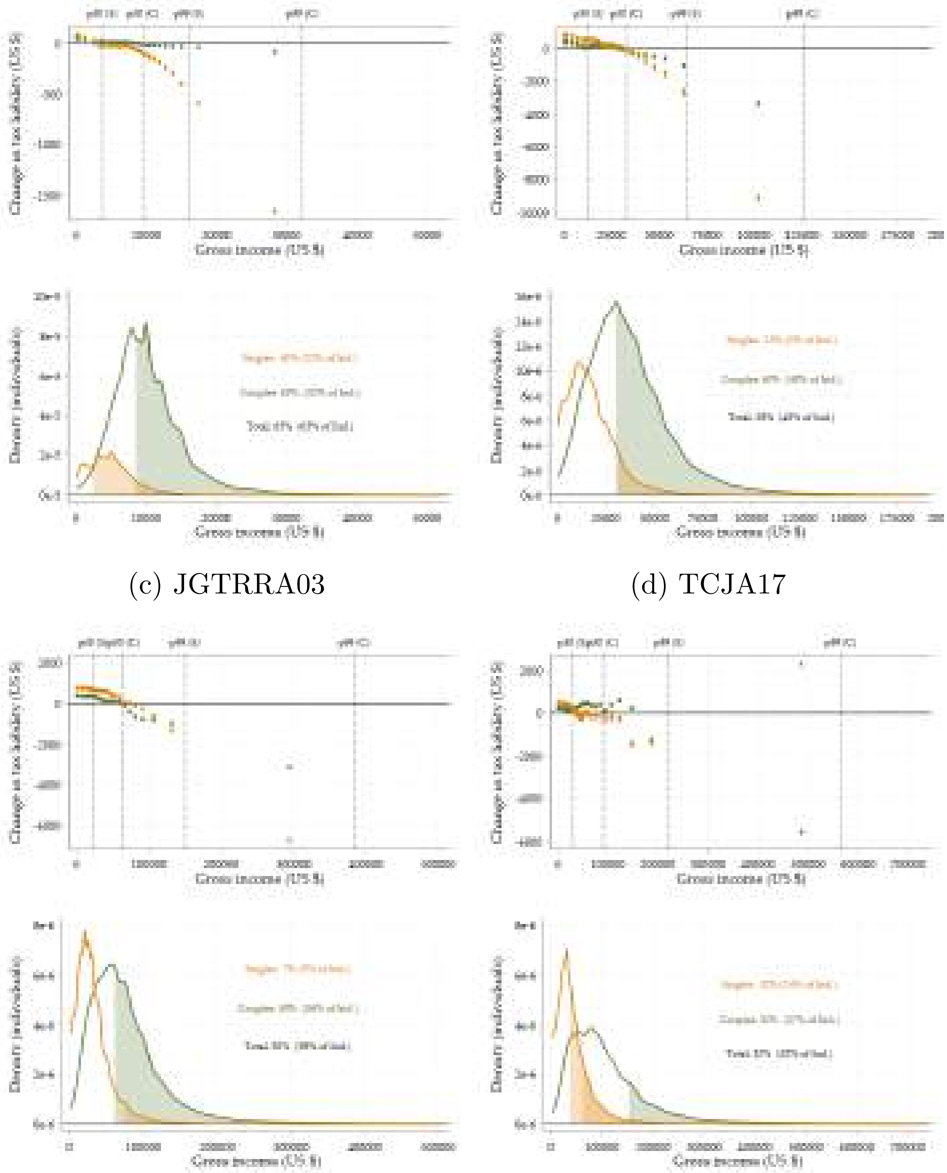


Notes: This figure shows revenue functions $\mathcal{R}$ in the respective pre-reform year. The revenue functions are shown separately for singles ($\mathcal{R}_s$, orange line) and married couples ($\mathcal{R}_m$, green line). The dashed lines that connect the revenue function for singles and couples indicate the pre-reform relationship of tax schedules via the empirical splitting function σ. The orange and green cross on the horizontal axis indicate the income level at which the revenue functions for singles and for couples cross the zero line. All revenue functions are based on behavioral responses at the intensive and extensive margin using assumptions from the baseline elasticity scenario (see Table 1). Figures for all reforms are displayed in Appendix Figure E.35. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.52 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

($\hat{y}_m = y_m^M$) implied forty percent support in the population at large. In 2017, by contrast, it implied only 28 percent support in the electorate.

Table E.5 in Appendix E shows support among singles, couples and in the overall population under alternative assumptions about the behavioral responses. Whether the reforms had majority support in any one of these groups is independent of the assumptions made, with only one exception: TRA86 gets a majority support in the population at large only under the assumption of a high intensive margin elasticity. Otherwise, TRA69 had majority support among singles and among married couples, hence in the population at large. TRA86 and JGTRRA03 had majority support among couples, but not among singles. JGTRRA03 lacks majority support in the population at large, even under the assumption of a high intensive margin elasticity. Finally, TCJA17 neither had majority support among singles nor among couples.[26]

Figure 8: Political feasibility



(a) TRA69 (b) TRA86

(c) JGTRRA03 (d) TCJA17

Notes: This figure shows the change in the tax liability (upper panel) and winners of the reform (lower panel) for singles (orange shaded area) and couples (green shaded area). The change in tax liability represents the average change in tax liability per capita (PC) for each of 25 gross income quantiles. We account for behavioral responses at both the intensive margin (baseline elasticity scenario from Table 1) and the extensive margin. It is assumed that tax revenues are rebated lump sum at the tax unit level. The figure also displays the share of singles, couples, and all tax units that benefit from a reform under the baseline elasticity scenario. The corresponding shares of individuals is displayed in brackets. Figures for all reforms are displayed in Appendix Figure E.36. Appendix Figure E.37 shows an alternative analysis based on lump-sum adjustments at the individual level. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.53 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

[26]Figure E.38 in the Appendix contains a robustness check for the analysis in this section. It assumes that tax revenue is rebated lump sum at the individual level, rather than at the tax unit level. This leads to some changes in the tax units that we identify as reform beneficiaries or reform losers. Aggregate support does not change qualitatively.

5.3 Welfare implications

Table 2 contains a description of the welfare measures that we consider. Our focus is on a comparison of Affirmative Feminist and Rawlsian social welfare functions. An Affirmative Feminist welfare function puts large weights on single women and on couples with a high income share of the secondary earner. A Rawlsian welfare function concentrates weights at the bottom of the income distribution.

Table 2: Welfare weights for reforms *in* the system

Welfare weights	Singles	Couples
Equal	$\forall y_s,\ g_s(y_s) = 1$	$\forall y_m,\ g_m(y_m) = 2$
Singles Only	$\forall y_s,\ g_s(y_s) = 1$	$\forall y_m,\ g_m(y_m) = 0$
Single Women Only	$\forall y_s,\ g_s(y_s) = \begin{cases} 1, & \text{for } female \\ 0, & \text{for } male \end{cases}$	$\forall y_m,\ g_m(y_m) = 0$
Couples Only	$\forall y_s,\ g_s(y_s) = 0$	$\forall y_m,\ g_m(y_m) = 2$
Decreasing	$\forall y_s,\ g_s(y_s) = y_s^{-a}$	$\forall y_m,\ g_m(y_m) = 2\left(\frac{y_m}{2}\right)^{-a}$
Rawlsian	$\forall y_s,\ g_s(y_s) = \begin{cases} 1, & \text{for } y_s \leq \text{P} \\ 0, & \text{for } y_s \geq \text{P} \end{cases}$	$\forall y_m,\ g_m(y_m) = \begin{cases} 2, & \text{for } \frac{y_m}{2} \leq \text{P} \\ 0, & \text{for } \frac{y_m}{2} \geq \text{P} \end{cases}$
Rawlsian (Single Only)	$\forall y_s,\ g_s(y_s) = \begin{cases} 1, & \text{for } y_s \leq \text{P} \\ 0, & \text{for } y_s \geq \text{P} \end{cases}$	$\forall y_m,\ g_m(y_m) = 0$
Rawlsian (Single Women Only)	$\forall y_s,\ g_s(y_s) = \begin{cases} 1, & \text{for } y_s \leq \text{P and } female \\ 0, & \text{for } y_s \geq \text{P or } male \end{cases}$	$\forall y_m,\ g_m(y_m) = 0$
Rawlsian (Couples Only)	$\forall y_s,\ g_s(y_s) = 0$	$\forall y_m,\ g_m(y_m) = \begin{cases} 2, & \text{for } \frac{y_m}{2} \leq \text{P} \\ 0, & \text{for } \frac{y_m}{2} \geq \text{P} \end{cases}$
Affirmative Action Feminist	$\forall y_s,\ g_s(y_s) = \begin{cases} 1, & \text{for } female \\ 0, & \text{for } male \end{cases}$	$\forall y_m,\ g_m(y_m) = \frac{y_{woman}}{y_{man}+y_{woman}}$
Rawlsian Affirmative Action Feminist	$\forall y_s,\ g_s(y_s) = \begin{cases} 1, & \text{for female and } y_s \leq \text{P} \\ 0, & \text{for male or } y_s > \text{P} \end{cases}$	$\forall y_m,\ g_m(y_m) = \begin{cases} \frac{y_{woman}}{y_{man}+y_{woman}}, & \text{for } \frac{y_m}{2} \leq \text{P} \\ 0, & \text{for } \frac{y_m}{2} > \text{P} \end{cases}$

Notes: This table shows different specifications of welfare weights to evaluate reforms *in* the system. The sum of weights over the whole population is normalized to 1. P refers to specific percentiles of the per capita income distribution and the parameter a is strictly positive.

The welfare function "Couples" assigns equal weights to all couples, and none to singles. It is meant to be descriptive, not to be normatively appealing. Couples' welfare goes up if and only if the social surplus among couples (total output minus total effort costs) goes up. Likewise, the welfare function "Singles" assigns equal weights to all singles, and none to couples, whereas the welfare function "Equal" assigns equal weights to all individuals. These welfare functions are all maximized by a *laissez-faire* outcome without distortionary taxation in the respective group. Thus, a positive evaluation by such a welfare function indicates that tax distortions have gone down, and a negative evaluation indicates that the tax system has become more distortionary within the considered group.

We also include a welfare function with weights that are a decreasing function of (per capita) income and one that we refer to as "Rawlsian Affirmative Feminist". The latter concentrates weights at the bottom of the income distribution. Weights for couples at the bottom are, moreover, increasing in the income share of the secondary earner.

Table 3 contains an evaluation of tax reforms that have in common that they reduced distortions in the tax system overall: the "Equal" welfare function approves them.[27] It

[27] A welfare evaluation of all major tax reforms since the 1960s, including for a more granular set of welfare weights, can be found in Appendix E.

also shows that these reforms are unambiguously rejected by Rawlsian welfare functions. More broadly, with inequality aversion, the loss of tax revenue trumps the effect that some taxpayers benefit from a tax cut. Possibly, such reform are approved, however, by an Affirmative Feminist social welfare measure. Reducing distortions in the system may be desirable from the perspective of secondary earners who face high marginal tax rates under joint taxation. However, since the gains from the reduction in the distortion among dual earner couples needs to outweigh the negative effects on single women (about which the Affirmative Action Feminist also cares a lot), strong behavioral responses are needed for an approval of the Affirmative Action Feminist.

The possibility of a tension between the welfare of "the poor" and the welfare of "working women" is a main theme also in the subsequent section that looks at reforms *of* the system.

Table 3: Welfare implications of past reforms

Reform	Welfare Weights	Int. Margin			Ext. + Int. Margin		
		Low	Baseline	High	Low	Baseline	High
	Equal	>	>	>	>	>	>
	Singles Only	>	>	>	>	>	>
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
TRA69	Rawlsian, p5	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	>	<	<	>
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	<
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
TRA86	Rawlsian, p5	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	>	<	<	>
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	<
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
JGTRRA03	Rawlsian, p5	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	<
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
TCJA17	Rawlsian, p5	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	>	>	>	>	>
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<

Notes: This table shows the welfare implications under different welfare weights for past reforms of the US federal income tax under different assumptions regarding behavioral responses (extensive + intensive margin, intensive margin only), and different scenarios for the intensive margin elasticity (see Table 1). Lump sum adjustments have been implemented on a per-tax-unit basis. Welfare implications for all reforms are shown in Appendix Table E.7-E.9. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Table G.11 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

6 Reforms *of* the system

We now turn from historical reforms *in* the system to hypothetical reforms *of* the system. The former altered the tax functions for couples and singles without touching the principle that the tax base for married couples is the sum of their incomes. The latter break with this principle and raise the marginal tax rates on primary earnings and/or lower the marginal tax rates on secondary earnings.

6.1 Pareto-improving reforms towards individual taxation

We use the revenue functions $\mathcal{R}_1 : y_1 \mapsto \mathcal{R}_1(y_1)$ and $\mathcal{R}_2 : y_2 \mapsto \mathcal{R}_2(y_2)$ to see whether changes of marginal tax rates just for primary earners or just for secondary earners would have been Pareto-improving. By Proposition 3, a status quo tax system is Pareto-efficient if and only if the revenue functions $\mathcal{R}_1$ and $\mathcal{R}_2$ are both non-increasing, bounded from below by 0 and bounded from above by 1.

Figure 9 plots the revenue functions in different years. A robust finding is that marginal tax rates on secondary earners in the upper deciles of the income distribution are inefficiently high. In some years, e.g. prior to the Reagan tax cuts in the 1980s, marginal tax rates are also too high for primary earners at the top of the income distribution. In 2019, by contrast, the taxation of primary earners does not give rise to inefficiencies, but the taxation of secondary earners does.

6.2 Inefficiency of joint taxation

By Corollary 1, joint taxation is inefficient if two conditions hold: First, the revenue function $\mathcal{R}_m : y_m \mapsto \mathcal{R}_m(y_m)$ lies throughout between zero and one and is non-increasing. In this case, there is no Pareto-improving reform of the tax function for married couples that stays *in* the system. Second, there are Pareto-improving reforms towards individual taxation.

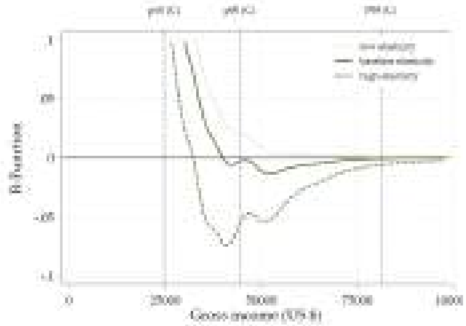
The plots of the revenue functions $\mathcal{R}_m$ and $\mathcal{R}_2 : y_2 \mapsto \mathcal{R}_2(y_2)$ in Figure 9 show that, in the 1980s, at the eve of the Reagan tax cuts, there existed Pareto-improving reforms both *in* the system and *of* the system. At the top of the income distribution marginal tax rates were inefficiently high across the board. Lowering them just for secondary earners would have been Pareto-improving. But lowering them simultaneously for primary and secondary earners would have been Pareto-improving too. In 2019, by contrast, there was no Pareto-improving reform *in* the system, while marginal tax rates on secondary earners were inefficiently high so that there was a Pareto-improving reform *of* the system. Thus, in the recent past, joint taxation was a source of inefficiency.

6.3 Revenue neutral reforms towards individual taxation

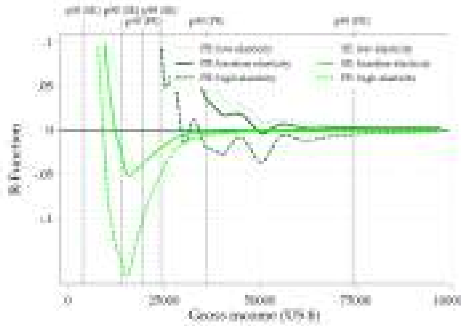
We are now considering revenue-neutral reforms towards individual taxation. Specifically, we check whether the conditions for political feasibility and welfare improvements in Proposition

Figure 9: Reforms *in* the system versus reforms *of* the system

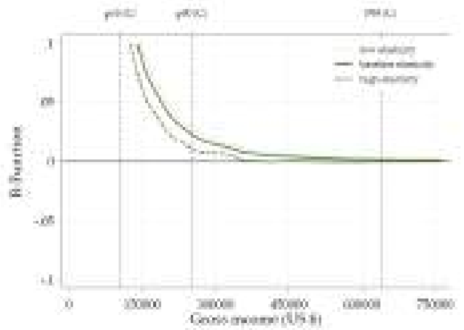
(a) Reforms *in* the system (1980)



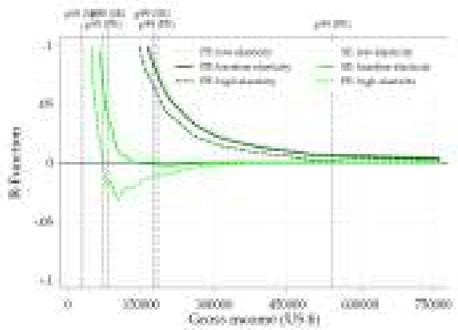
(b) Reforms *of* the system (1980)



(c) Reforms *in* the system (2019)



(d) Reforms *of* the system (2019)



Notes: This figure shows for 1980 and 2019 the revenue functions for married couples as a whole (reforms *in* the system, left panel) and separately for primary and secondary earners (reforms *of* the system, right panel). The revenue function accounts for intensive and extensive margin behavioral responses. Intensive margin responses are differentiated by baseline (solid line), low (dotted line), and high (dashed line) elasticity scenarios (see Table 1). The reform potential *in* the system and *of* the system for other years is shown in Appendix Figures E.40 and F.41), respectively. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.54 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

5 have been satisfied empirically.

Political feasibility. Figure 10 illustrates how the population shares of reform winners and losers have changed over time. In these graphs, winners from a reform towards individual taxation are those couples, whose primary earnings are below the (green) line. In 1961, only a fifth of all married couples would have benefited from the reform. Couples with high secondary earnings were rare and hence a reform towards individual taxation would not have been politically feasible.[28] The relative size of primary and secondary earners' responses to taxation governs the slope of the green line. Larger elasticities of primary earners tilt the lines to the right and thus tend to decrease the number or reform winners.

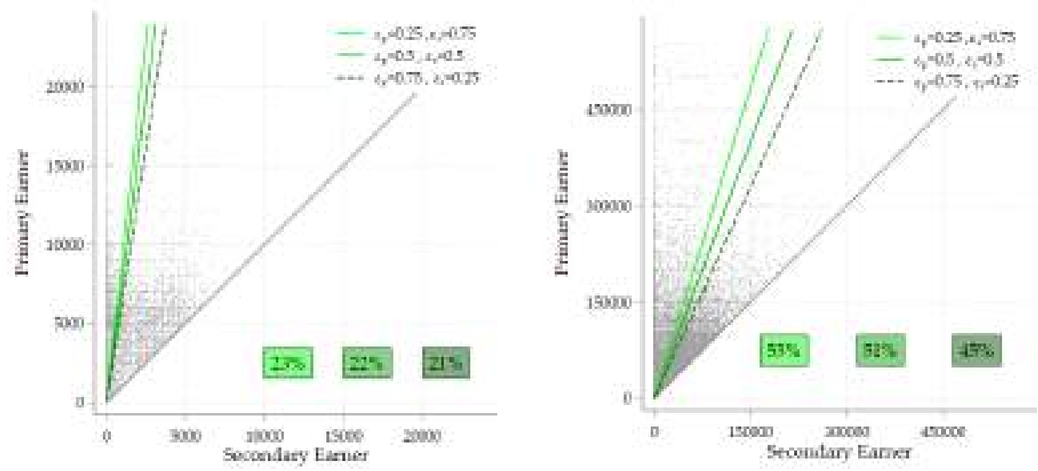
Figure 11 shows that the support for a revenue neutral reform towards individual taxation has increased over time. Under our baseline assumptions about behavioral responses to

[28]In 1961, around sixty percent of couples had no secondary earnings at all. These couples lie exactly on the vertical axis of Figure 10 and represent a large fraction of the losers from the reform.

taxation, support has increased from around 23 percent in the 1960s to 55 percent as of today.[29] Even under the empirically implausible assumption of a high elasticity of primary earnings to taxation, the reform is with 45 percent close to the majority threshold. Thus, while reforms towards individual taxation have not been politically feasible in the past, they will become so if this trend continues.

Figure 10: Reform towards individual taxation: Political economy

(a) 1961 (b) 2019

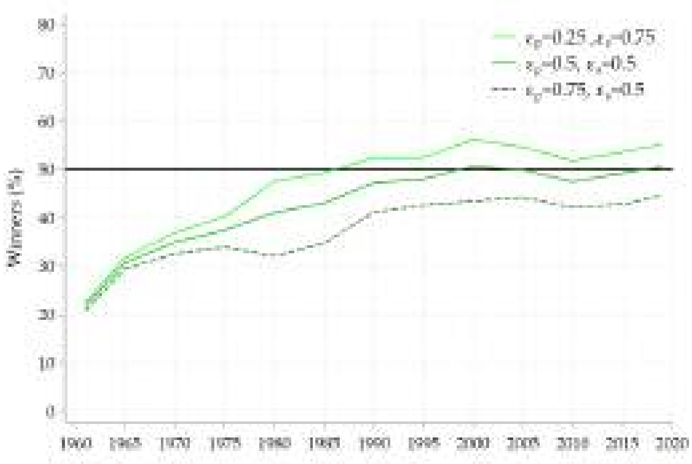


Notes: This figure shows for 1961 and 2019, how the political support for a revenue neutral reform towards individual taxation among married couples varies with behavioral responses to taxation. Each grey dot represents a couple in the data with specific income of the primary (secondary) earner displayed on the vertical (horizontal) axis. Couples that lie below (above) the green line are winners (losers) from a reform towards individual taxation. The light green solid line refers to the baseline elasticity scenario of Table 1 in which the primary (resp. secondary) earner has an elasticity of 0.25 (resp. 0.75). For illustrative purposes, the dark green solid line refers to the case where primary and secondary earners' elasticities coincide (0.5) while the dashed green line shows the results under the assumption that the primary earner's elasticity (0.75) is higher than for the secondary earner (0.25). All results are displayed including extensive margin responses. The figure also displays the respective share of couples than benefits from a reform towards individual taxation. Note that couples with no secondary earnings lie exactly on the vertical axis and constitute around 60 percent in 1961 and 25 percent in 2019. Figures for more years are displayed in Appendix Figure F.42. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.55 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

The welfare of "the poor" and the welfare of "working women". By Proposition 5, a generic social welfare function approves a revenue-neutral reform towards individual taxation if $Y_1^g < r\, Y_2^g$. With the reverse inequality it is welfare-damaging. Figure 12 shows results for various social welfare functions and for different assumptions about behavioral responses. If welfare-evaluation dots locate above (below) the respective green line, the

[29]As of 2019, married couples represent 37 (54) percent of all tax units (individuals). Single tax units are not affected by the reform towards individual taxation. At the individual level, this implies that around 30 percent of individuals would benefit from the reform, 24 percent would be made worse off, and 46 percent would be unaffected.

Figure 11: Reform towards individual taxation: Share of winners over time



Notes: This figure shows how the political support for a revenue neutral reform towards individual taxation among married couples evolved over time. All results are displayed including extensive margin responses. The light green solid line illustrates the result under the baseline elasticity scenario of Table 1 in which the primary (resp. secondary) earner has an elasticity of 0.25 (resp. 0.75). For illustrative purposes, the dark green solid line refers to the case where primary and secondary earners' elasticities coincide (0.5) while the dashed green line shows the results under the assumption that the primary earner's elasticity (0.75) is higher than for the secondary earner (0.25). All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.56 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

reform is considered welfare decreasing (welfare improving).

A striking feature is that a Rawlsian and an Affirmative Feminist social welfare function are on different sides of the line that separates winners and losers. The reason is that among low-income couples the share of primary earnings tends to be high (see Figure 13). Therefore, only few low-income couples benefit from lower taxes on secondary earnings, and all are harmed by the higher taxes on primary earnings.

Overcoming the tension between the welfare of "the poor" and the welfare of "working women". There is a way to get the Rawlsian and the Affirmative Feminist social welfare function on the same side. Consider an alternative revenue-neutral reform so that (i) marginal tax rates are lowered for all secondary earners, and (ii) marginal tax rates are increased only for primary earners from the upper half of the income distribution. Formally,

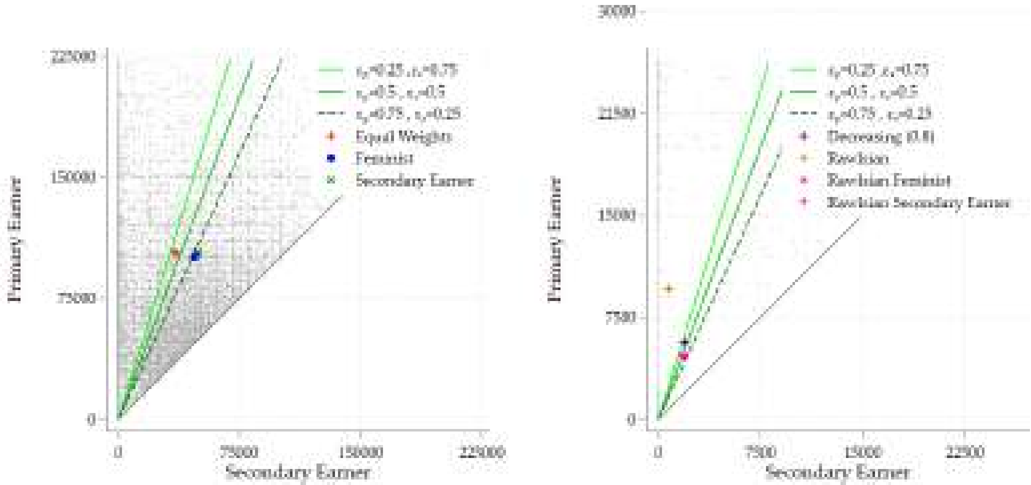
$$h_m(y_1, y_2) \quad = \quad \tau_1 \; h_1(y_1, y_2) + \tau_2 \; y_2 \; , \quad \text{with} \quad \tau_1 > 0 \; , \tau_2 < 0 \; , \quad \text{and}$$

$$h_1(y_1, y_2) \quad = \quad \begin{cases} 0, & \text{if} \quad y_1 + y_2 \leq y_m^M \; , \\ y_1, & \text{if} \quad y_1 + y_2 > y_m^M \; , \end{cases}$$

where y_m^M is the median of the income distribution amongst married couples. By construction, Rawlsian welfare will not decrease following such a reform. Poor couples with positive secondary earnings benefit, and poor couples without secondary earnings are not harmed.

Figure 12: Reform towards individual taxation: Welfare (2019)

(a) Middle of distribution (b) Bottom of distribution



Notes: This figure shows for the current tax system, how a reform towards individual taxation is evaluated from a welfare perspective under different exogenous welfare weights. Figure 12a (12b) displays welfare implications for welfare weights centered in the middle (bottom) of the income distribution. Each gray dot represents a couple in the data with specific income of the primary (secondary) earner displayed on the vertical (horizontal) axis. Couples that lie below (above) the green line are winners (losers) from a reform towards individual taxation. Welfare evaluations with different welfare weights are plotted as a colored dot the location of which is defined via the average welfare-weighted primary earnings (vertical axis) and the average welfare-weighted secondary earnings (horizontal axis). Welfare evaluations below (above) the green line indicate that the reform is welfare increasing (decreasing). The light green solid line illustrates the result under the baseline elasticity scenario of Table 1 in which the primary (secondary) earner has an elasticity of 0.25 (0.75). For illustrative purposes, the dark green solid line refers to the case where primary and secondary earners' elasticities coincide (0.5) while the dashed green line shows the results under the assumption that the primary earner's elasticity (0.75) is higher than for the secondary earner (0.25). All results are displayed including extensive margin responses. For detailed information on welfare weight specification, see Table F.10. The specific percentile used for Rawlsian weights is P5 and $a = 0.8$ for decreasing welfare weights. Illustrations for other years are shown in Appendix Figures F.43 and F.44. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.57 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

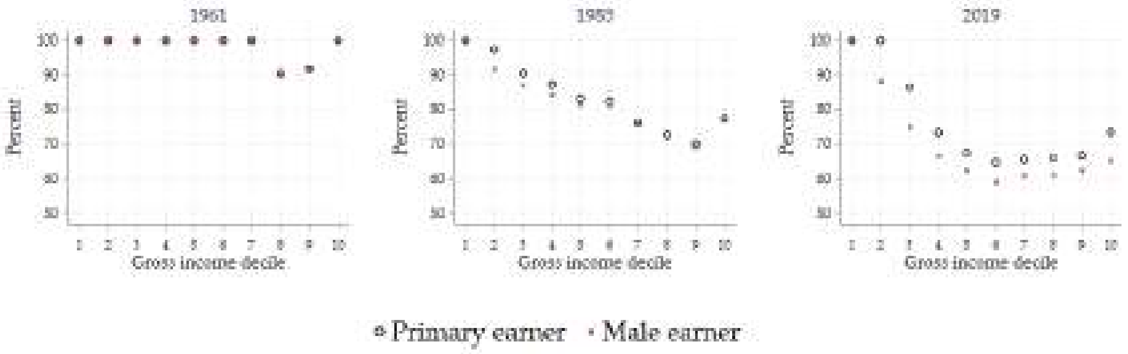
The reform does not collect as much revenue as one that taxes all primary earnings at a higher rate, with the implication that the tax rates on secondary earnings cannot be reduced as much. As Figure 14 shows, Affirmative Feminist welfare still goes up under such a reform. The reform is, moreover, politically feasible. There is one group that is harmed: couples from the upper part of the income distribution with low secondary earnings. The complementary group of reform beneficiaries accounts for more than 70 percent of the population.

7 Concluding remarks

Should one move away from the traditional tax treatment of married couples with its detrimental impact on the earnings incentives of secondary earners who mostly are women? The main results in this paper shed light on this question.

First, we find that, in the US, marginal tax rates on secondary earnings have been

Figure 13: Median share of primary and male earner



Notes: This figure shows the median income share of the primary earner in the couple by income decile. Earnings shares are computed on the basis of non-negative wage, business and farm income. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.58 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

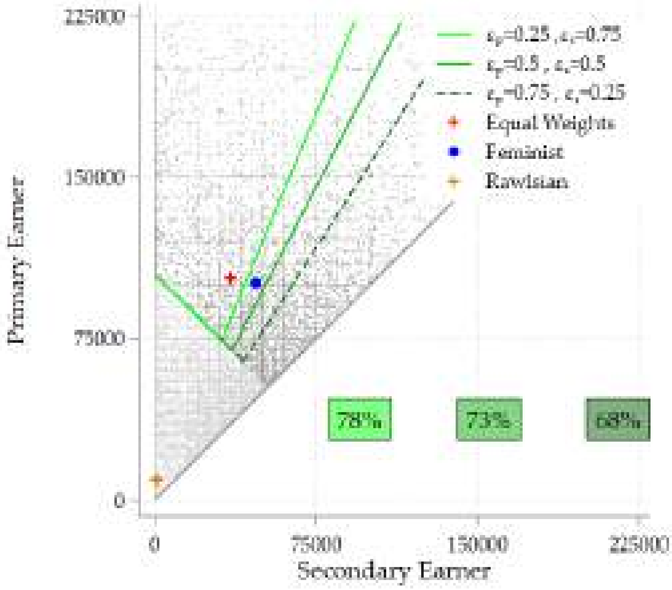
inefficiently high over decades: Lowering marginal tax rates on secondary earnings would have been a self-financing tax reform, one that has no losers and only winners. However, there were periods, such as the mid-1980s, where marginal tax rates were too high also for primary earners. A reform *in* the system that lowered marginal tax rates for high-income couples would have been self-financing too. In the recent past, however, we find that the scope for Pareto improvements *in* the system has been exhausted. The only way to reap the benefits from lower taxes on secondary earnings, therefore, is a reform *of* the system.

Second, our welfare analyses – both for US reforms *in* the system that were realised and for hypothetical reforms *of* the system that did not take place – show the possibility of a conflict between the interests of "the poor" and the interests of "working women". Reforms, mostly by Republican administrations, that lowered tax rates implied a loss of tax revenue and are rejected by a Rawlsian social welfare function. At the same time, they reduced distortions in the system, hence also the distortions faced by secondary earners. Possibly, such reforms are approved by an Affirmative Feminist social welfare function, one that has welfare weights that are increasing in the income share of the secondary earner.

Hypothetical reforms towards individual taxation – i.e. reforms that raise marginal tax rates on primary earnings and lower marginal tax rates on secondary earnings – are also rejected by Rawlsian social welfare functions. Among "the poor", the share of single-earner couples is particularly high. These couples are made worse off by such a reform. The beneficiaries are couples with secondary earnings close to primary earnings. Thus, such a reform increases an Affirmative Feminist welfare measure.

We also look at reforms towards individual taxation from a political economy perspective. Since the 1960s, both the share of singles relative to individuals living in married couples and the share of dual-earner couples relative to single-earner couples have been increasing. Consequently, the share of individuals benefitting from marriage bonuses has

Figure 14: Reconciling Rawlsian and Feminist welfare (2019)



Notes: This figure shows for the current tax system, how a partial reform towards individual taxation is evaluated from a welfare perspective under different exogenous welfare weights. A partial reform lowers marginal tax rates for all secondary earners but raises marginal tax rates only for primary earners above the median of the couple income distribution. Each grey dot represents a couple in the data with specific income of the primary (resp. secondary) earner displayed on the vertical (resp. horizontal) axis. Couples that lie below (above) the green line are winners (losers) from the reform. Welfare evaluations with different welfare weights are plotted as a colored dot the location of which is defined via the average welfare-weighted primary earnings (vertical axis) and the average welfare-weighted secondary earnings (horizontal axis). Welfare evaluations below (above) the green line indicate that the reform is welfare increasing (decreasing). The light green solid line illustrates the result under the baseline elasticity scenario of Table 1 in which the primary (secondary) earner has an elasticity of 0.25 (0.75). For illustrative purposes, the dark green solid line refers to the case where primary and secondary earners' elasticities coincide (0.5) while the dashed green line shows the results under the assumption that the primary earner's elasticity (0.75) is higher than for the secondary earner (0.25). All results are displayed including extensive margin responses. For detailed information on welfare weight specification, see Table F.10. The specific percentile used for Rawlsian weights is P5. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. Figure G.59 replicates this figure for the full adult population.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

been decreasing. We find that in the 1960s only about a fifth of all individuals would have benefitted from a reform towards individual taxation. In the recent past, this number has risen to fifty percent. Thus, at the time of writing, reforms towards individual taxation are at the brink of becoming politically feasible in the US – in the sense that a majority of individuals would benefit from such a reform.

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A Bargaining in married couples

Cooperative bargaining in a married couple selects a point on the couples' Pareto frontier. Any such point maximizes a social welfare function

$$\gamma_1 \; u_1(c_1, y_1, \theta_1) + \gamma_2 \; u_2(c_2, y_2, \theta_2) \; ,$$

where the weights γ_1 and $\gamma_2 = 1 - \gamma_1$ reflect the spouses' bargaining powers, and $c_1 \leq c_m$ and $c_2 \leq c_m$ are, respectively, the part of household consumption from which the spouses derive consumption utility. Alternative assumptions are conceivable here. If household consumption is a pure public good, then $c_1 = c_2 = c_m$. If consumption is a pure private good, then $c_1 + c_2 = c_m$. In the following, we will characterize the bargaining solution for these two polar cases.

Individual consumption as a private good. In this, case the married couples' optimization problem is to choose y_1, y_2, c_1 and c_2 to maximize

$$\gamma_1 \; u_1(c_1, y_1, \theta_1) + \gamma_2 \; u_2(c_2, y_2, \theta_2) \; ,$$

subject to $c_m \leq y_1 + y_2 - T_m(y_1 + y_2)$ and $c_1 + c_2 = c_m$. We can decompose this into an inner problem, the choice of c_1 and c_2 given y_1 and y_2 and hence c_m, and an outer problem, the choice of y_1 and y_2.

The inner problem's solution is characterized by two equations, the budget constraint $c_1 + c_2 = c_m$ and the first order condition

$$\gamma_1 \frac{\partial u_1(\cdot)}{\partial c_1} = \gamma_2 \frac{\partial u_2(\cdot)}{\partial c_2} \; .$$

The solution (c_1^*, c_2^*) depends in a parametric way on the earnings levels, the disposable income, the spouses' characteristics and the bargaining weights. Thus,

$$c_1^* = \alpha_1(c_m, y_1, y_2, \theta_m, \gamma_m)$$

and

$$c_2^* = \alpha_2(c_m, y_1, y_2, \theta_m, \gamma_m) \; ,$$

where we use the shorthand $\theta_m = (\theta_1, \theta_2)$, and $\gamma_m = (\gamma_1, \gamma_2)$. The outer problem then is to choose y_1, y_2 so as to maximize

$$\gamma_1 \; u_1(\alpha_1(\cdot), y_1, \theta_1) + \gamma_2 \; u_2(\alpha_2(\cdot), y_2, \theta_2) \; ,$$

subject to $c_m = y_1 + y_2 - T_m(y_1 + y_2)$.

Household consumption as a public good. In this case, the inner problem has a trivial solution: For all $c_m, y_1, y_2, \theta_m, \gamma_m$,

$$\alpha_1(\cdot) = c_m \quad \text{and} \quad \alpha_2(\cdot) = c_m \ .$$

The outer problem is to choose y_1, y_2 and c_m to maximize

$$\gamma_1 \ u_1(c_m, y_1, \theta_1) + \gamma_2 \ u_2(c_m, y_2, \theta_2) \ ,$$

subject to $c_m = y_1 + y_2 - T_m(y_1 + y_2)$.

Household production. We now extend the couples' bargaining problem to include who does how much of household production, takes care of children or the elderly in the family, etc. For ease of exposition, we only do so for the case in which individual consumption is a private good. Denote by d_1 the family duties of spouse 1 and by d_2 those of spouse 2. We now include the determination of d_1 and d_2 in the inner problem which now reads as: Given y_1, y_2 and hence c_m, choose c_1, c_2, d_1 and d_2 to maximize

$$\gamma_1 \ u_1(c_1, d_1, y_1, \theta_1) + \gamma_2 \ u_2(c_2, d_2, y_2, \theta_2) \ ,$$

subject to $c_1 + c_2 = c_m$ and $d_1 + d_2 = d_m$, where d_m is an exogenously given total level of family duties. There is now a further first order condition that determines the assignment of family duties

$$\gamma_1 \frac{\partial u_1(\cdot)}{\partial d_1} = \gamma_2 \frac{\partial u_2(\cdot)}{\partial d_2} \ ,$$

and the solution (d_1^*, d_2^*) can be written as

$$d_1^* = \beta_1(c_m, y_1, y_2, \theta_m, \gamma_m)$$

and

$$d_2^* = \beta_2(c_m, y_1, y_2, \theta_m, \gamma_m) \ .$$

The outer problem is to choose y_1, y_2 so as to maximize

$$\gamma_1 \ u_1(\alpha_1(\cdot), \beta_1(\cdot), y_1, \theta_1) + \gamma_2 \ u_2(\alpha_2(\cdot), \beta_2(\cdot), y_2, \theta_2) \ ,$$

subject to $c_m = y_1 + y_2 - T_m(y_1 + y_2)$.

Taking account of household production leads to a modification of Equation (2) in the main text which characterizes preferences over tax reforms. It now reads as

$$\tfrac{\partial}{\partial \tau} V_i(0, h, \rho_m, \theta_m, \gamma_m) = w_i(\theta_m, \gamma_m) \Big[\rho_m R_1^0(h) - h_m(y_m) \Big] \ . \tag{A.1}$$

where

$$w_i(\theta_m, \gamma_m) := u_{i1}^0(\theta_m, \gamma_m) \alpha_{i1}^0(\theta_m, \gamma_m) + u_{i2}^0(\theta_m, \gamma_m) \beta_{i1}^0(\theta_m, \gamma_m) \ .$$

Hence, if $w_i(\theta_m, \gamma_m) > 0$ for all i, we still have that both spouses in a couple are reform beneficiaries if $\rho_m R_1^0(h) - h(y_m) > 0$ and are reform losers otherwise. This property holds for frequently invoked functional forms. For instance, if the utility or disutility from home production is additively separable from the other arguments of the utility function, then the solution to

$$\gamma_1 \frac{\partial u_1(\cdot)}{\partial d_1} = \gamma_2 \frac{\partial u_2(\cdot)}{\partial d_2} \ ,$$

is independent of c_m so that $\beta_{i1}^0(\theta_m, \gamma_m) = 0$, for all i.

B A positive theory of multi-dimensional screening

We now provide a characterization of the revenue functions $\mathcal{R}_s$, $\mathcal{R}_m$, $\mathcal{R}_1$ and $\mathcal{R}_2$ for a special case of our general framework, albeit for one that is frequently used. Formal proofs of Lemmas and Propositions are collected in Subsection B.5. Specifically, we assume that household consumption is a public good and that preferences are quasi-linear in consumption: Thus, couples choose y_1 and y_2 to maximize

$$\gamma_1 \ u_1(c_m, y_1, \theta_1) + \gamma_2 \ u_2(c_m, y_2, \theta_2) \qquad \text{s.t.} \quad c_m = b_m + y_m - T_m(y_m) \ ,$$

where

$$u_1(c_m, y_1, \theta_1) = c_m - k_1(y_1, \theta_1) \quad \text{and} \quad u_2(c_m, y_2, \theta_1) = c_m - k_2(y_1, \theta_2) \ ,$$

and k_1 and k_2 are, respectively, the effort cost functions of the primary and the secondary earner. We let $\theta_1 \in \Theta_1 = \mathbb{R}_+$ and $\theta_2 \in \Theta_2 = \mathbb{R}_+$. We also impose the Spence-Mirrlees single crossing condition, so that the marginal effort costs of spouse i are decreasing in θ_i. Thus, θ_i is a measure of productive ability: more able individuals have lower marginal effort costs. A frequently used special case has iso-elastic effort cost functions, see Diamond (1998) for a prominent reference, so that

$$k_1(y_1, \theta_1) = \frac{1}{1 + \frac{1}{\varepsilon_1}} \left(\frac{y_1}{\theta_1} \right)^{1 + \frac{1}{\varepsilon_1}} \ , \tag{B.2}$$

and

$$k_2(y_2, \theta_2) = \frac{1}{1 + \frac{1}{\varepsilon_2}} \left(\frac{y_2}{\theta_2} \right)^{1 + \frac{1}{\varepsilon_2}} \ , \tag{B.3}$$

for the primary and the secondary earner, respectively. This formulation allows for different productive abilities as measured by θ_1 and θ_2 and for different Frisch elasticities, ε_1 and ε_2.

Golosov and Krasikov (2023) use this setup in their analysis of welfare-maximizing taxes.[30] They approach this as a problem of optimal multi-dimensional screening and obtain

[30] Golosov and Krasikov (2023) do not consider Nash-bargaining within couples. Instead, couples are assumed to maximize their joint surplus, defined as the couple's disposable income net of the spouses' effort costs. In our analysis this is nested as the special case that arises for $\gamma_1 = \gamma_2$.

a characterization of an optimal tax system in terms of the model's primitives; i.e. in terms of the joint distribution of $\theta = (\theta_1, \theta_2)$. We also use this framework, but for a different purpose. We assume that some status quo tax system is given and describe the couple's choices given this tax system. Again, the characterization is in terms of the model's primitives, which is why we refer to our approach in this section as a *positive* theory of multidimensional screening. Once our model has told us *"who does what in the status quo"*, we perturb the tax system and obtain a characterization of the revenue functions $\mathcal{R}_s$, $\mathcal{R}_m$, $\mathcal{R}_1$ and $\mathcal{R}_2$.

For ease of exposition, we impose the assumption that the status quo tax function is twice differentiable. Moreover, we assume that it has non-decreasing marginal tax rates, a property satisfied by all contemporaneous income tax systems. As we show formally below, this implies that secondary earnings go down when primary earnings go up, and vice versa. Thus, our framework captures that with joint and progressive taxation, secondary earnings suffer from downward distortions that are more pronounced than what they would be under individual taxation.

Finally, as an extension, we introduce fixed costs of labor market participation, with the implication that the fractions of single and dual earner couples are endogenous to the tax system and will be affected by tax reforms. The empirical literature documents that there are significant behavioral responses at the extensive margin. Thus, a positive theory of multidimensional screening with behavioral responses only at the intensive margin would be incomplete. Specifically, Propositions 6 and 7 contain formal characterizations of the revenue function $\mathcal{R}_m$ with and without behavioral responses at the extensive margin. Detailed proofs are in Appendix B.5. We state the analogous formulas for $\mathcal{R}_s$, $\mathcal{R}_1$ and $\mathcal{R}_2$ without proof.

B.1 Behavioral responses at the intensive margin only

With bargaining weights of γ_1 for spouse 1 and of $\gamma_2 = 1 - \gamma_1$ for spouse 2, the first order conditions that determine the utility-maximizing earning levels are

$$1 - T_m'(y_1 + y_2) = \gamma_1 \; k_{1,1}(y_1, \theta_1) \; , \tag{B.4}$$

and

$$1 - T_m'(y_1 + y_2) = \gamma_2 \; k_{2,1}(y_2, \theta_2) \; , \tag{B.5}$$

where $k_{1,1}$ and $k_{2,1}$, denote, respectively, the derivative of the cost functions k_1 and k_2 with respect to their first argument. Denote the solution to this system of equations by $y_1^*(\theta_1, \theta_2, \gamma_1)$ and $y_2^*(\theta_1, \theta_2, \gamma_1)$. The following Lemma gives comparative statics. The proof is straightforward and therefore omitted.

Lemma B.1 *Let T_m be continuous and convex. Then*

(i) The function y_1^* is non-decreasing in θ_1, and non-increasing in θ_2 and γ_1.

(ii) The function y_2^* is non-decreasing in θ_2 and γ_1, and non-increasing in θ_1.

(iii) The function $y^*_m = y^*_1 + y^*_2$ is non-decreasing in both θ_1 and θ_2.

Lemma B.1 shows that higher primary earnings crowd out secondary earnings and vice versa. When the productive abilities of, say, the primary earner go up then primary earnings go up as well. This leads to a higher marginal tax rate also for the secondary earner who responds with reduced earnings. Primary and secondary earnings are not perfect substitutes, though. The couple's joint earnings increase when one of the spouses becomes more productive.

Recall that $\mathcal{R}_m(y_m)$ gives the change in tax revenue in response to a reform that increases marginal tax rates for married couples with a joint income in a small neighborhood of y_m. Proposition 6 decomposes this change into a mechanical and a behavioral effect. The behavioral effect is due to the change of marginal tax rates for couples with an income close to y_m. Their earnings incentives go down when the marginal tax rate goes up, as captured by the elasticity $\bar{\mathcal{E}}_m(y_m)$ of joint earnings with respect to the retention or net of tax rate, $1 - T'$. This behavioral effect tends to lower tax revenues. The mechanical effect, captured by the mass of couples who pay higher taxes without facing higher marginal tax rates, $1 - F^y_m(y_m)$, tends to increase it.

Proposition 6 *Given a status quo tax system for couples T_{m0}, we have*

$$\mathcal{R}_m(y_m) = -\frac{T'_{m0}(y_m)}{1 - T'_{m0}(y_m)}\; y_m\, f^y_m(y_m)\, \bar{\mathcal{E}}_m(y_m) + \; 1 - F^y_m(y_m)\;, \tag{B.6}$$

where F^y_m is the (endogenous) cdf and f^y_m the density of the earnings distribution of married couples and

$$\bar{\mathcal{E}}_m(y_m) \;\; = \;\; \mathbf{E}_{(\theta_m,\gamma_m)}\left[e(\theta_m,\gamma_m) \mid y^0_m(\theta_m,\gamma_m) = y_m\right]$$

is a measure of the behavioral responses to a one-bracket tax reform affecting couples with a joint income close to y_m.

Iso-elastic effort cost functions. Married couples with a joint income close to y_m are distinguished by their types (θ_m, γ_m) and $e_m(\theta_m, \gamma_m)$ is the elasticity for a couple with characteristics (θ_m, γ_m). What matters for revenue is $\bar{\mathcal{E}}_m(y_m)$, the average value of $e_m(\theta_m, \gamma_m)$ among all couples with a joint income close to y_m, weighted by the mass of these couples $f^y_m(y_m)$. We use the special case of iso-elastic cost functions to explain what determines the elasticity of the couple's joint income.

Lemma B.2 *For iso-elastic effort cost functions,*

$$\begin{aligned} e_m(\cdot) \;\; &:= \;\; -\tfrac{y^*_{1,\tau_m} + y^*_{2,\tau_m}}{y^0_m}\,(1 - T'(y^0_1 + y^0_2)) \\ &= \;\; (\varepsilon_1 \pi^0_1 + \varepsilon_2 \pi^0_2)\left(1 + \tfrac{T''(y^0_1+y^0_2)}{1-T'(y^0_1+y^0_2)}(\varepsilon_1 y^0_1 + \varepsilon_2 y^0_2)\right)^{-1}\;, \end{aligned}$$

where $\pi^0_1 = \frac{y^0_1}{y^0_m}$ and $\pi^0_2 = \frac{y^0_2}{y^0_m}$.

Thus, the elasticity of the couple's joint income is essentially – i.e. modulo the correction term for the curvature of the tax function – a weighted average of the primary and the secondary earners' Frisch elasticities, with the weights reflecting their respective contributions to the couple's joint income.

B.2 On the proof of Proposition 6

We sketch the main steps in the proof of Proposition 6. We consider one-bracket reforms (τ_m, h_m); i.e. reforms so that

$$\tau_m\, h_m(\hat{y}_m) = \begin{cases} 0, & \text{for } \hat{y}_m \leq y_m \ , \\ \tau_m(\hat{y}_m - y_m), & \text{for } \hat{y}_m \in [y_m, y_m + \ell_m] \ , \\ \tau_m\, \ell_m, & \text{for } \hat{y}_m \geq y_m + \ell_m \ , \end{cases}$$

We denote by $R_m(\tau_m, \ell_m, y_m)$ the additional tax revenue due to the reform. With quasi-linear in consumption preferences, earnings do not depend on the transfer income. Hence,

$$\begin{aligned} R_m(\tau_m, \ell_m, y_m) &= \mathbf{E}_{(\theta_m,\gamma_m)}\left[T_{m1}(y^*_m(\tau_m, \theta_m, \gamma_m)) - T_{m0}(y^0_m(\theta_m, \gamma_m))\right] \\ &= \mathbf{E}_{(\theta_m,\gamma_m)}\left[T_{m0}(y^*_m(\tau_m, \theta_m, \gamma_m)) + \tau_m\, h_m(y^*_m(\tau_m, \theta_m, \gamma_m))\right] \\ &\quad - \mathbf{E}_{(\theta_m,\gamma_m)}\left[T_{m0}(y^0_m(\theta_m, \gamma_m))\right] \ , \end{aligned}$$

where the operator $\mathbf{E}_{(\theta_m,\gamma_m)}$ indicates that expectations are taken with respect to the joint distribution of $\theta_m = (\theta_1, \theta_2)$ and γ_m; $y^*_m(\tau_m, \theta_m, \gamma_m)$ is the couple's joint income as a function of the reform intensity τ_m and the couples' characteristics, and, finally, $y^0_m(\theta_m, \gamma_m) := y^*_m(0, \theta_m, \gamma_m)$ is the couple's income in the status quo. One can show – see e.g. Bierbrauer and Boyer (2018) for a derivation along these lines – that the derivative of $R_m(\tau_m, \ell_m, y_m)$ with respect to τ_m, evaluated at $\tau_m = 0$ equals

$$\begin{aligned} & R_{\tau_m}(0, \ell_m, y_m) = \\ & \quad \mathbf{E}_{(\theta_m,\gamma_m)}\left[\mathbf{1}(y^0_m(\theta_m, \gamma_m) \in [y_m, y_m + \ell_m]) T'_m(y^0_m(\theta_m, \gamma_m)) y^*_{m,1}(0, \theta_m, \gamma_m)\right] \\ & \quad + \mathbf{E}_{(\theta_m,\gamma_m)}\left[\mathbf{1}(y^0_m(\theta_m, \gamma_m) \in [y_m, y_m + \ell_m])(y^0_m(\theta_m, \gamma_m) - y_m)\right] \\ & \quad + \ell_m \mathbf{E}_{(\theta_m,\gamma_m)}\left[\mathbf{1}(y^0_m(\theta_m, \gamma_m) \geq y_m + \ell_m])\right] \ , \end{aligned} \tag{B.7}$$

where $\mathbf{1}$ is the indicator function. The proof of Proposition 6 in the Appendix takes this expression as the starting point and then computes the limit as $\ell_m \to 0$; i.e.

$$\mathcal{R}_m(y_m) \quad := \quad \lim_{\ell_m \to 0} \ R_{\tau_m}(0, \ell_m, y_m) \ .$$

To obtain this characterization of the function $\mathcal{R}_m$ we partition the couples' type space. In particular, we identify the primary earners and the secondary earners who show a behavioral response to a one-bracket reform that alters marginal tax rates for joint earnings that lie between y_m and $y_m + \ell_m$.

Primary earner types consistent with a joint income in the bracket. Given θ_2 and γ_m, define

$$\underline{\theta}_1^0(y_m \mid \theta_2, \gamma_m) := \min\{\theta_1 \mid y_1^0(\theta_m, \gamma_m) + y_2^0(\theta_m, \gamma_m) \geq y_m\},$$

and

$$\overline{\theta}_1^0(y_m + \ell \mid \theta_2, \gamma_m) := \max\{\theta_1 \mid y_1^0(\theta_m, \gamma_m) + y_2^0(\theta_m, \gamma_m) \leq y_m + \ell_m\}.$$

Thus, in the status quo, and given θ_2 and γ_m, there are different primary earner types consistent with a joint income in the bracket $[y_m, y_m + \ell_m]$. The lowest such type is denoted by $\underline{\theta}_1^0(y_m \mid \theta_2, \gamma_m)$ and the highest such type is denoted by $\overline{\theta}_1^0(y_m + \ell \mid \theta_2, \gamma_m)$. Note that, by the definition of the primary earner, $y_1^0(\theta_m, \gamma_m) \geq y_2^0(\theta_m, \gamma_m)$. Moreover, by Lemma B.1,

$$\underline{\theta}_1^0(y_m \mid \theta_2, \gamma_m) \leq \overline{\theta}_1^0(y_m + \ell \mid \theta_2, \gamma_m) \ .$$

When this inequality is strict, this indicates that we can fix the secondary earner's type at θ_2 and then find a range of primary earner types so that the couples' joint income lies in the bracket of interest. With an equality, by contrast, there is only one primary earner type with this property.

Secondary earner types consistent with a joint income in the bracket. Given γ_m, let

$$\underline{\theta}_2(y_m \mid \gamma_m) := \min\{\theta_2 \mid y_m^0(\theta_m, \gamma_m) \geq y_m\}$$

and

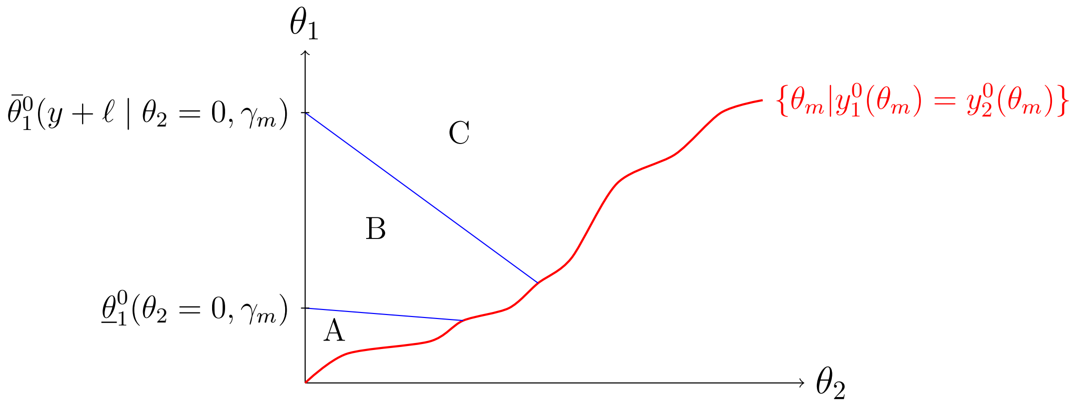
$$\overline{\theta}_2(y_m + \ell_m \mid \gamma_m) := \max\{\theta_2 \mid y_m^0(\theta_m, \gamma_m) \leq y_m + \ell_m\}$$

determine the range of secondary earner types for which one can find a primary earner so that the couple's joint income is in the bracket. Note that $\theta_2 = \bar{\theta}_2(\cdot)$ implies that

$$y_1^0(\theta_m, \gamma_m) = y_2^0(\theta_m, \gamma_m) = \frac{1}{2}(y_m + \ell_m) \ .$$

Letting the length of the bracket vanish. As detailed in the Appendix, we can now write $R_{\tau_m}(0, \ell_m, y_m)$ as a sum of the revenue changes due to couples in the regions A, B and C in Figure B.1. Note that there is no change in revenue from couples in A and that the boundary between A and B does not depend on ℓ_m. Couples in C face no change of the marginal tax rate, i.e. their tax burden changes in a lump sum fashion. Couples in B are confronted with a change in the marginal tax rate and hence adjust their earnings. Moreover, the boundary between regions B and C depends on ℓ_m. The formal proof in the Appendix consists in computing derivatives of all these expressions with respect to ℓ_m using Leibnitz' rule and in evaluating the resulting expressions in the limit case $\ell_m \to 0$.

Figure B.1: The impact of a one-bracket reform – behavioral responses only at the intensive margin.



$A/B/C$: couples with joint income below/in/above the bracket

Notes: This figure illustrates how different types of couples are affected by a reform that raises marginal tax rates for joint incomes between y_m and $y_m + \ell_m$. The tax burden for couples in A does not change. Couples in B face an increase of their marginal tax rate. Couples in C do not face an increase of their marginal tax rate, but their tax burden increases.

B.3 Behavioral responses also the extensive margin

We now extend the above framework and assume that the generation of earnings also comes with fixed costs, both for the primary and the secondary earner. A couple is then characterized by a measure of productivity or earnings ability for each spouse, a fixed cost for each spouse, and weights in the household bargaining problem. The primitives in this model are represented by a joint distribution of these characteristics. In this setup, changes in the tax system affect the mass of primary and secondary earners who choose to generate positive or earnings, or, alternatively, prefer to stay unemployed. Hence, there are behavioral responses both at the intensive and at the extensive margin.

We use, again, the model of household bargaining with quasi-linear in consumption preferences and household consumption as a public good. We add fixed costs of productive effort, captured by the parameters $\tilde{\phi}_m = (\tilde{\phi}_1, \tilde{\phi}_2)$. Thus, a couple with bargaining weights $\gamma_m = (\gamma_1, \gamma_1)$ solves: Choose y_1 and y_2 so as to maximize

$$C(y_1 + y_2) - \phi_1 \, \mathbf{1}(y_1 > 0) - \gamma_1 \, k_1(y_1, \theta_1) - \phi_2 \, \mathbf{1}(y_2 > 0) - \gamma_2 \, k_2(y_2, \theta_1) \ ,$$

where

$$C(y_1 + y_2) = y_1 + y_2 - T_m(y_1 + y_2),$$

and, we use, for ease of notation, the shorthand $\phi_1 = \gamma_1 \, \tilde{\phi}_1$, $\phi_2 = \gamma_2 \, \tilde{\phi}_2$ and $\phi_m = (\phi_1, \phi_2)$. Also for ease of notation, we impose the following assumption.

Assumption B.1 *The distribution of $\tilde{\phi}_1$ is stochastically independent of θ_2 and the distribution of $\tilde{\phi}_2$ is stochastically independent of θ_1.*

Assumption B.1 implies that the conditional densities that will be invoked in the derivation below carry fewer conditioning variables.

When, at a solution to the above utility-maximization problem, both the primary and the secondary earner have positive earnings, their optimal choices $y_1^*(\theta_m, \gamma_m)$ and $y_2^*(\theta_m, \gamma_m)$ satisfy the first order conditions in (B.4) and (B.5). When only the primary earner has positive earnings, then $y_1^* = y_{sec}^*$ and $y_2^* = 0$, where $y_{sec}^*(\theta_1, \gamma_m)$ is the level of y_1 solving

$$1 - T_m'(y_1) = \gamma_1 \; k_{1,1}(y_1, \theta_1) \; . \tag{B.8}$$

The secondary earner's extensive margin. For extensive margin decisions, the surplus of consumption utility over the variable efforts costs is compared to the fixed costs of effort. Going for positive earnings is the optimal choice if that surplus exceeds the fixed costs. Let $\Delta(\theta_m, \gamma_m)$ be the difference between the surplus realized by a couple when both are working and the surplus realized when only the primary earner is working;

$$\begin{aligned}\Delta(\theta_m, \gamma_m) \quad &= \quad C(y_1^*(\theta_m) + y_2^*(\theta_m)) - \gamma_1 \; k_1(y_1^*(\theta_m), \theta_1) - \gamma_2 \; k_2(y_2^*(\theta_m), \theta_1) \\ &\quad - \Big(C(y_{1s}^*(\theta_1)) - \gamma_1 \; k_1(y_{1s}^*(\theta_1), \theta_1)) \Big) \; .\end{aligned}$$

The couple chooses positive secondary earnings when

$$\phi_2 \quad < \quad \Delta(\theta_m, \gamma_m).$$

Note that Δ is increasing in θ_2. Thus, given ϕ_2, γ_m and θ_1, there is a threshold value $\hat{\theta}_2(\phi_2, \theta_1, \gamma_m)$ so that $y_2^* > 0$ when $\theta_2 > \hat{\theta}_2(\phi_2, \theta_1, \gamma_m)$ and $y_2^* = 0$ when $\theta_2 < \hat{\theta}_2(\phi_2, \theta_1, \gamma_m)$.

The primary earner's extensive margin. Consider a primary earner with type θ_1 and suppose first that she is married to a spouse with type $\theta_2 < \hat{\theta}_2(\phi_2, \theta_1, \gamma_m)$. Then the primary earner chooses positive earnings if

$$C(y_{1s}^*(\theta_1)) - \gamma_1 \; k_1(y_{sec}^*(\theta_1), \theta_1) \quad > \quad \phi_1 \; ,$$

and chooses zero earnings otherwise. The left-hand side of this expression is increasing in θ_1. Thus, there is a cutoff type $\hat{\theta}_1(\phi_1, \gamma_m)$ so that $y_1^* > 0$ when $\theta_1 > \hat{\theta}_1(\phi_1, \gamma_m)$ and $y_1^* = 0$ when $\theta_1 < \hat{\theta}_1(\phi_1, \gamma_m)$.

Now suppose that $\theta_2 \geq \hat{\theta}_2(\phi_2, \theta_1, \gamma_m)$. Then the primary earner chooses positive earnings if

$$C(y_1^*(\theta_m) + y_2^*(\theta_m)) - \gamma_1 \; k_1(y_1^*(\theta_m), \theta_1) - \gamma_2 \; k_2(y_2^*(\theta_m), \theta_1) > \phi_1 + \phi_2 \; ,$$

or, equivalently, if

$$C(y_{1s}^*(\theta_1)) - \gamma_1 \; k_1(y_{sec}^*(\theta_1), \theta_1)) - \phi_1 \quad > \quad \phi_2 - \Delta(\theta_m, \gamma_m) \; .$$

This inequality holds whenever $\theta_1 > \hat{\theta}_1(\phi_1, \gamma_m)$. In this case, the left-hand side is positive by the definition of $\hat{\theta}_1(\phi_1, \gamma_m)$. Moreover, the right hand side is negative by the definition of

$\hat{\theta}_2(\phi_2, \theta_1, \gamma_m)$. Thus, a primary earner who works when the secondary earner has a low type and does not become active on the labor market, also works when paired with a secondary earner with a higher type and positive earnings. The following Lemma summarizes the preceding analysis.

Lemma B.3

1. *For any given ϕ_1 and γ_m, let $\hat{\theta}_1(\phi_1, \gamma_m)$ be the value of θ_1 that solves*

$$C(y^*_{sec}(\theta_1)) - \gamma_1\, k_1(y^*_{sec}(\theta_1), \theta_1) \quad = \quad \phi_1 .$$

Then, $y^*_1 > 0$ when $\theta_1 > \hat{\theta}_1(\phi_1, \gamma_m)$ and $y^*_1 = 0$ when $\theta_1 < \hat{\theta}_1(\phi_1, \gamma_m)$.

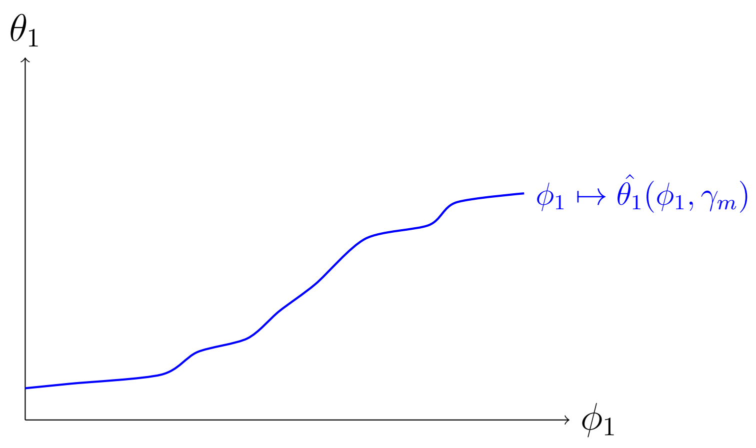
2. *For any given $\theta_1 > \hat{\theta}_1(\phi_1, \gamma_m)$ and ϕ_2, let $\hat{\theta}_2(\phi_2, \theta_1, \gamma_m)$ be the value of θ_2 that solves*

$$\Delta(\theta_1, \theta_2, \gamma_m) \quad = \quad \phi_2 \; .$$

Then $y^*_2 > 0$ when $\theta_2 > \hat{\theta}_2(\phi_2, \theta_1, \gamma_m)$ and $y^*_2 = 0$ when $\theta_2 < \hat{\theta}_2(\phi_2, \theta_1, \gamma_m)$.

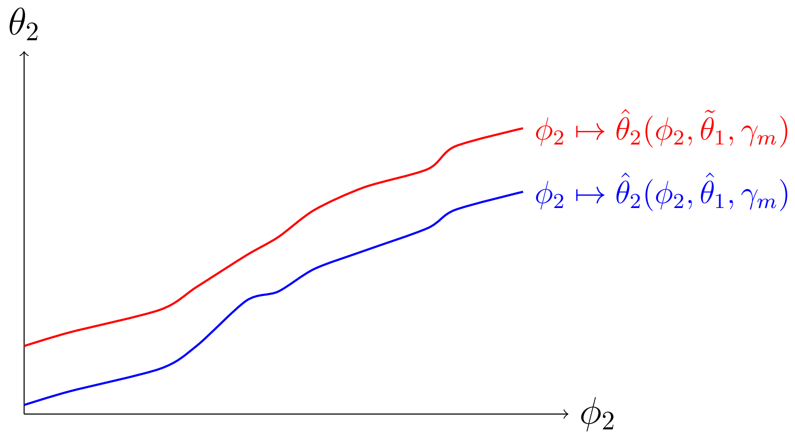
For given $\gamma_m = (\gamma_1, \gamma_2)$, the higher the fixed cost type, the larger the threshold level of ability $\hat{\theta}_1(\phi_1, \gamma_m)$ that is needed to overcome the fixed cost of generating positive earnings. Consequently, for given ϕ_1, the distribution of primary earnings is a truncated distribution that has no mass on $[0, y^*_{sec}(\hat{\theta}_1(\phi_1, \gamma_m)]$. The larger ϕ_1, the larger the gap. For secondary earners this is similar, but there is one important difference: the range of active secondary earners depends on the primary earner's productive ability. The higher the latter, the higher the productive abilities required of the secondary earner to justify positive earnings. Figures B.2 and B.3 provide an illustration.

Figure B.2: Primary earners – behavioral responses at the extensive margin



Notes: This figure shows the type space of primary earners, for fixed bargaining weights γ_m. The blue line separates those with positive earnings (above the line) and those with zero earnings (below the line). Positive primary earnings require productive abilities that exceed a cutoff $\hat{\theta}_1$. The cutoff depends on the primary earner's fixed costs. The higher the fixed costs, the larger is the cutoff.

Figure B.3: Secondary earners – behavioral responses at the extensive margin



Notes: This figure shows the type space of secondary earners, for fixed bargaining weights γ_m. The lines separate those with positive earnings (above the line) and those with zero earnings (below the line). Positive secondary earnings require productive abilities that exceed a cutoff $\hat{\theta}_2$. The cutoff depends on the secondary earner's fixed costs. The higher the fixed costs, the larger the cutoff. The position of the line depends on the primary earner's productive abilities: Higher abilities of the primary earner shift the line upwards. The blue line is drawn for $\theta_1 = \hat{\theta}_2$ and the red line is drawn for $\theta_1 = \tilde{\theta}_1$, where $\tilde{\theta}_1 > \hat{\theta}_1$.

Revenue implications of one bracket reforms. Again, we consider reforms (τ_m, h_m) so that

$$\tau_m \, h_m(y'_m) = \begin{cases} 0, & \text{for} \quad y'_m \leq y_m \;, \\ \tau_m(y'_m - y_m), & \text{for} \quad y'_m \in [y_m, y_m + \ell_m] \;, \\ \tau_m \, \ell_m, & \text{for} \quad y'_m \geq y_m + \ell_m \;. \end{cases}$$

The reform raises marginal tax rates by τ_m for all couples with a joint income that lies between y_m and $y_m + \ell_m$. Again, we seek to characterize the marginal effect on tax revenue in the limit as $\tau_m \to 0$ and $\ell_m \to 0$. A challenge for the characterization of the function $\mathcal{R}_m$ that describes this revenue effect is that, in the given setting, Figure B.1 describes the effect of such a reform only for couples with low fixed cost types, i.e. fixed cost types for which incomes (primary, secondary and joint) at the extensive margin lie below y_m. For couples with higher fixed cost types, the reform affects the incentives to generate positive earnings – formally, the cutoff types $\hat{\theta}_1(\phi_1, \gamma_m)$ and $\hat{\theta}_2(\phi_2, \theta_1, \gamma_m)$ become functions of the reform intensity τ_m. The derivation of $\mathcal{R}_m$ in the Appendix deals with these issues and provides a decomposition of the reform's revenue effect into extensive ($\mathcal{X}$) and intensive ($\mathcal{I}$) margin effects, both for single earner couples (*sec*) and dual earner couples (*dec*).

Proposition 7 *Given a status quo tax system for couples T_{m0}, we have*

$$\mathcal{R}_m(y) \quad = \quad \mathcal{X}_{sec}(y_m) + \mathcal{I}_{sec}(y) + \mathcal{X}_{dec}(y_m) + \mathcal{I}_{dec}(y) \;,$$

where

$$\mathcal{I}_{sec}(y) \quad = \quad \lambda^0_{sec} \left(-\tfrac{T'_{m0}(y)}{1 - T'_{m0}(y)} \; y \; f^y_{sec}(y) \; \bar{\mathcal{E}}_{sec}(y) + 1 - F^y_{sec}(y) \right) \;,$$

$$\mathcal{X}_{sec}(y) \quad = \quad -\lambda^0_{sec} \int_y^{\bar{y}} \frac{T_{m0}(y')}{y'-T_{m0}(y')} \, \bar{\pi}_{sec}(y') \, f^y_{sec}(y') \, dy' \; ,$$

$$\mathcal{I}_{dec}(y) \quad = \quad \lambda^0_{dec} \left(-\frac{T'_{m0}(y)}{1-T'_{m0}(y)} \, y \, f^y_{dec}(y) \, \bar{\mathcal{E}}_{dec}(y) + 1 - F^y_{dec}(y) \right) \; ,$$

and

$$\mathcal{X}_{dec}(y) \quad = \quad -\lambda^0_{dec} \int_y^{\bar{y}} \frac{T_{m0}(y')}{y'-T_{m0}(y')} \, \bar{\pi}_{dec}(y') \, f^y_{dec}(y') \, dy \; .$$

The mass of single earner couples with an income exceeding y is given by $\lambda^0_{sec}(1 - F^y_{sec}(y))$, where λ^0_{sec} is the share of single earner couples among all couples, and F^y_{sec} is the *cdf* of the income distribution among single earner couples, and f^y_{sec} is the density associated with this distribution. The terms for dual earner couples are analogously defined.

The average intensive margin elasticity for single earners with an income of y is denoted by $\bar{\mathcal{E}}_{sec}(y)$ and analogously for $\bar{\mathcal{E}}_{dec}(y)$. Again, these are weighted averages of the elasticities of joint earnings with respect to the retention rate $1 - T'$, where separate averages are computed for single and dual earner couples with an income close to y. The average extensive margin elasticity for single earner couples with an income of y is denoted by $\bar{\pi}_{sec}(y)$ and analogously for $\bar{\pi}_{dec}(y)$. Any such elasticity measures the percentage of couples with an income close to y who opt out of being a single or dual earner couple after a one percent decrease of their after-tax income.

B.4 The revenue functions $\mathcal{R}_1$ and $\mathcal{R}_2$

The formulas in Propositions 6 and 7 that characterize the revenue function $\mathcal{R}_m$ also apply to the revenue functions $\mathcal{R}_s$, $\mathcal{R}_1$ and $\mathcal{R}_2$ with an important qualification: The relevant notions of income and also the relevant elasticities are different ones. For instance, with behavioral responses only at the intensive margin, and an obvious change of notation,

$$\mathcal{R}_s(y_s) = -\frac{T'_s(y_s)}{1 - T'_s(y_s)} \, y_s \, f^y_s(y_s) \, \bar{\mathcal{E}}_s(y_s) + \; 1 - F^y_s(y_s) \; , \tag{B.9}$$

for

$$\bar{\mathcal{E}}_s(y_s) := \mathbf{E}_{\theta_s} \left[e_s(\theta_s) \mid y^0_s(\theta_s) = y_s \right] \; .$$

With intensive margin responses only, we also have

$$\begin{aligned} \mathcal{R}_1(y_1) \quad = \quad & -y_1 f^y_1(y_1) \mathbf{E}_{(\theta_m, \gamma_m)} \left[\frac{T'_m(y^0_m(\theta_m,\gamma_m))}{1-T'_m(y^0_m(\theta_m,\gamma_m))} e_1(\theta_m, \gamma_m) \mid y^0_1(\theta_m, \gamma_m) = y_1 \right] \\ & +1 - F^y_1(y_1) \; , \end{aligned} \tag{B.10}$$

where F^y_1 is the *cdf* and f^y_1 the density of the primary earnings in married couples, and $e_1(\theta_m, \gamma_m)$ is the elasticity of the couple's joint income with respect to the marginal tax rate faced by the primary earner. Analogously,

$$\begin{aligned} \mathcal{R}_2(y_2) \quad = \quad & -y_2 f^y_2(y_2) \mathbf{E}_{(\theta_m, \gamma_m)} \left[\frac{T'_m(y^0_m(\theta_m,\gamma_m))}{1-T'_m(y^0_m(\theta_m,\gamma_m))} e_2(\theta_m, \gamma_m) \mid y^0_2(\theta_m, \gamma_m) = y_2 \right] \\ & +1 - F^y_2(y_2) \; , \end{aligned} \tag{B.11}$$

where F_2^y is the *cdf* and f_2^y the density of the secondary earnings in married couples, and where $e_2(\theta_m, \gamma_m)$ is the elasticity of the couple's joint income with respect to the marginal tax rate faced by the secondary earner.

A difference to Proposition 6 is that the ratio $\frac{T'_m(y_m^0(\theta_m,\gamma_m))}{1-T'_m(y_m^0(\theta_m,\gamma_m))}$ now appears in the expectation operator rather than in front of it. The reason is that revenue effects depend on the couple's joint income in the status quo; e.g. for $\mathcal{R}_1$, the behavioral response comes from all couples with primary earnings close to y_1, but the consequences of these behavioral responses for tax revenue depend on the couple's joint income y_m.

We again use the special case of iso-elastic effort cost functions to illustrate the difference between the relevant elasticities for the revenue functions $\mathcal{R}_m$, $\mathcal{R}_1$ and $\mathcal{R}_2$.[31]

Lemma B.4 *With iso-elastic cost functions*

$$e_1(\cdot) \;=\; \varepsilon_1 \left(1 + \tfrac{T''(y_1^0+y_2^0)}{1-T'(y_1^0+y_2^0)}(\varepsilon_1 y_1^0 + \varepsilon_2 y_2^0)\right)^{-1} ,$$

and

$$e_2(\cdot) \;=\; \varepsilon_2 \left(1 + \tfrac{T''(y_1^0+y_2^0)}{1-T'(y_1^0+y_2^0)}(\varepsilon_1 y_1^0 + \varepsilon_2 y_2^0)\right)^{-1} ,$$

Remember that $\mathcal{R}_m$ depends on a weighted average of the primary and the secondary earners' Frisch elasticities, with the weights reflecting their relative contributions to the couple's joint income. By contrast, for $\mathcal{R}_1$ only the primary earner's Frisch elasticity matters and for $\mathcal{R}_2$ it is the secondary earner's Frisch elasticity.

The extensive margin elasticities that matter for the revenue functions $\mathcal{R}_1$ and $\mathcal{R}_2$ are also different from the ones that matter for $\mathcal{R}_m$. For $\mathcal{R}_1$ and $\mathcal{R}_2$, the relevant extensive margin elasticities are measures of how the masses of single and dual earner couples change in response to a change in the tax treatment of primary or secondary earnings.[32] Again, revenue effects depend on the couple's joint income in the status quo while behavioral responses are triggered by a change in the tax treatment of primary or secondary earnings. For instance, for dual earner couples the extensive margin response to a "small" one bracket reform that affects primary earnings larger or equal to y_1 is now captured by

$$\mathcal{X}_{dec}(y_1) \;=\; -\int_{y_1}^{\bar{y}} \Pi_{dec}(y_1')\, m_{dec}^{y_1}(y_1')\, dy_1' ,$$

for

$$\Pi_{dec}(y_1') \;=\; \mathbf{E}_{(\theta_m,\phi_m,\gamma_m)} \left[\tfrac{T_{m0}(y_m^0(\theta_m,\phi_m,\gamma_m))}{y_m^0(\theta_m,\phi_m,\gamma_m)-T_{m0}(y_m^0(\theta_m,\phi_m,\gamma_m))} \times \right.$$

$$\left. \pi_{dec,1}(\theta_m,\phi_m,\gamma_m)\tfrac{m_{dec}(\theta_m,\phi_m,\gamma_m)}{m_{dec}^{y_1}(y_1')} \mid y_1^0(\theta_m,\phi_m,\gamma_m) = y_1' \right]$$

[31]We omit a formal proof of Lemma B.4. The Lemma can be proven along the same lines as Lemma B.2. For the latter the proof is in Appendix B.5.

[32]More formally, the cutoff types at the extensive margin – defined in Equations (B.22) and (B.23) in the Appendix for the case of $\mathcal{R}_m$ – become functions of τ_1 for the case of $\mathcal{R}_1$ and of τ_2 and for the case of $\mathcal{R}_2$.

where $m_{dec}(\theta_m, \phi_m, \gamma_m)$ is the mass of dual earner couples with characteristics $(\theta_m, \phi_m, \gamma_m)$ and $m_{dec}^{y_1}(y_1')$ is the mass of dual earner couples with primary earnings close to y_1'. The extensive margin elasticity $\pi_{dec,1}(\theta_m, \phi_m, \gamma_m)$ gives the percentage change in dual earner couples with characteristics $(\theta_m, \phi_m, \gamma_m)$ – in response to a change in the tax treatment of primary earnings. Appendix D.4.2 provides insights on how revenue functions are estimated in the data.

B.5 Proofs

B.5.1 Proof of Lemma B.2

We characterize $e_m(\theta_m, \gamma_m)$ for the special case of iso-elastic cost functions, i.e. for the cost functions in (B.2) and (B.3). The first order conditions characterizing $y_1^*(\tau_m, \theta_m, \gamma_m)$ and $y_2^*(\tau_m, \theta_m, \gamma_m)$ are then

$$1 - T'(y_1^*(\cdot) + y_2^*(\cdot)) - \tau_m = \gamma_1 \; \theta_1^{-\left(1+\frac{1}{\varepsilon_1}\right)} y_1^*(\cdot)^{\frac{1}{\varepsilon_1}} \;, \tag{B.12}$$

and

$$1 - T'(y_1^*(\cdot) + y_2^*(\cdot)) - \tau_m = \gamma_2 \; \theta_2^{-\left(1+\frac{1}{\varepsilon_2}\right)} y_2^*(\cdot)^{\frac{1}{\varepsilon_2}} \;. \tag{B.13}$$

Differentiating with respect to τ_m, evaluating at $\tau_m = 0$, and using (B.12) and (B.13) yields

$$-T''(y_1^0 + y_2^0)(y_{1,\tau_m}^* + y_{2,\tau_m}^*) - 1 = \Big(1 - T'(y_1^0 + y_2^0)\Big) \; \frac{1}{\varepsilon_1} \; \frac{1}{y_1^0} \; y_{1,\tau_m}^*(\cdot) \;, \tag{B.14}$$

and

$$-T''(y_1^0 + y_2^0)(y_{1,\tau_m}^* + y_{2,\tau_m}^*) - 1 = \Big(1 - T'(y_1^0 + y_2^0)\Big) \frac{1}{\varepsilon_2} \; \frac{1}{y_2^0} \; y_{2,\tau_m}^*(\cdot) \;, \tag{B.15}$$

where y_1^0 and y_2^0 are respectively, primary and secondary earnings in the status quo. Equations (B.14) and (B.15) imply

$$y_{1,\tau_m}^* + y_{2,\tau_m}^* = -\frac{\varepsilon_1 y_1^0 + \varepsilon_2 y_2^0}{1 - T'(y_1^0 + y_2^0)} \left(1 + \frac{T''(y_1^0 + y_2^0)}{1 - T'(y_1^0 + y_2^0)} (\varepsilon_1 y_1^0 + \varepsilon_2 y_2^0)\right)^{-1} \;. \tag{B.16}$$

Hence,

$$\begin{aligned} e_m \;&:=\; -\tfrac{y_{1,\tau_m}^* + y_{2,\tau_m}^*}{y_m^0} \; (1 - T'(y_1^0 + y_2^0)) \\ &=\; (\varepsilon_1 \pi_1^0 + \varepsilon_2 \pi_2^0) \left(1 + \tfrac{T''(y_1^0 + y_2^0)}{1 - T'(y_1^0 + y_2^0)} (\varepsilon_1 y_1^0 + \varepsilon_2 y_2^0)\right)^{-1} \;, \end{aligned}$$

where

$$\pi_1^0 = \frac{y_1^0}{y_m^0} \quad \text{and} \quad \pi_2^0 = \frac{y_2^0}{y_m^0}$$

are, respectively, the income share of the primary and the secondary earner.

B.5.2 Proof of Proposition 6

Rewriting Equation (B.7). We can rewrite the terms that enter equation (B.7) in the following way: First,

$$\begin{aligned}&\mathbf{E}_{(\theta_m,\gamma_m)}\left[\mathbf{1}(y^0_m(\theta_m,\gamma_m)\in[y_m,y_m+\ell_m])T'_m(y^0_m(\theta_m,\gamma_m))y^*_{m,1}(0,\theta_m,\gamma_m)\right]\\ &=\mathbf{E}_{\gamma_m}\left[\int_{\underline{\theta}_2}^{\bar{\theta}_2}\int_{\underline{\theta}^0_1}^{\bar{\theta}^0_1}a(\theta_1,\theta_2,\gamma_m)d\theta_1\,d\theta_2\right]\end{aligned}$$

where, for ease of notation, we suppressed the arguments in the limits of the double integral, and

$$a(\theta_1,\theta_2,\gamma_m):=T'_m(y^0_m(\theta_m,\gamma_m))y^*_{m,1}(0,\theta_m,\gamma_m)f^\theta_1(\theta_1\mid\theta_2,\gamma_m)f^\theta_2(\theta_2\mid\gamma_m)\ .$$

The function $f^\theta_1(\cdot\mid\theta_2,\gamma)$ is the density representing the conditional distribution of θ_1 for given θ_2 and γ_m. Analogously, $f^\theta_2(\cdot\mid\gamma_m)$ is the density of θ_2 conditional on γ_m.

Second,

$$\begin{aligned}&\mathbf{E}_{(\theta_m,\gamma_m)}\left[\mathbf{1}(y^0_m(\theta_m,\gamma_m)\in[y_m,y_m+\ell_m])(y^0_m(\theta_m,\gamma_m)-y_m)\right]\\ &=\mathbf{E}_{\gamma_m}\left[\int_{\underline{\theta}_2}^{\bar{\theta}_2}\int_{\underline{\theta}^0_1}^{\bar{\theta}^0_1}b(\theta_m,\gamma_m)d\theta_1\,d\theta_2\right]\end{aligned}$$

where

$$b(\theta_m,\gamma_m):=(y^0_m(\theta_m,\gamma_m)-y_m)f^\theta_1(\theta_1\mid\theta_2,\gamma_m)f^\theta_2(\theta_2\mid\gamma_m)\ .$$

Third, let F^y_m be the *cdf* of y_m, then we can write

$$\begin{aligned}&\ell_m\mathbf{E}_{(\theta_m,\gamma_m)}\left[\mathbf{1}(y^0_m(\theta_m,\gamma_m)\geq y_m+\ell_m])\right]\\ &=\ell_mF^y_m(y_m+\ell_m)\ .\end{aligned}$$

Thus, collecting terms, we have

$$\begin{aligned}&R_{\tau_m}(0,\ell_m,y_m)=\\ &\quad\mathbf{E}_{\gamma_m}\left[\int_{\underline{\theta}_2}^{\bar{\theta}_{m2}}\int_{\underline{\theta}^0_1}^{\bar{\theta}^0_{m1}}a(\theta_1,\theta_2,\gamma_m)d\theta_1\,d\theta_2\right]\\ &\quad+\mathbf{E}_{\gamma_m}\left[\int_{\underline{\theta}_2}^{\bar{\theta}_{m2}}\int_{\underline{\theta}^0_1}^{\bar{\theta}^0_{m1}}b(\theta_1,\theta_2,\gamma_m)d\theta_1\,d\theta_2\right]\\ &\quad+\ell_m(1-F^y_m(y_m+\ell_m))\ ,\end{aligned}\tag{B.17}$$

The cross-derivative. We turn to a characterization of the cross derivative R_{τ_m,ℓ_m} evaluated at $\tau_m=0$ and $\ell_m=0$. To this end, for all terms that appear in (B.17) we compute the derivative with respect to ℓ_m and evaluate the resulting expression at $\ell_m=0$.

For the first two terms, we make use of Leibnitz rule. Specifically consider an abstract function $h:(\theta_1,\theta_2)\mapsto h(\theta_1,\theta_2)$ and define the function $G:\ell\mapsto G(\ell)$

$$G(l)=\int_{\underline{\theta}_2}^{\overline{\theta}_2(l)}\int_{\underline{\theta}_1}^{\overline{\theta}_1(l)}h(\theta_1,\theta_2)d\theta_1d\theta_2\ .$$

Note that G depends on ℓ via the upper limits in the double integral. A repeated application of Leibnitz' rule yields,

$$\begin{aligned}G'(l)\ &=\ \int_{\underline{\theta}_2}^{\overline{\theta}_2(l)}h(\overline{\theta}_1(l),\theta_2)\,\overline{\theta}'_{m1}(l)\,d\theta_2\\ &\qquad+\int_{\underline{\theta}_1}^{\overline{\theta}_1(l)}h(\theta_1,\overline{\theta}_2(l))\,\overline{\theta}'_{m2}(l)\,d\theta_1\ .\end{aligned}$$

Upon noting that $\theta_2 = \overline{\theta}_2(l)$ implies $\underline{\theta}_1 = \overline{\theta}_1(l)$, this expression simplifies:

$$G'(l) = \int_{\underline{\theta}_2}^{\overline{\theta}_2(l)} h(\overline{\theta}_1(l), \theta_2)\, \overline{\theta}'_{m1}(l)\, d\theta_2 \,.$$

Using this formula to differentiate

$$\mathbf{E}_{\gamma_m}\left[\int_{\underline{\theta}_2}^{\bar{\theta}_2}\int_{\underline{\theta}_1}^{\bar{\theta}_1} a(\theta_1, \theta_2, \gamma_m) d\theta_1\, d\theta_2\right]$$

with respect to ℓ_m and evaluating at $\ell_m = 0$ yields

$$\mathbf{E}_{\gamma_m}\left[\int_{\underline{\theta}_2(y_m|\gamma_m)}^{\bar{\theta}_2(y_m|\gamma_m)} a(\bar{\theta}_{m1}(y_m \mid \theta_2, \gamma_m), \theta_2, \gamma_m)\, \bar{\theta}'_{m1}(y_m \mid \theta_2, \gamma_{m1})\, d\theta_2\right],$$

where $\bar{\theta}'_{m1}(\cdot \mid \theta_2, \gamma_{m1})$ is the derivative of the function $\bar{\theta}_{m1}(\cdot \mid \theta_2, \gamma_{m1})$.

Analogously, using it to differentiate

$$\mathbf{E}_{\gamma_m}\left[\int_{\underline{\theta}_2}^{\bar{\theta}_2}\int_{\underline{\theta}_1}^{\bar{\theta}_1} b(\theta_1, \theta_2, \gamma_m) d\theta_1\, d\theta_2\right]$$

with respect to ℓ_m and evaluating at $\ell_m = 0$ yields

$$\mathbf{E}_{\gamma_m}\left[\int_{\underline{\theta}_2(y_m|\gamma_m)}^{\bar{\theta}_{m2}(y_m|\gamma_m)} b(\bar{\theta}_{m1}(y_m \mid \theta_2, \gamma_m), \theta_2, \gamma_m)\, \bar{\theta}'_{m1}(y_m \mid \theta_2, \gamma_{m1})\, d\theta_2\right].$$

Since the function b is bounded from below by zero and from above by ℓ_m this term vanishes.

Finally, a straightforward application of the product rule shows that the derivative of $\ell_m(1 - F^y_m(y_m + \ell_m))$ with respect to ℓ_m, evaluated at $\ell_m = 0$, simply equals $1 - F^y_m(y_m)$. Thus upon collecting terms we have

$$\begin{aligned} R_{\tau_m,\ell_m}(0,0,y_m) &= \mathbf{E}_{\gamma_m}\left[\int_{\underline{\theta}_2(y_m|\gamma_m)}^{\bar{\theta}_2(y_m|\gamma_m)} a(\bar{\theta}_1(y_m \mid \theta_2, \gamma_m), \theta_2, \gamma_m)\, \bar{\theta}'_1(y_m \mid \theta_2, \gamma_m)\, d\theta_2\right] \\ &\quad + 1 - F^y_m(y_m)\,, \end{aligned} \tag{B.18}$$

where, for ease of reference, we recall that

$$a(\theta_m, \gamma_m) := T'_m(y^0_m(\theta_m, \gamma_m))y^*_{m,1}(0, \theta_m, \gamma_m)f^\theta_1(\theta_1 \mid \theta_2, \gamma_m)f^\theta_2(\theta_2 \mid \gamma_m)\,.$$

With a bracket length of zero, evaluating $a(\cdot)$ at

$$\theta_m = (\theta_1, \theta_2) = (\bar{\theta}_1(y_m \mid \theta_2, \gamma_m), \theta_2)$$

and integrating over $\theta_2 \in [\underline{\theta}_2(y_m \mid \gamma_m), \overline{\theta}_2(y_m \mid \gamma_m)]$ amounts to integrating over all couples, with bargaining weights γ_m who have a joint income equal to y_m. We now work towards a characterization of $R_{\tau_m,\ell_m}(0,0,y_m)$ that can be more easily interpreted.

θ_{mi} is also an admissible representation of the individual's type, in the sense that it yields a representation of preferences so that higher types have lower marginal effort costs and therefore end up choosing higher earnings levels. observed in the data, i.e. $\theta_2 = y_2^0$. Likewise, given θ_2 and γ_{m1}, we can represent the primary earner's type by her status quo earnings, $\theta_1 = y_1^0$. This is convenient as it allows us to identify abstract type distributions with the (conditional) distributions of status quo income. Thus, $f_2(\cdot \mid \gamma_m)$ is then the distribution of secondary earnings in the status quo, conditional on γ_m and $f_1(\cdot \mid \theta_2, \gamma_m)$ is the status quo distribution of primary earnings conditional on γ_m and secondary earnings of θ_2.

Step 1. The retention rate $1 - T'_m(\cdot)$ gives the fraction of an additional income that a couple can spend on consumption. In the status quo, the derivative of the couple's earnings with respect to a change of the retention rate is given by

$$-y^*_{m,1}(0, \theta_m, \gamma_m) \; .$$

The elasticity of the married couples' earnings with respect to the retention rate then equals

$$e_m(\theta_m, \gamma_m) := -y^*_{m,1}(0, \theta_m, \gamma_m)\frac{1 - T'_m(\cdot)}{y^0_m(\theta_m, \gamma_m)} \; .$$

These two observations imply that

$$y^*_{m,1}(0, \theta_m, \gamma_m) = -e_m(\theta_m, \gamma_m)\,\frac{y^0_m(\theta_m, \gamma_m)}{1 - T'_m(\cdot)} \; . \tag{B.19}$$

Step 2. Define the shorthand

$$g(\theta_2, \gamma_m) := f_1^\theta(\bar{\theta}_{m1}(y_m \mid \theta_2, \gamma_m) \mid \theta_2, \gamma_m) f_2^\theta(\theta_2 \mid \gamma_m).$$

We now argue that the term

$$g(\theta_2, \gamma_m)\bar{\theta}'_{m1}(y_m \mid \theta_2, \gamma_{m1})$$

admits an interpretation as a conditional density of the cross-sectional distribution of the couples' joint earnings. To see this, let μ be a measure on the set of types $\Theta_1 \times \Theta_2$, representing the joint distribution of θ_1 and θ_2. Then,

$$\begin{aligned}
& F^y_m(y_m \mid \gamma_m) := \mu(\theta_m \mid y^0_m(\theta_1, \theta_2) \le y_m) \\
= \quad & \mu\big(\{\theta_m \mid \theta_2 \le \underline{\theta}_2(y_m \mid \gamma_m)\}\big) \\
& + \mu\big(\{\theta_m \mid \theta_2 \in [\underline{\theta}_2(y_m \mid \gamma_m), \bar{\theta}_{m2}(y_m \mid \gamma_m)] \text{ and } \theta_1 \le \bar{\theta}_{m1}(y_m \mid \theta_2, \gamma_m)\}\big) \\
= \quad & F_2^\theta(\underline{\theta}_2(y_m \mid \gamma_m)) \\
& + \int_{\underline{\theta}_2(y_m|\gamma_m)}^{\bar{\theta}_{m2}(y_m|\gamma_m)} F_1^\theta(\bar{\theta}_{m1}(y_m \mid \theta_2, \gamma_m)) f_2^\theta(\theta_2 \mid \gamma_m) d\theta_2 \; ,
\end{aligned}$$

where F_1^θ and F_2^θ are the *cdf*s of the marginal distributions of θ_1 and θ_2, respectively, and f_1^θ and f_2^θ are the corresponding densities. Straightforward computations, invoking Leibnitz' rule, yield that

$$f^y_m(y_m \mid \gamma_m) = \frac{\partial}{\partial y_m} F^y_m(y_m \mid \gamma_m),$$

where

$$f_m^y(y_m) := \mathbf{E}_{\gamma_m}\left[\int_{\underline{\theta}_2(y_m|\gamma_m)}^{\bar{\theta}_{m2}(y_m|\gamma_m)} g(\theta_2,\gamma_m)\,\bar{\theta}'_{m1}(y_m \mid \theta_2,\gamma_m)\,d\theta_2\right].$$

Thus, we can interpret $g(\theta_2,\gamma_m)\,\bar{\theta}'_{m1}(y_m \mid \theta_2,\gamma_m)$ as a density of y_m conditional on θ_2 and write

$$f_m^y(y_m \mid \theta_2) = g(\theta_2,\gamma_m)\,\bar{\theta}'_{m1}(y_m \mid \theta_2,\gamma_m)\,. \tag{B.20}$$

Step 3. Substituting (B.19) and (B.20) into (B.18) yields

$$R_{\tau_m,\ell_m}(0,0,y_m) \;=\; -\tfrac{T'_m(y_m)}{1-T'_m(y_m)}\,y_m\,f_m^y(y_m)\,\bar{\mathcal{E}}_m(y_m) + \;1 - F_m^y(y_m)\,, \tag{B.21}$$

where

$$\begin{aligned}\bar{\mathcal{E}}_m(y_m) \;&:=\; \mathbf{E}_{\gamma_m}\left[\int_{\underline{\theta}_2(y_m|\gamma_m)}^{\bar{\theta}_{m2}(y_m|\gamma_m)} e_m(\bar{\theta}_{m1}(y_m \mid \theta_2,\gamma_m)\theta_2,\gamma_m)\tfrac{f_m^y(y_m|\theta_2)}{f_m^y(y_m)}d\theta_2\right]\\ &=\; \mathbf{E}_{(\theta_m,\gamma_m)}\left[e_m(\theta_m,\gamma_m) \mid y_m^0(\theta_m,\gamma_m)=y_m\right]\end{aligned}$$

is the average value of $e_m(\theta_m,\gamma_m)$ among all married couples with a joint income of y_m.

B.5.3 Proof of Proposition 7

Extensive margin effects. For a given reform direction h_m, the cutoff types $\hat{\theta}_1$ and $\hat{\theta}_2$, for the primary and the secondary earner, respectively, become functions of the reform intensity τ_m, and we write $\hat{\theta}_1(\tau_m,\phi_1,\gamma_m)$ and $\hat{\theta}_2(\tau_m,\phi_2,\theta_1,\gamma_m)$. More precisely, $\hat{\theta}_1(\tau_m,\phi,\gamma_m)$ is now the value of θ_1 that solves

$$y^*_{sec}(\theta_1) - T_{m0}(y^*_{sec}(\theta_1)) - \tau_m h_m(y^*_{sec}(\theta_1)) - \gamma_{m1}k_1(y^*_{sec}(\theta_1),\theta_1) \;=\; \phi_1\,. \tag{B.22}$$

Note that for $\tau_m = 0$, the cutoff type $\hat{\theta}_1(\tau_m,\phi_1,\gamma_m)$ coincides with the status quo cutoff type $\hat{\theta}_1,(\phi_1,\gamma_m)$ defined in the body of the text, for any h_m. More formally, $\hat{\theta}_1(0,\phi_1,\gamma_m) = \hat{\theta}_1(\phi_1,\gamma_m)$, for all h_m.

Analogously, $\hat{\theta}_2(\tau_m,\phi_2,\theta_1,\gamma_m)$ is the value of θ_2 that solves

$$\Delta(\theta_1,\theta_2,\gamma_m) - \tau_m\Big(h_m\left(y_1^*(\theta_1,\theta_2)+y_2^*(\theta_1,\theta_2)\right) - h_m\left(y^*_{sec}(\theta_1)\right)\Big) \;=\; \phi_2\,. \tag{B.23}$$

If, say, $\hat{\theta}_1$ and $\hat{\theta}_2$ increase in τ_m, then a reform in direction h_m implies that some previously active primary and secondary earners no longer generate positive earnings. Again, $\hat{\theta}_2(0,\phi_2,\theta_1,\gamma_m) = \hat{\theta}_2(\phi_2,\theta_1,\gamma_m)$

Intensive margin effects. Utility-maximizing earnings levels are now also functions of τ_m and we write $y^*_{sec}(\tau_m,\theta_1,\gamma_m)$, $y_1^*(\tau_m,\theta_m,\gamma_m)$ and $y_2^*(\tau_m,\theta_m,\gamma_m)$. Note that, with quasi-linear in consumption preferences, the derivative of these functions with respect to τ_m are different from zero only when the couple's joint income lies in the bracket ranging from y_m to $y_m+\ell_m$, i.e. in the range of incomes where marginal tax rates change due to the reform.

Earnings levels and behavioral responses at the extensive margin. Tax reforms modify tax rates that depend on income. In our formal framework, behavioral responses depend on the individuals' types. To trace out the extensive margin effects associated with a tax reform, it will prove useful to have a mapping from the set of incomes subject to a change of the tax burden to the set of types who adjust their behavior at the extensive margin. Here, we introduce such a mapping.

The reform (τ_m, h_m) defined above has no effect on the taxes paid by couples with a joint income below y_m. For all other couples the tax burden is affected, with the consequence of extensive margin effects. Our formalism captures this as follows: The cutoff types $\hat{\theta}_1$ and $\hat{\theta}_2$ depend on the fixed costs ϕ_1 and ϕ_2. A reform that affects marginal tax rates in a bracket ranging from y_m to $y_m + \ell_m$ has extensive margin effects only for levels of ϕ_1 and ϕ_2 so that

$$y^*_{sec}(\tau_m, \hat{\theta}_1(\tau_m, \phi_1, \gamma_m), \gamma_m) \geq y_m$$

or

$$y^*_1(\tau_m, \theta_1, \hat{\theta}_2(\tau_m, \phi_2, \theta_1, \gamma_m), \gamma_m) + y^*_2(\tau_m, \theta_1, \hat{\theta}_2(\tau_m, \phi_2, \theta_1, \gamma_m), \gamma_m) \geq y_m \ .$$

Single earner couples. Let $\underline{\phi}_1(\tau_m, y \mid \gamma_m)$ be the value of ϕ_1 that solves

$$y^*_{sec}(\tau_m, \hat{\theta}_1(\phi_1, \gamma_m)\gamma_m) = y \ .$$

Thus, $\underline{\phi}_1(\tau_m, y \mid \gamma_m)$ is the lowest fixed cost type consistent with an earnings level of y in a single earner couple. Higher fixed cost types only consider earnings levels exceeding y. In the status quo, i.e. for $\tau_m = 0$, we write $\underline{\phi}^0_1(y \mid \gamma_m)$, etc. The function $y \mapsto \underline{\phi}^0_1(y \mid \gamma_m)$ will prove useful below. It is a mapping from the set of earnings levels to the set of single-earner couples types with extensive margin responses: A "small" reform (τ_m, h_m) that affects the tax burden of couples with a joint income of y_m and above, has extensive margin effects in the set single earner couples with $\phi_1 \geq \underline{\phi}^0_1(y \mid \gamma_m)$. Put differently, $\phi_1 < \underline{\phi}^0_1(y \mid \gamma_m)$ implies that $\hat{\theta}_1(\tau_m, \phi_1, \gamma_m)$ remains constant as τ_m changes.

Dual earner couples. For dual earner couples, we proceed analogously. Denote by

$$\underline{y}_{dec}(\tau_m, \phi_m, \gamma_m) := y^*_m(\tau_m, \hat{\theta}_1(\tau_m, \phi_1, \gamma_m), \hat{\theta}_2(\tau_m, \phi_2, \hat{\theta}_1(\tau_m, \phi_1, \gamma_m), \gamma_m), \gamma_m) \ ,$$

the lowest level of joint earnings consistent with a pair of fixed cost types $\phi_m = (\phi_1, \phi_2)$. In the status quo, for $\tau_m = 0$, we write

$$\underline{y}^0_{dec}(\phi_m, \gamma_m) := y^0_m(\hat{\theta}^0_1(\phi_1, \gamma_m), \hat{\theta}^0_2(\phi_2, \hat{\theta}^0_1(\phi_1, \gamma_m), \gamma_m), \gamma_m) \ .$$

For a "small" reform, the mapping from joint earnings to the set of dual earner couples with extensive margin responses is then given by the function $y \mapsto \Phi^0_m(y \mid \gamma_m)$, where

$$\Phi^0_m(y \mid \gamma_m) := \{\phi_m \mid \underline{y}^0_{dec}(\phi_m) \geq y\} \ .$$

Revenue implications. We denote by $R_m(\tau_m, \ell_m, y_m)$ the additional tax revenue due to the reform. With quasi-linear in consumption preferences, earnings choices do not depend on transfers. Hence,

$$\begin{aligned}
&R_m(\tau_m, \ell_m, y_m)\\
&= \mathbf{E}_{(\theta_m,\phi_m,\gamma_m)}\left[T_{m1}(y^*_m(\tau_m,\theta_m,\phi_m,\gamma_m)) - T_{m0}(y^0_m(\theta_m,\phi_m,\gamma_m))\right]\\
&= \mathbf{E}_{(\theta_m,\phi_m,\gamma_m)}\left[T_{m0}(y^*_m(\tau_m,\theta_m,\phi_m,\gamma_m)) + \tau_m\ h_m(y^*_m(\tau_m,\theta_m,\phi_m,\gamma_m))\right]\\
&\quad -\mathbf{E}_{(\theta_m,\phi_m,\gamma_m)}\left[T_{m0}(y^0_m(\theta_m,\phi_m,\gamma_m))\right]\ ,
\end{aligned}$$

where the operator $\mathbf{E}_{(\theta_m,\phi_m\gamma_m)}$ indicates that expectations are taken with respect to the joint distribution of θ_m, ϕ_m and γ_m; $y^*_m(\tau_m,\theta_m,\phi_m,\gamma_m)$ is the couple's joint income as a function of the reform intensity τ_m and the couple's characteristics, and, finally, $y^0_m(\theta_m,\phi_m,\gamma_m)$ is the couple's income in the status quo. Using the law of iterated expectations, we can also write this as

$$R_m(\tau_m, \ell_m, y_m) \quad = \quad \mathbf{E}_{\gamma_m}\mathbf{E}_{\phi_m}\left[R_m(\tau_m, \ell_m, y_m \mid \gamma_m, \phi_m)\right]\ ,$$

where

$$\begin{aligned}
&R_m(\tau_m, \ell_m, y_m \mid \gamma_m, \phi_m)\\
&= \mathbf{E}_{\theta_m}\left[T_{m0}(y^*_m(\tau_m,\theta_m,\phi_m,\gamma_m)) + \tau_m\ h_m(y^*_m(\tau_m,\theta_m,\phi_m,\gamma_m)) \mid \gamma_m,\phi_m\right]\\
&\quad -\mathbf{E}_{\theta_m}\left[T_{m0}(y^0_m(\theta_m,\phi_m,\gamma_m)) \mid \gamma_m,\phi_m\right]\ ,
\end{aligned}$$

Using that $T_{m0}(0) = h(0) = 0$, we can also write

$$\begin{aligned}
&R_m(\tau_m, \ell_m, y_m \mid \gamma_m, \phi_m)\\
&= \int_{\hat{\theta}_1(\tau_m,\phi_1,\gamma_m)}^{\bar{y}} \int_0^{\hat{\theta}_2(\tau_m,\theta_1,\phi_2,\gamma_m)} a_{sec}(\tau_m,\theta_m,\gamma_m)\ d\theta_2\ d\theta_1\\
&\quad + \int_{\hat{\theta}_1(\tau_m,\phi_1,\gamma_m)}^{\bar{y}} \int_{\hat{\theta}_2(\tau_m,\theta_1,\phi_2,\gamma_m)}^{\bar{y}} a_{dec}(\tau_m,\theta_m,\gamma_m)\ d\theta_2\ d\theta_1\\
&\quad -\mathbf{E}_{\theta_m}\left[T_{m0}(y^0_m(\theta_m,\phi_m\gamma_m)) \mid \gamma_m,\phi_m\right]\ ,
\end{aligned}$$

where

$$\begin{aligned}
a_{dec}(\tau_m,\theta_m,\phi_m,\gamma_m) \quad &= \quad \Big(T_{m0}(y^*_m(\tau_m,\theta_m,\gamma_m)) + \tau_m\ h_m(y^*_m(\tau_m,\theta_m,\gamma_m))\Big)\\
&\quad\quad \times f^{\theta}_2(\theta_2 \mid \theta_1,\gamma_m,\phi_m) f^{\theta}_1(\theta_1 \mid \gamma_m,\phi_m)\ .
\end{aligned}$$

and

$$\begin{aligned}
a_{sec}(\tau_m,\theta_m,\phi_m,\gamma_m) \quad &= \quad \Big(T_{m0}(y^*_{sec}(\tau_m,\theta_1,\gamma_m)) + \tau_m\ h_m(y^*_{sec}(\tau_m,\theta_1,\gamma_m))\Big)\\
&\quad\quad \times f^{\theta}_2(\theta_2 \mid \theta_1,\gamma_m,\phi_m) f^{\theta}_1(\theta_1 \mid \gamma_m,\phi_m)\ .
\end{aligned}$$

Revenue implications at the margin. The derivative of $R_m(\tau_m, \ell_m, y_m)$ with respect to the first argument, evaluated at $\tau_m = 0$, equals

$$R_{m,\tau_m}(0, \ell_m, y_m) \quad = \quad \mathbf{E}_{\gamma_m}\mathbf{E}_{\phi_m}\left[R_{m,\tau_m}(0, \ell_m, y_m \mid \gamma_m, \phi_m)\right]\ ,$$

where $R_{m,\tau_m}(0, \ell_m, y_m \mid \gamma_m, \phi_m)$ can be decomposed into a term due to single earner couples and a term due to couples with both primary and secondary earnings:

$$R_{m,\tau_m}(0, \ell_m, y_m \mid \gamma_m, \phi_m) = R^{sec}_{m,\tau_m}(0, \ell_m, y_m \mid \gamma_m, \phi_m) + R^{dec}_{m,\tau_m}(0, \ell_m, y_m \mid \gamma_m, \phi_m)\ .$$

for

$$R^{sec}_{m,\tau_m}(0,\ell_m,y_m \mid \gamma_m,\phi_m) = \frac{d}{d\tau_m}\left(\int_{\hat{\theta}_1(\tau_m,\phi_1,\gamma_m)}^{\bar{y}}\int_0^{\hat{\theta}_2(\tau_m,\theta_1,\phi_2,\gamma_m)} a_{sec}(\tau_m,\theta_m,\gamma_m)d\theta_1 d\theta_2\right)\Bigg|_{\tau_m=0}$$

and

$$R^{dec}_{m,\tau_m}(0,\ell_m,y_m \mid \gamma_m,\phi_m) = \frac{d}{d\tau_m}\left(\int_{\hat{\theta}_1(\tau_m,\phi_1,\gamma_m)}^{\bar{y}}\int_{\hat{\theta}_2(\tau_m,\theta_1,\phi_2,\gamma_m)}^{\bar{y}} a_{dec}(\tau_m,\theta_m,\gamma_m)d\theta_1 d\theta_2\right)\Bigg|_{\tau_m=0}$$

Computing these derivatives, invoking the Leibnitz rule, yields

$$\begin{aligned}
&R^{sec}_{m,\tau_m}(0,\ell_m,y_m \mid \gamma_m,\phi_m) = \\
&\int_{\hat{\theta}^0_1(\phi_1,\gamma_m)}^{\bar{y}} a^0_{sec}(\theta_1,\hat{\theta}^0_2(\theta_1,\phi_2,\gamma_m),\gamma_m)\ \hat{\theta}^0_{2,\tau_m}(\theta_1,\phi_2,\gamma_m)\ d\theta_1 \\
&-\left(\int_0^{\hat{\theta}^0_2(\hat{\theta}^0_1(\phi_1,\gamma_m),\phi_2,\gamma_m)} a^0_{sec}(\hat{\theta}^0_1(\phi_1,\gamma_m),\theta_2,\gamma_m)\ \hat{\theta}^0_{1,\tau_m}(\phi_1,\gamma_m)\ \ d\theta_2\right) \\
&+\int_{\hat{\theta}^0_1(\phi_1,\gamma_m)}^{\bar{y}}\int_0^{\hat{\theta}^0_2(\theta_1,\phi_2,\gamma_m)} a^0_{sec,\tau_m}(\theta_m,\gamma_m)\ d\theta_1 d\theta_2,
\end{aligned}$$

and

$$\begin{aligned}
&R^{dec}_{m,\tau_m}(0,\ell_m,y_m \mid \gamma_m,\phi_m) = \\
&-\left(\int_{\hat{\theta}^0_2(\hat{\theta}^0_1(\phi_1,\gamma_m),\phi_2,\gamma_m)}^{\bar{y}} a^0_{dec}(\hat{\theta}^0_1(\phi_1,\gamma_m),\theta_2,\gamma_m)\ \hat{\theta}^0_{1,\tau_m}(\phi_1,\gamma_m)\ d\theta_2\right) \\
&-\left(\int_{\hat{\theta}^0_1(\phi_1,\gamma_m)}^{\bar{y}} a^0_{dec}(\theta_1,\hat{\theta}^0_2(\theta_1,\phi_2,\gamma_m),\gamma_m)\ \hat{\theta}^0_{2,\tau_m}(\theta_1,\phi_2,\gamma_m)\ d\theta_1\right) \\
&+\int_{\hat{\theta}^0_1(\phi_1,\gamma_m)}^{\bar{y}}\int_{\hat{\theta}^0_2(\theta_1,\phi_2,\gamma_m)}^{\bar{y}} a^0_{dec,\tau_m}(\theta_m,\gamma_m)\ \ d\theta_1 d\theta_2,
\end{aligned}$$

where the superscript 0 indicates an evaluation at the status quo, i.e. for $\tau_m = 0$, and the subscript τ_m indicates the derivative of a function with respect to τ_m.

We now take an expectation over fixed cost types and write

$$\mathcal{R}^{sec}_{m,\tau_m}(0,\ell,y_m) := \mathbf{E}_{\phi_m}\left[R^{sec}_{m,\tau_m}(0,\ell_m,y_m \mid \gamma_m,\phi_m)\right]$$

and

$$\mathcal{R}^{dec}_{m,\tau_m}(0,\ell,y_m) := \mathbf{E}_{\phi_m}\left[R^{dec}_{m,\tau_m}(0,\ell_m,y_m \mid \gamma_m,\phi_m)\right]$$

Repeating the steps outlined previously in Section B.5.2, we now compute the cross-derivatives

$$\mathcal{R}^{sec}_{\tau_m,\ell_m}(0,0,y_m \mid \gamma_m) \quad \text{and} \quad \mathcal{R}^{dec}_{\tau_m,\ell_m}(0,0,y_m \mid \gamma_m,\phi_m)\ .$$

We obtain

$$\begin{aligned}
&\mathcal{R}^{sec}_{\tau_m,\ell_m}(0,0,y_m \mid \gamma_m) = \\
&\mathbf{E}_{\phi_m}\left[\mathbf{1}\left(\phi_1 \geq \underline{\phi}^0_1(y_m \mid \gamma_m)\right)\left(\int_{\hat{\theta}^0_1(\phi_1,\gamma_m)}^{\bar{y}} a^0_{sec}(\theta_1,\hat{\theta}^0_2(\theta_1,\phi_2,\gamma_m),\gamma_m)\ \hat{\theta}^0_{2,\tau_m}(\theta_1,\phi_2,\gamma_m)\ d\theta_1\right)\right] \\
&-\mathbf{E}_{\phi_m}\left[\mathbf{1}\left(\phi_1 \geq \underline{\phi}^0_1(y_m \mid \gamma_m)\right)\left(\int_0^{\hat{\theta}^0_2(\hat{\theta}^0_1(\phi_1,\gamma_m),\phi_2,\gamma_m)} a^0_{sec}(\hat{\theta}^0_1(\phi_1,\gamma_m),\theta_2,\gamma_m)\ \hat{\theta}^0_{1,\tau_m}(\phi_1,\gamma_m)\ d\theta_2\right)\right] \\
&+\mathbf{E}_{\phi_m}\left[\lambda_{sec}(\gamma_m,\phi_m)I_s(y_m \mid \gamma_m,\phi_m)\right]
\end{aligned}$$

where

$$I_{sec}(y_m \mid \gamma_m, \phi_m) := -\frac{T'(y_m)}{1-T'(y_m)}\, y_m\, \mathcal{E}_{sec}(y_m \mid \gamma_m, \phi_m)\, f^y_{sec}(y_m \mid \gamma_m, \phi_m) + 1 - F^y_{sec}(y_m \mid \gamma_m, \phi_m)\ .$$

Moreover, $\lambda_{sec}(\gamma_m, \phi_m)$ is the share of single earner couples among all couples with characteristics (γ_m, ϕ_m), $F^y_{sec}(\cdot \mid \gamma_m, \phi_m)$ is the (conditional) *cdf* representing the distribution of incomes among single earner couples and $f^y_{sec}(\cdot \mid \gamma_m, \phi_m)$ the corresponding density; finally, $\mathcal{E}_{sec}(y_m \mid \gamma_m, \phi_m)$ is the intensive margin elasticity of earnings (for single earner couples with earnings of y_m) with respect to the net of tax rate.

Analogously, we obtain

$$\begin{aligned}
&\mathcal{R}^{dec}_{m,\tau_m,\ell_m}(0,0,y_m \mid \gamma_m) = \\
&-\mathbf{E}_{\phi_m}\left[\mathbf{1}(\phi_m \in \Phi^0_m(y_m \mid \gamma_m))\left(\int_{\hat{\theta}^0_2(\hat{\theta}^0_1(\phi_1,\gamma_m),\phi_2,\gamma_m)}^{\bar{y}} a^0_{dec}(\hat{\theta}^0_1(\phi_1,\gamma_m),\theta_2,\gamma_m)\, \hat{\theta}^0_{1,\tau_m}(\phi_1,\gamma_m)\, d\theta_2\right)\right] \\
&-\mathbf{E}_{\phi_m}\left[\mathbf{1}(\phi_m \in \Phi^0_m(y_m \mid \gamma_m))\left(\int_{\hat{\theta}^0_1(\phi_1,\gamma_m)}^{\bar{y}} a^0_{dec}(\theta_1,\hat{\theta}^0_2(\theta_1,\phi_2,\gamma_m),\gamma_m)\, \hat{\theta}^0_{2,\tau_m}(\theta_1,\phi_2,\gamma_m)\, d\theta_1\right)\right] \\
&+\mathbf{E}_{\phi_m}\left[\lambda_{dec}(\gamma_m,\phi_m)\, I_{dec}(y_m \mid \gamma_m,\phi_m)\right]\ ,
\end{aligned}$$

where

$$\Phi^0_m(y_m \mid \gamma_m) := \{\phi_m \mid \underline{y}^0_{dec}(\phi_m) \geq y_m\}\ ,$$

with

$$\underline{y}^0_{dec}(\phi_m) := y^0_m(\hat{\theta}^0_1(\phi_1,\gamma_m), \hat{\theta}^0_2(\phi_2, \hat{\theta}^0_1(\phi_1,\gamma_m),\gamma_m))\ ,$$

and

$$I_{dec}(y_m \mid \gamma_m, \phi_m) := -\frac{T'(y_m)}{1-T'(y_m)}\, y_m\, \mathcal{E}_{dec}(y_m \mid \gamma_m, \phi_m)\, f^y_{dec}(y_m \mid \gamma_m, \phi_m) + 1 - F^y_{dec}(y_m \mid \gamma_m, \phi_m)\ .$$

Collecting terms capturing intensive margin responses of single earner couples. Above we derived an expression for $I_{sec}(y_m \mid \gamma_m, \phi_m)$ that captures the intensive margin responses of single earner couples, conditional on bargaining weights being given by γ_m and fixed costs being given be ϕ_m. Using the law of iterated expectations, we now compute the average intensive margin response of all single earner couples:

$$\begin{aligned}
\mathcal{I}_{sec}(y) &:= \mathbf{E}_{\gamma_m}\mathbf{E}_{\phi_m}\left[\lambda_{sec}(\gamma_m,\phi_m) I_{sec}(y_m \mid \gamma_m,\phi_m)\right] \\
&= \tfrac{T'(y_m)}{1-T'(y_m)}\, y_m\, \mathbf{E}_{\gamma_m}\mathbf{E}_{\phi_m}\left[\lambda_{sec}(\gamma_m,\phi_m)\, f^y_{sec}(y_m \mid \gamma_m,\phi_m)\, \mathcal{E}_{sec}(y_m \mid \gamma_m,\phi_m)\right] \\
&\quad + \ \mathbf{E}_{\gamma_m}\mathbf{E}_{\phi_m}\left[\lambda_{sec}(\gamma_m,\phi_m)(1 - F^y_{sec}(y_m \mid \gamma_m,\phi_m))\right]\ .
\end{aligned}$$

To obtain a more concise expression, let

$$M^+_{sec}(y) := \mathbf{E}_{\gamma_m}\mathbf{E}_{\phi_m}\left[\lambda_{sec}(\gamma_m,\phi_m)(1 - F^y_{sec}(y_m \mid \gamma_m,\phi_m))\right]$$

be the mass of single earner couples with an income above y, and

$$m_{sec}(y) := \mathbf{E}_{\gamma_m}\mathbf{E}_{\phi_m}\left[\lambda_{sec}(\gamma_m,\phi_m)\, f^y_{sec}(y_m \mid \gamma_m,\phi_m)\right]$$

the mass of single earner couples with an income close to y. Then, we can write

$$\begin{aligned}
&\mathbf{E}_{\gamma_m}\mathbf{E}_{\phi_m}\left[\lambda_{sec}(\gamma_m,\phi_m)\, f^y_{sec}(y_m \mid \gamma_m,\phi_m)\, \mathcal{E}_{sec}(y_m \mid \gamma_m,\phi_m)\right] \\
&= m_s(y)\, \mathbf{E}_{\phi_m}\left[\tfrac{\lambda_s(\gamma_m,\phi_m)\, f^y_{ms}(y_m \mid \gamma_m,\phi_m)}{m_s(y)}\, \mathcal{E}_{ms}(y_m \mid \gamma_m,\phi_m)\right] \\
&=: m_s(y)\, \bar{\mathcal{E}}_{ms}(y)\ ,
\end{aligned}$$

where $\bar{\mathcal{E}}_{sec}(y)$ is the average intensive margin elasticity among single earner couples with an income close to y. Thus,

$$\mathcal{I}_{sec}(y) \ = \ -\tfrac{T'(y)}{1-T'(y)}\, y\, m_{sec}(y)\, \bar{\mathcal{E}}_{sec}(y) + M^+_{sec}(y)\ .$$

Collecting terms capturing intensive margin responses of dual earner couples. Following the same steps as in the previous paragraph we obtain

$$\begin{aligned}\mathcal{I}_{dec}(y) &= -\tfrac{T'(y)}{1-T'(y)}\; y\; \mathbf{E}_{\gamma_m}\mathbf{E}_{\phi_m}\left[\lambda_{dec}(\gamma_m,\phi_m)\; f^{y}_{dec}(y_m \mid \gamma_m,\phi_m)\; \mathcal{E}_{dec}(y_m \mid \gamma_m,\phi_m)\right] \\ &\quad + M^{+}_{dec}(y)\ ,\end{aligned}$$

where $M^{+}_{dec}(y)$ is the mass of dual earner couples with an income above y. This formula can be rewritten as

$$\mathcal{I}_{dec}(y) = -\tfrac{T'(y)}{1-T'(y)}\; y\; m_{dec}(y)\; \bar{\mathcal{E}}_{dec}(y) + M^{+}_{dec}(y)\ ,$$

where $m_{dec}(y)$ is the mass of dual earner couples with an income close to y, and $\bar{\mathcal{E}}_{dec}(y)$ is the average intensive margin elasticity among dual earner couples with an income close to y.

Extensive margin responses, single earner couples. We treat γ_m as a fixed parameter, also suppress it in terms of notation, and consider

$$X^2_{sec}(y_m) := \mathbf{E}_{\phi_1}\left[\mathbf{E}_{\phi_2}\left[\mathbf{1}\left(\phi_1 \geq \underline{\phi}^0_1(y_m)\right)\left(\int_{\hat{\theta}^0_1(\phi_1)}^{\bar{y}} a^0_{1s}(\theta_1,\hat{\theta}^0_2(\theta_1,\phi_2))\;\hat{\theta}^0_{2,\tau_m}(\theta_1,\phi_2)\; d\theta_1\right) \mid \phi_1\right]\right],$$

and

$$X^1_{sec}(y_m) := \mathbf{E}_{\phi_1}\left[\mathbf{E}_{\phi_2}\left[\mathbf{1}\left(\phi_1 \geq \underline{\phi}^0_1(y_m)\right)\left(\int_0^{\hat{\theta}^0_2(\hat{\theta}^0_1(\phi_1),\phi_2)} a^0_{1s}(\hat{\theta}^0_1(\phi_1),\theta_2)\;\hat{\theta}^0_{1,\tau_m}(\phi_1)\; d\theta_2\right) \mid \phi_1\right]\right].$$

<u>*Step 1. Rewriting $X^2_{sec}(y_m)$.*</u> Note that

$$X^2_{sec}(y_m) = \int_{\underline{\phi}^0_1(y_m)}^{\bar{y}} \mathbf{E}_{\phi_2}\left[\left(\int_{\hat{\theta}^0_1(\phi_1)}^{\bar{y}} a^0_{1s}(\theta_1,\hat{\theta}^0_2(\theta_1,\phi_2))\;\hat{\theta}^0_{2,\tau_m}(\theta_1,\phi_2)\; d\theta_1\right) \mid \phi_1\right] f^{\phi_1}_1(\phi_1)d\phi_1\ ,$$

where $f^{\phi_1}_1$ is the density of the distribution of ϕ_1. Using the assumption that ϕ_2 and θ_1 are stochastically independent, this can be rewritten as

$$X^2_{sec}(y_m) = \int_{\underline{\phi}^0_1(y_m)}^{\bar{y}} \left(\int_{\hat{\theta}^0_1(\phi_1)}^{\bar{y}} T_{m0}(y^0_{1s}(\theta_1))\; z(\theta_1,\phi_1)\; d\theta_1\right) f^{\phi_1}_1(\phi_1)d\phi_1\ ,$$

where

$$z(\theta_1,\phi_1) := \mathbf{E}_{\phi_2}\left[f^{\theta}_2(\hat{\theta}_2(\theta_1,\phi_2) \mid \theta_1,\phi_m)\;\hat{\theta}^0_{2,\tau_m}(\theta_1,\phi_2) \mid \phi_1\right]\; f^{\theta}_1(\theta_1 \mid \phi_m)\ .$$

After an integration by substitution, this can be rewritten as

$$X^2_{sec}(y_m) = \int_{\underline{\phi}_1(y_m)}^{\bar{y}} \left(\int_{\phi_1}^{\bar{y}} T_{m0}(y^0_{1s}(\hat{\theta}^0_1(\phi_1)))\; z(\hat{\theta}^0_1(\phi_1),\phi_1)\;\hat{\theta}^{0'}_1(\phi_1)\; d\phi_1\right) f^{\phi_1}_1(\phi_1)d\phi_1\ ,$$

where $\hat{\theta}^{0'}_1$ is the derivative of the function $\hat{\theta}^0_1$. After an integration by parts, this latter expression can be written as

$$X^2_{sec}(y_m) = \int_{\underline{\phi}_1(y_m)}^{\bar{y}} T_{m0}(y^0_{1s}(\hat{\theta}^0_1(\phi_1)))\; z(\hat{\theta}^0_1(\phi_1),\phi_1)\;\hat{\theta}^{0'}_1(\phi_1)\;\left(F^{\phi}_1(\phi_1) - F^{\phi}_1(\underline{\phi}_1(y_m))\right) d\phi_1\ .$$

After another integration by substitution, we obtain

$$X^2_{sec}(y_m) = \int_{y_m}^{\bar{y}} T_{m0}(y)\, g_{sec}(y)\, dy,$$

where

$$g_{sec}(y) := z(\hat{\theta}^0_1(\underline{\phi}_1(y)), \phi_1)\, \hat{\theta}^{0\prime}_1(\underline{\phi}_1(y)) \, \left(F^{\phi}_1(\underline{\phi}_1(y)) - F^{\phi}_1(\underline{\phi}_1(y_m))\right) \underline{\phi}'_1(y)$$

measures the gain of single earner couples with an income close to y due to the tax reform; this gain comes from dual earner couples in which the secondary earner becomes inactive.

Upon defining an extensive margin elasticity that relates changes in the fraction of single earner households to changes in their after-tax incomes

$$\pi^+_{sec}(y) := \frac{g_{sec}(y)}{m^y_{sec}(y)}(y - T_{m0}(y)) \ ,$$

where $m_{sec}(y)$ is the mass of single earner couples with an income close to y,[33] we can rewrite $X^2_{sec}(y_m)$ one more time:

$$X^2_{sec}(y_m) = \int_{y_m}^{\bar{y}} \frac{T_{m0}(y)}{y - T_{m0}(y)} \ \pi^+_{sec}(y)\, m^y_{sec}(y)\, dy \ .$$

Averaging over γ_m. Now, we bring back the conditioning variable γ_m and write this as

$$X^2_{sec}(y_m \mid \gamma_m) = \int_{y_m}^{\bar{y}} \frac{T_{m0}(y)}{y - T_{m0}(y)} \ \pi^+_{sec}(y \mid \gamma_m)\, m^y_{sec}(y \mid \gamma_m)\, dy \ .$$

We finally define

$$\mathcal{X}^2_{sec}(y_m) := \mathbf{E}_{\gamma_m}\left[X^2_{sec}(y_m \mid \gamma_m)\right]$$

and note that

$$\mathcal{X}^2_{sec}(y_m) = \int_{y_m}^{\bar{y}} \frac{T_{m0}(y)}{y - T_{m0}(y)} \ \mathbf{E}_{\gamma_m}\left[\pi^+_{sec}(y \mid \gamma_m)\, m^y_{sec}(y \mid \gamma_m)\right] dy \ .$$

Step 2. Rewriting $X^1_{sec}(y_m)$. Repeating, mutatis mutandis, the analysis in Step 1, brings the following results: Denote by $l^1_{sec}(y)$ the loss/fraction of single earner couples with an income close to y that are turned into couples with no earnings in response to the tax reform. The corresponding extensive margin elasticity is

$$\pi^-_{sec}(y) := \frac{l^1_{sec}(y)}{m^y_{sec}(y)}(y - T_{m0}(y)) \ .$$

For given γ_m, this elasticity enters the expression

$$X^1_{sec}(y_m \mid \gamma_m) = \int_{y_m}^{\bar{y}} \frac{T_{m0}(y)}{y - T_{m0}(y)} \ \pi^-_{sec}(y \mid \gamma_m)\, m^y_{sec}(y \mid \gamma_m)\, dy \ .$$

Using that $\mathcal{X}^1_{sec}(y_m) := \mathbf{E}_{\gamma_m}\left[X^1_{sec}(y_m \mid \gamma_m)\right]$ we finally obtain

$$\mathcal{X}^1_{sec}(y_m) = \int_{y_m}^{\bar{y}} \frac{T_{m0}(y)}{y - T_{m0}(y)} \ \mathbf{E}_{\gamma_m}\left[\pi^-_{sec}(y \mid \gamma_m)\, m^y_{sec}(y \mid \gamma_m)\right] dy \ .$$

Step 3. Collecting terms We can now consolidate these expressions and define

$$\begin{aligned}
\mathcal{X}_{sec}(y_m) &= \mathcal{X}^1_{sec}(y_m) + \mathcal{X}^2_{sec}(y_m) \\
&= \int_{y_m}^{\bar{y}} \tfrac{T_{m0}(y)}{y - T_{m0}(y)} \ \mathbf{E}_{\gamma_m}\left[\left(\pi^-_{sec}(y \mid \gamma_m) + \pi^+_{sec}(y \mid \gamma_m)\right) m^y_{sec}(y \mid \gamma_m)\right] dy \\
&:= \int_{y_m}^{\bar{y}} \tfrac{T_{m0}(y)}{y - T_{m0}(y)} \ \mathbf{E}_{\gamma_m}\left[\pi_{sec}(y \mid \gamma_m)\, m^y_{sec}(y \mid \gamma_m)\right] dy,
\end{aligned}$$

[33] Formally, m_{sec} is the derivative of the function M^-_{sec}, where $M^-_{sec}(y)$ is the mass of single earner couples with an income below y.

where $\pi_{sec}(y \mid \gamma_m) := \pi^-_{sec}(y \mid \gamma_m) + \pi^+_{sec}(y \mid \gamma_m)$. Upon defining

$$m^y_{sec}(y) := \mathbf{E}_{\gamma_m} \left[m^y_{sec}(y \mid \gamma_m) \right],$$

and

$$\bar{\pi}_{sec}(y) := \mathbf{E}_{\gamma_m} \left[\pi_{sec}(y \mid \gamma_m) \, \frac{m^y_{sec}(y \mid \gamma_m)}{m^y_{sec}(y)} \right],$$

this can be rewritten as

$$\mathcal{X}_{sec}(y_m) \quad = \quad \int_{y_m}^{\infty} \tfrac{T_{m0}(y)}{y - T_{m0}(y)} \, \bar{\pi}_{sec}(y) \, m^y_{sec}(y) \, dy \, .$$

Extensive margin responses, dual earner couples. We proceed along the same lines as in the previous paragraph on single earner couples: We first treat γ_m as a fixed parameter, also suppress it in terms of notation, and compute

$$X^2_{dec}(y_m) := \mathbf{E}_{\phi_1} \left[\mathbf{E}_{\phi_2} \left[\mathbf{1}(\phi_m \in \Phi^0_m(y_m)) \left(\int_{\hat{\theta}^0_1(\phi_1)}^{\bar{y}} a^0(\theta_1, \hat{\theta}^0_2(\theta_1, \phi_2)) \, \hat{\theta}^0_{2,\tau_m}(\theta_1, \phi_2) \, d\theta_1 \right) \mid \phi_1 \right] \right],$$

and

$$X^1_{dec}(y_m) := \mathbf{E}_{\phi_1} \left[\mathbf{E}_{\phi_2} \left[\mathbf{1}(\phi_m \in \Phi^0_m(y_m)) \left(\int_{\hat{\theta}^0_2(\hat{\theta}^0_1(\phi_1), \phi_2)}^{\bar{y}} a^0(\hat{\theta}^0_1(\phi_1), \theta_2) \, \hat{\theta}^0_{1,\tau_m}(\phi_1, \gamma_m) \, d\theta_2 \right) \mid \phi_1 \right] \right].$$

The term X^2_{dec} measures a loss of tax revenue from dual earner couples because some are turned into single earner couples. The term X^1_{dec} measures a loss of tax revenue because some dual earner couples are turned into couples with no earnings at all. We will compute expectations with respect to γ_m afterwards. We only sketch how the derivations change relative to those for single earner couples.

Step 1. Rewriting $X^2_{dec}(y_m)$. Starting from

$$X^2_{dec}(y_m) = \int_{\underline{\phi}^0_{1dec}(y_m)}^{\bar{y}} \int_{\underline{\phi}^0_{2dec}(y_m \mid \phi_1)}^{\bar{y}} \left(\int_{\hat{\theta}^0_1(\phi_1)}^{\bar{y}} a^0(\theta_1, \hat{\theta}^0_2(\theta_1, \phi_2)) \, \hat{\theta}^0_{2,\tau_m}(\theta_1, \phi_2) \, d\theta_1 \right) f^\phi_2(\phi_2 \mid \phi_1) \, d\phi_2 \, f^\phi_1(\phi_1) \, d\phi_1,$$

we ultimately obtain

$$X^2_{dec}(y_m) = \int_{y_m}^{\bar{y}} \frac{T_{m0}(y)}{y - T_{m0}(y)} \, \pi_{21}(y) \, m^y_{dec}(y) \, dy \, .$$

where $\pi_{21}(y)$ measures the fraction of dual earner couples with a joint income close to y that are turned into single earner couples.

Averaging over γ_m. Now, we bring back the conditioning variable γ_m and write this as

$$X^2_{dec}(y_m \mid \gamma_m) = \int_{y_m}^{\bar{y}} \frac{T_{m0}(y)}{y - T_{m0}(y)} \, \pi_{21}(y \mid \gamma_m) \, m^y_{dec}(y \mid \gamma_m) \, dy \, .$$

We finally define

$$\mathcal{X}^2_{dec}(y_m) := \mathbf{E}_{\gamma_m} \left[X^2_{dec}(y_m \mid \gamma_m) \right]$$

and note that

$$\mathcal{X}^2_{dec}(y_m) = \int_{y_m}^{\bar{y}} \frac{T_{m0}(y)}{y - T_{m0}(y)} \, \mathbf{E}_{\gamma_m} \left[\pi_{21}(y \mid \gamma_m) \, m^y_{dec}(y \mid \gamma_m) \right] dy \, .$$

Step 2. Rewriting $X^1_{dec}(y_m)$ and averaging over γ_m. Analogously, we find

$$X^1_{dec}(y_m) = \int_{y_m}^{\bar{y}} \frac{T_{m0}(y)}{y - T_{m0}(y)} \, \pi_{20}(y) \, m^y_{dec}(y) \, dy \, .$$

where $\pi_{20}(y)$ measures the fraction of dual earner couples with a joint income close to y that are turned into couples with no earnings. As before, we have

$$X^1_{dec}(y_m \mid \gamma_m) = \int_{y_m}^{\bar{y}} \frac{T_{m0}(y)}{y - T_{m0}(y)} \, \pi_{20}(y \mid \gamma_m) \, m^y_{dec}(y \mid \gamma_m) \, dy \, .$$

$$\mathcal{X}^1_{dec}(y_m) := \mathbf{E}_{\gamma_m} \left[X^1_{dec}(y_m \mid \gamma_m) \right] ,$$

and

$$\mathcal{X}^1_{dec}(y_m) = \int_{y_m}^{\bar{y}} \frac{T_{m0}(y)}{y - T_{m0}(y)} \, \mathbf{E}_{\gamma_m} \left[\pi_{20}(y \mid \gamma_m) \, m^y_{dec}(y \mid \gamma_m) \right] dy \, .$$

<u>*Step 3. Collecting terms.*</u> We finally define

$$\begin{aligned} \mathcal{X}_{dec}(y_m) &:= X^1_{dec}(y_m) + X^2_{dec}(y_m) \\ &= \int_{y_m}^{\bar{y}} \tfrac{T_{m0}(y)}{y - T_{m0}(y)} \, \mathbf{E}_{\gamma_m} \left[\Big(\pi_{20}(y \mid \gamma_m) + \pi_{21}(y \mid \gamma_m) \Big) \, m^y_{dec}(y \mid \gamma_m) \right] dy \\ &:= \int_{y_m}^{\bar{y}} \tfrac{T_{m0}(y)}{y - T_{m0}(y)} \, \mathbf{E}_{\gamma_m} \left[\pi_2(y \mid \gamma_m) \, m^y_{dec}(y \mid \gamma_m) \right] dy, \end{aligned}$$

where $\pi_{dec}(y \mid \gamma_m) = \pi_{20}(y \mid \gamma_m) + \pi_{21}(y \mid \gamma_m)$. Again, this can be rewritten as

$$\mathcal{X}_{dec}(y_m) \;=\; \int_{y_m}^{\bar{y}} \tfrac{T_{m0}(y)}{y - T_{m0}(y)} \, \bar{\pi}_{dec}(y) \, m^y_{dec}(y) \, dy \, .$$

cdf of the income distribution among single earner couples. Analogously, we define $M^-_s(y) = \lambda^0_s F^y_s(y)$ and $m_s(y) = \lambda^0_s \; f^y_s(y)$. The terms $M^+_b(y)$ and $m_b(y)$ for dual earner couples are analogously defined.

C Evaluating "large" reforms

Our analysis of US tax reforms in Section 5 provides answers to the following questions: First, was there an efficiency rationale for the changes in marriage penalties and bonuses? Second, was there majority support for the US tax reforms that altered the tax treatment of single and couples? Third, what were the implications of these reforms for social welfare? The first question can be answered using the characterization of Pareto-improving reform directions that was developed in Section 3. For the second and the third question, we need to extend this framework. To get at the second question we need to determine, for each single and for each spouse in a married couple, whether he or she was made better off by the reform that actually took place. To answer the third question we need, moreover, an assessment of how much he or she was made better or worse off.

Our answers will be micro-founded, i.e., we trace them back to an analysis of welfare implications at the individual level. In this section, we explain our approach to this individual-level welfare analysis; that is, we explain how we determine whether a single with an annual income of, say, 60,000 USD was a beneficiary of the Reagan tax cuts, and by how much this person was better off. We also explain how we get from there to analyses of political feasibility and social welfare implications.

Recall that, for a given tax reform (τ, h), we defined $V_s(\tau, h, \rho_s, \theta_s) - V_s(0, h, \rho_s, \theta_s)$ as the reform-induced change in indirect utility for a single with characteristics θ_s. Analogously,

$V_i(\tau, h, \rho_m, \theta_m, \gamma_m) - V_i(0, h, \rho_m, \theta_m, \gamma_m)$ is the reform-induced change in indirect utility for spouse i in a married couple with characteristics θ_m and intra-family bargaining weights γ_m. Equations (1) and (2) above characterize the derivatives of these expressions with respect to the reform intensity τ and evaluate them at the status quo, i.e. at $\tau = 0$. We now generalize this and consider the effects of a change of the reform intensity also away from the status quo. Specifically, we denote the marginal effect of a further increase of the reform intensity – starting from intensity τ' – on the indirect utility of spouse i by $V_{i,\tau}(\tau', h, \rho_m, \theta_m, \gamma_m)$. We define $V_{s,\tau}(\tau', h, \rho_s, \theta_s)$ analogously. Obviously,

$$V_s(\tau, h, \rho_s, \theta_s) - V_s(0, h, \rho_s, \theta_s) = \int_0^\tau V_{s,\tau}(\tau', h, \rho_s, \theta_s)\, d\tau' \,, \tag{C.24}$$

and

$$V_i(\tau, h, \rho_m, \theta_m, \gamma_m) - V_i(0, h, \rho_m, \theta_m, \gamma_m) = \int_0^\tau V_{i,\tau}(\tau', h, \rho_m, \theta_m, \gamma_m)\, d\tau' \,. \tag{C.25}$$

By the envelope theorem,

$$V_{s,\tau}(\tau', h, \rho_s, \theta_s) = u_{s1}(\tau', \theta_s)\Big[\rho_s R_\tau(\tau', h) - h_s(y_s^*(\tau', \theta_s))\Big] \,, \tag{C.26}$$

where $u_{s1}(\tau', \theta_s)$ is the marginal utility of consumption evaluated at reform intensity τ', $R_\tau(\tau', h)$ is the derivative of aggregate tax revenue with respect to further increases of the reform intensity at τ', and finally, $y_s^*(\tau', \theta_s)$ is the utility maximizing earnings level of a type θ_s single when the reform intensity equals τ'. Analogously, we obtain

$$\begin{aligned} \tfrac{\partial}{\partial \tau} V_i(\tau', h, \rho_m, \theta_m, \gamma_m) \quad = \quad & u_{i1}^0(\tau', \theta_m, \gamma_m)\alpha_{i1}^0(\tau', \theta_m, \gamma_m) \times \\ & \Big[\rho_m R_\tau(\tau', h) - h_m(y_m^*(\tau', \theta_m, \gamma_m))\Big] \,. \end{aligned} \tag{C.27}$$

We now impose the simplifying assumptions that preferences are quasi-linear in consumption and that household consumption is a public good. Equations (C.26) and (C.27) then become

$$\frac{\partial}{\partial \tau} V_s(0, h, \rho_s, \theta_s) = \rho_s R_\tau(\tau', h) - h_s(y_s^*(\tau', \theta_s)) \,, \tag{C.28}$$

and

$$\frac{\partial}{\partial \tau} V_i(0, h, \rho_m, \theta_m, \gamma_m) = \rho_m R_\tau(\tau', h) - h_m(y_m^*(\tau', \theta_m, \gamma_m)) \,. \tag{C.29}$$

We impose a further assumption, namely that tax revenue is rebated lump-sum at the tax unit level. This implies that $\rho_s = \rho_m = \frac{1}{\nu_s + \nu_m} = 1$. Thus,

$$\rho_s R_\tau(\tau', h) = \rho_m R_\tau(\tau', h) = R_\tau(\tau', h) \,. \tag{C.30}$$

With this assumption, heterogeneity in preferences over tax reforms is then entirely due to heterogeneity in the change of individual tax burdens. We view this as a natural benchmark.[34] Together Equations (C.24), (C.25), (C.28), (C.29) and (C.30) imply that

$$V_s(\tau, h, \rho_s, \theta_s) - V_s(0, h, \rho_s, \theta_s) = \Delta R - \int_0^\tau h_s(y_s^*(\tau', \theta_s))\, d\tau' \ , \tag{C.31}$$

and

$$V_i(\tau, h, \rho_m, \theta_m, \gamma_m) - V_i(0, h, \rho_m, \theta_m, \gamma_m) = \Delta R - \int_0^\tau h_m(y_m^*(\tau', \theta_m, \gamma_m))\, d\tau' \ , \tag{C.32}$$

where $\Delta R := R(\tau, h) - R(0, h)$. Finally, to estimate

$$\int_0^\tau h_s(y_s^*(\tau', \theta_s))\, d\tau' \quad \text{and} \quad \int_0^\tau h_m(y_m^*(\tau', \theta_m, \gamma_m))\, d\tau'$$

we impose following assumptions:

Assumption C.2 *The functions h_s and h_m are monotonic functions of income.*

Assumption C.3 *The functions y_s^* and y_m^* are monotonic functions of τ.*

Assumption C.2 holds provided that tax reforms are monotonic in the sense that the changes of the tax burdens of singles and couples,

$$\tau_s h_s(y_s) = T_{s1}(y_s) - T_{s0}(y_s) \quad \text{and} \quad \tau_m h_m(y_m) = T_{s1}(y_m) - T_{s0}(y_m)\,,$$

are monotonic functions of y_s and y_m, respectively. This property is satisfied by most tax reforms (see Figure E.28 in the Appendix and the discussion in Bierbrauer et al. (2021)). Assumption C.3 postulates that behavioral responses are monotonic in the intensity of reforms. Intuitively, if the gap between the new and the old schedule becomes larger, the behavioral adjustment does not become smaller. Under these assumptions, one can show that

$$\int_0^\tau h_s(y_s^*(\tau', \theta_s)) \quad \in \quad [\Delta T_s(y_s^1(\theta_s)), \Delta T_s(y_s^0(\theta_s))] \ , \tag{C.33}$$

where $y_s^1(\theta_s)$ is the post-reform income of type θ_s, $y_s^0(\theta_s)$ is the pre-reform income and, for any y_s,

$$\Delta T_s(y_s) = T_1(y_s) - T_0(y_s)$$

[34] A conceivable alternative would be to assume that tax revenue is rebated lump-sum at the individual level, so that

$$\rho_s = \frac{\nu_s}{\nu_s + 2\nu_m} \quad \text{and} \quad \rho_m = \frac{2\nu_m}{\nu_s + 2\nu_m} \ .$$

When household consumption is treated as a public good, this amounts to the assumption that a married individual benefits from an increase of tax revenue twice as much as a single, i.e., both the "own" transfer and the spouse's transfer are sources of utility. When we assume that tax revenue is rebated lump sum at the tax unit level, this effectively amounts to the assumption that all individuals value additional tax revenue in the same way; that is, we suppress heterogeneity in preferences for the level and the composition of public expenditures.

is the mechanical change in the tax burden. Likewise,

$$\int_0^\tau h_m(y_m^*(\tau', \theta_m, \gamma_m))\, d\tau' \quad \in \quad [\Delta T_m(y_m^1(\theta_m, \gamma_m)), \Delta T_m(y_m^0(\theta_m, \gamma_m))] \,. \tag{C.34}$$

Thus, the impact of the tax reform on individual welfare has an upper bound and a lower bound, with one bound being the mechanical change of the tax burden holding income fixed at the pre-reform level and one bound being the mechanical effect holding income fixed at the post-reform level.

Using (C.31) and (C.33), we assert that a type θ_s single benefits from a tax reform if

$$\Delta R \quad - \quad \max\{\Delta T_s(y_s^1(\theta_s)), \Delta T_s(y_s^0(\theta_s))\} \quad \geq \quad 0 \,, \tag{C.35}$$

and loses if

$$\Delta R \quad - \quad \min\{\Delta T_s(y_s^1(\theta_s)), \Delta T_s(y_s^0(\theta_s))\} \quad \leq \quad 0 \,, \tag{C.36}$$

According to (C.35), a single is identified as a beneficiary of a tax reform if the change in tax revenue outweighs two measures of how the reform affects the single's tax burden: one is the change of the tax burden holding income fixed at the pre-reform level, the other is the change of the tax burden holding income fixed at the post-reform level. Note that the two measures coincide when there are no behavioral responses to the tax reform. We identify a single as a loser of a tax reform is both these measures exceed the reform's revenue implications. If neither (C.35) nor (C.36) holds, our approach leaves open whether a type θ_s single is a reform beneficiary or a reform loser.

Analogously, we say that the spouses in a couple are reform beneficiaries if

$$\Delta R \quad - \quad \max\{\Delta T_m(y_m^1(\theta_m, \gamma_m)), \Delta T_m(y_m^0(\theta_m, \gamma_m))\} \quad \geq \quad 0 \,, \tag{C.37}$$

and reform losers if

$$\Delta R \quad - \quad \min\{\Delta T_m(y_m^1(\theta_m, \gamma_m)), \Delta T_m(y_m^0(\theta_m, \gamma_m))\} \quad \leq \quad 0 \,. \tag{C.38}$$

In Appendix D.4.1, we explain how we make use of the TAXSIM microsimulation model to obtain, for every tax unit, an estimate of all the terms that enter in the left-hand sides of inequalities (C.35) - (C.38). This enables us to tell for every such tax unit whether its members benefited from the reform. This is used for our analysis of political feasibility in Section 5.2 which rests on a comparison of the number of individuals that benefitted from a reform to the number of individuals that were made worse off.

For the welfare analysis in Section 5.3 we aggregate the gains of reform winners and the losses of reform losers using various social welfare functions. We use these social welfare functions as descriptive tools. For instance, an evaluation with a Rawlsian social welfare function will tell us whether "the poor" benefitted from a reform. An evaluation with an "Affirmative Feminist" welfare function will tell us whether working women benefitted from a reform. Table 2 contains a description of all the welfare functions that we use in our analysis. Any such social welfare function involves the computation of a weighted average of individual welfare gains and losses. In the main text, we use

$$\Delta R \quad - \quad \max\{\Delta T_s(y_s^1(\theta_s)), \Delta T_s(y_s^0(\theta_s))\}$$

and

$$\Delta R \quad - \quad \max\{\Delta T_m(y_m^1(\theta_m, \gamma_m)), \Delta T_m(y_m^0(\theta_m, \gamma_m))\} \; .$$

as measures of individual welfare changes. Thus, we are using money-metric welfare functions with a "conservative" estimate of welfare gains, as our measure is a lower bound on the welfare gains that reform beneficiaries actually obtain.[35]

D Empirical analysis

D.1 Data

The Current Population Survey (CPS) is conducted by the US Census Bureau and the Bureau of Labor Statistics and contains nationally representative cross-sectional survey data from 1962 onwards. We use data from the Annual Social and Economic Supplement of the Current Population Survey (CPS-ASEC).[36] The sample size of CPS-ASEC increased from around 30,000 households in 1962 to more than 90,000 in the most recent wave. In contrast to tax return micro data such as the public use files (IRS-SOI PUF) from the Statistics of Income (SOI) division of the Internal Revenue Service (IRS), as, e.g., used by Bargain et al. (2015) or Bierbrauer et al. (2021), the CPS data contain exact information about the incomes of primary and secondary earners of the tax unit.[37]

To adapt the CPS to the input requirements of the microsimulation model, we transform the CPS from a household-level data set to a tax unit level data set. For this purpose, we form tax units by joining all married spouses with their dependent children. Single

[35] A conceivable alternative is to have a "conservative" estimate of welfare losses based on

$$\Delta R \quad - \quad \min\{\Delta T_s(y_s^1(\theta_s)), \Delta T_s(y_s^0(\theta_s))\}$$

and

$$\Delta R \quad - \quad \min\{\Delta T_m(y_m^1(\theta_m, \gamma_m)), \Delta T_m(y_m^0(\theta_m, \gamma_m))\} \; .$$

As we show in the Appendix, which of these two approaches is taken is without consequence for our conclusions (see in particular Figure E.39).

[36] See Flood et al. (2021) and `https://cps.ipums.org` for a detailed description of CPS data.

[37] In the IRS-SOI PUF, the relevant information on salaries and wages from the W2-form of the primary and secondary earner is only available for the year 1974 and imputed for all other years using an undocumented procedure. For 1974, in which reliable information is available, the distribution of different couple types across per capita income distribution is very similar to the CPS data (see Figure D.5). Moreover, Bargain et al. (2015) compare inequality measures as well as the direct policy effect, ΔT, based on CPS and SOI-PUF data and show that results are very similar (except for the very top of the distribution).

individuals and unmarried spouses form separate tax units. Children of single individuals are in most cases allocated to the household head. Adult individuals with a total income below the year-specific personal exemption threshold are assumed to reflect dependents of the household head. Table D.1 illustrates in detail the correspondence between variables utilized in NBER TAXSIM and variables in the CPS data.

Treatment of top incomes In the CPS data, information on top incomes is limited by (i) public topcoding, and (ii) internal censoring. We address both limitations by harmonizing the treatment of top incomes across the different survey years and by following Piketty and Saez (2003) and Piketty (2003) in assuming that top incomes are well represented by a Pareto distribution.

In a first step, we address the challenge that public topcoding methods vary over time. In most recent years (since 2011), the Census Bureau uses a rank proximity swapping procedure to preserve the privacy for top income earners while maintaining the internal distribution of top incomes. In this procedure, values at or above a specific swap threshold are switched against other top income values within a bounded interval. For previous years, however, the CPS data originally contains top income values that are based on different procedures, in particular traditional topcoding (1962-1995), and a replacement value system procedure (1996-2010). To be able to consistently analyze the effect of tax reforms over the full time horizon, we apply the most recent method of rank proximity swapping also to previous years using supplementary files provided by IPUMS.[38] Thereby, we preserve the internally used distribution of top incomes whenever possible.

In a second step, we address the challenge that top incomes are also internally censored based on the value range limits of the income variables. As shown by Larrimore, Burkhauser, Feng and Zayatz (2008), since these censoring thresholds have changed discretely at specific points in time, the share of individuals affected by censoring varies and can reach up to one percent in specific years. To address the unequal representation of censored incomes, we replace censored incomes by random draws from a Pareto distribution. In particular, we first identify for every year and every income type the highest possible income T assigned in a given year. Based on this censoring threshold, we generate for every year and every income type the parameter α of a Pareto distribution with density $f(Y) = \alpha * T^{\alpha} * Y^{-\alpha-1}$. We thereby assume that incomes above the 99th percentile follow a Pareto distribution and thus estimate the shape parameter α as

$$\alpha = \frac{ln\left(\frac{N_{Y \geq p99}}{N_{Y=T}}\right)}{ln\left(\frac{Y_T}{Y_{p99}}\right)}$$

where $N_{Y \geq p99}$ is the number of individuals with an income above the 99th percentile of the

[38]For details on the treatment of top incomes in general and the data used for rank proximity swapping, see https://cps.ipums.org/cps/topcodes_tables.shtml and https://cps.ipums.org/cps/income_cell_means.shtml.

income distribution, $N_{Y=T}$ is the number of individuals at the highest income, and Y_T and Y_{p99} are the top income and the income at the 99th percentile respectively.[39] Finally, we use the distribution to replace the top incomes T by random draws from this calibrated distribution.[40]

Sample restrictions We are mainly interested in the differences between married couples and single individuals. We thereby assume that married couples always file jointly. While married couples can also file separately, this filing status is usually not beneficial (see Figure D.6) and is chosen by less than two percent of all tax units (see Figure D.4).[41] Similarly, we abstract from the qualifying widow(er) filing status that gives widowed individuals a preferential tax treatment in the two years following the spouses' death. Given our sample restriction, the occurrence of widow(er)s is negligible (see also Figure D.4). If not indicated otherwise, we restrict the sample to tax units in which primary and secondary taxpayer are between 25 and 55 years old and have non-negative gross income. This sample restriction is guided by (i) our model that considers neither education nor retirement decisions, and (ii) the assumptions on labor supply responses to taxation that are not valid for young and old people with weak labor force attachment. In Section G we replicate all main results for an alternative sample restriction focusing on the full adult population.

Throughout the analysis, we calculate tax payments as well as average and marginal tax rates based on the federal income tax and abstract from state income tax and social security payroll taxes. Our pre-tax gross income variable of interest contains wage income, farm income, business income, income from dividends, income from interest, income from rent, and retirement income.

[39] Discussions of different estimation methods for the shape parameter of the Pareto distribution can be found in Armour, Burkhauser and Larrimore (2016) and Blanchet, Garbinti, Goupille-Lebret and Martínez-Toledano (2018).

[40] To reduce the impact of random sampling on our results, we use quantiles of the distribution. The number of quantiles utilized depends on the number of individuals at the top income. For instance, if we observe 25 individuals at the top income, we assign these individuals income levels that correspond to the 25 quantiles of the randomly drawn values from the calibrated Pareto distribution. Thereby, we preserve the information of the distribution while limiting the influence of random draws.

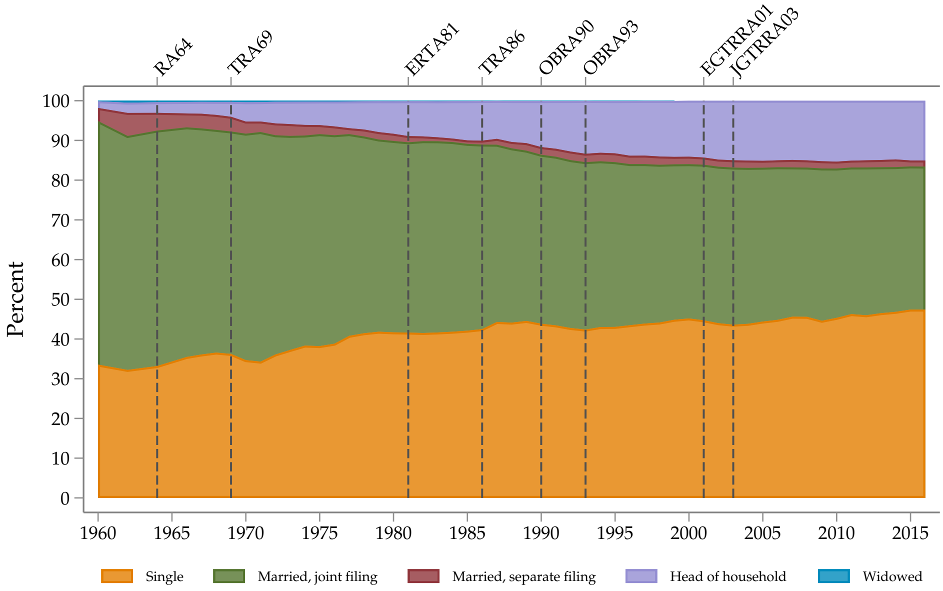
[41] Filing separately can be beneficial in very particular circumstances that we do not observe, i.e., in the case of substantial itemizable deductions (e.g. high medical expenses or student loan repayments).

Table D.1: TAXSIM variables and CPS application

TAXSIM Variable	Explanation	CPS Application
taxsimid	Case ID	N/A
year	Tax year	ASEC income reference year
state	State	State of residence
mstat	Marital Status	Marital status (married vs. unmarried)
page	Age of primary taxpayer	Age of husband
sage	Age of spouse	Age of spouse
depx	Number of dependents	Number of children below and of age 18 + additional dependents
dep13	Number of children under 13	Number of children under 13
dep17	Number of children under 17	Number of children under 17
dep18	Number of qualifying children for EITC.	Number of children below and of age 18
pwages	Wage and salary income of Primary Taxpayer	Wage income + business income + farm income of husband
swages	Wage and salary income of Spouse	Wage income + business income + farm income of spouse
dividends	Dividend income	Income from dividends
intrec	Interest Received	Income from interest
stcg	Short Term Capital Gains or losses	N/A
ltcg	Long Term Capital Gains or losses.	Capital gains - capital losses
otherprop	Other property income	Income from rent
nonprop	Other non-property income	Income from other Source not specified + income from alimony
pensions	Taxable Pensions and IRA distributions	Retirement income
gssi	Gross Social Security Benefits	Social Security income
ui	Unemployment compensation received	Income from unemployment benefits
transfers	Other non-taxable transfer Income	Welfare (public assistance) income + income from worker's compensation + income from veteran benefits + income from survivor benefits + income from disability benefits + income from child support + income from educational assistance + income from SSI + income from assistance
rentpaid	Rent Paid	N/A
proptax	Real Estate taxes paid	Annual property taxes
otheritem	Other Itemized deductions	Indirect calculation via difference between adjusted gross income and taxable income calculated by the Census Bureau's taxy model.
childcare	Child care expenses	N/A
mortgage	Deductions not included in otheritem	N/A

Notes: This table displays the variables utilized as part of the tax calculation via the NBER TAXSIM (v32) microsimulation model and the corresponding information from the CPS used for the respective variables. For details on TAXSIM (v32) see Feenberg and Coutts (1993) and `https://users.nber.org/~taxsim/`.
Source: NBER TAXSIM and CPS-ASEC.

Figure D.4: Filing status according to SOI data

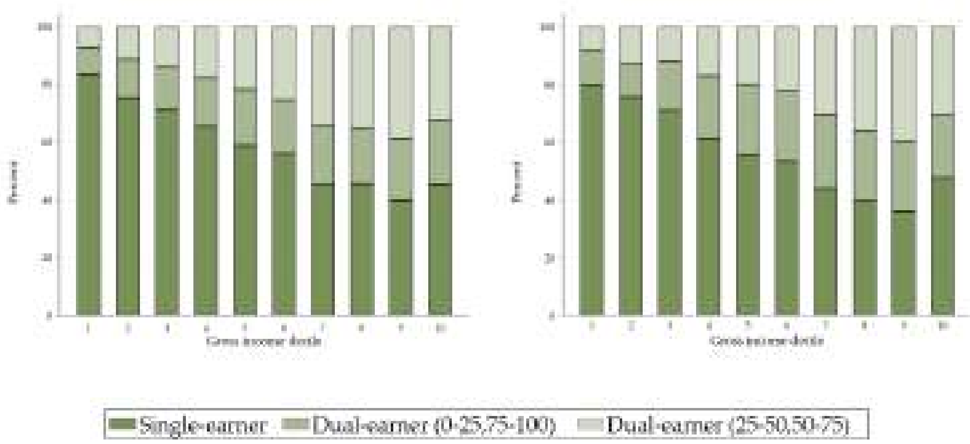


Notes: This figure shows the distribution of filing status from 1960 to 2016. Filing statuses are based on the IRS-SOI PUF administrative tax return micro data.
Source: Authors' calculations based on SOI PUF.

Figure D.5: Comparison of CPS and SOI data (1974), couple types

(a) CPS

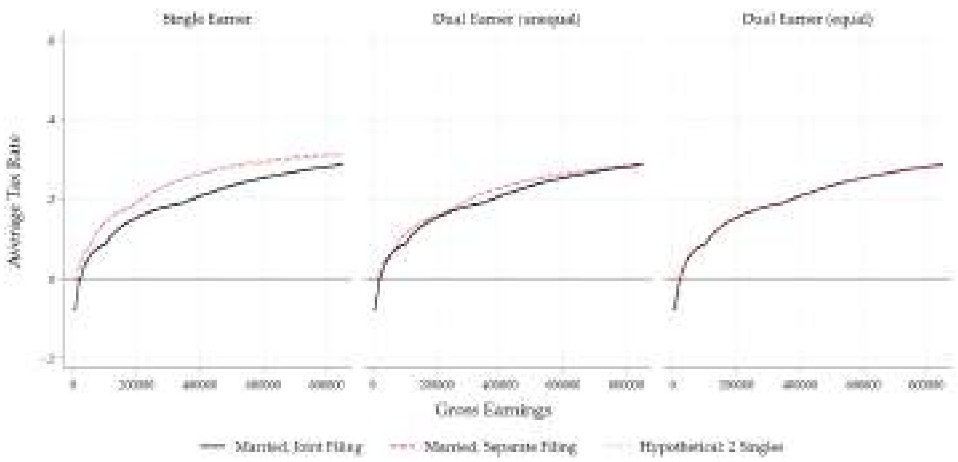
(b) SOI



Notes: This figure displays for the tax year of 1974 the distribution of married couple types across deciles of the per capita income distribution. The figure compares the distribution based on the CPS data (Figure D.5a) to the distribution based on the IRS-SOI PUF tax return micro data (Figure D.5b). All estimates are based on tax units with strictly positive gross income in which both spouses are between 25 and 55 years old.

Source: Authors' calculations based on CPS-ASEC and SOI PUF.

Figure D.6: Married couples filing jointly and separately (2019)



Notes: This figure shows how the average tax rate of a couple with specific gross earnings differs between whether this couple files separately or jointly. In addition, the figure also shows the average tax rate of two singles with the same joint income. The figure differentiates further by the type of couple: single earner couples (95% / 5%), unequal dual earner couples (75% / 25%) and dual earner couples with equal incomes (50% / 50%).
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

D.2 Tax systems and tax reforms

In this section, we provide (i) a brief overview of the tax treatment of couples around the world, (ii) outline the broad changes in the tax treatment of couples and singles in the US federal income tax system (see also the review in Borella et al. (2022)), and (iii) describe the main aspects of specific US tax reforms that we analyze. In the Appendix H we also discuss narratives about a selection of tax reforms using textual analyses.

Tax treatment of couples around the world. The tax treatment of couples and singles around the world can be mainly differentiated by the tax unit, to which the tax code in the respective countries applies to. As shown in Table D.2, a large majority of countries treats the individual as the relevant tax unit, while only few nowadays either treat the household as the tax unit or allow for a choice between individual and household level taxation. This has not always been the case, as many countries that feature nowadays individual-level or optional tax treatment previously had household level taxation. Some of these changes have been analyzed, among others, for Canada, the Czech Republic, Spain, Sweden, and the United Kingdom (see Crossley and Jeon (2007), Kalíšková (2014), Fuenmayor, Granell and Mediavilla (2018), Selin (2014), and Stephens and Ward-Batts (2004)). For the United States, LaLumia (2008) analyzes a reform in 1948 that introduced joint taxation across the United States, but affected only a subset of states (see also discussions below).

It is also important to note that the tax unit type is not sufficient to evaluate the tax treatment of couples, because even though the tax unit might be the individual, there are often particular rules in place, that account for the presence of spouses in the household like spousal allowances or spousal tax credits.

Table D.2: Tax treatment of couples around the world

Country	Tax unit	Particularities tax treatment of couples	Exemplary reforms of couples taxation	
Argentina	individual			
Australia	individual			
Austria	individual	tax credit for spouse	1973	Introduction of individual tax treatment.
Belgium	household			
Brazil	optional			
Canada	individual	tax credit for spouse	1988	Reduction of the "jointness" of the income tax system.
Costa Rica	individual			
Croatia	individual			
Czech Republic	individual		2008	Introduction of individual tax treatment.
Denmark	individual		1970	Introduction of individual tax treatment.
Estonia	individual	flat rate, allowance for spouse		
Finland	individual		1970	Introduction of individual tax treatment.
France	household			
Germany	optional		1958	Introduction of optional individual tax treatment.
Greece	individual			
Hungary	individual	flat rate		
Iceland	household			
Indonesia	household			
Ireland	optional	allowance / tax credit for spouse	2000	Introduction of individual tax treatment.
Israel	individual			
Italy	individual	allowance / tax credit for spouse	1973	Introduction of individual tax treatment.
Japan	individual	allowance for spouse	1950	Introduction of individual tax treatment.
Kenya	individual			
Latvia	individual	allowance for spouse		
Luxembourg	optional	allowance for spouse	2018	Introduction of optional tax treatment.
Mexico	individual			
Malaysia	optional		1977 (1990)	Introduction of (automatic) individual tax treatment.
Montenegro	individual			
Netherlands	optional		1970	Introduction of individual tax treatment.
New Zealand	individual		1973	Introduction of individual tax treatment.
Norway	individual		1970	Introduction of individual tax treatment.
Peru	individual			
Portugal	optional		2015	Introduction of optional tax treatment.
Romania	individual	flat rate		
San Marino	individual			
Slovakia	individual	allowance for spouse		
Slovenia	individual			
South Africa	individual			
South Korea	individual	allowance for spouse	1954	Introduction of individual tax treatment
Spain	optional		1988	Introduction of optional tax treatment.
Sweden	individual		1970	Introduction of individual tax treatment.
Switzerland	household	allowance for spouse	-	
Tunisia	individual			
Turkey	individual	tax credit for spouse		
Ukraine	optional	flat rate		
United Kingdom	individual	allowance for spouse	1990	Introduction of individual tax treatment.
United States	household			see detailed analysis below

Notes: This table provides an overview on the tax treatment of couples in selected countries around the world by displaying information on the relevant tax unit, the progressivity of the tax system, and particularities associated with the tax treatment of couples. In addition, if available, the table displays information about exemplary reforms of the tax treatment of couples in the respective country.
Source: OECD, 2022, PWC Tax Summaries, 2022.

Tax treatment of singles and couples in the US. The federal income tax code in the United States consists of a tax schedule which is differentiated by four filing statuses referring to (i) married individuals filing jointly,[42] (ii) heads of households,[43] (iii) unmarried individuals, and (iv) married individuals filing separately. While the objective of this differentiation is to balance out conflicting goals (tax progressivity, equal treatment of married couples, equal treatment of married and unmarried couples), it results in a complex system of marriage bonuses and penalties across the income distribution.[44]

The history of joint taxation in the US can be broadly separated into four periods (see Table D.3). Between 1913 and 1948, the US *formally* had a federal income tax system based on individual income taxation.[45]

With the Revenue Act of 1948, the United States introduced a system of joint taxation, in which the couples' tax liability was calculated by applying the tax schedule to the average income of the couple and by multiplying the resulting tax liability by two. The resulting system resembles very closely the current system of joint taxation in Germany. The system of joint taxation with income splitting was replaced in 1954 with the introduction of two separate tax schedules for couples filing jointly and couples filing separately (also applied to single filers). However, the de-facto treatment of couples stayed the same, because marginal tax rates were not differentiated and all tax brackets for joint filers were set to be twice as large compared to those of separate filers (see Figure D.7).[46]

The de-facto splitting system led to tax liabilities for singles which were up to 42 percent higher compared to couples with the same income level. While some of this marriage bonus was considered to be justified on the basis of different living expenses, the size of the penalty for singles was considered to be too high. Therefore, the Tax Reform Act of 1969 (TRA69) installed a new tax schedule for unmarried persons (not falling under the head of household filing status), which had both lower marginal tax rates and different tax brackets. It was designed specifically to reduce the difference in tax liability between singles and couples with the same income. Both at very low and high incomes, the marriage bonus gradually decreased. Since the tax schedule for couples filing separately was still in place, married couples now faced a higher tax liability than two singles with the same joint income. This was justified on the grounds that even though a married couple plausibly has higher living

[42]This filing status also refers to qualifying widow(er)s, i.e. taxpayers whose spouse died during the last two years, who maintains a household with dependent children and who has not remarried.

[43]Unmarried taxpayers who are not a surviving spouse and who maintain a household with dependent persons (e.g. children, father/mother), if a deduction for these persons is possible.

[44]See, for instance, the arguments discussed in a study by the Congressional Budget Office in 1997.

[45]For some states - mostly community property law states - couples' income was assigned in equal terms to both spouses already before 1948. For details, see LaLumia (2008).

[46]In order to give some of the splitting benefits of joint taxation to widows, widowers, and single persons with dependents in their households, the Revenue Act of 1951 introduced a separate tax schedule for heads of households. While this was implemented using a separate tax schedule with both different marginal tax rates and different tax brackets, it was designed to result at any given income level in a tax liability which lies halfway between the tax paid by couples and single filers. For details, see the General Explanation of the Tax Reform Act of 1969 by the Joint Committee on Internal Revenue Taxation.

Table D.3: US tax treatment of singles and couples

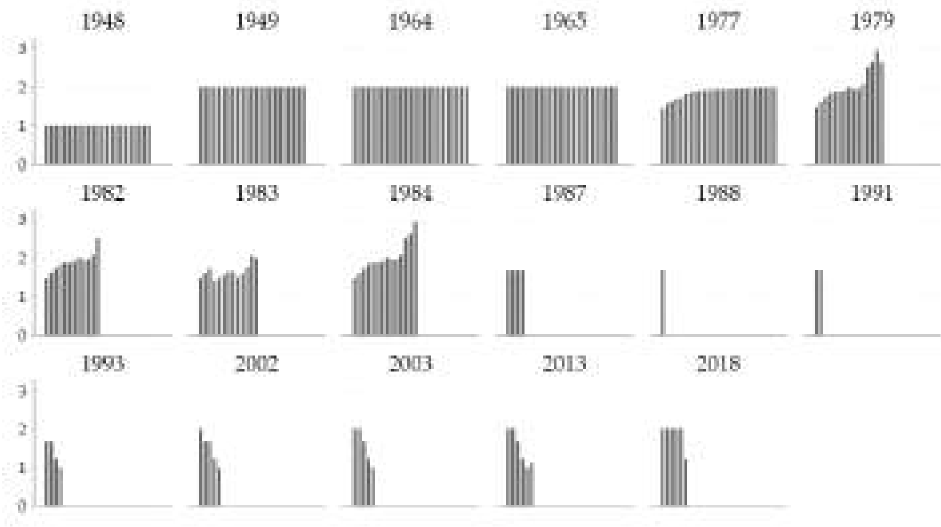
Tax Year	Difference
1913-1948	Income splitting in community law states (Washington, Idaho, Nevada, California, Arizona, New Mexico, Texas, Louisiana), individual taxation in common law states
1949-1970	Income splitting
1971-1986	Difference in tax brackets and differences in marginal tax rates
1987-2020	Only difference in tax brackets, same marginal tax rates

expenses than a single with the same income and should therefore pay less taxes, the couple might well have less living expenses than *two* singles (unmarried couple) with the same joint income. In this third period, the fixed relationship between bracket lengths across the income distribution was broken (see Figure D.7).

The fourth period started with the Tax Reform Act of 1986 (TRA86) which harmonized marginal tax rates for all filing statuses and only treated them differently with respect to the length of tax brackets. This relationship between brackets across singles and couples has changed significantly over time. From 1987 to 1992, although the number of tax brackets varied, the relationship between upper bracket limits for couples and singles was constant. The Omnibus Budget Reconciliation Act of 1993 (OBRA93) differentiated this relationship with the newly introduced tax brackets and thereby increased the potential for marriage penalties at higher incomes. The Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA01) eliminated the marriage penalty for the lowest bracket but strengthened the potential of marriage penalties at the upper tail of the distribution by the newly introduced upper bracket. Starting with the tax year 2003, the marriage penalty in the second tax bracket (15 percent marginal tax rate) was eliminated. Furthermore, the Tax Cuts and Jobs Act of 2017 (TCJA17) eliminated marriage penalties for brackets 3 to 5.

Major US tax reforms. We analyze all major changes in the US personal income tax system from 1964 until 2017. Table D.4 provides an overview of the 11 reforms that we identified and analyze. We concentrate on large legislative changes which drive the tax policy effect. These reforms are the Revenue Act of 1964 (RA64), the Tax Reform Act of 1969 (TRA69), the Revenue Act of 1978 (RA78), the Economic Recovery Tax Act of 1981 (ERTA81), the Tax Reform Act of 1986 (TRA86), the Omnibus Budget Reconciliation Act of 1990 and 1993 (OBRA90 and OBRA93), the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA01), the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA03), the American Taxpayer Relief Act of 2012 (ATRA12) and the Tax Cuts and Jobs Act of 2017 (TCJA17).

Figure D.7: Upper Limit of Tax Bracket, Single/Couple



Notes: This figure shows the relation between the upper tax bracket limit of the tax schedule of couples and singles for all tax brackets in the respective tax year. We display those years, in which the number or relation of brackets changed. In all years, the highest bracket is excluded since it has no upper limit.
Source: Historical U.S. Federal Individual Income Tax Rates and Brackets.

D.3 Descriptives

D.3.1 Marriage penalties and bonuses

The microsimulation model allows us to compare for every couple in the data its actual tax liability ($T^{act} = T_m(y_1 + y_2)$) in the status quo tax system with a hypothetical tax liability in a situation in which the couple would not be married and thus file as two singles ($T^{hyp} = T_s(y_1) + T_s(y_2)$). In the case of dependent children, we must allocate dependents to either one of the two spouses. The counterfactual tax burden is an average over two hypothetical tax burdens in which dependents are allocated to either one of the spouses. Based on actual and hypothetical tax payments, we can construct

Absolute marriage bonus: $B^{abs} = T^{hyp} - T^{act}$,

Relative marriage bonus: $B^{rel} = \frac{B^{abs}}{y_1+y_2}$.

Since the 1960s, Figure D.9 illustrates that the share of couples experiencing a marriage bonus decreased while the share of couples facing a marriage penalty increased. The picture mirrors the change in couple types displayed in Figure 1b in the main text (reproduced in Figure D.8) and rationalizes our focus on the tax reforms in 1968 and 2003 around which we observe strong aggregate changes in marriage bonuses and penalties. The demographic change towards more singles and more dual-earner couples holds broadly across different US

Table D.4: Overview of US reforms

Tax reform	pre	post	key features of the reform
RA64	1963	1966	Tax cut (top rate from 91% to 70%)
TRA69	1968	1971	Introduction of Alternative Minimum Tax and new tax schedule for single taxpayers
RA78	1978	1979	Widening of tax brackets (and reducing their number)
ERTA81	1980	1984	Tax cut (top rate from 70% to 50%)
TRA86	1985	1988	Broadening of tax base and reductions in MTRs (top rate from 50% to 28%)
OBRA90	1990	1991	Increase of top tax rate from 28% to 31%
OBRA93	1992	1993	Expansion of EITC and increase of top tax rate from 31% to 39.6%
EGTRRA01	2000	2002	Reductions in marginal tax rates
JGTRRA03	2002	2003	Reductions in marginal tax rates
ATRA12	2012	2013	Increase of tax rates for high income earners
TCJA17	2016	2018	Tax cuts (top rate from 39.6% to 37%)

Notes: Table D.4 lists the major reforms of the federal income tax in the US after WWII: the Revenue Act of 1964 (RA64), the Tax Reform Act of 1969 (TRA69), the Revenue Act of 1978 (RA78), the Economic Recovery Tax Act of 1981 (ERTA81), the Tax Reform Act of 1986 (TRA86), the Omnibus Budget Reconciliation Act of 1990 and 1993 (OBRA90 and OBRA93), the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA01), the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA03), the American Taxpayer Relief Act of 2012 (ATRA12) and the Tax Cuts and Jobs Act of 2017 (TCJA17). The pre reform year is always the last year before any change was implemented while the post reform year is the one after all changes are phased in. See Appendix H of Bierbrauer et al. (2021) for more details and the distributional implications of these reforms.

states (see Figure D.11). The expansion of singles has been particularly prominent in the lower part of the income distribution while dual earner couples are particularly relevant at the top of the income distribution (see Figure D.12).

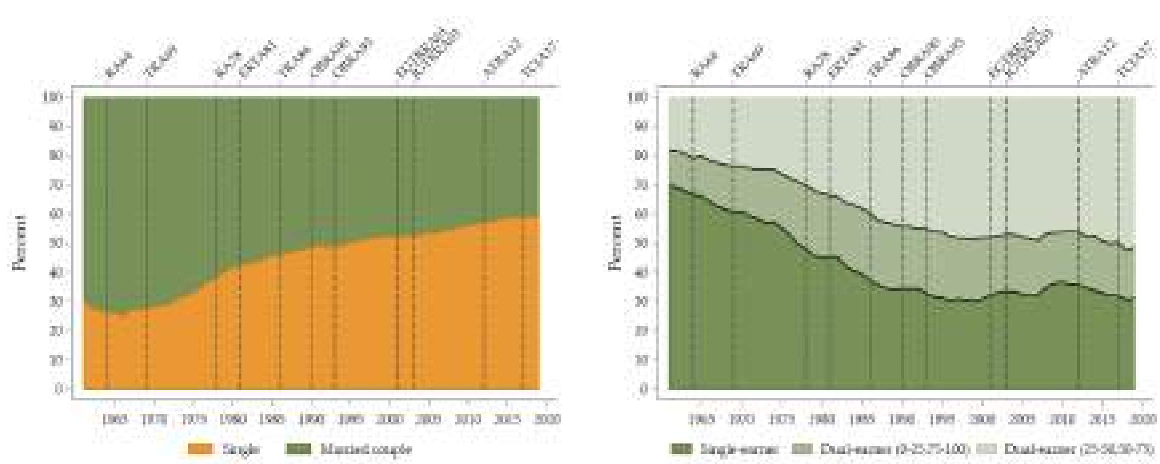
D.3.2 Empirical splitting function σ

The evolution of marriage penalties and bonuses is driven by (i) the change in demographics towards a larger share of dual earner couples and (ii) changes in the relative treatment of couples and singles in the tax system. As discussed in the main text, σ allows us to describe changes in this relative treatment in a constructive manner. We can reformulate Equation (12) as an implicit relationship between the average tax rates of couples and singles

$$\bar{\tau}_m(y_m) = \bar{\tau}_s\left(\frac{y_m}{\sigma(y_m)}\right) , \tag{D.39}$$

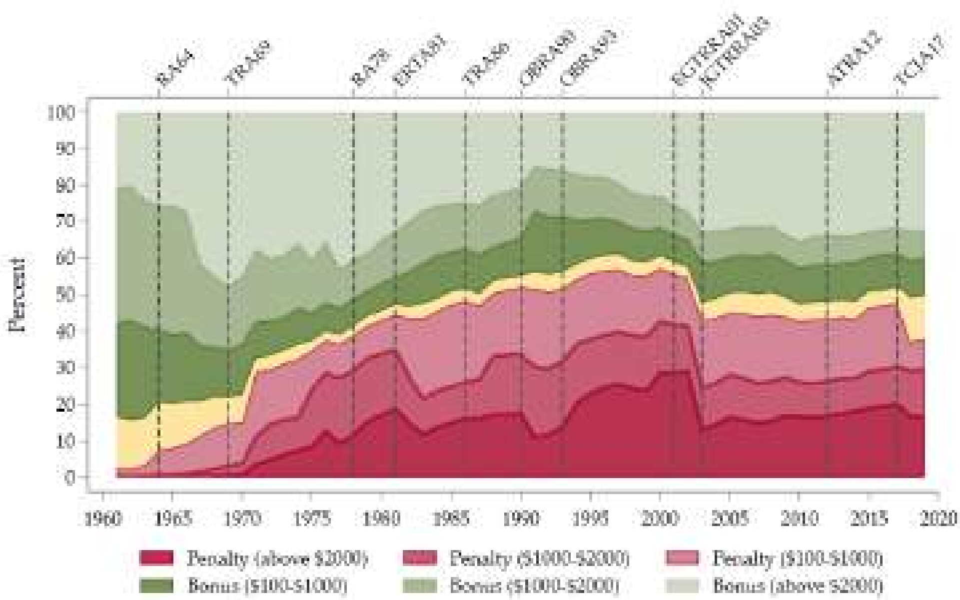
Figure D.8: Demographic change over time

(a) Tax unit types (b) Couple types



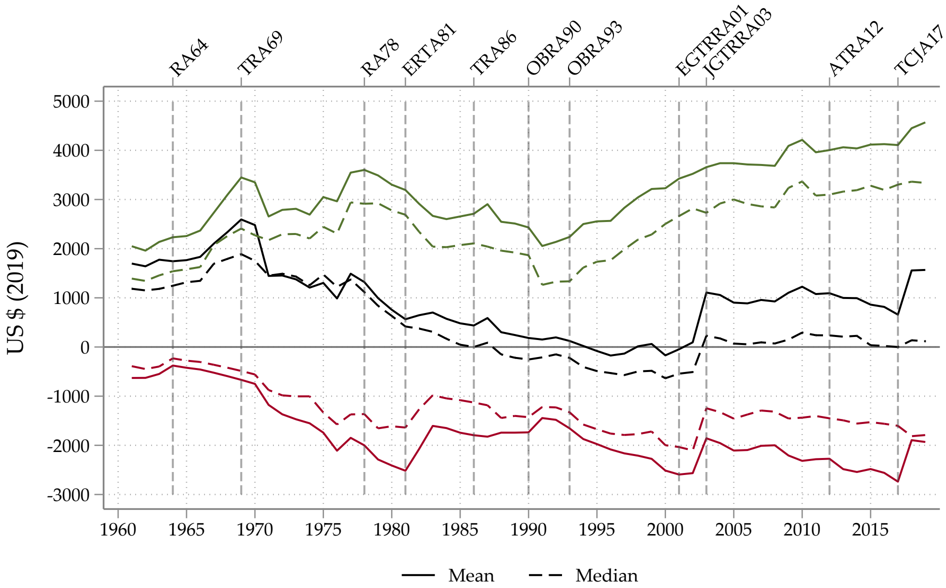
Notes: This figure replicates Figure 1 and shows the distribution of tax unit types over time. Figure D.8a displays the share of single tax units (orange area) and the share of couple tax units (green area). Figure D.8b displays the share of single-earner and dual-earner couples. A single-earner couple refers to a married couple, in which one spouse is not employed (dark green area). The figure further displays the share of dual-earner couples in which both spouses are employed and (i) one spouse earns between 0 and 25 percent (mid green area) and (ii) between 25 and 50 percent of total earnings (light green area). Earnings shares are computed on the basis of wage, business and farm income. Reforms of the federal income tax code as described in Table D.4 are displayed as vertical lines. All estimates are based on tax units with strictly positive gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on CPS-ASEC.

Figure D.9: Distribution of marriage bonuses and penalties in USD over time



Notes: This figure shows how the distribution of absolute marriage bonuses and penalties B^{abs} changed over time. Marriage bonuses and penalties have been constructed by estimating for every married couple a counterfactual tax burden of two singles with their respective individual incomes. The counterfactual tax burden is an average over two tax burdens that allocate dependent to either spouse. Absolute marriage bonuses are CPI-adjusted and measured in 2019 US dollars. Reforms of the federal income tax code as described in Table D.4 are displayed as vertical lines. All estimates are based on tax units with strictly positive gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.10: Absolute marriage bonuses and penalties over time



Notes: This figure shows how the magnitude of the absolute marriage bonus (penalty) B^{abs} changed over time. Mean bonuses / penalties are CPI-adjusted. Marriage bonuses and penalties have been constructed by estimating for every married couple a counterfactual tax burden of two singles with their respective individual incomes. The counterfactual tax burden is an average over two tax burdens that allocate dependent to either spouse. Absolute marriage bonuses are CPI-adjusted and measured in 2019 US dollars. Reforms of the federal income tax code as described in Table D.4 are displayed as vertical lines. All estimates are based on tax units with strictly positive gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.11: Demographic change, by state

(a) Tax unit types

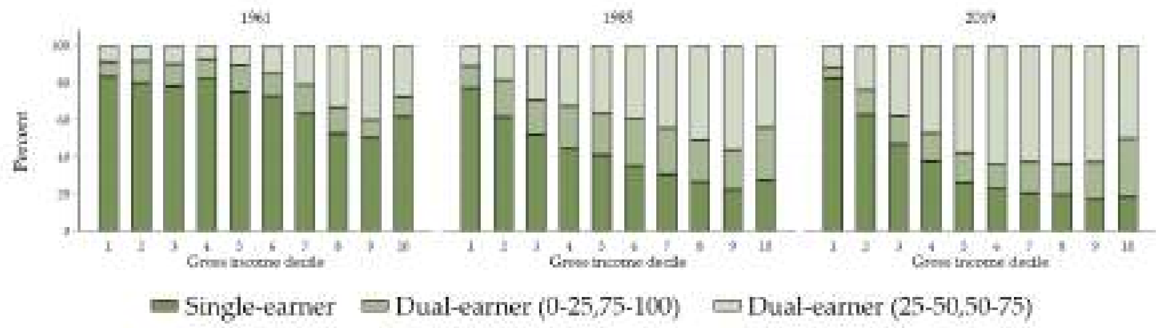
(b) Couple types

Notes: This figure displays the distribution of tax unit types over time for all states starting in 1976. Figure D.11a displays the share of single tax units (orange area) and the share of couple tax units (green area). Figure D.11b displays the share of single-earner and dual-earner couples. A single-earner couple refers to a married couple, in which one spouse is not employed (dark green area). The figure further displays the share of dual-earner couples in which both spouses are employed and (i) one spouse earns between 0 and 25 percent (mid green area) and (ii) between 25 and 50 percent of total earnings (light green area). Earnings shares are computed on the basis of wage, business and farm income. Reforms of the federal income tax code as described in Table D.4 are displayed as vertical lines. All estimates are based on tax units with strictly positive gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on CPS-ASEC.

Figure D.12: Demographic change, by income decile

(a) Tax unit types

(b) Couple types



Notes: This figure displays the distribution of tax unit types by deciles of the per-capita gross income distribution. Figure D.12a displays the share of single tax units and the share of couple tax units. Figure D.12b displays the share of single-earner and dual-earner couples. A single-earner couple refers to a married couple, in which earnings of one spouse are zero. The figure further displays the share of dual-earner couples, in which one spouse earns between 0 and 25 percent (25 and 50 percent) of total earnings. Earnings shares are computed on the basis of wage, business and farm income. Reforms of the federal income tax code are displayed as vertical lines. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on CPS-ASEC.

where

$$\bar{\tau}_m(y_m) \;:=\; \frac{T_m(y_m)}{y_m} \quad \text{and} \quad \bar{\tau}_s\left(\frac{y_m}{\sigma(y_m)}\right) \;:=\; \frac{\sigma(y_m)}{y_m} T_s\left(\frac{y_m}{\sigma(y_m)}\right) .$$

Figure D.13 illustrates that the expression in terms of average tax rates is instrumental to the empirical estimation of the function $\sigma : y_m \mapsto \sigma(y_m)$. For the empirical estimation of σ, we proceed in two steps. First, since in the baseline we abstract from heterogeneity beyond income and filing status, we estimate the mean average tax rate for couples and singles at every income level z:

$$\bar{\tau}_i^*(z) = \mathbb{E}\big[\bar{\tau}_i(z, .)\big] \;\; , \;\; i \in \{s, m\} \; . \tag{D.40}$$

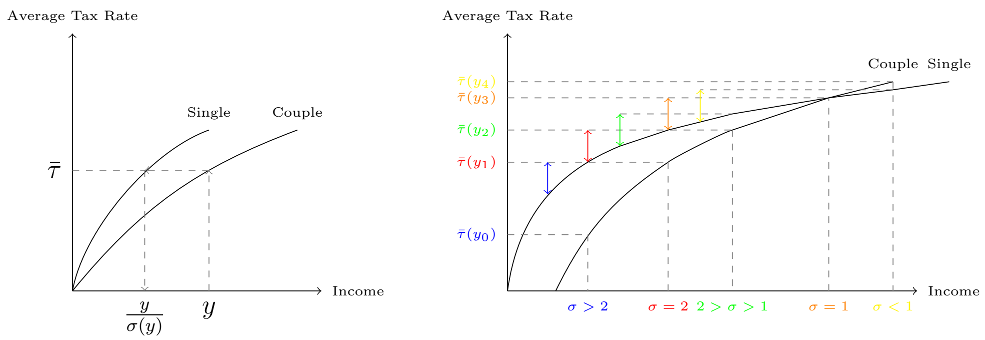
This is reported in Figure D.14. Second, we solve the following equation for $\sigma(z)$:

$$\bar{\tau}_m^*(z) = \bar{\tau}_s^*\left(\frac{z}{\sigma(z)}\right) \; . \tag{D.41}$$

Figure D.15 provides evidence on the heterogeneity of σ when we do not consider the mean average tax rate of all singles and all couples jointly but make separate comparisons of σ by conditioning on the number of children in a household.

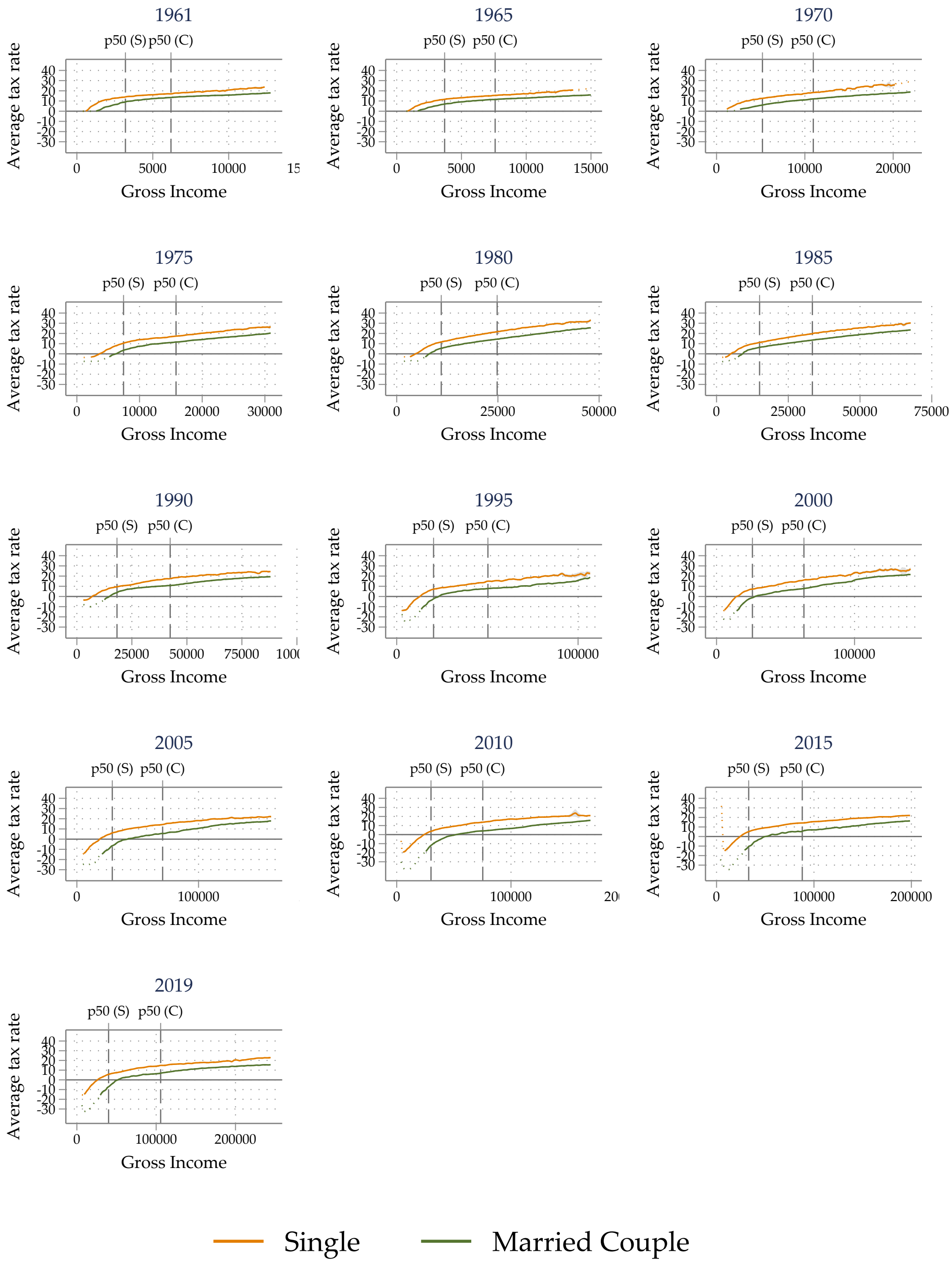
Figure D.13: Illustration of σ-function

(a) σ-function (b) Marriage Penalties and Bonuses



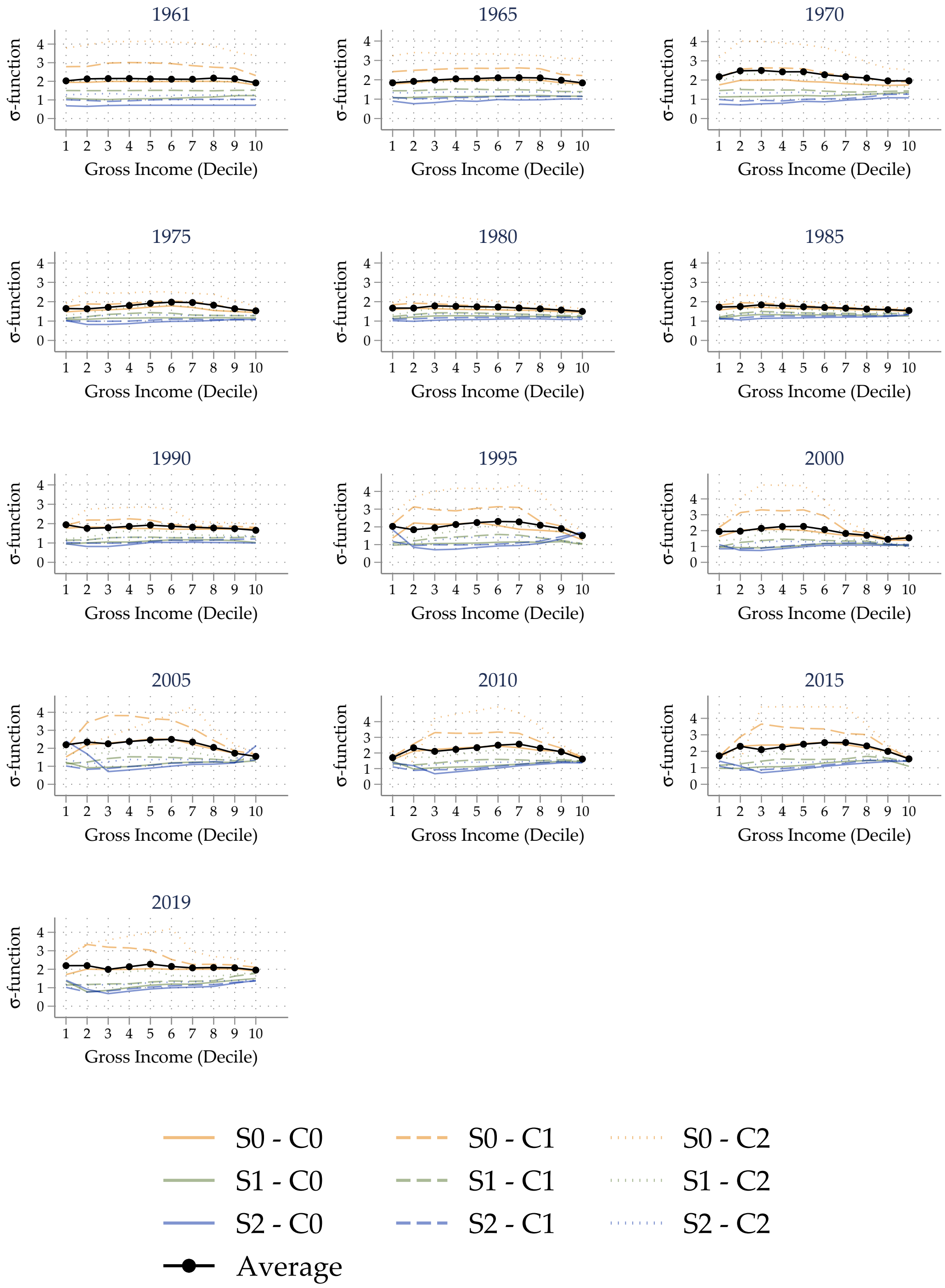
Notes: This figure illustrates the reasoning behind the estimation of the splitting function σ (Figure D.13a) and relates it to the possibilities of marriage bonuses and penalties (Figure D.13b). Figure D.13b shows average tax rates of couples filing jointly at different income levels, where the splitting function is greater than 2 (blue), equal to 2 (red), between 1 and 2 (green), equal to 1 (orange) and smaller than one (yellow). The vertical colored arrows indicate the corresponding range of average tax rates for two singles with the same joint income like the couple filing jointly.

Figure D.14: Average tax rates



Notes: This figure displays average tax rates for married couples and single individuals for selected years. Average tax rates have been estimated using a kernel weighted local mean estimation. The solid part of the estimated average tax rate function satisfies the conditions for which σ-functions can be estimated uniquely (see Figure 2 and Figure D.15). All estimates are based on tax units with strictly positive gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.15: Heterogeneity analysis of the empirical splitting function σ



Notes: This figure explores the heterogeneity behind the empirical splitting function σ (see Figure 2). The baseline (comparison) tax unit is always a single tax unit (S) to a couple tax unit (C) accounting for different number of children (0 - no children, 1 - one child, 2 - more than one child) in both the baseline and the comparison tax unit. The σ-function is calculated for tax units by estimating mean average tax rates of couples and singles with different number of children. Deciles refer to the gross income distribution of couples in the respective year. All estimates are based on tax units with strictly positive gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

D.4 From theory to data

D.4.1 Methodology

For each tax unit j, we observe gross income y_0^j prior to the reform. Moreover, we observe whether a couple is a single earner couple or a dual earner couple. Based on the information from the CPS, we use the TAXSIM microsimulation model to calculate the person's tax payment $T_0(y_0^j)$, the average tax rate t_0^j and the marginal tax rate τ_0^j that are relevant for this tax unit prior to the reform. Finally, we observe the post-reform counterparts t_1^j and τ_1^j. We do not use the post-reform income y_1^j. Instead, we construct a (counterfactual) measure of the change in a taxpayer's tax burden that is only due to the reform, holding all individual characteristics, including the person's income, fixed, i.e. we compute the so-called "tax policy effect" (see, e.g., Eissa et al. (2008), Bargain et al. (2015), or Bierbrauer et al. (2021)).

For conceptual clarity, we proceed in two steps: We first explain how we would estimate the quantities of interest on the assumption that a tax reform takes place in an instant. In a second step, we take account of the complication that arises when a reform, such as the Reagan tax cuts, is phased in over several years.

Approximating the revenue implications of tax reforms. For each tax unit, we compute the change in taxes paid due to the reform. The change in taxes paid for a tax unit j is given by

$$\Delta T^j = t_1^j \, y_1^j - t_0^j \, y_0^j \, . \tag{D.42}$$

Behavioral responses to taxation imply that y_1^j will in general be different from y_0^j.

We take account of behavioral responses both at the extensive and the intensive margin. To do so, we think of every tax unit as being representative of a group of tax units with similar characteristics. Tax units similar to j are split into two groups. One group opts out and has $y_1^j = 0$ after the reform. The other groups stays in, $y_1^j > 0$. Remember that the extensive margin elasticity at an income of y measures the percentage share of tax units with an initial income close to y that choose zero earnings in response to a one percent decrease of their disposable income. Possibly, these elasticities differ not only by income, but also depend on marital status – i.e., on whether the tax unit is a single, a single earner couple, or a dual earner couple. Let π^j be the extensive margin elasticity that applies to tax units similar to j. The reform induced percentage change in disposable income for tax units j is given by

$$\frac{y_0^j - T_1(y_0^j) - (y_0^j - T_0(y_0^j))}{y_0^j - T_0(y_0^j)} = \frac{T_1(y_0^j) - T_0(y_0^j)}{y_0^j - T_0(y_0^j)} = \frac{(t_j^1 - t_j^0) y_0^j}{y_0^j - t_0^j \, y_0^j} = \frac{t_j^1 - t_j^0}{1 - t_0^j} \, . \tag{D.43}$$

Thus, the fraction dropping out of the labor market is given by $\pi^j \, \frac{t_j^1 - t_j^0}{1 - t_0^j}$. The complementary fraction is staying in. For those who stay in, there are behavioral responses at the intensive margin. Our assumptions on preferences imply that such behavioral responses are driven entirely by changes of the marginal tax rates that tax units face. Thus, using a first order Taylor approximation,

$$y_1^j = y_0^j + (\tau_1^j - \tau_0^j)\, y_\tau^j \ ,$$

where y_τ^j is the marginal effect that an infinitesimal change of the marginal tax rate has on j's taxable income (in the status quo). Using that $y_\tau^j = -y_{1-\tau}^j$, we can express this also via the marginal effect associated with a change of the net of tax rate $1-\tau$. Hence,

$$y_1^j = y_0^j - (\tau_1^j - \tau_0^j)\, y_{1-\tau}^j \ ,$$

Using the definition of the elasticity of taxable income (ETI), $\varepsilon^j := y_{1-\tau}^j \, \frac{1-\tau_0^j}{y_0^j}$, we can rewrite this as well as

$$y_1^j = \left(1 - \frac{\tau_1^j - \tau_0^j}{1-\tau_0^j}\, \varepsilon^j\right) y_0^j \ .$$

Thus, for tax units that stay in, we have that

$$t_1^j\, y_1^j = t_1^j \left(1 - \frac{\tau_1^j - \tau_0^j}{1-\tau_0^j}\, \varepsilon^j\right) y_0^j \ .$$

Collecting terms, overall we have that

$$\Delta T^j = \left(1 - \pi^j\, \frac{t_j^1 - t_j^0}{1-t_0^j}\right) t_1^j \left(1 - \frac{\tau_1^j - \tau_0^j}{1-\tau_0^j}\, \varepsilon^j\right) y_0^j - t_0^j\, y_0^j \ . \tag{D.44}$$

By summing across all tax units, we obtain an estimate for the aggregate change of tax revenue $\sum_j \Delta T^j$. Dividing by the number of tax units J yields an estimate for the revenue change per tax unit

$$\Delta R = \frac{1}{J} \sum_j \Delta T^j \ . \tag{D.45}$$

Implications for individual welfare: Number of winners and losers. The analysis of political feasibility in Section 5.2 rests on a comparison of the number of individuals that benefit from a reform to the number of individuals that are made worse off. We now explain how we get to these number. We use conditions (C.35)-(C.38) to determine whether or not tax units benefit from a reform. When we bring these conditions to the data, we say that an individual tax unit j is a reform beneficiary if

$$\Delta R \quad - \quad (t_1^j - t_0^j)\ \max\{y_1^j, y_0^j\} \quad \geq \quad 0 \ , \tag{D.46}$$

and loses if

$$\Delta R \quad - \quad (t_1^j - t_0^j)\ \min\{y_1^j, y_0^j\} \quad \leq \quad 0 \ . \tag{D.47}$$

However, and as explained above, we think of an individual tax unit j as being representative of a group of tax units with similar characteristics. Thus, when average tax rates go up, $t_1^j - t_0^j > 0$, a fraction

$$\pi^j \, \frac{t_j^1 - t_j^0}{1 - t_0^j}$$

of this group has $y_1^j = 0$ and the complementary fraction with mass

$$1 - \pi^j \, \frac{t_j^1 - t_j^0}{1 - t_0^j}$$

has

$$y_1^j = \left(1 - \frac{\tau_1^j - \tau_0^j}{1 - \tau_0^j} \, \varepsilon^j\right) y_0^j \, .$$

By contrast, when average tax rates go down $t_1^j - t_0^j > 0$, we have tax units with $y_0^j = 0$ who now opt in at an income level of

$$y_1^j = \left(1 - \frac{\tau_1^j - \tau_0^j}{1 - \tau_0^j} \, \varepsilon^j\right) y_0^j \, .$$

and tax units with $y_0^j > 0$ who also choose this income level after the reform. The mass of tax units opting in equals

$$-\pi^j \, \frac{t_j^1 - t_j^0}{1 - t_0^j}$$

and the mass of tax units with a post-reform income of y_j^1 is then equal to

$$1 - \pi^j \, \frac{t_j^1 - t_j^0}{1 - t_0^j} \, .$$

Implications for individual welfare: Gains and losses. For the welfare analysis in Section 5.3 we aggregate the gains of reform winners and the losses of reform losers using various social welfare functions. The expressions on the left-hand sides of (D.46) and (D.47), respectively, are alternative measures of by how much individuals are affected. In the main text we present an analysis using the left-hand sides of (D.46). This makes it demanding to find welfare gains. In Appendix E we compare this baseline welfare measure against the alternative measure that uses the left-hand sides of (D.47), which makes it demanding to find welfare losses.

Adjusting for the time gap between pre- and post-reform years. The need of adjustment comes from the fact that the pre- and the post-reform tax systems apply in different calendar years. In case of the Reagan tax cuts, the reform was gradually implemented over several years, and we take 1985 as the last year with pre-reform schedule and 1988 as the first year with the post-reform schedule. We want an answer to a ceteris paribus question: All else equal, what is the effect of replacing the 1985-schedule by the 1988-schedule? To answer this question, we will have to compute an inflation adjusted version of y_0^j that we will denote by $\hat{y}_0^j$. If y_0^j is pre-reform income in 1985 USD, we think of $\hat{y}_0^j$ as the same pre-reform income, but expressed in 1988 USD.[47] Put differently, in moving from y_0^j to $\hat{y}_0^j$ we keep real income constant. We now explain how this adjustment modifies the above formulas.

First, note that we can express τ_0^j and τ_1^j also as

$$\tau_0^j = T_0'(y_0^j) \quad \text{and} \quad \tau_1^j = T_1'(\hat{y}_0^j) \ ,$$

and t_0^j and t_1^j also as

$$t_0^j = \frac{T_0(y_0^j)}{y_j^0} \quad \text{and} \quad t_1^j = \frac{T_1(\hat{y}_0^j)}{\hat{y}_0^j} \ .$$

The *direct policy effect* of the reform is then given by

$$\Delta T^j = T_1(\hat{y}_0^j) - T_0(y_0^j). \tag{D.48}$$

The reform induced percentage change in disposable income for tax units j – see Equation (D.43) – is now given by

$$\frac{\hat{y}_0^j - T_1(\hat{y}_0^j) - (y_0^j - T_0(y_0^j))}{y_0^j - T_0(y^j)} = \frac{\hat{y}_0^j - T_1(\hat{y}_0^j)}{y_0^j - T_0(y^j)} - 1 := r^j \ . \tag{D.49}$$

The fraction opting out when this expression is positive is given by $\pi^j \ r^j$. For those who stay in,

$$y_1^j = \hat{y}_0^j + (\tau_1^j - \tau_0^j) \ y_\tau^j \ .$$

Again, using the definition of the elasticity, $\varepsilon^j := y_{1-\tau}^j \ \frac{1-\tau_0^j}{y_0^j}$, we can rewrite this as well as

$$y_1^j = \left(1 - \frac{\tau_1^j - \tau_0^j}{1 - \tau_0^j} \ \varepsilon^j \right) \hat{y}_0^j \ .$$

Thus, for tax units that stay in, we have that

$$t_1^j \ y_1^j = t_1^j \left(1 - \frac{\tau_1^j - \tau_0^j}{1 - \tau_0^j} \ \varepsilon^j \right) \hat{y}_0^j \ .$$

Collecting terms, overall we have that

$$\Delta T^j = \left(1 - \pi^j \ \frac{t_j^1 - t_j^0}{1 - t_0^j} \right) t_1^j \left(1 - \frac{\tau_1^j - \tau_0^j}{1 - \tau_0^j} \ \varepsilon^j \right) \hat{y}_0^j - t_0^j \ y_0^j \ . \tag{D.50}$$

[47] As Bierbrauer et al. (2021), we use the Consumer Price Index research series using current methods (CPI-U-RS) from the Bureau of Labor Statistics as an uprating factor to inflate/deflate incomes.

By summing across all tax units we obtain an estimate for the aggregate change of tax revenue $\sum_j \Delta T^j$. Dividing by the number of tax units J yields an estimate for the revenue change per tax unit

$$\Delta R = \frac{1}{J}\sum_j \Delta T^j \ . \tag{D.51}$$

We say that an individual tax unit j is a reform beneficiary if

$$\Delta R \quad - \quad (t_1^j - t_0^j)\ \max\{y_1^j, \hat{y}_0^j\} \quad \geq \quad 0 \ , \tag{D.52}$$

and loses if

$$\Delta R \quad - \quad (t_1^j - t_0^j)\ \min\{y_1^j, \hat{y}_0^j\} \quad \leq \quad 0 \ . \tag{D.53}$$

and we use the left-hand sides of (D.52) and (D.53) as measures of how much individuals gain or lose due to a tax reform.

Hypothetical reforms. Our methodology is not only valid for reforms that were implemented in the past. We can also apply it to the analysis of hypothetical tax reforms that did not take place. Given our focus on the tax treatment of couples and singles, one such hypothetical reform type is one in which we take the change in taxes for singles through a particular historical reform as given but translate that observed tax change for singles according to the pre-reform σ-function to couples.

In particular, we replace the post-reform tax function for couples by a hypothetical one that is linked via the pre-reform σ-function to the post-reform tax schedule for singles. For instance, the hypothetical mechanical change in tax payments for couples is then given by

$$\Delta T^j = T_{m1}^{hyp}(\hat{y}_{m0}) - T_{m0}(y_{m0}), \tag{D.54}$$

$$\Delta T^j = \sigma_0\ T_{s1}\left(\frac{\hat{y}_{m0}}{\sigma_0}\right) - T_{m0}(y_{m0}). \tag{D.55}$$

D.4.2 Calibration of revenue functions and Pareto bounds

To analyze whether reforms realized Pareto improvements, we estimate $\mathcal{R}_m(y_m)$ and $\mathcal{R}_s(y_s)$ under intensive (and extensive) margin responses according to Proposition 6 (and Proposition 7).

Intensive margin. Remember that for couples, revenue functions considering only intensive margin responses are characterized by

$$\frac{1}{\nu_m}\mathcal{R}_m(y_m) = -\frac{T'_{m0}(y_m)}{1 - T'_{m0}(y_m)}\ y_m\ f_m^y(y_m)\ \bar{\mathcal{E}}_m(y_m) + \ 1 - F_m^y(y_m)\ , \tag{D.56}$$

where F^y_m is the *cdf* and f^y_m the density of the earnings distribution of married couples and

$$\bar{\mathcal{E}}_m(y_m) \quad = \quad \mathbf{E}_{(\theta_m,\gamma_m)}\left[e(\theta_m,\gamma_m) \mid y^0_m(\theta_m,\gamma_m) = y_m\right]$$

is a measure of the behavioral responses to a one-bracket tax reform affecting couples with a joint income close to y_m.

The main ingredients of these equations are (i) estimates of the gross income distribution, (ii) an approximation of marginal and participation tax rates, and (iii) assumptions about behavioral responses at the intensive margin.

We estimate gross income distributions for couples and singles from the CPS data using an adaptive kernel density estimator with a Gaussian kernel on an equally spaced grid between the first percentile and a value equal to the 99.9th percentile of the gross income distribution. Subsequently, we adjust the estimated distribution to the share of tax units without any income. Figures D.16 and D.17 show the resulting cumulative distribution functions (CDF) and probability density functions (PDF).

We estimate effective marginal tax rates based on the TAXSIM microsimulation model for every tax unit in the data. To approximate effective marginal tax rates at a given income level, we estimate a kernel-weighted local polynomial using the same grid and bandwidth as for the estimation of the income distributions. Figure D.18 shows the estimated pre-reform marginal tax rates.

Based on the assumptions about behavioral responses at the intensive margin illustrated in Table 1, we assign every single tax unit the respective intensive margin elasticity and every couple a weighted average based on the income shares of the primary and secondary earner. In line with the estimation of average effective marginal tax rates, we approximate the intensive margin elasticity at a given income level using a kernel weighted local polynomial. Note that even though elasticities are constant for primary and secondary earners, the average elasticity for couples can vary across the income distribution and across years due to the change in the earnings share of primary and secondary earners. Figure D.19 shows for the baseline assumptions about the elasticity of taxable income, how the pre-reform average elasticities assigned to couples varies across the income distribution.

Intensive and extensive margin. Remember that for couples, revenue functions considering extensive and intensive margin responses are characterized by

$$\tfrac{1}{\nu_m}\mathcal{R}_m(y) \quad = \quad \mathcal{X}_{sec}(y_m) + \mathcal{I}_{sec}(y) + \mathcal{X}_{dec}(y_m) + \mathcal{I}_{dec}(y) \ ,$$

where

$$\mathcal{I}_{sec}(y) \quad = \quad \lambda^0_{sec}\left(-\tfrac{T'_{m0}(y)}{1-T'_{m0}(y)}\ y\ f^y_{sec}(y)\ \bar{\mathcal{E}}_{sec}(y) + 1 - F^y_{sec}(y)\right) \ ,$$

$$\mathcal{X}_{sec}(y) \quad = \quad -\lambda^0_{sec}\int_y^{\bar{y}} \tfrac{T_{m0}(y')}{y'-T_{m0}(y')}\ \bar{\pi}_{sec}(y')\ f^y_{sec}(y')\ dy' \ ,$$

$$\mathcal{I}_{dec}(y) \;=\; \lambda^0_{dec}\left(-\tfrac{T'_{m0}(y)}{1-T'_{m0}(y)}\; y\; f^y_{dec}(y)\; \bar{\mathcal{E}}_{dec}(y) + 1 - F^y_{dec}(y)\right) \;,$$

and

$$\mathcal{X}_{dec}(y) \;=\; -\lambda^0_{dec}\;\int_y^{\bar{y}} \tfrac{T_{m0}(y')}{y'-T_{m0}(y')}\; \bar{\pi}_{dec}(y')\; f^y_{dec}(y')\; dy \;.$$

The additional ingredients with respect to the ones used above are (i) the share of dual and single earner couples, (ii) separate income distributions for dual and single earner couples - see Figures D.20 and D.21, (iii) estimates of the participation tax rate - see Figure D.22, (iv) assumptions about the participation elasticity. For the latter, we assume that participation tax do not vary across tax unit types, but vary across the income distribution, i.e. it decreases from 0.65 to 0.25 between a gross income of zero and the 90th percentile of the gross income distribution (see Figure D.23).

Application to primary and secondary earners. Based on Equation (B.10), and under the assumption of constant intensive margin elasticities for the primary and secondary earner, the revenue functions under intensive and extensive margin responses can be calculated as

$$\mathcal{R}_1^{int}(y_1) = -\; y_1\; f_1^y(y_1)\; e_1\; \mathbf{E}\left[\frac{T'_m(y^0_m)}{1-T'_m(y^0_m)} \mid y^0_1 = y_1\right] \;+\; 1 - F^y_1(y_1),$$

where e_1 is the elasticity of the couple's joint income with respect to the marginal tax rate faced by the primary earner, for which we use the elasticities provided in table 1.

Beyond the elasticities for primary and secondary earners, the estimation of these revenue functions requires (i) separate income distributions for the primary and the secondary earner - see Figures D.24 and D.25, and (ii) an estimate of the couples' marginal tax rate at a given primary and secondary earnings level (see Figures D.26 and D.27).

For the consideration of extensive margin responses, we assume that the extensive margin reaction of dual earner couples does not differ of whether the tax treatment of primary or secondary earnings are modified, i.e. $\pi_{dec,1} = \pi_{dec_2} = \pi_{dec}$ revenue functions are

$$\mathcal{R}_1^{int+ext}(y_1) = -\; y_1\; f_1^y(y_1)\; e_1\; \mathbf{E}\left[\frac{T'_m(y^0_m)}{1-T'_m(y^0_m)} \mid y^0_1 = y_1\right] + \mathcal{X}_{dec}(y_1) + \mathcal{X}_{sec}(y_1) \;+\; 1 - F^y_1(y_1) \;,$$

$$\mathcal{X}_{dec}(y_1) = -\int_{y_1}^{\bar{y}} \mathbf{E}\left[\frac{T_{m0}(y^0_m)}{y^0_m - T_{m0}(y^0_m)} \;\times \pi_{dec}(y^0_m) \mid y^0_1 = y'_1\right]\; m^{y_1}_{dec}(y'_1)\; dy'_1 \;,$$

$$\mathcal{X}_{sec}(y_1) = -\int_{y_1}^{\bar{y}} \mathbf{E}\left[\frac{T_{m0}(y^0_m)}{y^0_m - T_{m0}(y^0_m)} \;\times \pi_{sec}(y^0_m) \mid y^0_1 = y'_1\right]\; m^{y_1}_{sec}(y'_1)\; dy'_1 \;.$$

Again, we assume that participation responses are larger at the bottom of the income distribution, i.e. the participation elasticities decrease from 0.65 to 0.25 between a gross income of zero and the 90th percentile of the gross income distribution (see Figure D.23).

Note that in contrast to intensive margin responses, we cannot put the participation elasticity in front of the expectation operator, because the participation elasticity is assumed to be income dependent. Therefore, we first compute the term inside the expectation operator at the tax unit level, and estimate the average of this term across varying levels of primary and secondary earnings.

Pareto bounds. We can visualize the Pareto improvement possibilities also by displaying the upper Pareto bound in relation to the pre-reform marginal tax rates. For this purpose, we can rewrite Equations (B.9), (B.6) and (7) and define upper Pareto bounds for marginal tax rates. We can define upper bounds under intensive margin responses only, but also with extensive margin responses. The empirical ingredients remain the same as above. Hence,

$$UB_s^{int} = \frac{1 - F_s^y(y_s)}{y_s f_s^y(y_s)\bar{\mathcal{E}}_s(y_s)} \ , \tag{D.57}$$

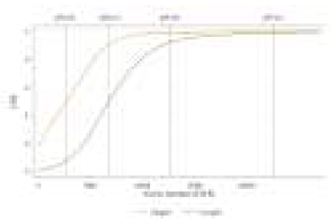
$$UB_s^{int+ext} = \frac{1 - F_s^y(y_s) - \int_y^{\bar{y}} \frac{T_{s0}(y')}{y' - T_{s0}(y')} \ \bar{\pi}_s(y') \ m_s^y(y') \ dy' \ ,}{y_s f_s^y(y_s)\bar{\mathcal{E}}_s(y_s)} \ , \tag{D.58}$$

$$UB_m^{int} = \frac{1 - F_m^y(y_m)}{y_m f_m^y(y_m)\bar{\mathcal{E}}_m(y_m)} \ , \tag{D.59}$$

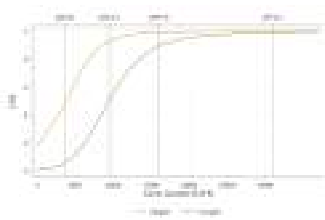
$$UB_m^{int+ext} = \frac{1 - F_m^y(y_m) - \int_y^{\bar{y}} \frac{T_{m0}(y')}{y' - T_{m0}(y')} \ \bar{\pi}_{sec}(y') \ m_{sec}^y(y') \ dy' \ - \int_y^{\bar{y}} \frac{T_{m0}(y')}{y' - T_{m0}(y')} \ \bar{\pi}_{dec}(y') \ m_{dec}^y(y') \ dy}{y_m f_m^y(y_m)\bar{\mathcal{E}}_m(y_m)} \ . \tag{D.60}$$

Figure D.16: Cumulative distribution function, pre-reform

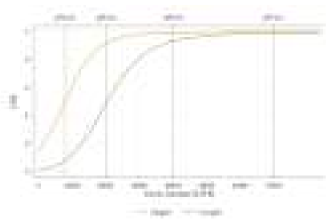
(a) RA64



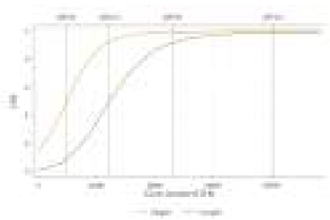
(b) TRA69



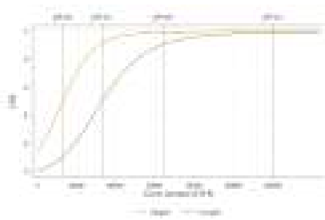
(c) RA78



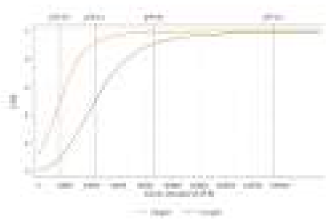
(d) ERTA81



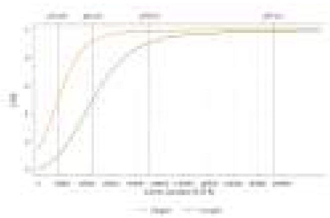
(e) TRA86



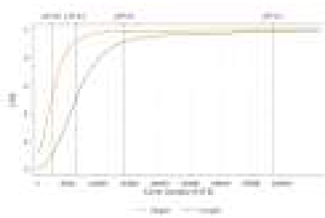
(f) OBRA90



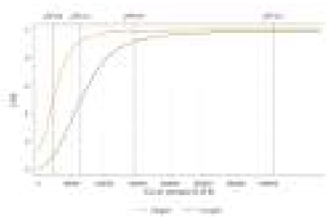
(g) OBRA93



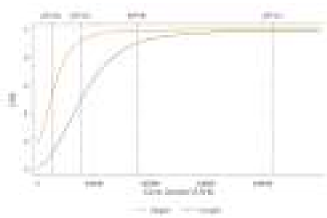
(h) EGTRA01



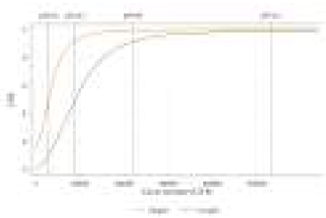
(i) JGTRRA03



(j) ATRA12



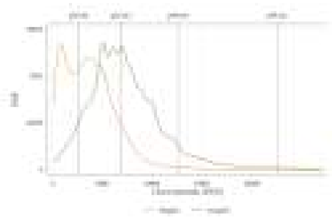
(k) TCJA17



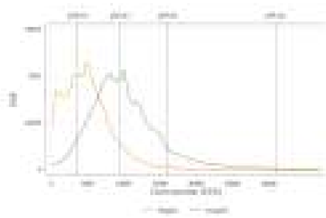
Notes: This figure displays estimates of the cumulative distribution function of gross income for singles (orange line) and couples (green line) in the respective pre-reform year. Distributions are estimated using an adaptive kernel density estimator with a Gaussian kernel on an equally spaced grid between the first percentile and a value equal to the 99.9th percentile of the gross income distribution.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.17: Probability density function, pre-reform

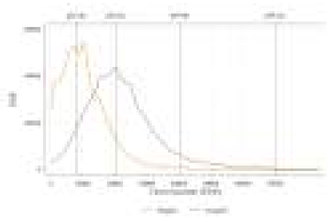
(a) RA64



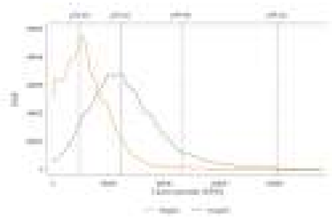
(b) TRA69



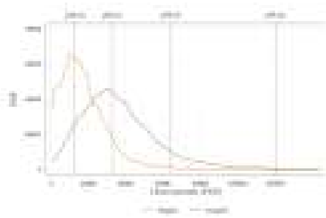
(c) RA78



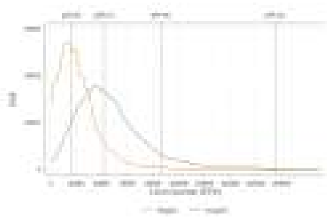
(d) ERTA81



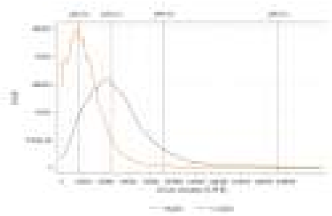
(e) TRA86



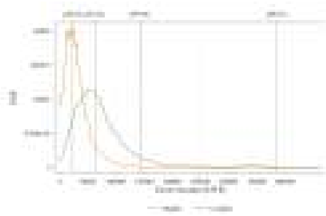
(f) OBRA90



(g) OBRA93



(h) EGTRA01



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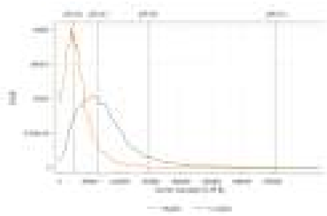
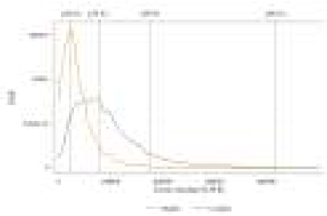
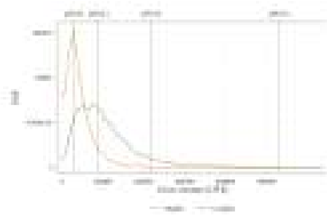


(j) ATRA12



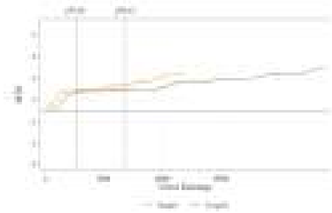
(k) TCJA17



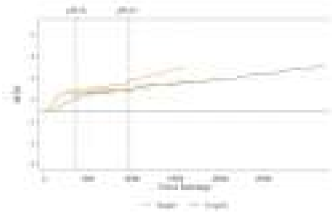
Notes: This figure displays estimates of the probability density function of gross income for singles (orange line) and couples (green line) in the respective pre-reform year. Distributions are estimated using an adaptive kernel density estimator with a Gaussian kernel on an equally spaced grid between the first percentile and a value equal to the 99.9th percentile of the gross income distribution.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.18: Effective marginal tax rates, pre-reform

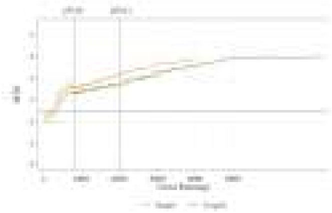
(a) RA64



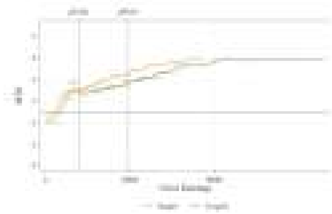
(b) TRA69



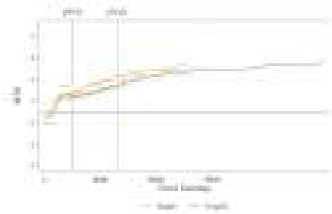
(c) RA78



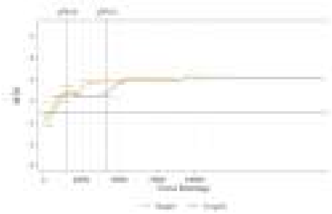
(d) ERTA81



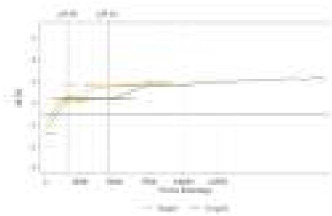
(e) TRA86



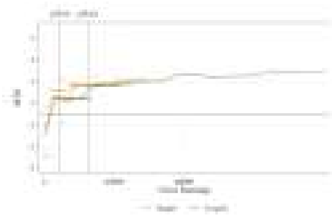
(f) OBRA90



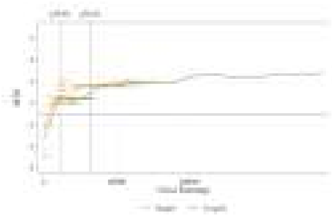
(g) OBRA93



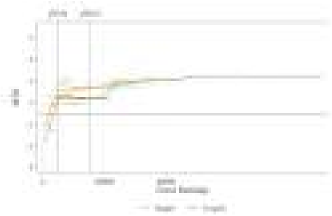
(h) EGTRA01



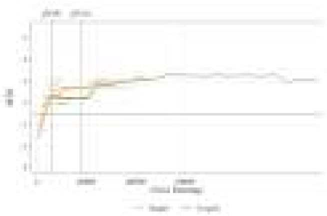
(i) JGTRRA03



(j) ATRA12



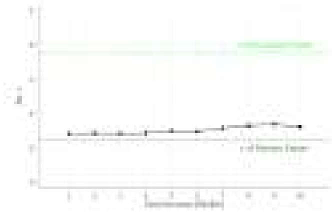
(k) TCJA17



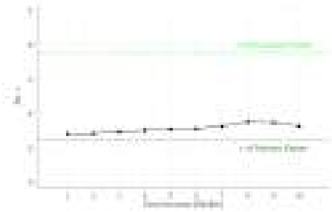
Notes: This figure displays average effective marginal tax rates for singles (orange lines) and couples (green lines) before the reform (solid lines) and after the reform (dashed lines). Average marginal tax rates at a given gross income level are estimated with a kernel-weighted local polynomial using the same grid and bandwidth as for the estimation of the income distributions (see Figure D.16 and D.17).
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.19: Average elasticities of couples

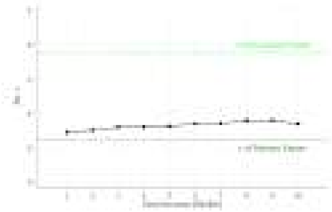
(a) RA64



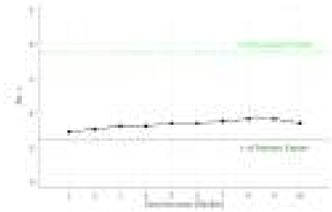
(b) TRA69



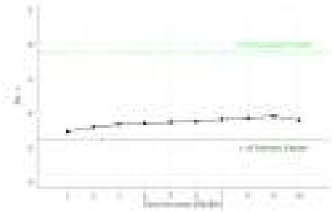
(c) RA78



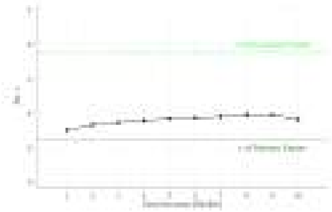
(d) ERTA81



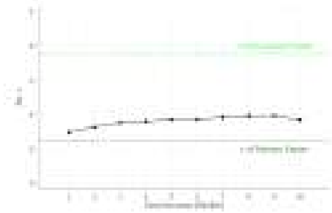
(e) TRA86



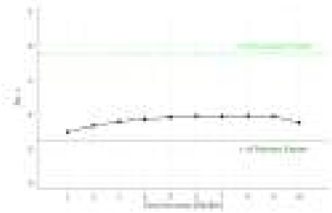
(f) OBRA90



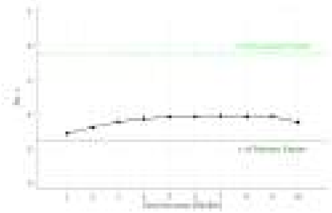
(g) OBRA93



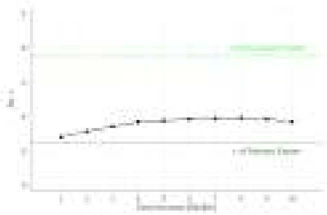
(h) EGTRA01



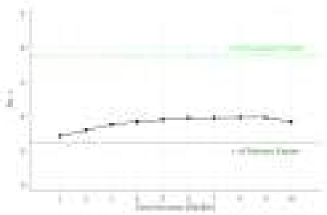
(i) JGTRRA03



(j) ATRA12

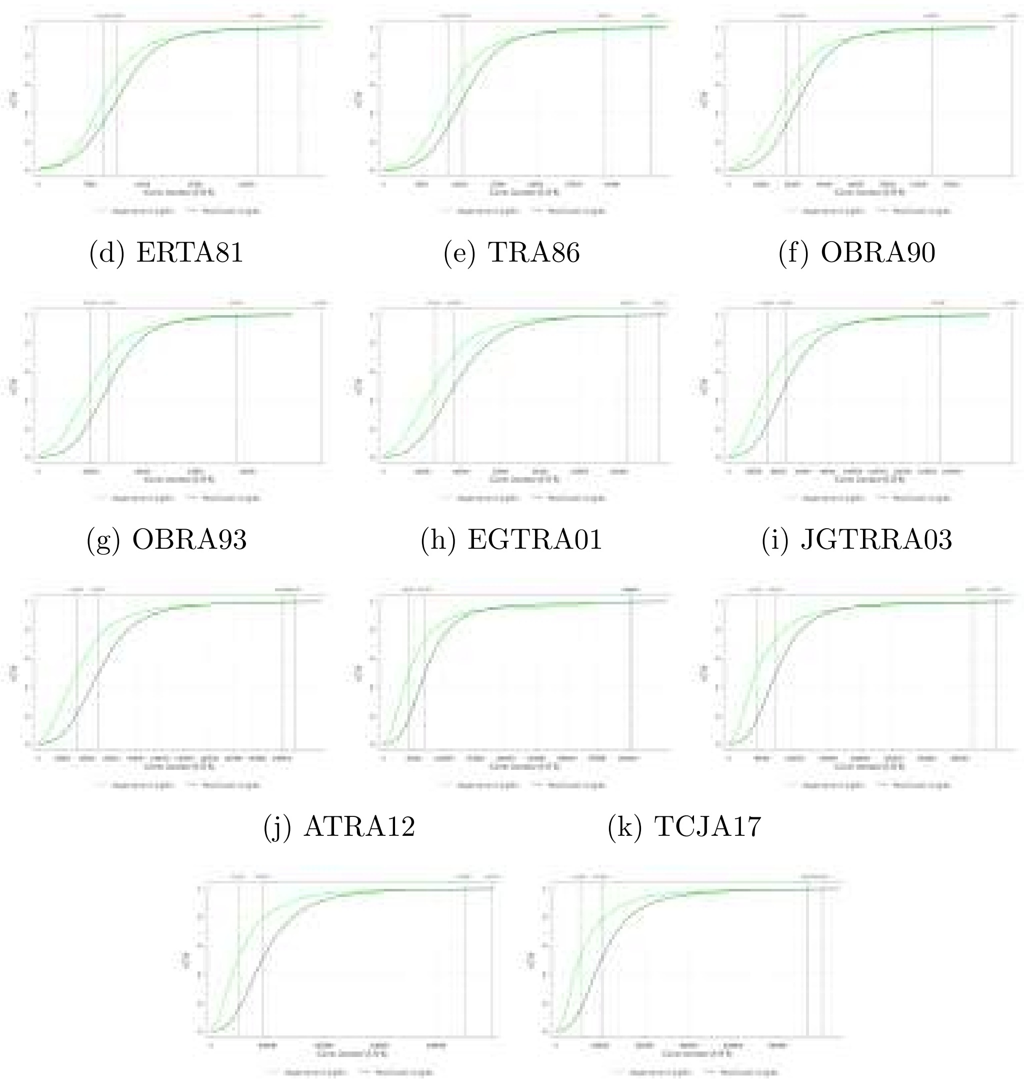


(k) TCJA17



Notes: This figure displays the average intensive margin elasticity of taxable income for couples across gross income deciles in the respective pre-reform year. Elasticities are calculated for every couple based on an income-share weighted elasticity of 0.25 for the primary earner and 0.75 for the secondary earner (see Table 1). Deciles are computed based on the gross income distribution of couples. Earnings shares are based on wage, business and farm income.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.20: CDF, single earner and dual earner couples, pre-reform



(a) RA64 (b) TRA69 (c) RA78

(d) ERTA81 (e) TRA86 (f) OBRA90

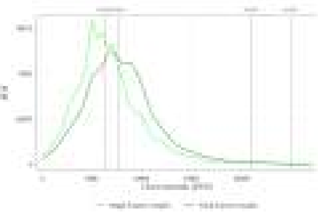
(g) OBRA93 (h) EGTRA01 (i) JGTRRA03

(j) ATRA12 (k) TCJA17

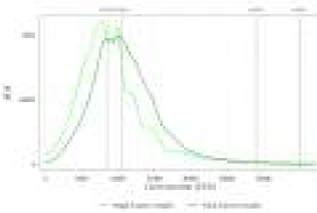
Notes: This figure displays estimates of the cumulative distribution function of gross income for single earner (light green line) and dual earner couples (dark green line) in the respective pre-reform year. Distributions are estimated using an adaptive kernel density estimator with a Gaussian kernel on an equally spaced grid between the first percentile and a value equal to the 99.9th percentile of the gross income distribution.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.21: PDF, single earner and dual earner couples, pre-reform

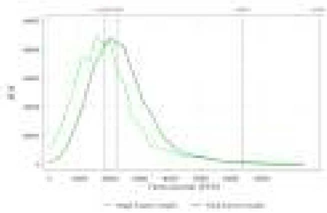
(a) RA64



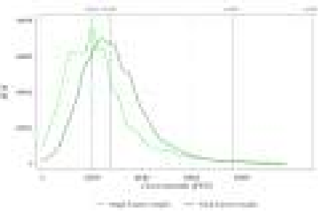
(b) TRA69



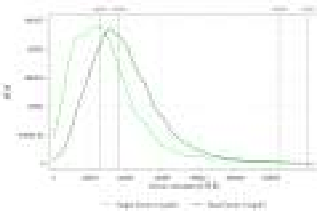
(c) RA78



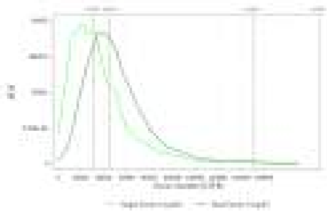
(d) ERTA81



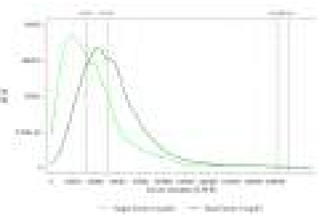
(e) TRA86



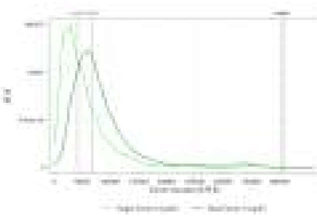
(f) OBRA90



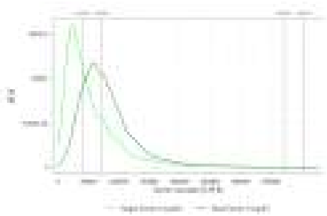
(g) OBRA93



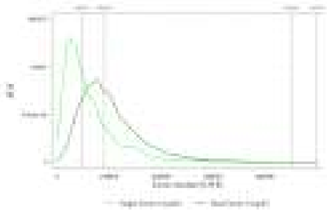
(h) EGTRA01



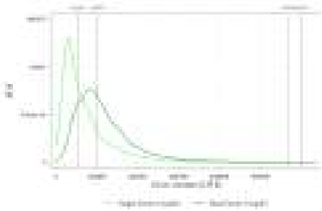
(i) JGTRRA03



(j) ATRA12



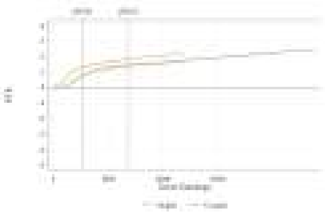
(k) TCJA17



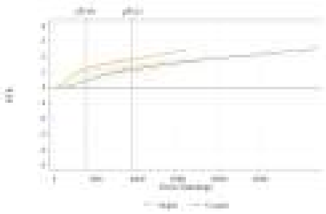
Notes: This figure displays estimates of the probability density function of gross income for single earner (light green line) and dual earner couples (dark green line) in the respective pre-reform year. Distributions are estimated using an adaptive kernel density estimator with a Gaussian kernel on an equally spaced grid between the first percentile and a value equal to the 99.9th percentile of the gross income distribution.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.22: Participation tax rates, pre-reform

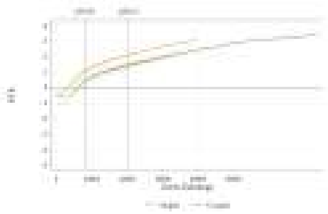
(a) RA64



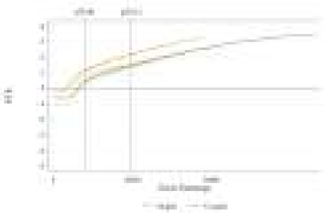
(b) TRA69



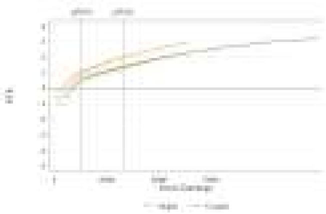
(c) RA78



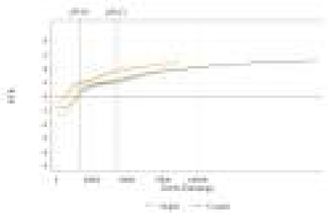
(d) ERTA81



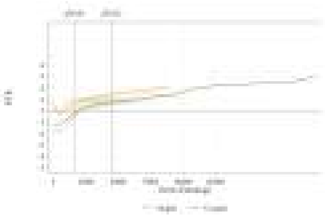
(e) TRA86



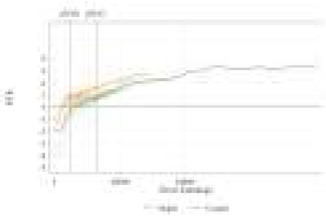
(f) OBRA90



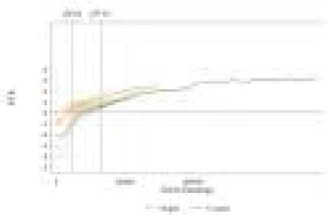
(g) OBRA93



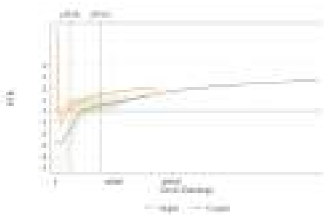
(h) EGTRA01



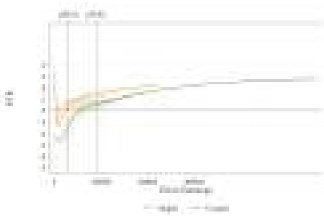
(i) JGTRRA03



(j) ATRA12



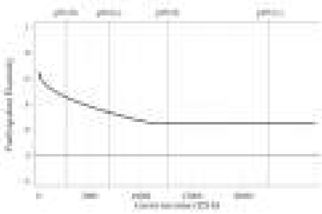
(k) TCJA17



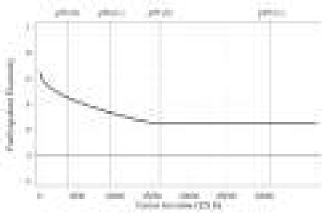
Notes: This figure displays participation tax rates for every single (light orange dots) and every couple (light green dots) in the respective pre-reform year. Solid orange (green) lines represent estimates of the average marginal tax rate schedule for singles (couples). Average participation tax rates at a given gross income level are estimated with a kernel-weighted local polynomial using the same bandwidth as for the estimation of the income distributions (see Figure D.16 and D.17).
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.23: Participation elasticities

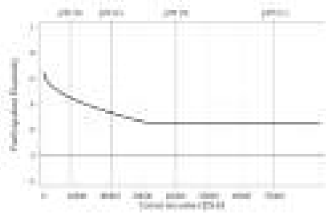
(a) RA64



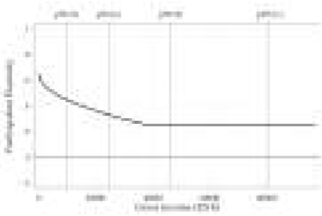
(b) TRA69



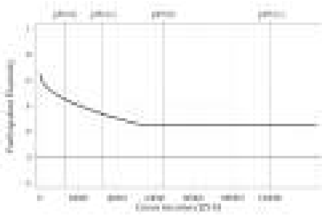
(c) RA78



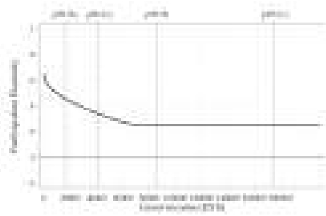
(d) ERTA81



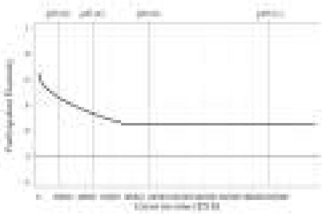
(e) TRA86



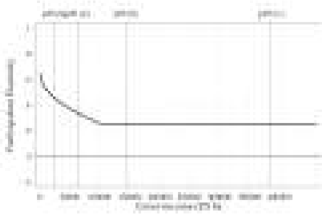
(f) OBRA90



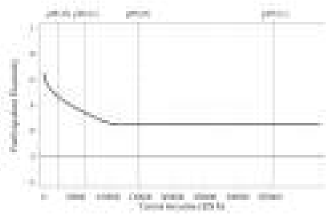
(g) OBRA93



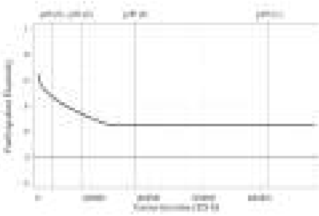
(h) EGTRA01



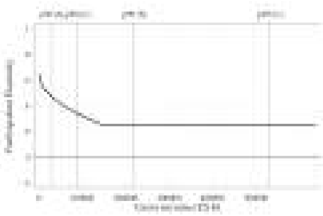
(i) JGTRRA03



(j) ATRA12

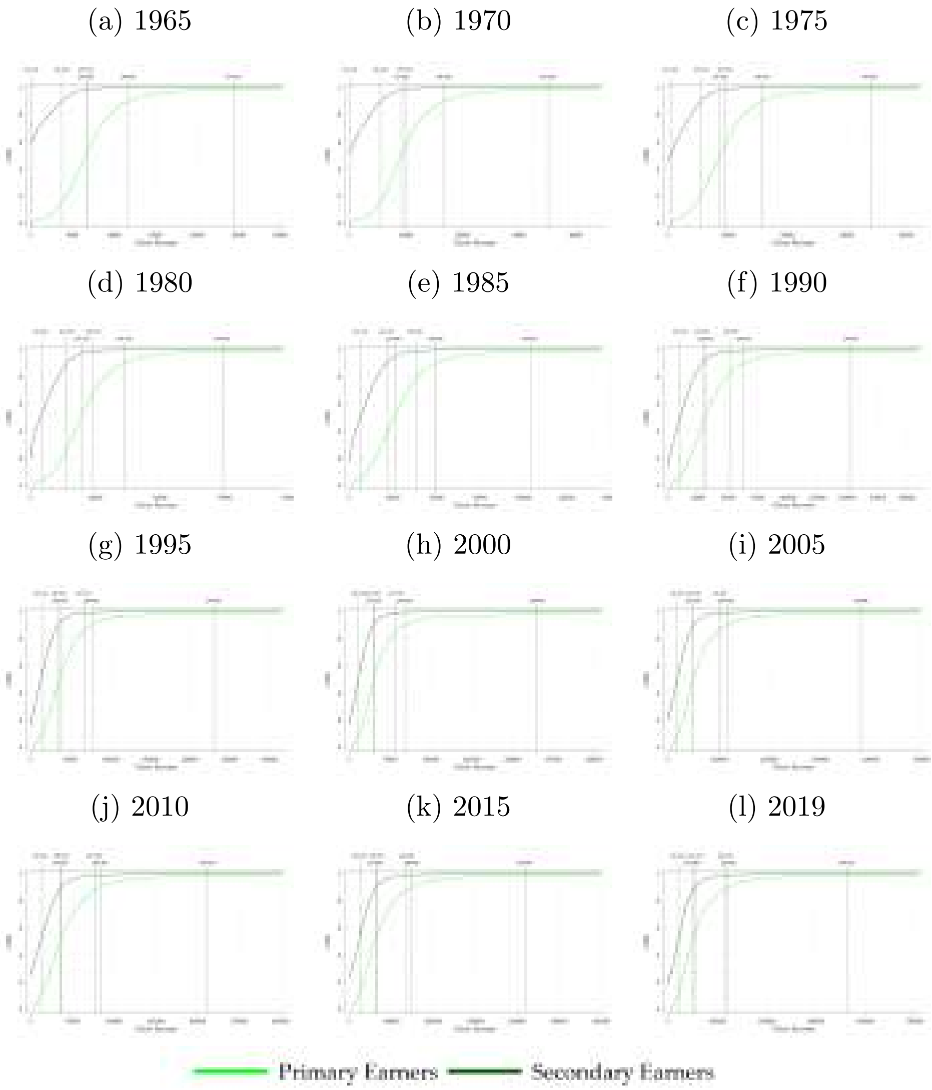


(k) TCJA17



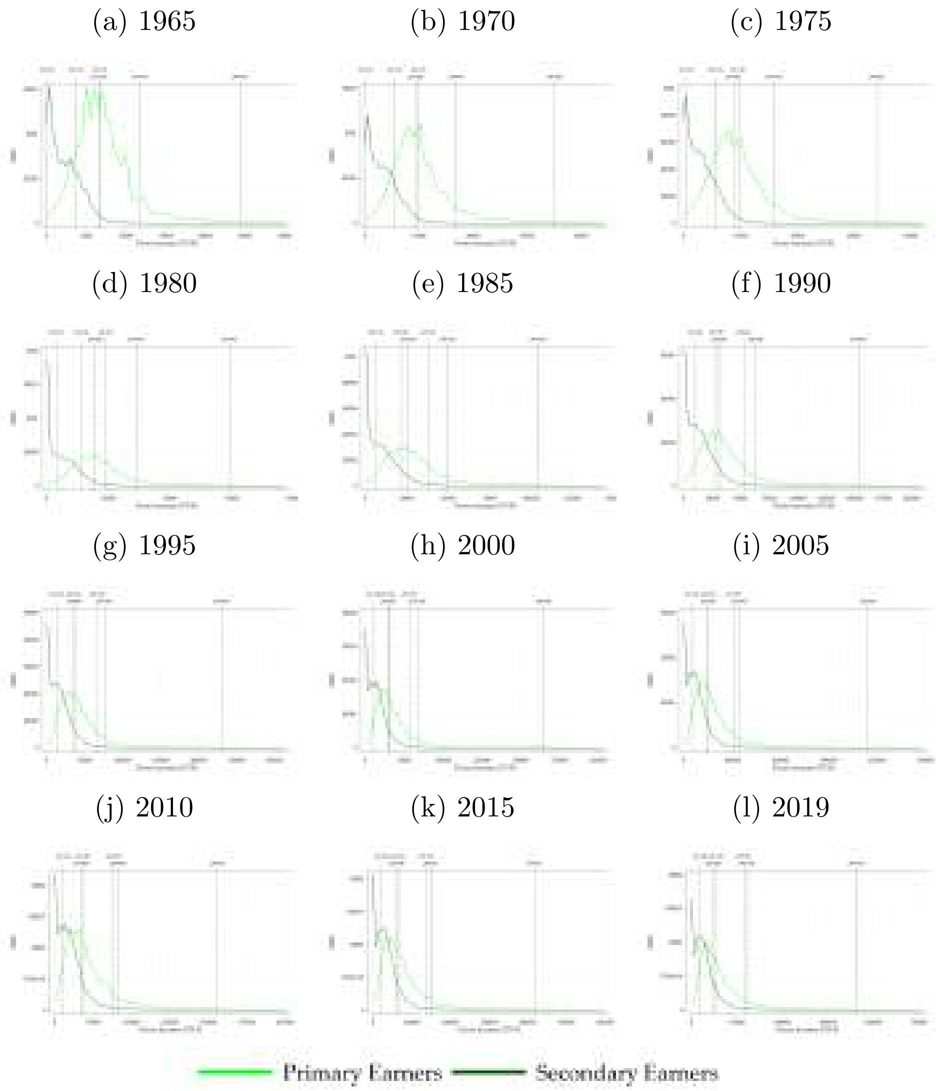
Notes: This figure displays for every pre-reform year the evolution of the participation elasticity over income. The participation elasticity is assumed to decrease from 0.65 to 0.25 between zero and the 90th percentile of the gross income distribution based on the formula $\pi = 0.65 - 0.4\left(\frac{y}{y_{P90}}\right)^{\frac{1}{2}}$.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.24: Cumulative distribution function, primary and secondary earners



Notes: This figure shows for selected years the cumulative density function of primary and secondary earnings. Distributions are estimated using an adaptive kernel density estimator with a Gaussian kernel on an equally spaced grid between the first percentile and a value equal to the 99.9th percentile of the gross income distribution.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

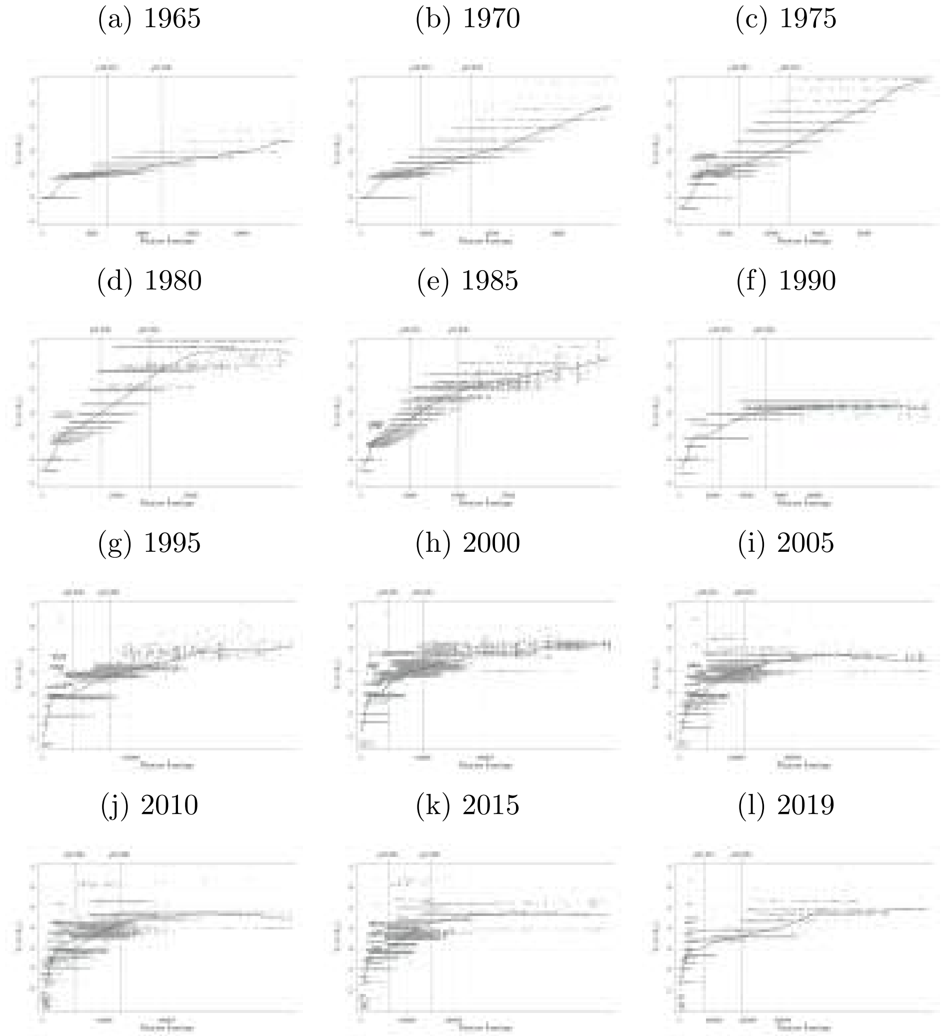
Figure D.25: Probability density function, primary and secondary earners



Notes: This figure shows for selected years the probability density function of primary and secondary earnings. Distributions are estimated using an adaptive kernel density estimator with a Gaussian kernel on an equally spaced grid between the first percentile and a value equal to the 99.9th percentile of the gross income distribution.

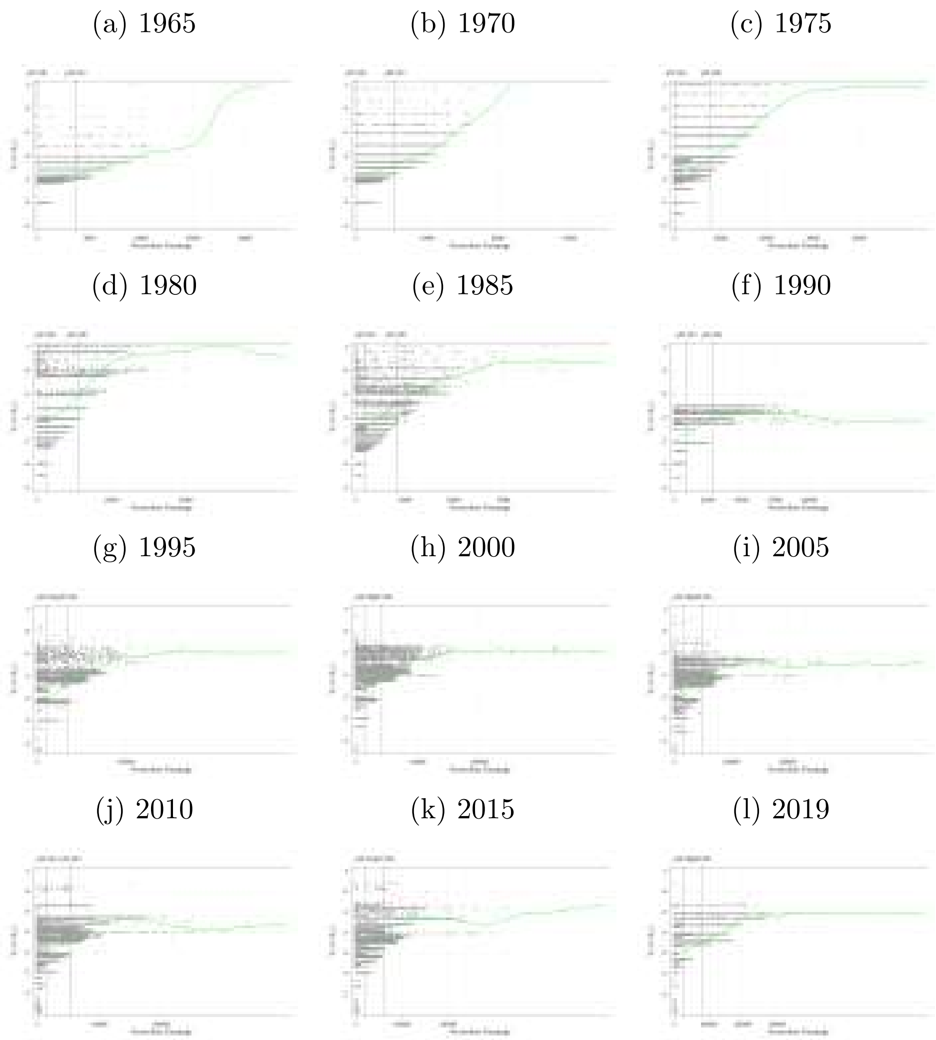
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.26: Average marginal tax rates by primary earnings



Notes: This figure shows for selected years the marginal tax rate ratio $\frac{T'}{1-T'}$ across primary earnings. The solid line represents an average calculated using a local polynomial regression.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure D.27: Average marginal tax rates by secondary earnings



(a) 1965 (b) 1970 (c) 1975

(d) 1980 (e) 1985 (f) 1990

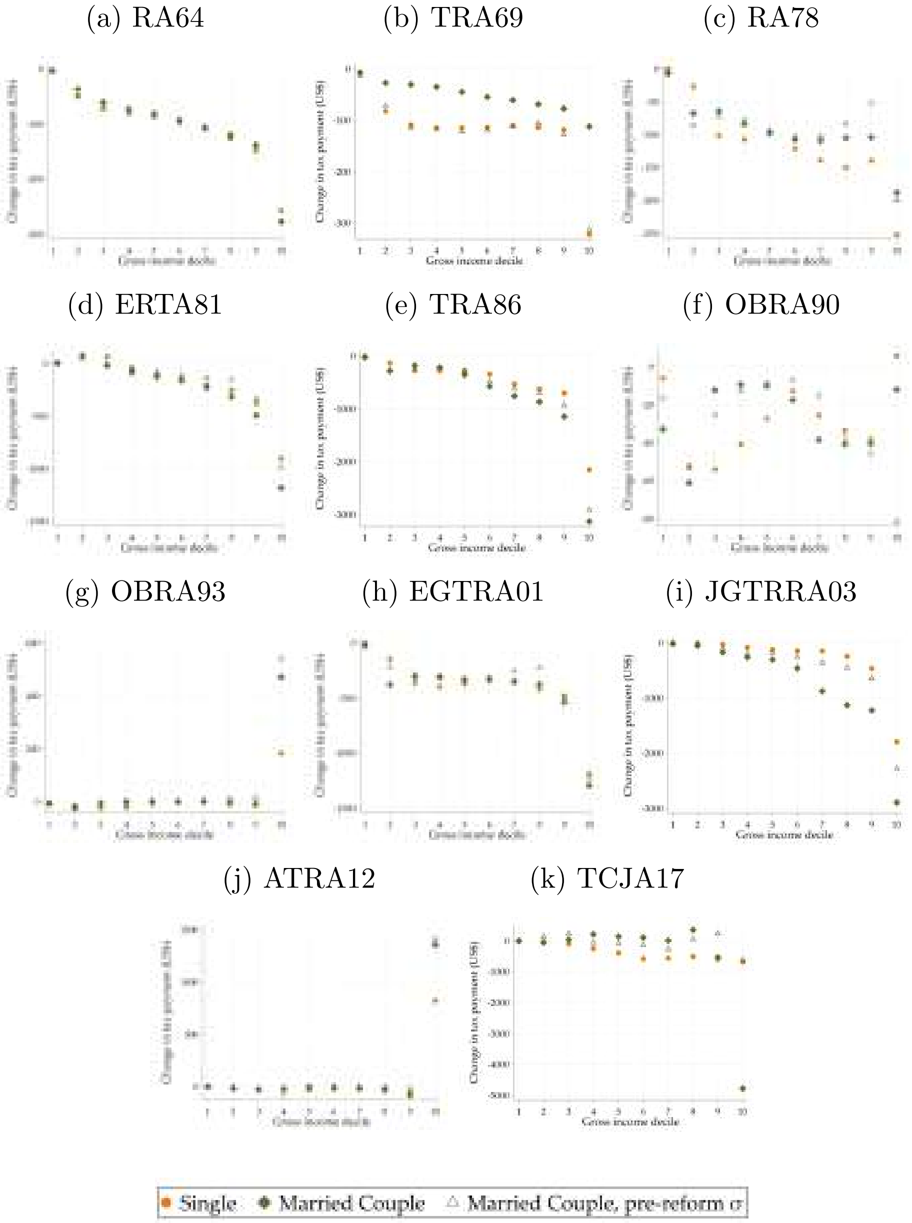
(g) 1995 (h) 2000 (i) 2005

(j) 2010 (k) 2015 (l) 2019

Notes: This figure shows for selected years the marginal tax rate ratio $\frac{T'}{1-T'}$ across secondary earnings. The solid line represents an average calculated using a local polynomial regression.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

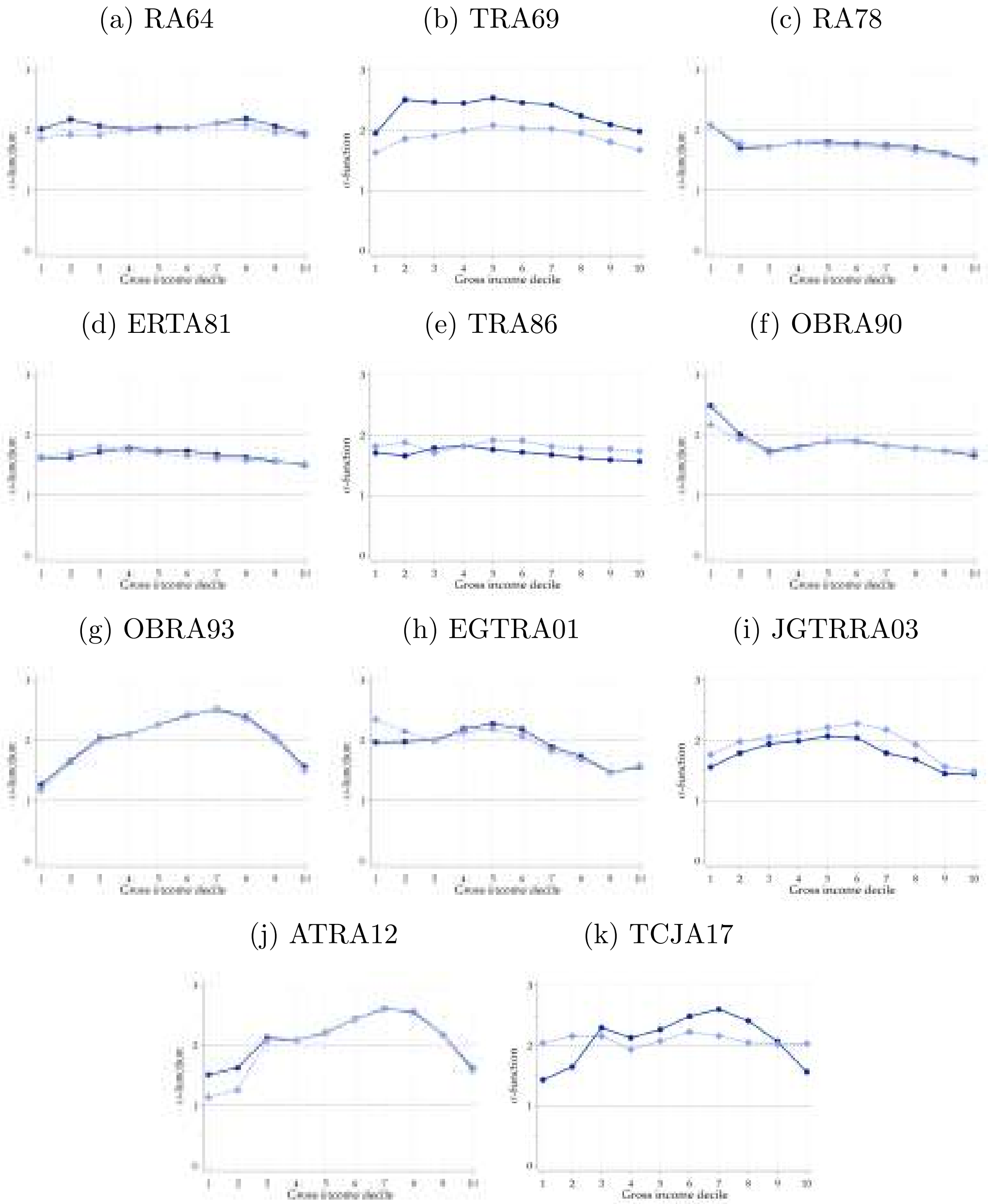
E Supplementary material: Reforms *in* the system

Figure E.28: Differential effect of tax reform



Notes: This figure replicates Figure 3 for all reforms. It shows how tax reforms affected the per-capita tax burden of singles (orange circles) and couples (green diamonds), holding their income fixed at the pre-reform level, by deciles of the per capita gross income distribution. At the tax unit level, the change is equal to $T_{s1}(\hat{y}_{s0}) - T_{s0}(y_{s0})$ for singles and $T_{m1}(\hat{y}_{m0}) - T_{m0}(y_{m0})$ for couples. Post-reform tax payments $T_1(\hat{y}_0)$ are calculated based on the inflation-adjusted pre-reform income $\hat{y}_0$ using the CPI-U-RS deflator as uprating factor. In addition, the figure displays the hypothetical change in tax liability for couples under the assumption that observed tax changes of singles would have translated according to the empirical pre-reform splitting function σ to couples, i.e. $\sigma_0 \, T_{s1}\left(\frac{\hat{y}_{m0}}{\sigma_0}\right) - T_{m0}(y_{m0})$ (grey triangles). For details on the methodology on the analysis of actual and hypothetical tax reforms, see Appendix D.4.1. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure E.29: Change of σ

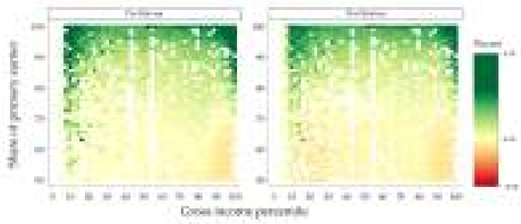


Notes: This figure replicates Figure 4 for all reforms. It shows the effects on the splitting function σ, holding incomes fixed at the pre-reform level. Pre-reform (dark blue circles) and post-reform (light blue diamonds) splitting functions are calculated by estimating mean average tax rates of couples and singles in the respective year. Mean average tax rates are used to solve numerically for σ (see Appendix D.3.2)). Deciles refer to the gross income distribution of couples in the respective year. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.

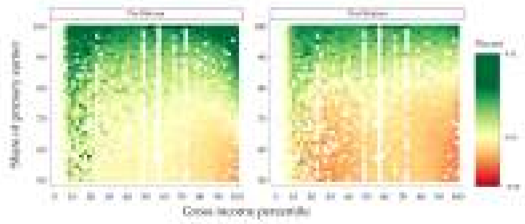
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure E.30: Change of marriage bonuses and penalties

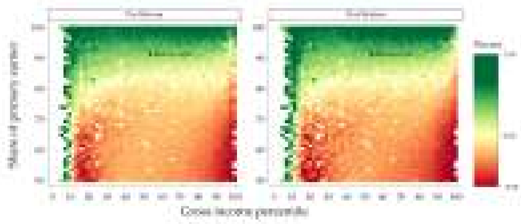
(a) RA64



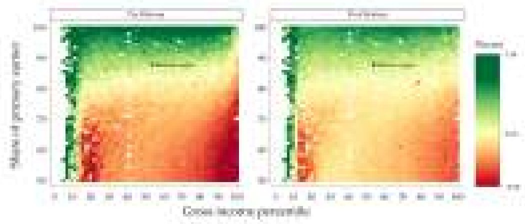
(b) TRA69



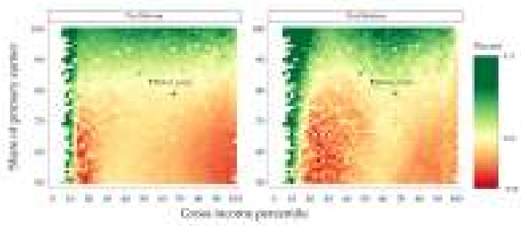
(c) RA78



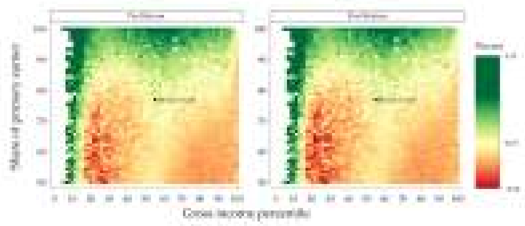
(d) ERTA81



(e) TRA86



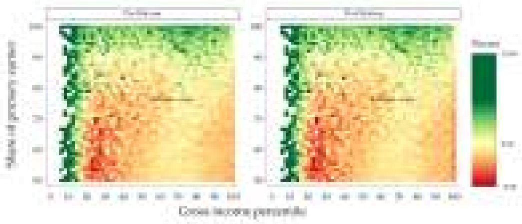
(f) OBRA90



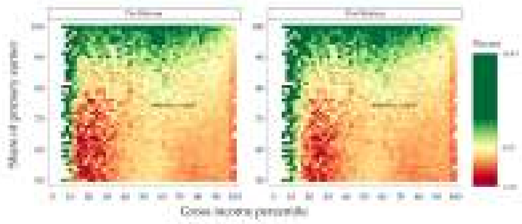
Notes: This figure shows marriage bonuses and penalties relative to gross income. Each square in a figure represents an average of marriage bonuses (green) or penalties (red) for a group of tax units at a particular income percentile (horizontal axis) and with a particular primary earner income share (vertical axis). Relative marriage bonuses/penalties relate the absolute monetary advantage from filing as a married couple to the total income of the couple, i.e. $\frac{T_m(y_1+y_2)-(T_s(y_1)+T_s(y_2))}{y_1+y_2}$ (see Appendix D.3.1 for details). The distribution of marriage penalties and bonuses is shown for the pre-reform year (left panel) and the post-reform year (right panel). Income percentiles at the horizontal axis refer to the per capita income distribution of the full sample, i.e. individuals in couples are assigned half of the joint income. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure E.31: Change of marriage bonuses and penalties (cont.)

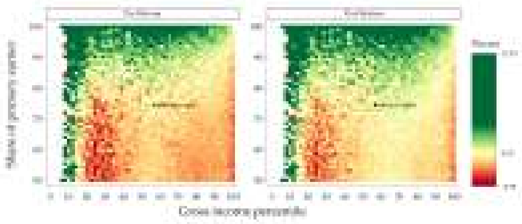
(a) OBRA93



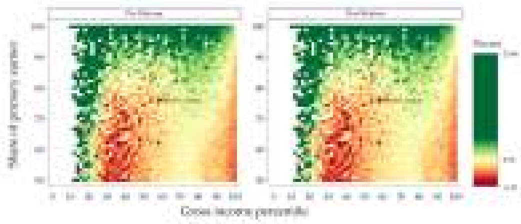
(b) EGTRA01



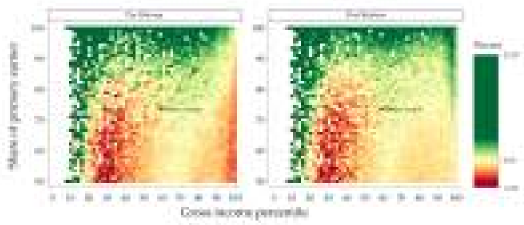
(c) JGTRRA03



(d) ATRA12

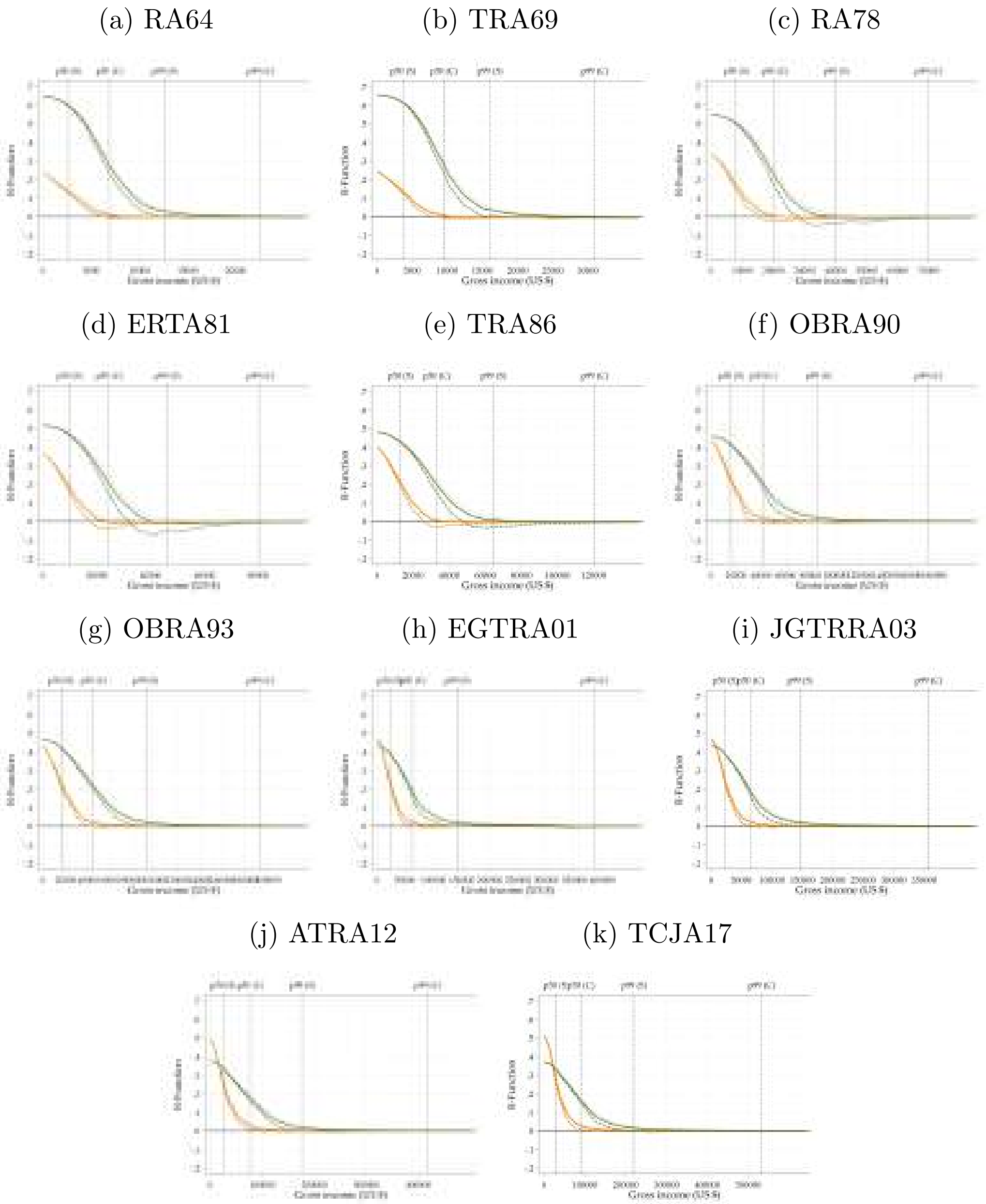


(e) TCJA17



Notes: This figure shows marriage bonuses and penalties relative to gross income. Each square in a figure represents an average of marriage bonuses (green) or penalties (red) for a group of tax units at a particular income percentile (horizontal axis) and with a particular primary earner income share (vertical axis). Relative marriage bonuses/penalties relate the absolute monetary advantage from filing as a married couple to the total income of the couple, i.e. $\frac{T_m(y_1+y_2)-(T_s(y_1)+T_s(y_2))}{y_1+y_2}$ (see Appendix D.3.1 for details). The distribution of marriage penalties and bonuses is shown for the pre-reform year (left panel) and the post-reform year (right panel). Income percentiles at the horizontal axis refer to the per capita income distribution of the full sample, i.e. individuals in couples are assigned half of the joint income. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old. *Source:* Authors' calculations based on NBER TAXSIM and CPS-ASEC.

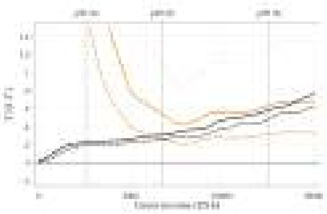
Figure E.32: Separate reforms



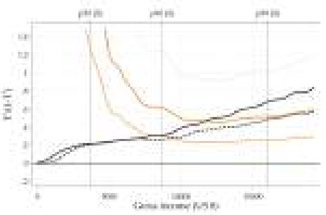
Notes: This figure replicates Figure 5 for all reforms. It shows revenue functions $\mathcal{R}$ in the respective pre-reform year. The revenue functions are shown separately for singles ($\mathcal{R}_s$, orange line) and married couples ($\mathcal{R}_m$, green line). All revenue functions are based on behavioral responses at the intensive and extensive margin using low (dotted line), baseline (solid line), and high (dashed line) elasticity scenarios described in Table 1. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure E.33: Separate reforms, upper Pareto bounds (singles)

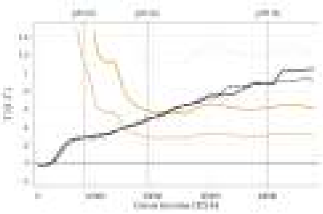
(a) RA64



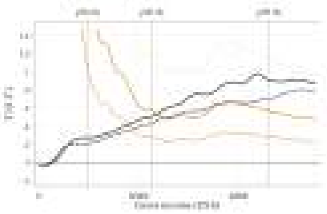
(b) TRA69



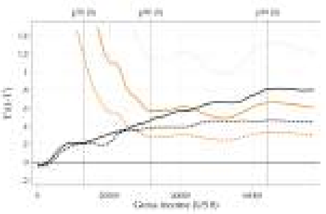
(c) RA78



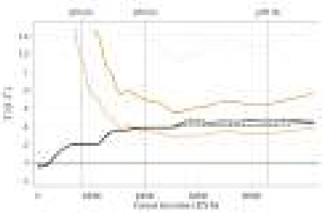
(d) ERTA81



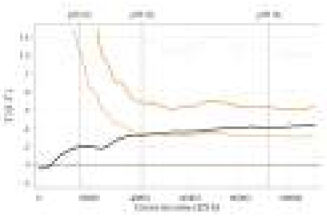
(e) TRA86



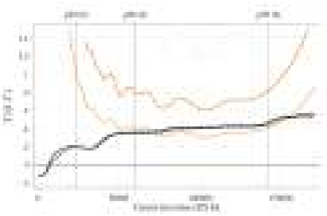
(f) OBRA90



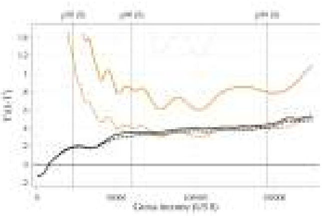
(g) OBRA93



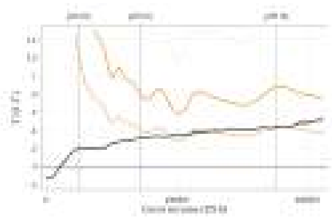
(h) EGTRA01



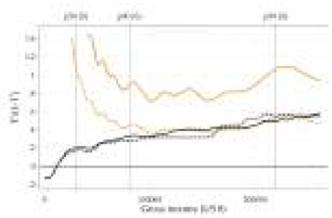
(i) JGTRRA03



(j) ATRA12



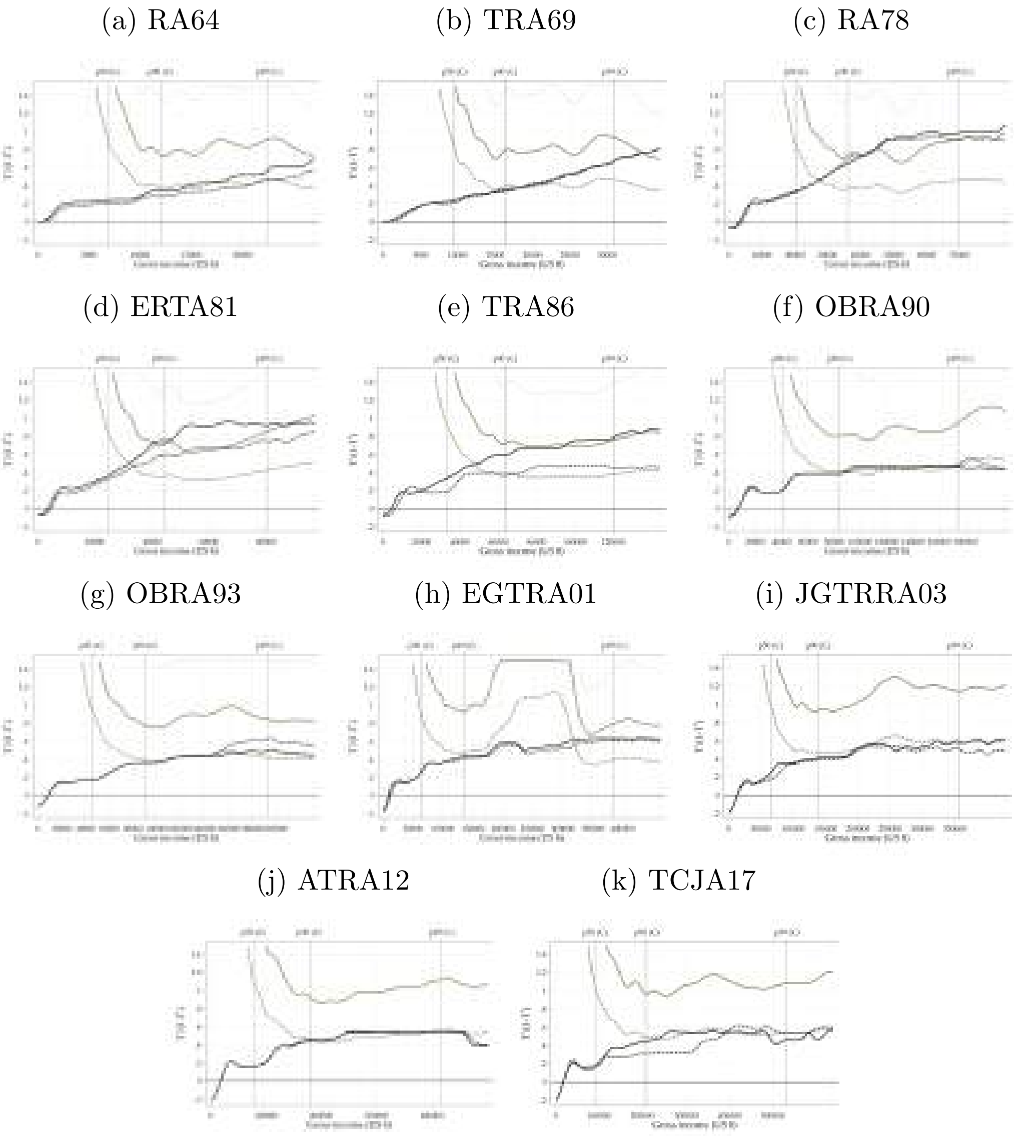
(k) TCJA17



Notes: This figure replicates parts of Figure 6 for all reforms. It shows the upper Pareto bounds UB (see Appendix D.4 and especially equations D.57–D.60) in the respective pre-reform year and the ratio $\frac{T'}{1-T'}$ of the effective marginal tax rates before (solid black line) and after (dashed black line) the reform. The bounds are shown for singles (orange lines). All upper bounds are conditional on extensive margin responses and displayed for low (dotted line), baseline (solid line), and high (dashed line) intensive margin elasticity scenarios described in Table 1. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.

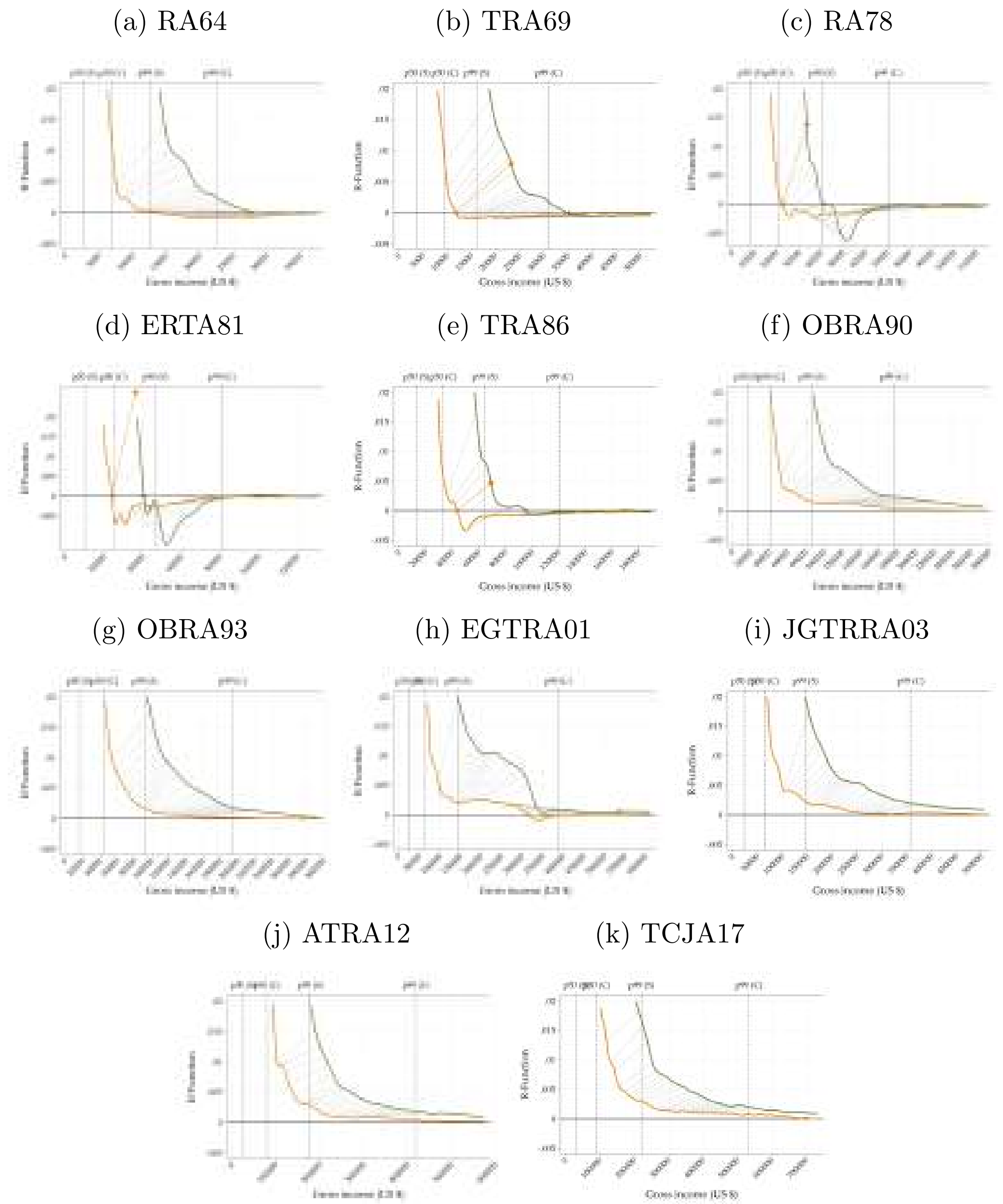
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure E.34: Separate reforms, upper Pareto bounds (couples)



Notes: This figure replicates parts of Figure 6 for all reforms. It shows the upper Pareto bounds UB (see Appendix D.4 and especially equations D.57–D.60) in the respective pre-reform year and the ratio $\frac{T'}{1-T'}$ of the effective marginal tax rates before (solid black line) and after (dashed black line) the reform. The bounds are shown for couples (green lines). All upper bounds are conditional on extensive margin responses and displayed for low (dotted line), baseline (solid line), and high (dashed line) intensive margin elasticity scenarios described in Table 1. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure E.35: Combined reform, fixed σ



(a) RA64 (b) TRA69 (c) RA78

(d) ERTA81 (e) TRA86 (f) OBRA90

(g) OBRA93 (h) EGTRA01 (i) JGTRRA03

(j) ATRA12 (k) TCJA17

Notes: This figure replicates Figure 7 for all reforms. It shows revenue functions $\mathcal{R}$ in the respective pre-reform year. The revenue functions are shown separately for singles ($\mathcal{R}_s$, orange line) and married couples ($\mathcal{R}_m$, green line). The dashed lines that connect the revenue function for singles and couples indicate the pre-reform relationship of tax schedules via the empirical splitting function σ. The orange and green cross on the horizontal axis indicate the income level at which the revenue functions for singles and for couples cross the zero line. All revenue functions are based on behavioral responses at the intensive and extensive margin using assumptions from the baseline elasticity scenario (see Table 1). All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.

Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Table E.5: Political economy of past reforms (part 1)

1. Reform	2. Behavioral Responses		3. Couple Shares		4. Winners (TU)			5. Winners (Ind.)		
	Extensive	Intensive	TU	Ind.	Singles	Couples	All	Singles	Couples	All
RA64	Yes	low	68.9%	81.6%	16.7%	63.6%	49.0%	3.1%	51.9%	55.0%
	Yes	baseline	68.9%	81.6%	18.4%	69.8%	53.8%	3.4%	56.9%	60.3%
	Yes	high	68.9%	81.6%	26.0%	75.0%	59.8%	4.8%	61.2%	66.0%
	No	low	68.9%	81.6%	15.5%	59.1%	45.5%	2.9%	48.2%	51.0%
	No	baseline	68.9%	81.6%	16.6%	63.0%	48.6%	3.1%	51.4%	54.5%
	No	high	68.9%	81.6%	19.5%	71.9%	55.6%	3.6%	58.7%	62.3%
TRA69	Yes	low	68.7%	81.4%	60.8%	58.5%	59.2%	11.3%	47.7%	58.9%
	Yes	baseline	68.7%	81.4%	62.6%	63.0%	62.9%	11.6%	51.3%	62.9%
	Yes	high	68.7%	81.4%	64.7%	72.6%	70.1%	12.0%	59.1%	71.1%
	No	low	68.7%	81.4%	58.9%	54.1%	55.6%	10.9%	44.1%	55.0%
	No	baseline	68.7%	81.4%	60.8%	58.4%	59.2%	11.3%	47.6%	58.9%
	No	high	68.7%	81.4%	63.3%	69.0%	67.2%	11.8%	56.2%	67.9%
RA78	Yes	low	58.2%	73.6%	29.6%	76.5%	56.9%	7.8%	56.3%	64.1%
	Yes	baseline	58.2%	73.6%	34.9%	80.9%	61.7%	9.2%	59.6%	68.8%
	Yes	high	58.2%	73.6%	46.1%	87.3%	70.1%	12.2%	64.3%	76.5%
	No	low	58.2%	73.6%	21.8%	68.6%	49.0%	5.8%	50.5%	56.2%
	No	baseline	58.2%	73.6%	29.8%	76.9%	57.2%	7.9%	56.6%	64.5%
	No	high	58.2%	73.6%	40.3%	84.9%	66.3%	10.6%	62.5%	73.1%
ERTA81	Yes	low	55.0%	71.0%	19.5%	48.8%	35.6%	5.7%	34.6%	40.3%
	Yes	baseline	55.0%	71.0%	22.2%	53.6%	39.5%	6.4%	38.1%	44.5%
	Yes	high	55.0%	71.0%	37.2%	65.8%	52.9%	10.8%	46.7%	57.5%
	No	low	55.0%	71.0%	18.6%	46.5%	33.9%	5.4%	33.0%	38.4%
	No	baseline	55.0%	71.0%	21.0%	50.9%	37.4%	6.1%	36.1%	42.2%
	No	high	55.0%	71.0%	33.7%	61.6%	49.0%	9.8%	43.7%	53.5%
TRA86	Yes	low	50.8%	67.4%	10.5%	54.4%	32.8%	3.4%	36.7%	40.1%
	Yes	baseline	50.8%	67.4%	13.4%	58.0%	36.0%	4.4%	39.1%	43.4%
	Yes	high	50.8%	67.4%	20.2%	66.5%	43.7%	6.6%	44.8%	51.4%
	No	low	50.8%	67.4%	9.5%	52.5%	31.3%	3.1%	35.4%	38.5%
	No	baseline	50.8%	67.4%	12.1%	55.9%	34.3%	4.0%	37.7%	41.6%
	No	high	50.8%	67.4%	17.1%	63.5%	40.7%	5.6%	42.8%	48.4%
OBRA90	Yes	low	48.1%	64.9%	15.4%	53.5%	33.7%	5.4%	34.7%	40.1%
	Yes	baseline	48.1%	64.9%	15.4%	53.5%	33.7%	5.4%	34.7%	40.1%
	Yes	high	48.1%	64.9%	15.4%	53.5%	33.7%	5.4%	34.8%	40.2%
	No	low	48.1%	64.9%	15.4%	53.5%	33.7%	5.4%	34.7%	40.1%
	No	baseline	48.1%	64.9%	15.4%	53.5%	33.7%	5.4%	34.8%	40.1%
	No	high	48.1%	64.9%	15.4%	53.7%	33.8%	5.4%	34.9%	40.3%

Notes: This table shows whether there was majority support for past reforms of the US federal income tax (column 1) under different assumptions regarding behavioral responses (column 2). Column 3 shows the share of married couples among all tax units and the share of individuals living in married couples. Column 4 shows the share of winners among tax units while column 5 shows the share of winners among individuals. Lump-sum adjustments are at the tax unit level. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

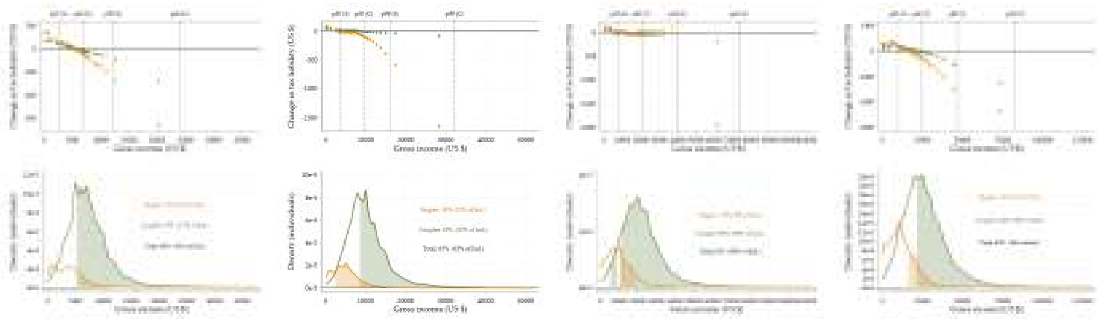
Table E.6: Political economy of past reforms (part 2)

1. Reform	2. Behavioral Responses		3. Couple Shares		4. Winners (TU)			5. Winners (Ind.)		
	Extensive	Intensive	TU	Ind.	Singles	Couples	All	Singles	Couples	All
OBRA93	Yes	low	48.1%	65.0%	99.1%	95.4%	97.3%	34.7%	62.0%	96.7%
	Yes	baseline	48.1%	65.0%	99.0%	93.8%	96.5%	34.7%	61.0%	95.6%
	Yes	high	48.1%	65.0%	29.0%	34.4%	31.6%	10.1%	22.3%	32.5%
	No	low	48.1%	65.0%	99.2%	95.6%	97.4%	34.7%	62.1%	96.8%
	No	baseline	48.1%	65.0%	99.1%	95.1%	97.2%	34.7%	61.8%	96.5%
	No	high	48.1%	65.0%	29.7%	34.9%	32.2%	10.4%	22.7%	33.1%
EGTRRA01	Yes	low	45.0%	62.0%	16.0%	80.8%	45.1%	6.1%	50.1%	56.2%
	Yes	baseline	45.0%	62.0%	16.9%	81.8%	46.1%	6.4%	50.7%	57.1%
	Yes	high	45.0%	62.0%	19.0%	83.2%	47.9%	7.2%	51.6%	58.8%
	No	low	45.0%	62.0%	13.4%	74.3%	40.8%	5.1%	46.1%	51.2%
	No	baseline	45.0%	62.0%	15.9%	80.6%	45.0%	6.0%	50.0%	56.1%
	No	high	45.0%	62.0%	17.9%	82.3%	46.8%	6.8%	51.0%	57.8%
JGTRRA03	Yes	low	44.5%	61.6%	6.6%	56.3%	28.7%	2.5%	34.7%	37.2%
	Yes	baseline	44.5%	61.6%	6.9%	56.9%	29.2%	2.7%	35.0%	37.7%
	Yes	high	44.5%	61.6%	9.0%	61.1%	32.2%	3.4%	37.6%	41.1%
	No	low	44.5%	61.6%	6.4%	55.6%	28.3%	2.5%	34.2%	36.7%
	No	baseline	44.5%	61.6%	6.6%	56.3%	28.7%	2.5%	34.7%	37.2%
	No	high	44.5%	61.6%	8.0%	60.4%	31.3%	3.1%	37.2%	40.2%
ATRA12	Yes	low	38.4%	55.5%	99.6%	98.3%	99.1%	44.3%	54.5%	98.9%
	Yes	baseline	38.4%	55.5%	99.6%	97.9%	98.9%	44.3%	54.3%	98.7%
	Yes	high	38.4%	55.5%	99.3%	95.5%	97.8%	44.2%	53.0%	97.2%
	No	low	38.4%	55.5%	99.7%	98.4%	99.2%	44.3%	54.6%	98.9%
	No	baseline	38.4%	55.5%	99.6%	98.2%	99.1%	44.3%	54.5%	98.9%
	No	high	38.4%	55.5%	99.5%	96.7%	98.4%	44.3%	53.7%	98.0%
TCJA17	Yes	low	37.8%	54.9%	27.9%	29.9%	28.7%	12.6%	16.4%	29.0%
	Yes	baseline	37.8%	54.9%	31.1%	31.4%	31.2%	14.0%	17.2%	31.3%
	Yes	high	37.8%	54.9%	38.6%	36.4%	37.8%	17.4%	20.0%	37.4%
	No	low	37.8%	54.9%	27.1%	29.2%	27.9%	12.2%	16.0%	28.3%
	No	baseline	37.8%	54.9%	29.3%	30.7%	29.8%	13.2%	16.8%	30.1%
	No	high	37.8%	54.9%	37.1%	35.5%	36.5%	16.7%	19.5%	36.3%

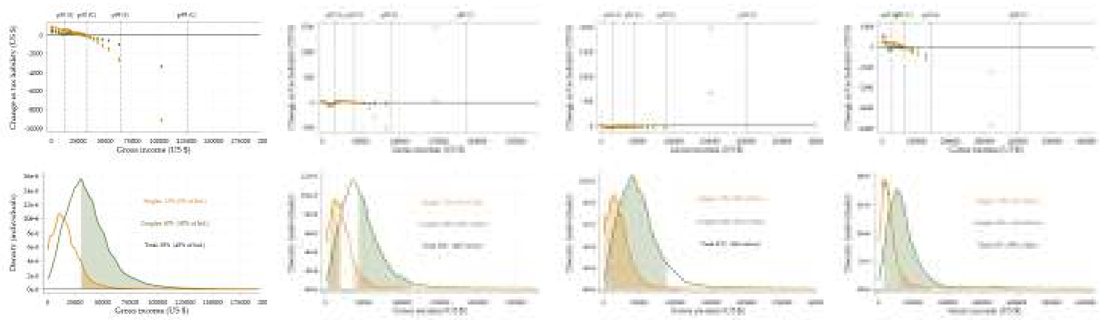
Notes: This table shows the majority support for past reforms of the US federal income tax (column 1) under different assumptions regarding behavioral responses (column 2). Column 3 shows the share of married couples among all tax units and the share of individuals living in married couples. Column 4 shows the share of winners among tax units while column 5 shows the share of winners among individuals. Lump-sum adjustments are at the tax unit level. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure E.36: Political feasibility

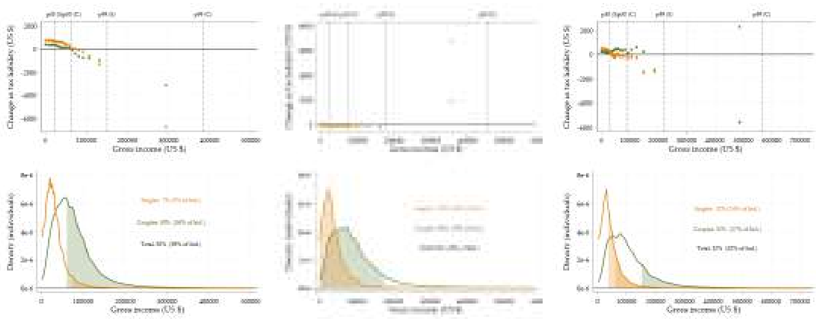
(a) RA64 (b) TRA69 (c) RA78 (d) ERTA81



(e) TRA86 (f) OBRA90 (g) OBRA93 (h) EGTRA01



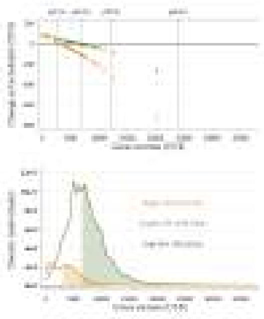
(i) JGTRRA03 (j) ATRA12 (k) TCJA17



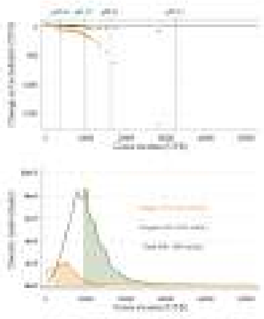
Notes: This figure replicates Figure 8 for all reforms. It shows the change in the tax liability (upper panel) and winners of the reform (lower panel) for singles (orange shaded area) and couples (green shaded area). The change in tax liability represents the average change in tax liability per capita (PC) for each of 25 gross income quantiles. We account for behavioral responses at both the intensive margin (baseline elasticity scenario from Table 1) and the extensive margin. It is assumed that tax revenues are rebated lump sum at the tax unit level. Appendix Figure E.37 shows an alternative analysis based on lump-sum adjustments at the individual level. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure E.37: Political feasibility, lump-sum adjustment per-capita

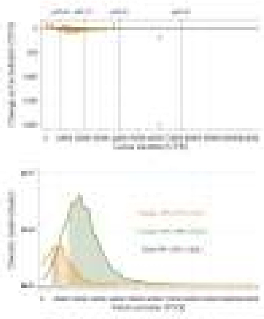
(a) RA64



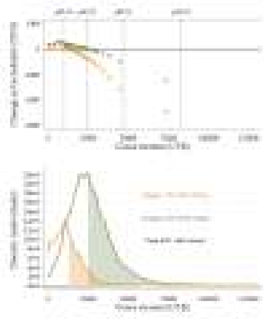
(b) TRA69



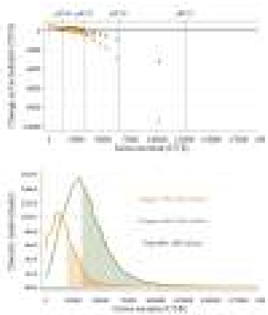
(c) RA78



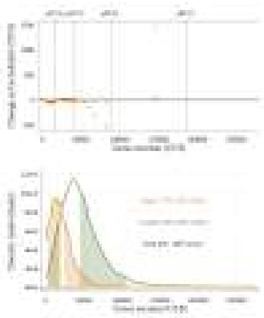
(d) ERTA81



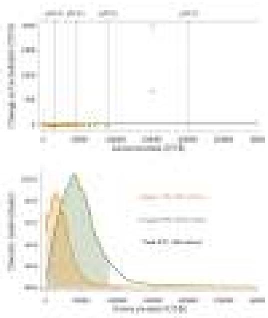
(e) TRA86



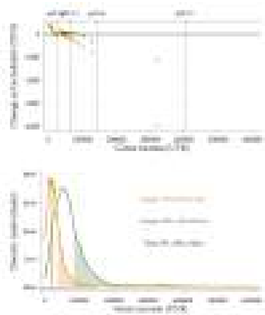
(f) OBRA90



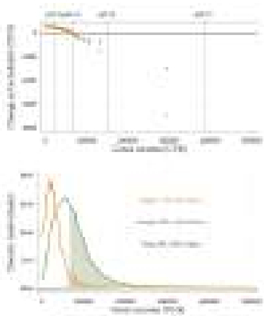
(g) OBRA93



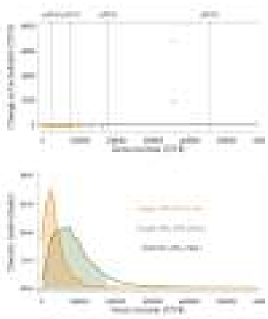
(h) EGTRA01



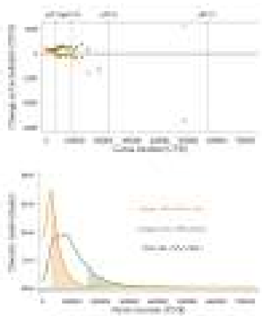
(i) JGTRRA03



(j) ATRA12



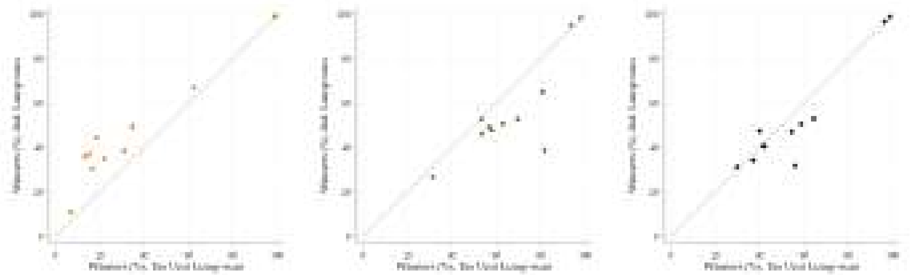
(k) TCJA17



Notes: This figure replicates Figure E.36 using lump-sum adjustment at the individual level instead of the tax unit level. It shows the change in the tax liability (upper panel) and winners of the reform for singles (orange shaded area) and couples (green shaded area). The change in tax liability represents the average change in tax liability per capita (PC) for each of 25 gross income quantiles. We account for behavioral responses at the intensive margin (baseline elasticity scenario from Table 1) and extensive margin responses. Furthermore, reforms are made revenue neutral by distributing any gains or losses lump-sum. Lump-sum adjustments are implemented at the per capita level. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure E.38: Choice of lump-sum adjustment, political economy

(a) Singles (b) Couples (c) Aggregate



Notes: This figure displays how majority support among singles, couples, and in the aggregate population under lump-sum adjustment at the tax unit level compares to majority support under a per-capita lump-sum adjustment. Every dot represents a specific reform. The figure displays majority support under extensive and intensive margin responses using the baseline elasticity scenario from Table 1). Detailed graphical analyses on the majority support under tax-unit (individual) lump-sum adjustment are shown in Figure E.36 (E.37). All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Table E.7: Welfare implications of past reforms (part 1)

Reform	Welfare Weights	Int. Margin			Ext. + Int. Margin		
		Low	Baseline	High	Low	Baseline	High
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	<
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
	Decreasing, a=2	<	<	<	<	<	<
	Rawlsian, p10	<	<	<	<	<	<
	Rawlsian, p5	<	<	<	<	<	<
RA64	Rawlsian (Single Only), p10	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p10	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p10	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p10	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<
	Equal	>	>	>	>	>	>
	Singles Only	>	>	>	>	>	>
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
	Decreasing, a=2	<	<	<	<	<	<
	Rawlsian, p10	<	<	<	<	<	<
	Rawlsian, p5	<	<	<	<	<	<
TRA69	Rawlsian (Single Only), p10	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p10	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p10	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	>	<	<	>
	Rawlsian Affirmative Action Feminist, p10	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	>
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
	Decreasing, a=2	<	<	<	<	<	<
	Rawlsian, p10	<	<	<	<	<	<
	Rawlsian, p5	<	<	<	<	<	<
RA78	Rawlsian (Single Only), p10	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p10	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p10	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p10	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	>
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
	Decreasing, a=2	<	<	<	<	<	<
	Rawlsian, p10	<	<	<	<	<	<
	Rawlsian, p5	<	<	<	<	<	<
ERTA81	Rawlsian (Single Only), p10	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p10	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p10	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	>	<	>	>
	Rawlsian Affirmative Action Feminist, p10	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<

Notes: This table replicates Table 3 for all reforms. It shows the welfare implications under different welfare weights for past reforms of the US federal income tax under different assumptions regarding behavioral responses (extensive + intensive margin, intensive margin only), and different scenarios for the intensive margin elasticity (see Table 1). Lump sum adjustments have been implemented on a per-tax-unit basis. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Table E.8: Welfare implications of past reforms (part 2)

Reform	Welfare Weights	Int. Margin			Ext. + Int. Margin		
		Low	Baseline	High	Low	Baseline	High
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	<
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
	Decreasing, a=2	<	<	<	<	<	<
	Rawlsian, p10	<	<	<	<	<	<
	Rawlsian, p5	<	<	<	<	<	<
TRA86	Rawlsian (Single Only), p10	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p10	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p10	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	>	<	<	>
	Rawlsian Affirmative Action Feminist, p10	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	<
	Single Women Only	>	>	>	>	>	>
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
	Decreasing, a=2	<	<	<	<	<	<
	Rawlsian, p10	<	<	<	<	<	<
	Rawlsian, p5	<	<	<	<	<	<
OBRA90	Rawlsian (Single Only), p10	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p10	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p10	>	>	>	>	>	>
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	>	>	>	>	>	>
	Rawlsian Affirmative Action Feminist, p10	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<
	Equal	<	<	<	<	<	<
	Singles Only	>	>	<	>	>	<
	Single Women Only	>	>	<	>	>	<
	Couples Only	<	<	<	<	<	<
	Decreasing, a=.8	>	>	<	>	>	<
	Decreasing, a=2	>	>	<	>	>	<
	Rawlsian, p10	>	>	<	>	>	<
	Rawlsian, p5	>	>	<	>	>	<
OBRA93	Rawlsian (Single Only), p10	>	>	<	>	>	<
	Rawlsian (Single Only), p5	>	>	<	>	>	<
	Rawlsian (Single Woman Only), p10	>	>	<	>	>	<
	Rawlsian (Single Woman Only), p5	>	>	<	>	>	<
	Rawlsian (Couples Only), p10	>	>	>	>	>	>
	Rawlsian (Couples Only), p5	>	>	<	>	>	<
	Affirmative Action Feminist	>	>	<	>	>	<
	Rawlsian Affirmative Action Feminist, p10	>	>	<	>	>	<
	Rawlsian Affirmative Action Feminist, p5	>	>	<	>	>	<
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	<
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
	Decreasing, a=2	<	<	<	<	<	<
	Rawlsian, p10	<	<	<	<	<	<
	Rawlsian, p5	<	<	<	<	<	<
EGTRRA01	Rawlsian (Single Only), p10	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p10	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p10	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p10	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<

Notes: This table replicates Table 3 for all reforms. It shows the welfare implications under different welfare weights for past reforms of the US federal income tax under different assumptions regarding behavioral responses (extensive + intensive margin, intensive margin only), and different scenarios for the intensive margin elasticity (see Table 1). Lump sum adjustments have been implemented on a per-tax-unit basis. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

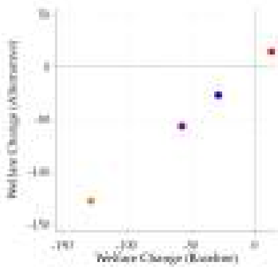
Table E.9: Welfare implications of past reforms (part 3)

Reform	Welfare Weights	Int. Margin			Ext. + Int. Margin		
		Low	Baseline	High	Low	Baseline	High
	Equal	$>$	$>$	$>$	$>$	$>$	$>$
	Singles Only	$<$	$<$	$<$	$<$	$<$	$<$
	Single Women Only	$<$	$<$	$<$	$<$	$<$	$<$
	Couples Only	$>$	$>$	$>$	$>$	$>$	$>$
	Decreasing, a=.8	$<$	$<$	$<$	$<$	$<$	$<$
	Decreasing, a=2	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian, p10	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian, p5	$<$	$<$	$<$	$<$	$<$	$<$
JGTRRA03	Rawlsian (Single Only), p10	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian (Single Only), p5	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian (Single Woman Only), p10	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian (Single Woman Only), p5	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian (Couples Only), p10	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian (Couples Only), p5	$<$	$<$	$<$	$<$	$<$	$<$
	Affirmative Action Feminist	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian Affirmative Action Feminist, p10	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian Affirmative Action Feminist, p5	$<$	$<$	$<$	$<$	$<$	$<$
	Equal	$<$	$<$	$<$	$<$	$<$	$<$
	Singles Only	$>$	$>$	$>$	$>$	$>$	$<$
	Single Women Only	$>$	$>$	$>$	$>$	$>$	$>$
	Couples Only	$<$	$<$	$<$	$<$	$<$	$<$
	Decreasing, a=.8	$>$	$>$	$>$	$>$	$>$	$>$
	Decreasing, a=2	$>$	$>$	$>$	$>$	$>$	$>$
	Rawlsian, p10	$>$	$>$	$>$	$>$	$>$	$>$
	Rawlsian, p5	$>$	$>$	$>$	$>$	$>$	$>$
ATRA12	Rawlsian (Single Only), p10	$>$	$>$	$>$	$>$	$>$	$>$
	Rawlsian (Single Only), p5	$>$	$>$	$>$	$>$	$>$	$>$
	Rawlsian (Single Woman Only), p10	$>$	$>$	$>$	$>$	$>$	$>$
	Rawlsian (Single Woman Only), p5	$>$	$>$	$>$	$>$	$>$	$>$
	Rawlsian (Couples Only), p10	$>$	$>$	$>$	$>$	$>$	$>$
	Rawlsian (Couples Only), p5	$>$	$>$	$>$	$>$	$>$	$>$
	Affirmative Action Feminist	$>$	$>$	$<$	$>$	$<$	$<$
	Rawlsian Affirmative Action Feminist, p10	$>$	$>$	$>$	$>$	$>$	$>$
	Rawlsian Affirmative Action Feminist, p5	$>$	$>$	$>$	$>$	$>$	$>$
	Equal	$>$	$>$	$>$	$>$	$>$	$>$
	Singles Only	$<$	$<$	$<$	$<$	$<$	$<$
	Single Women Only	$<$	$<$	$<$	$<$	$<$	$<$
	Couples Only	$>$	$>$	$>$	$>$	$>$	$>$
	Decreasing, a=.8	$<$	$<$	$<$	$<$	$<$	$<$
	Decreasing, a=2	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian, p10	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian, p5	$<$	$<$	$<$	$<$	$<$	$<$
TCJA17	Rawlsian (Single Only), p10	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian (Single Only), p5	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian (Single Woman Only), p10	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian (Single Woman Only), p5	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian (Couples Only), p10	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian (Couples Only), p5	$<$	$<$	$<$	$<$	$<$	$<$
	Affirmative Action Feminist	$<$	$>$	$>$	$>$	$>$	$>$
	Rawlsian Affirmative Action Feminist, p10	$<$	$<$	$<$	$<$	$<$	$<$
	Rawlsian Affirmative Action Feminist, p5	$<$	$<$	$<$	$<$	$<$	$<$

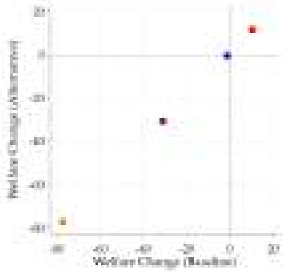
Notes: This table replicates Table 3 for all reforms. It shows the welfare implications under different welfare weights for past reforms of the US federal income tax under different assumptions regarding behavioral responses (extensive + intensive margin, intensive margin only), and different scenarios for the intensive margin elasticity (see Table 1). Lump sum adjustments have been implemented on a per-tax-unit basis. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure E.39: Welfare, baseline and alternative measure

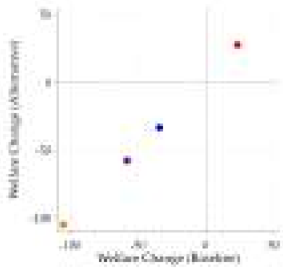
(a) RA64



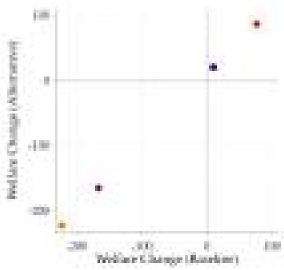
(b) TRA69



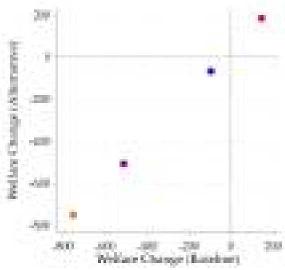
(c) RA78



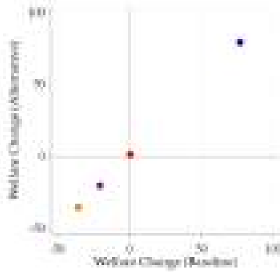
(d) ERTA81



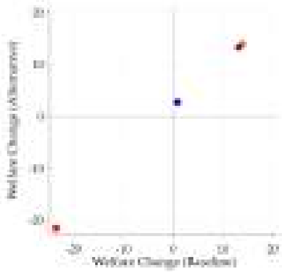
(e) TRA86



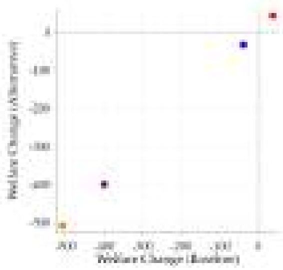
(f) OBRA90



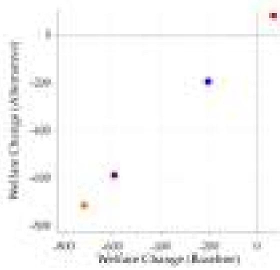
(g) OBRA93



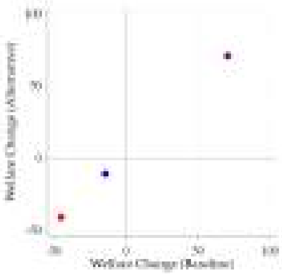
(h) EGTRA01



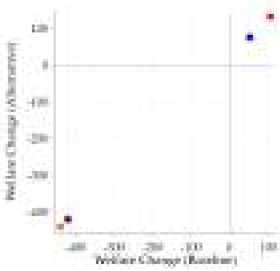
(i) JGTRRA03



(j) ATRA12



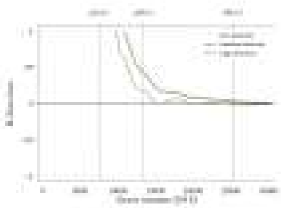
(k) TCJA17



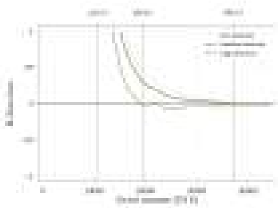
Notes: This figure shows for different welfare measures, how the baseline measure based on equation (D.46) compares to the alternative measure based on equation (D.47). Rawlsian weights are based on p5 while decreasing weights are based on $\alpha = 0.8$. The table shows welfare effects for the case with behavioral responses at the intensive margin (baseline elasticity scenario from Table 1) and extensive margin responses. Further, reforms are made revenue neutral by distributing any gains or losses lump-sum. Lump-sum adjustments are implemented at the tax unit level. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure E.40: Reforms *in* the system

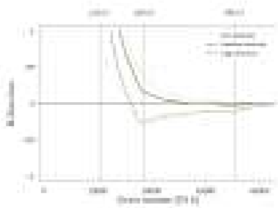
(a) 1965



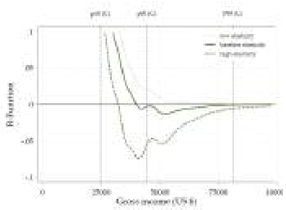
(b) 1970



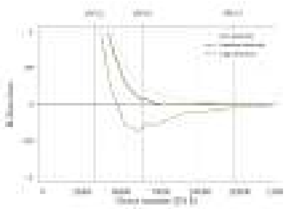
(c) 1975



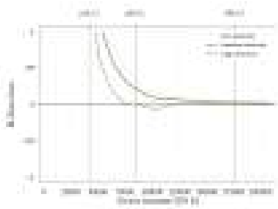
(d) 1980



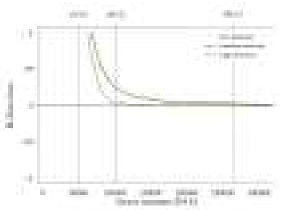
(e) 1985



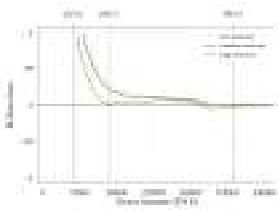
(f) 1990



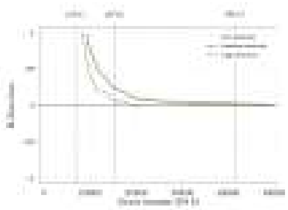
(g) 1995



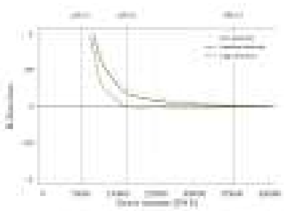
(h) 2000



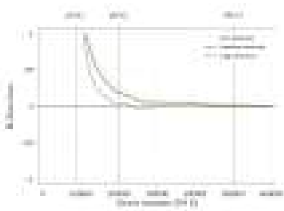
(i) 2005



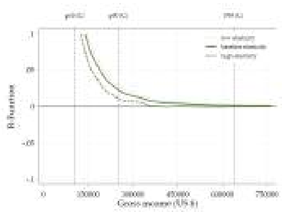
(j) 2010



(k) 2015



(l) 2019



Notes: This figure replicates the left panels of Figure 9 for more years. It shows the revenue functions for married couples as a whole (reforms *in* the system). The revenue function accounts for intensive and extensive margin behavioral responses. Intensive margin responses are differentiated by baseline (solid line), low (dotted line), and high (dashed line) elasticity scenarios (see Table 1). All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

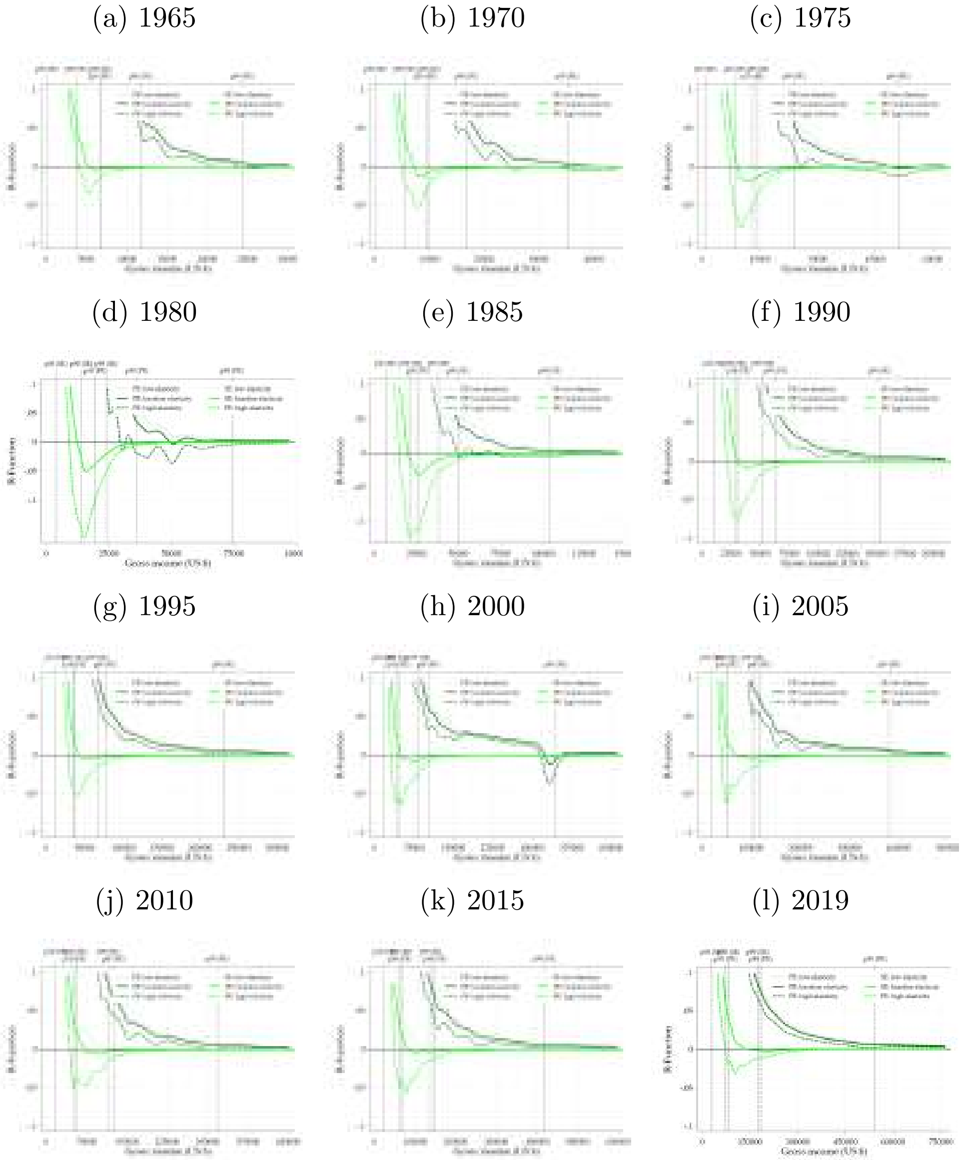
F Supplementary material: Reforms *of* the system

Table F.10: Welfare weights for reforms *of* the system

Welfare weights	
Equal (Feminist)	$\forall y_m,\, g_m(y_m) = 1$
Decreasing	$\forall y_m,\, g_m(y_m) = (y_1 + y_2)^{-a}$
Rawlsian	$\forall y_m,\, g_m(y_m) = \begin{cases} 1, & \text{for } y_m \leq \text{P} \\ 0, & \text{for } y_m \geq \text{P} \end{cases}$
Affirmative Action Secondary Earner	$\forall y_m,\, g_m(y_m) = \frac{y_2}{y_m}$
Affirmative Action Feminist	$\forall y_m,\, g_m(y_m) = \frac{y_{woman}}{y_{man}+y_{woman}}$
Rawlsian Affirmative Action Feminist	$\forall y_m,\, g_m(y_m) = \begin{cases} \frac{y_{woman}}{y_{man}+y_{woman}}, & \text{for } y_m \leq \text{P} \\ 0, & \text{for } y_m \geq \text{P} \end{cases}$

Notes: This table shows different specifications of welfare weights to evaluate reforms *of* the system. The sum of weights over the whole population of married couples is normalized to 1. P refers to specific percentiles of the couple income distribution and the parameter a is strictly positive. Note that our sample consists also of a small share of same-sex married couples (in 2019 around 0.8 percent of all married couples). While homosexual couples are included for the welfare analysis using Affirmative Action Secondary Earner welfare weights, they are not considered in the analysis using Affirmative Action Feminist welfare weights.

Figure F.41: Reforms *of* the system

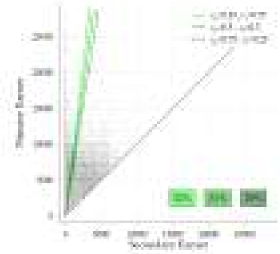


Notes: This figure replicates the right panels of Figure 9. It shows the revenue functions separately for primary and secondary earners (reforms *of* the system). The revenue function accounts for intensive and extensive margin behavioral responses. Intensive margin responses are differentiated by baseline (solid line), low (dotted line), and high (dashed line) elasticity scenarios (see Table 1). All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.

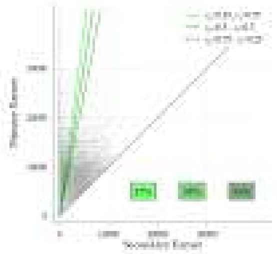
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure F.42: Reform towards individual taxation, political economy

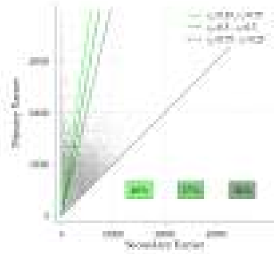
(a) 1965



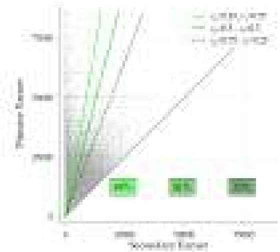
(b) 1970



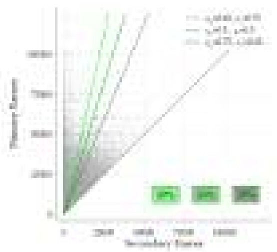
(c) 1975



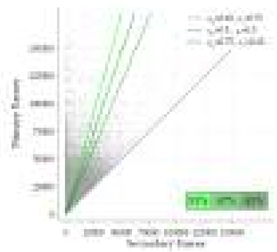
(d) 1980



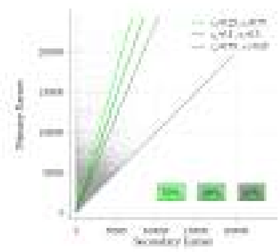
(e) 1985



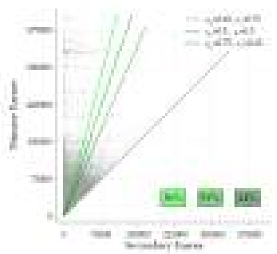
(f) 1990



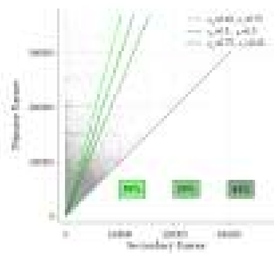
(g) 1995



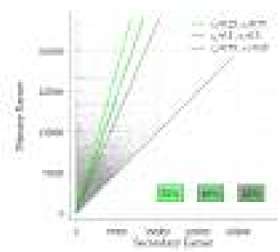
(h) 2000



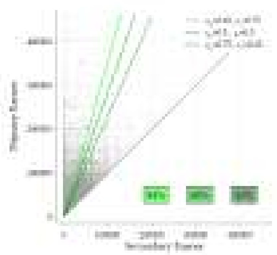
(i) 2005



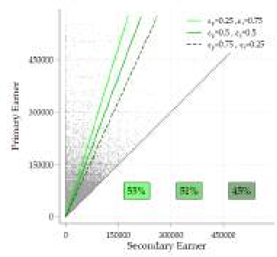
(j) 2010



(k) 2015



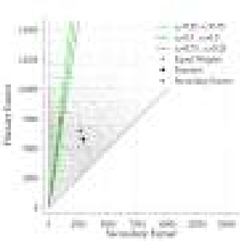
(l) 2019



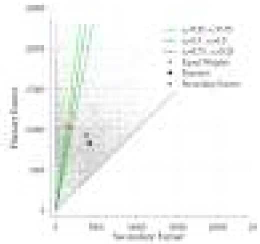
Notes: This figure replicates Figure 10 for more years. It shows how the political support for a revenue neutral reform towards individual taxation varies with behavioral responses to taxation. Each grey dot represents a couple in the data with specific income of the primary (secondary) earner displayed on the vertical (horizontal) axis. Couples that lie below (above) the green line are winners (losers) from a reform towards individual taxation. The light green solid line refers to the baseline elasticity scenario of Table 1 in which the primary (resp. secondary) earner has an elasticity of 0.25 (resp. 0.75). For illustrative purposes, the dark green solid line refers to the case where primary and secondary earners' elasticities coincide (0.5) while the dashed green line shows the results under the assumption that the primary earner's elasticity (0.75) is higher than for the secondary earner (0.25). All results are displayed including extensive margin responses. The figure also displays the respective share of couples than benefits from a reform towards individual taxation. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure F.43: Reform towards individual taxation, welfare (middle)

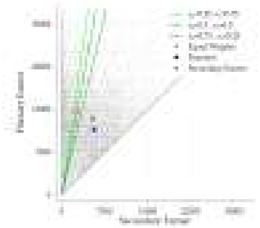
(a) 1965



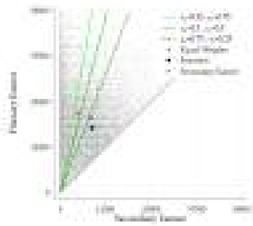
(b) 1970



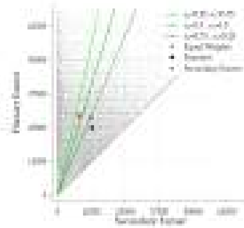
(c) 1975



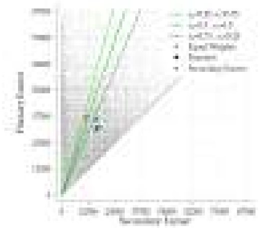
(d) 1980



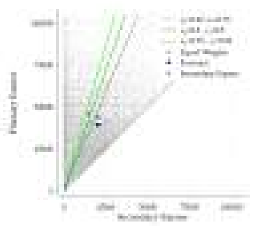
(e) 1985



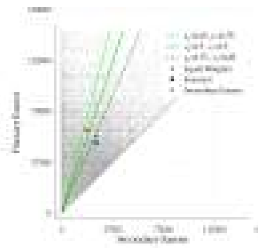
(f) 1990



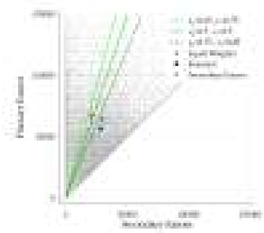
(g) 1995



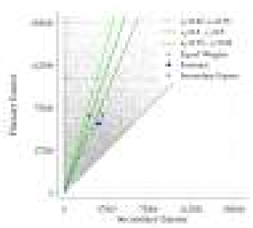
(h) 2000



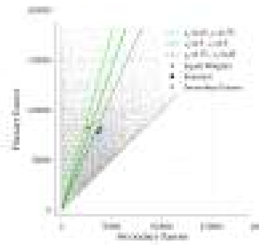
(i) 2005



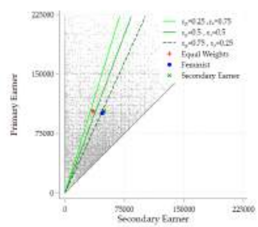
(j) 2010



(k) 2015



(l) 2019

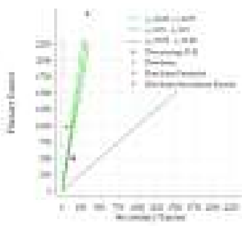


Notes: This figure replicates the left panel of Figure 12 for more years. It shows how a reform towards individual taxation is evaluated from a welfare perspective under different exogenous welfare weights. It displays welfare implications for welfare weights centered in the middle of the income distribution. Each gray dot represents a couple in the data with specific income of the primary (resp. secondary) earner displayed on the vertical (resp. horizontal) axis. Welfare evaluations with different welfare weights are plotted as a colored dot the location of which is defined via the average welfare-weighted primary earnings (vertical axis) and the average welfare-weighted secondary earnings (horizontal axis). Welfare evaluations below (above) the green line indicate that the reform is welfare increasing (decreasing). The light green solid line illustrates the result under the baseline elasticity scenario of Table 1 in which the primary (secondary) earner has an elasticity of 0.25 (0.75). For illustrative purposes, the dark green solid line refers to the case where primary and secondary earners' elasticities coincide (0.5) while the dashed green line shows the results under the assumption that the primary earner's elasticity (0.75) is higher than for the secondary earner (0.25). All results are displayed including extensive margin responses. For detailed information on welfare weight specification, see Table F.10. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.

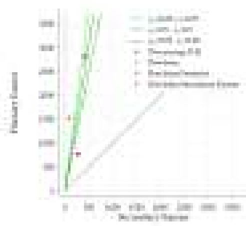
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure F.44: Reform towards individual taxation, welfare (bottom)

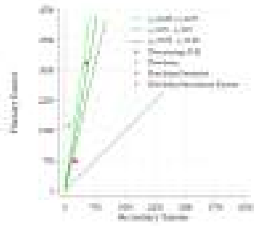
(a) 1965



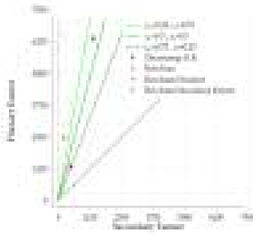
(b) 1970



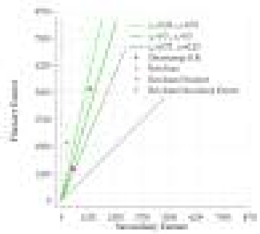
(c) 1975



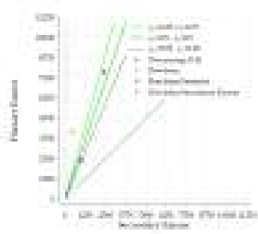
(d) 1980



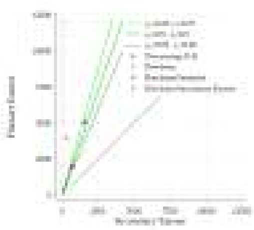
(e) 1985



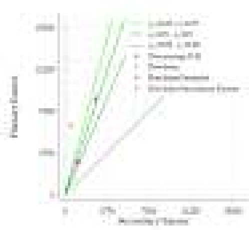
(f) 1990



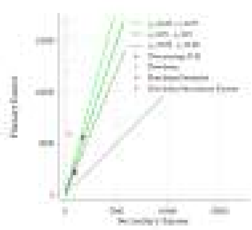
(g) 1995



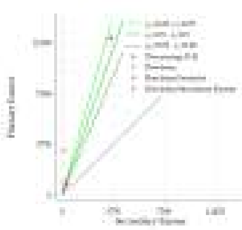
(h) 2000



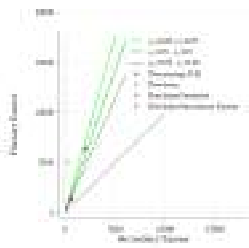
(i) 2005



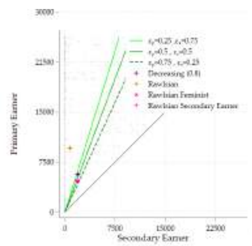
(j) 2010



(k) 2015



(l) 2019



Notes: This figure replicates the right panel of Figure 12 for more years. It shows how a reform towards individual taxation is evaluated from a welfare perspective under different exogenous welfare weights. It displays welfare implications for welfare weights centered at the bottom of the income distribution. Each gray dot represents a couple in the data with specific income of the primary (resp. secondary) earner displayed on the vertical (resp. horizontal) axis. Welfare evaluations with different welfare weights are plotted as a colored dot the location of which is defined via the average welfare-weighted primary earnings (vertical axis) and the average welfare-weighted secondary earnings (horizontal axis). Welfare evaluations below (above) the green line indicate that the reform is welfare increasing (decreasing). The light green solid line illustrates the result under the baseline elasticity scenario of Table 1 in which the primary (secondary) earner has an elasticity of 0.25 (0.75). For illustrative purposes, the dark green solid line refers to the case where primary and secondary earners' elasticities coincide (0.5) while the dashed green line shows the results under the assumption that the primary earner's elasticity (0.75) is higher than for the secondary earner (0.25). All results are displayed including extensive margin responses. For detailed information on welfare weight specification, see Table F.10. The specific percentile used for Rawlsian weights is P5 and $a = 0.8$ for decreasing welfare weights. All estimates are based on tax units with non-negative gross income in which both spouses are between 25 and 55 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

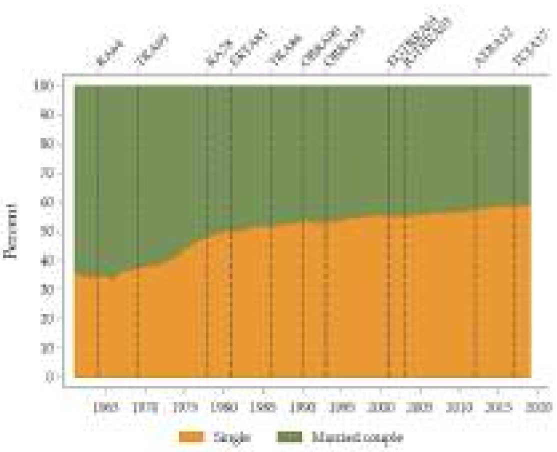
G Supplementary material: Alternative sample restriction

The main analysis focuses on the working age population, i.e. we restrict the sample to tax units with non-negative gross income in which both spouses are between 25 and 55 years old. This sample restriction follows from our model that does not include retirement and education decisions. In addition, since labor force attachment is much lower among old and young groups, our assumptions on behavioral responses to taxation do not apply straightforwardly to these groups.

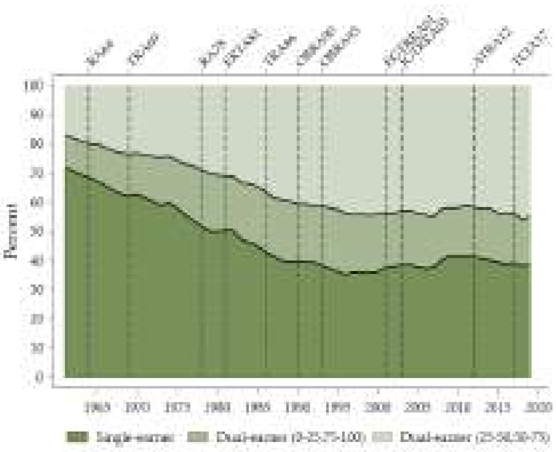
In this section, as a robustness check, we replicate the figures and tables presented in the main text for an alternative sample restriction in which we consider all adults in tax units with non-negative gross income.[48] The main takeaway from this analysis is that the qualitative properties of our results remain valid. In general, the full population contains more tax units with zero gross income, more singles, and more single-earner couples. The main quantitative differences are based on the latter fact. Given that single-earner couples tend to lose from a reform towards individual taxation, this reform has less support than in our main analysis (47 percent instead of 55 percent for our baseline scenario).

Figure G.45: Demographic change, alternative sample restriction

(a) Tax unit types



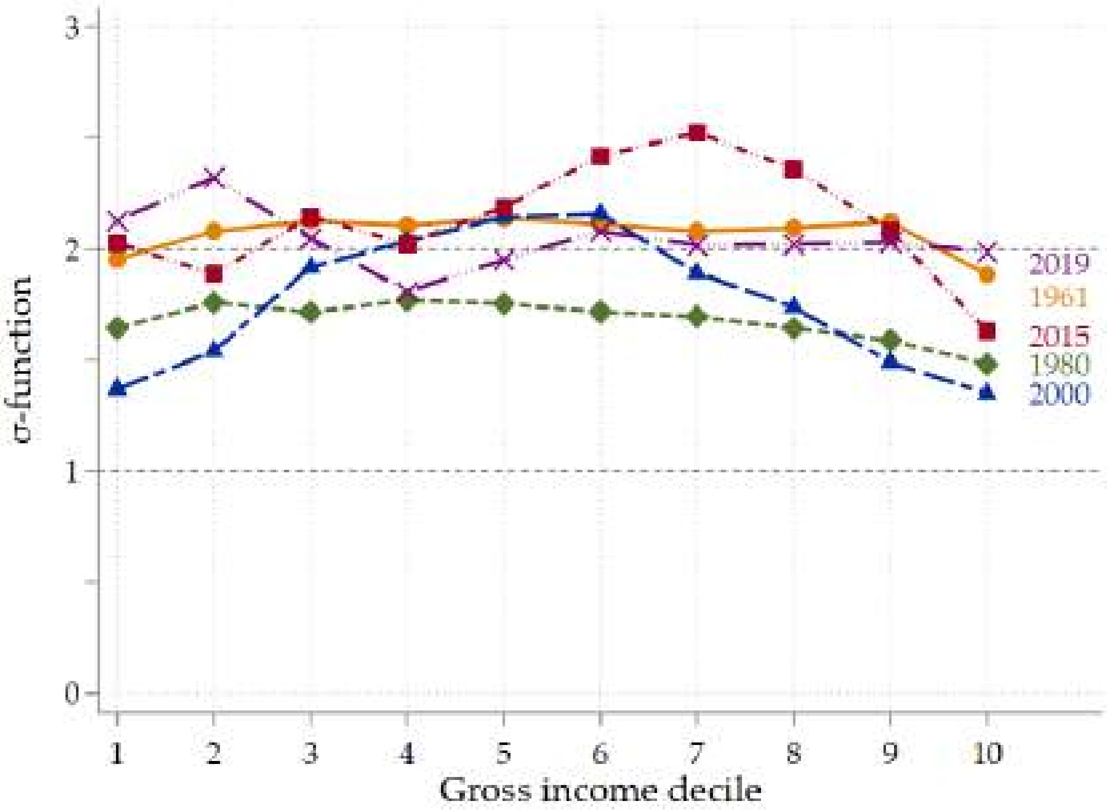
(b) Couple types



Notes: This figure replicates Figure 1 for the full adult population instead of the working age population. It shows the distribution of tax unit types over time. Figure G.45a displays the share of single tax units (orange area) and the share of couple tax units (green area). Figure G.45b displays the share of single-earner and dual-earner couples. A single-earner couple refers to a married couple, in which one spouse is not employed (dark green area). The figure further displays the share of dual-earner couples in which both spouses are employed and (i) one spouse earns between 0 and 25 percent (mid green area) and (ii) between 25 and 50 percent of total earnings (light green area). Earnings shares are computed on the basis of wage, business and farm income. Reforms of the federal income tax code as described in Table D.4 are displayed as vertical lines. All estimates are based on tax units with strictly positive gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on CPS-ASEC.

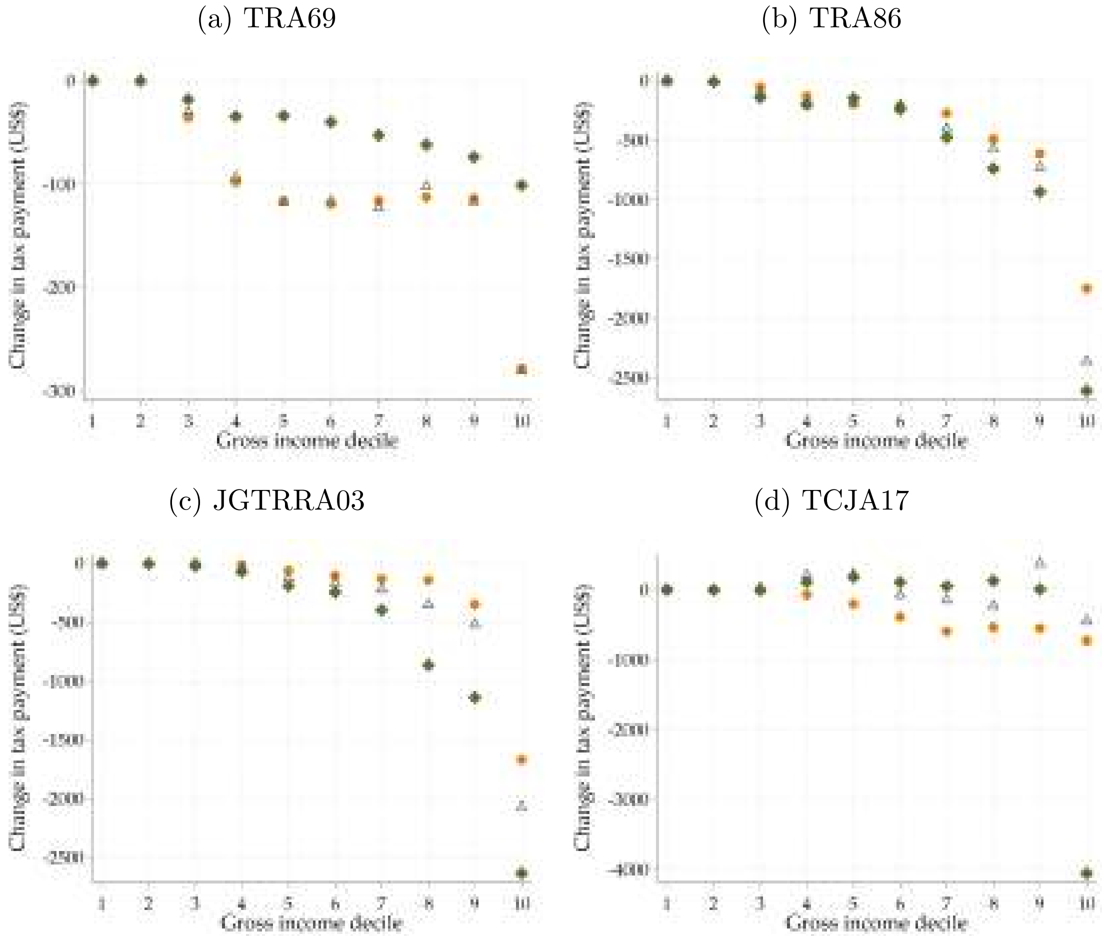
[48]Under this sample restriction, all singles and both spouses in a couple are at least 18 years old.

Figure G.46: The empirical splitting function σ, alternative sample restriction



Notes: This figure replicates Figure 2 for the full adult population instead of the working age population. It shows estimates of the splitting function σ for selected years. The σ-function is calculated by estimating mean average tax rates of couples and singles. Mean average tax rates are used to solve numerically for σ (see Appendix D.3.2). Deciles refer to the gross income distribution of couples in the respective year. All estimates are based on tax units with strictly positive gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

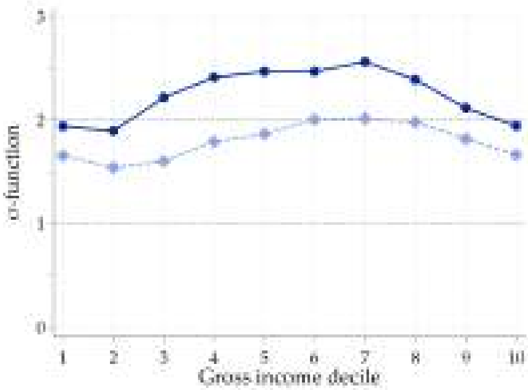
Figure G.47: Reform induced changes of the tax burden: Mechanical effects, alternative sample restriction



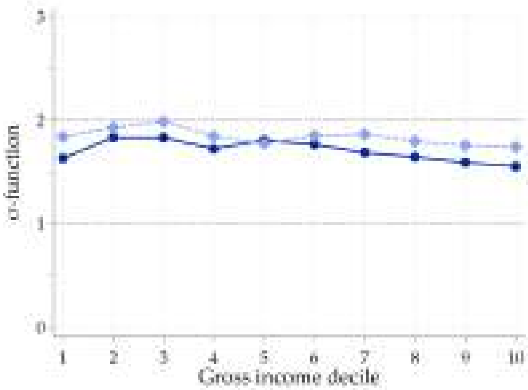
Notes: This figure replicates Figure 3 for the full adult population instead of the working age population. It shows how tax reforms affected the per-capita tax burden of singles (orange circles) and couples (green diamonds), holding their income fixed at the pre-reform level, by deciles of the per capita gross income distribution. At the tax unit level, the change is equal to $T_{s1}(\hat{y}_{s0}) - T_{s0}(y_{s0})$ for singles and $T_{m1}(\hat{y}_{m0}) - T_{m0}(y_{m0})$ for couples. Post-reform tax payments $T_1(\hat{y}_0)$ are calculated based on the inflation-adjusted pre-reform income $\hat{y}_0$ using the CPI-U-RS deflator as uprating factor. In addition, the figure displays the hypothetical change in tax liability for couples under the assumption that observed tax changes of singles would have translated according to the empirical pre-reform splitting function σ to couples, i.e. $\sigma_0 \; T_{s1}\left(\frac{\hat{y}_{m0}}{\sigma_0}\right) - T_{m0}(y_{m0})$ (grey triangles). For details on the methodology on the analysis of actual and hypothetical tax reforms, see Appendix D.4.1. All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.48: Change of the splitting function σ, alternative sample restriction

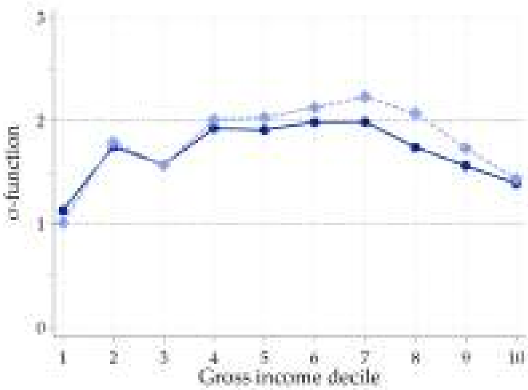
(a) TRA69



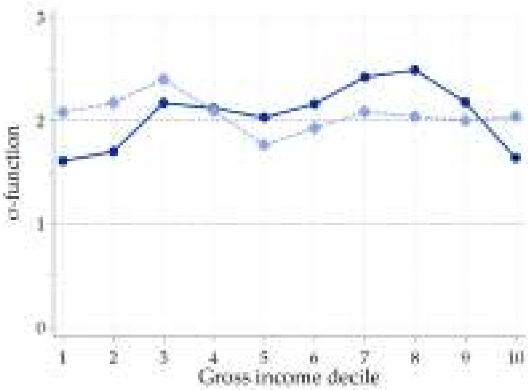
(b) TRA86



(c) JGTRRA03



(d) TCJA17

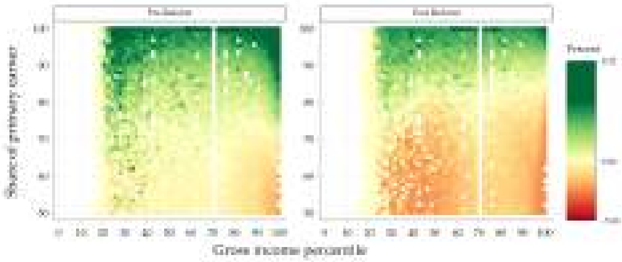


Notes: This figure replicates Figure 4 for the full adult population instead of the working age population. It shows the effects of selected tax reforms on the splitting function σ, holding incomes fixed at the pre-reform level. Pre-reform (dark blue circles) and post-reform (light blue diamonds) splitting functions are calculated by estimating mean average tax rates of couples and singles in the respective year. Mean average tax rates are used to solve numerically for σ (see Appendix D.3.2)). Deciles refer to the gross income distribution of couples in the respective year. All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.

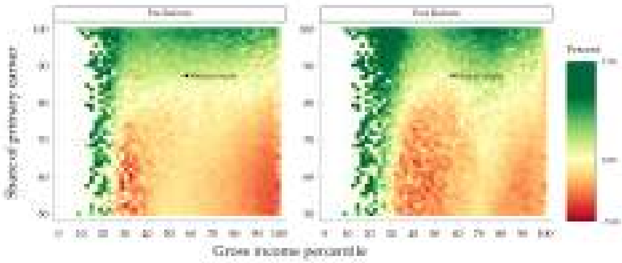
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.49: Change of marriage bonuses and penalties, alternative sample restriction

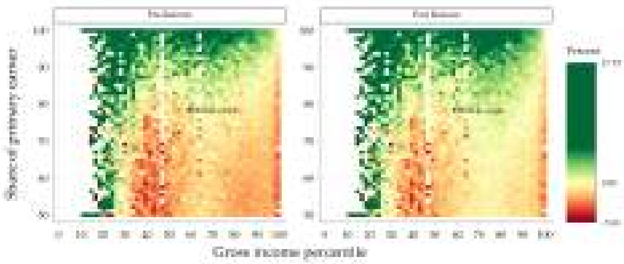
(a) TRA69



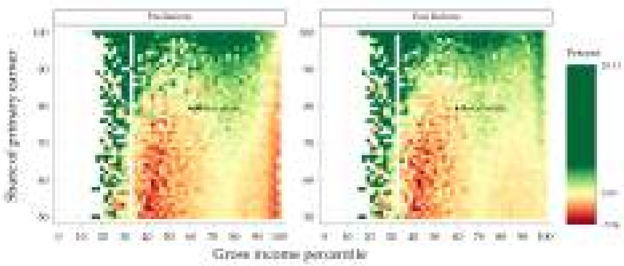
(b) TRA86



(c) JGTRRA03



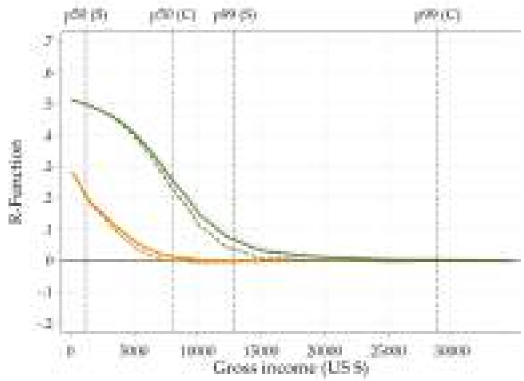
(d) TCJA17



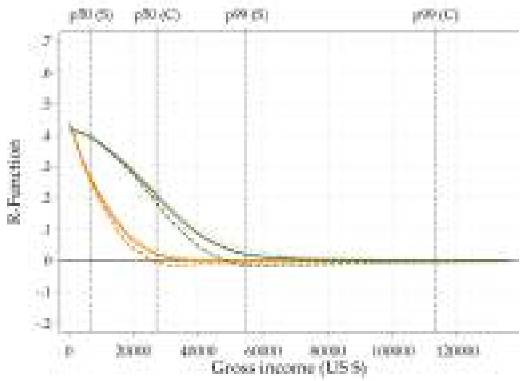
Notes: This figure replicates Figure E.30 for the full adult population instead of the working age population. It shows marriage bonuses and penalties relative to gross income. Each square in a figure represents an average of marriage bonuses (green) or penalties (red) for a group of tax units at a particular income percentile (horizontal axis) and with a particular primary earner income share (vertical axis). Relative marriage bonuses/penalties relate the absolute monetary advantage from filing as a married couple to the total income of the couple, i.e. $\frac{T_m(y_1+y_2)-(T_s(y_1)+T_s(y_2))}{y_1+y_2}$ (see Appendix D.3.1 for details). The distribution of marriage penalties and bonuses is shown for the pre-reform year (left panel) and the post-reform year (right panel). Income percentiles at the horizontal axis refer to the per capita income distribution of the full sample, i.e. individuals in couples are assigned half of the joint income. All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.50: Revenue functions, alternative sample restriction

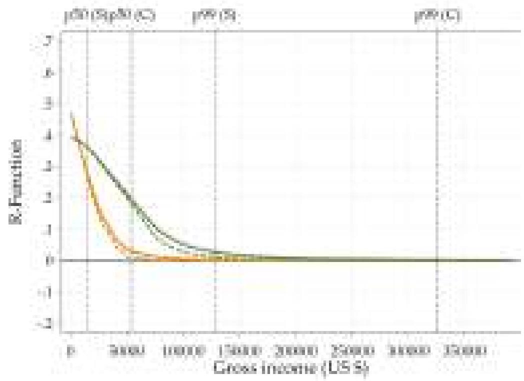
(a) TRA69



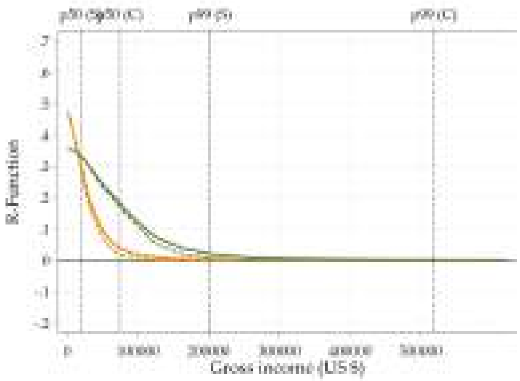
(b) TRA86



(c) JGTRRA03



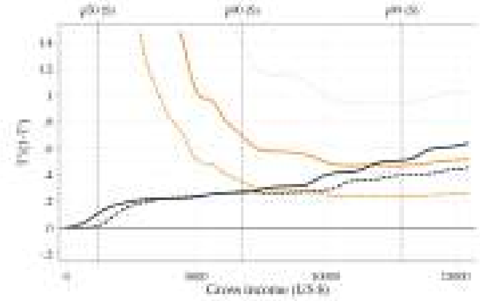
(d) TCJA17



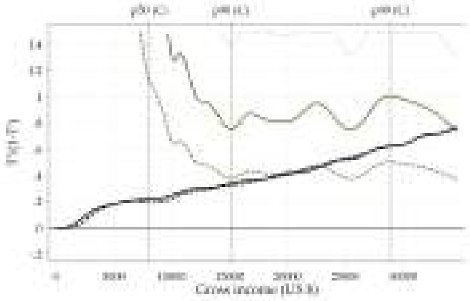
Notes: This figure replicates Figure 5 for the full adult population instead of the working age population. It shows revenue functions $\mathcal{R}$ in the respective pre-reform year. The revenue functions are shown separately for singles ($\mathcal{R}_s$, orange line) and married couples ($\mathcal{R}_m$, green line). All revenue functions are based on behavioral responses at the intensive and extensive margin using low (dotted line), baseline (solid line), and high (dashed line) elasticity scenarios described in Table 1. All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.51: Upper Pareto bounds, alternative sample restriction

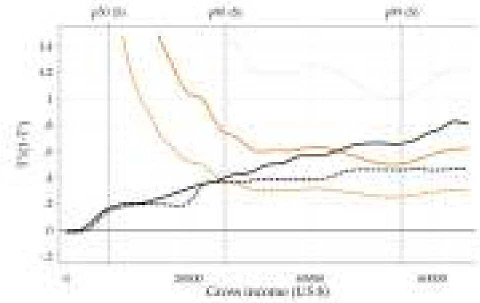
(a) TRA69 (Singles)



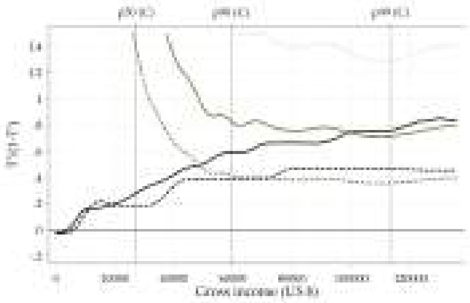
(b) TRA69 (Couples)



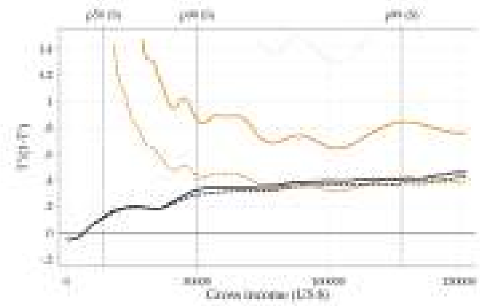
(c) TRA86 (Singles)



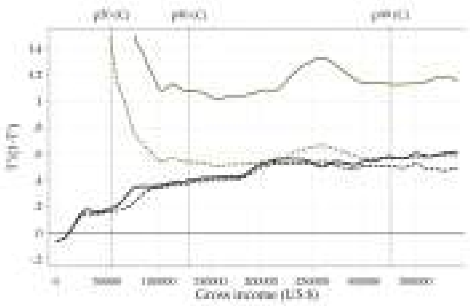
(d) TRA86 (Couples)



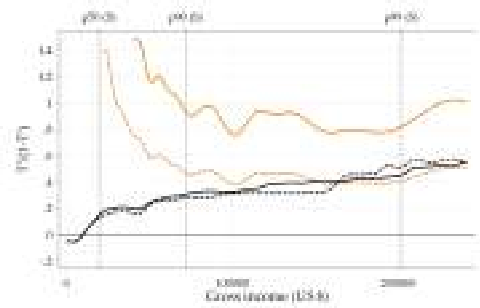
(e) JGTRRA03 (Singles)



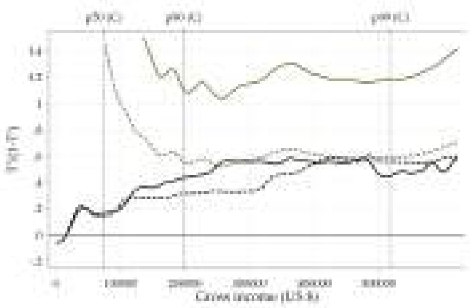
(f) JGTRRA03 (Couples)



(g) TCJA17 (Singles)



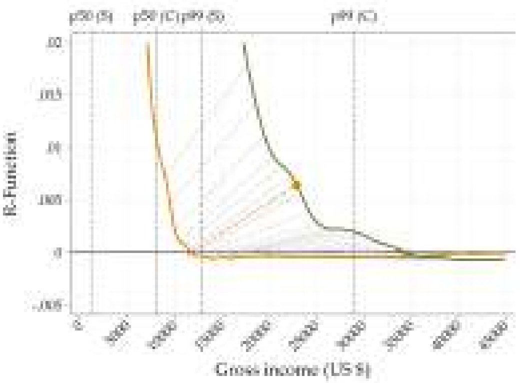
(h) TCJA17 (Couples)



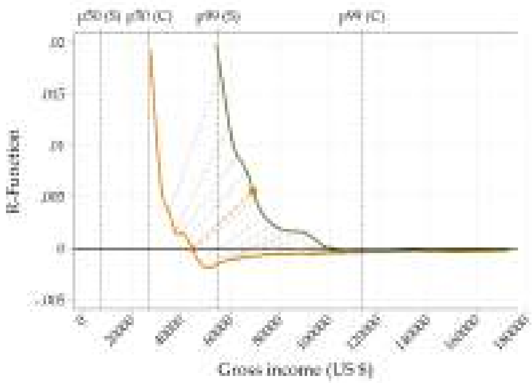
Notes: This figure replicates Figure 6 for the full adult population instead of the working age population. It shows the upper Pareto bounds UB (see Appendix D.4 and especially equations D.57–D.60) in the respective pre-reform year and the ratio $\frac{T'}{1-T'}$ of the effective marginal tax rates before (solid black line) and after (dashed black line) the reform. The bounds are shown separately for singles (orange lines) and couples (green lines). All upper bounds are conditional on extensive margin responses and displayed for low (dotted line), baseline (solid line), and high (dashed line) intensive margin elasticity scenarios described in Table 1. All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.52: Relationship between revenue functions of singles and couples with fixed splitting function σ, alternative sample restriction

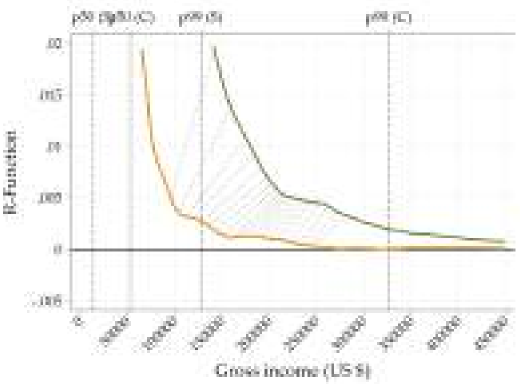
(a) TRA69



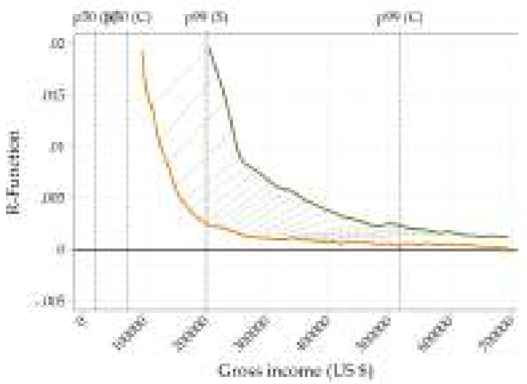
(b) TRA86



(c) JGTRRA03



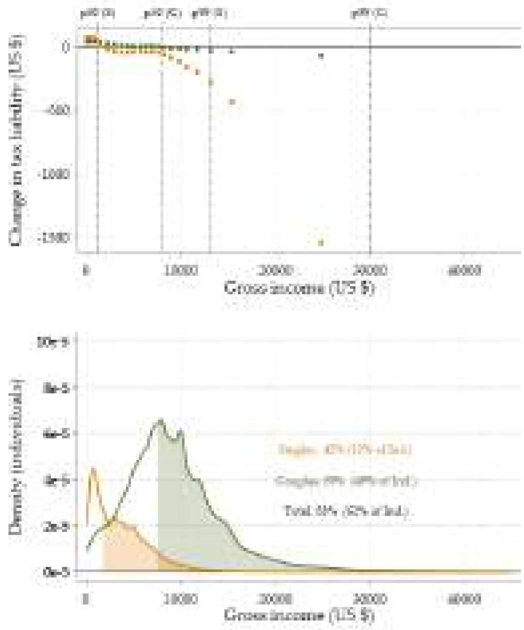
(d) TCJA17



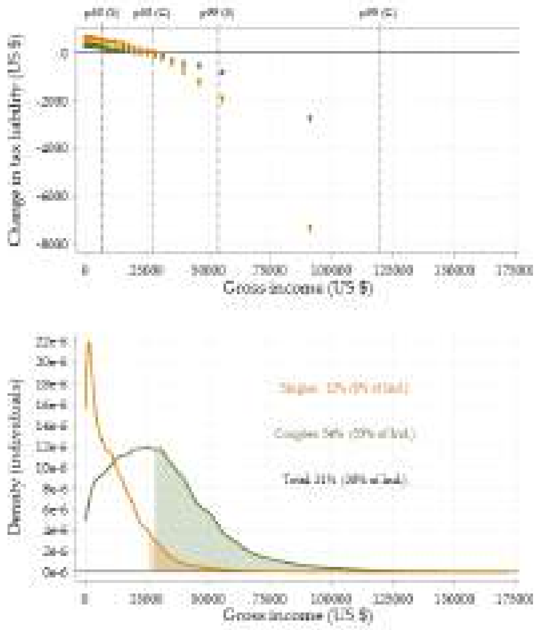
Notes: This figure replicates Figure 7 for the full adult population instead of the working age population. It shows revenue functions $\mathcal{R}$ in the respective pre-reform year. The revenue functions are shown separately for singles ($\mathcal{R}_s$, orange line) and married couples ($\mathcal{R}_m$, green line). The dashed lines that connect the revenue function for singles and couples indicate the pre-reform relationship of tax schedules via the empirical splitting function σ. The orange and green crosses on the horizontal axis indicate the income level at which the revenue functions for singles and for couples cross the zero line. All revenue functions are based on behavioral responses at the intensive and extensive margin using assumptions from the baseline elasticity scenario (see Table 1). All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.53: Political feasibility, alternative sample restriction

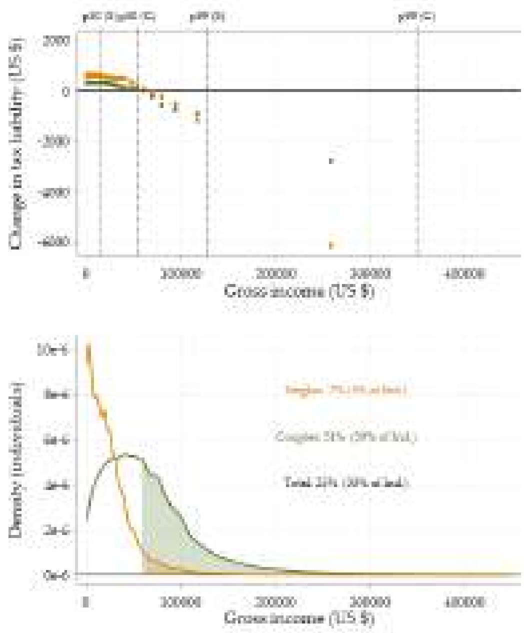
(a) TRA69



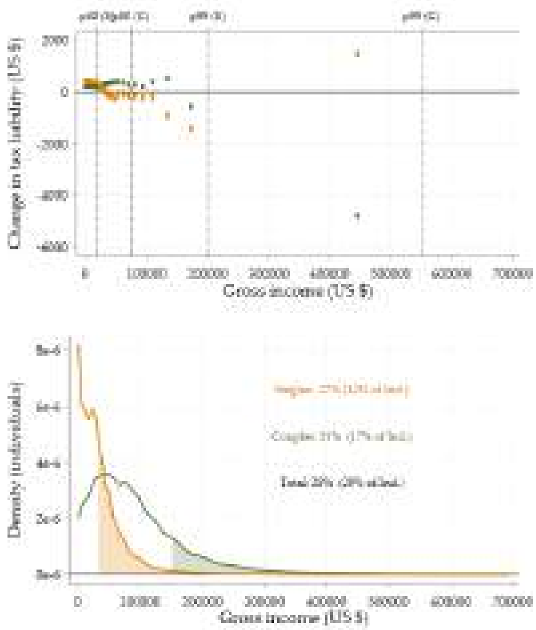
(b) TRA86



(c) JGTRRA03



(d) TCJA17



Notes: This figure replicates Figure 8 for the full adult population instead of the working age population. It shows the change in the tax liability (upper panel) and winners of the reform (lower panel) for singles and couples and for an alternative sample restriction, i.e. the full adult population. The change in tax liability represents the average change in tax liability for each of 25 gross income quantiles. We account for behavioral responses at the intensive margin (baseline elasticity scenario from Table 1) and extensive margin responses. Further, reforms are made revenue neutral by distributing any gains or losses lump-sum. Lump-sum adjustments are implemented at the tax unit level. All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

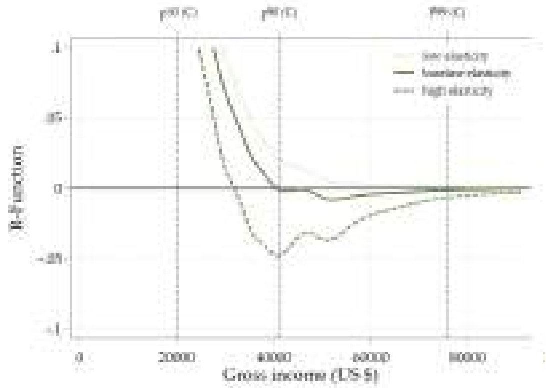
Table G.11: Welfare implications of past reforms, alternative sample restriction

Reform	Welfare Weights	Int. Margin			Ext. + Int. Margin		
		Low	Baseline	High	Low	Baseline	High
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	<
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
TRA69	Rawlsian, p5	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	<
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
TRA86	Rawlsian, p5	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<
	Equal	>	>	>	<	>	>
	Singles Only	<	<	<	<	<	<
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
JGTRRA03	Rawlsian, p5	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	<	<	<	<
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<
	Equal	>	>	>	>	>	>
	Singles Only	<	<	<	<	<	<
	Single Women Only	<	<	<	<	<	<
	Couples Only	>	>	>	>	>	>
	Decreasing, a=.8	<	<	<	<	<	<
TCJA17	Rawlsian, p5	<	<	<	<	<	<
	Rawlsian (Single Only), p5	<	<	<	<	<	<
	Rawlsian (Single Woman Only), p5	<	<	<	<	<	<
	Rawlsian (Couples Only), p5	<	<	<	<	<	<
	Affirmative Action Feminist	<	<	>	<	<	>
	Rawlsian Affirmative Action Feminist, p5	<	<	<	<	<	<

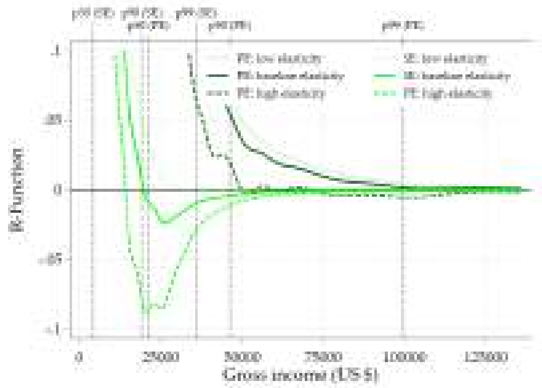
Notes: This table replicates Table 3 for the full adult population instead of the working age population. It shows the welfare implications under different welfare weights for past reforms of the US federal income tax under different assumptions regarding behavioral responses (extensive + intensive margin, intensive margin only), and different scenarios for the intensive margin elasticity (see Table 1). Lump sum adjustments have been implemented on a per-tax-unit basis. All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.54: Reforms *in* the system versus reforms *of* the system, alternative sample restriction

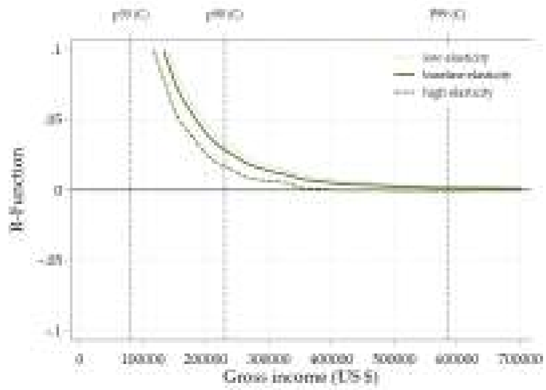
(a) Reforms *in* the system (1980)



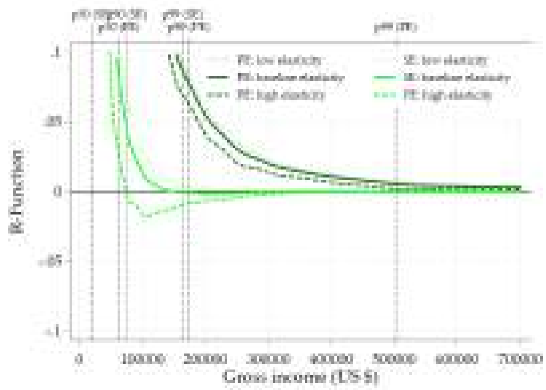
(b) Reforms *of* the system (1980)



(c) Reforms *in* the system (2019)



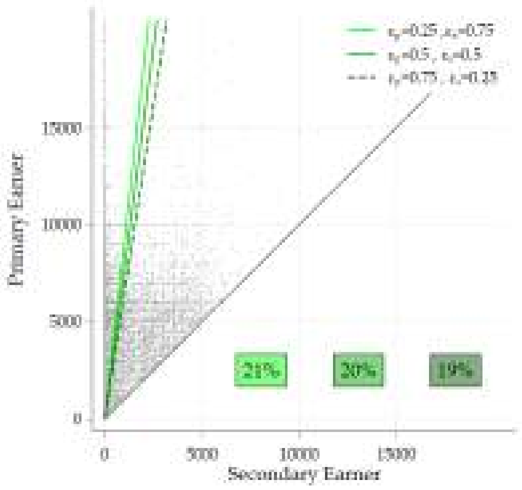
(d) Reforms *of* the system (2019)



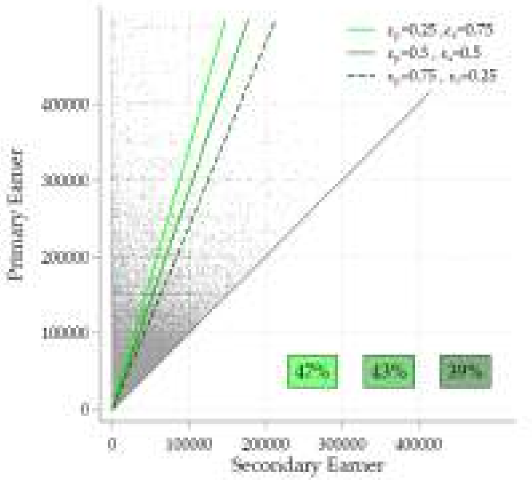
Notes: This figure replicates Figure 9 for the full adult population instead of the working age population. It shows for 1980 and 2019 the revenue functions for married couples as a whole (reforms *in* the system, left panel) and separately for primary and secondary earners (reforms *of* the system, right panel). The revenue function accounts for intensive and extensive margin behavioral responses. Intensive margin responses are differentiated by baseline (solid line), low (dotted line), and high (dashed line) elasticity scenarios (see Table 1). All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.55: Reform towards individual taxation: Political economy, alternative sample restriction

(a) 1961



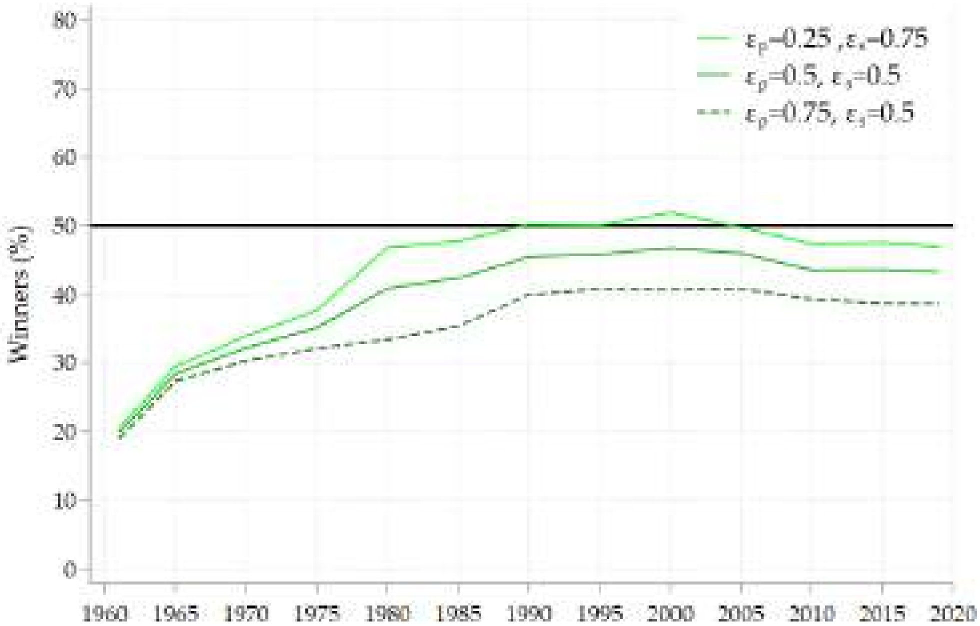
(b) 2019



Notes: This figure replicates Figure 10 for the full adult population instead of the working age population. It shows for 1961 and 2019, how the political support for a revenue neutral reform towards individual taxation varies with behavioral responses to taxation. Each grey dot represents a couple in the data with specific income of the primary (secondary) earner displayed on the vertical (horizontal) axis. Couples that lie below (above) the green line are winners (losers) from a reform towards individual taxation. The light green solid line refers to the baseline elasticity scenario of Table 1 in which the primary (resp. secondary) earner has an elasticity of 0.25 (resp. 0.75). For illustrative purposes, the dark green solid line refers to the case where primary and secondary earners' elasticities coincide (0.5) while the dashed green line shows the results under the assumption that the primary earner's elasticity (0.75) is higher than for the secondary earner (0.25). All results are displayed including extensive margin responses. The figure also displays the respective share of couples than benefits from a reform towards individual taxation. All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.

Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.56: Reform towards individual taxation: Share of winners over time, alternative sample restriction

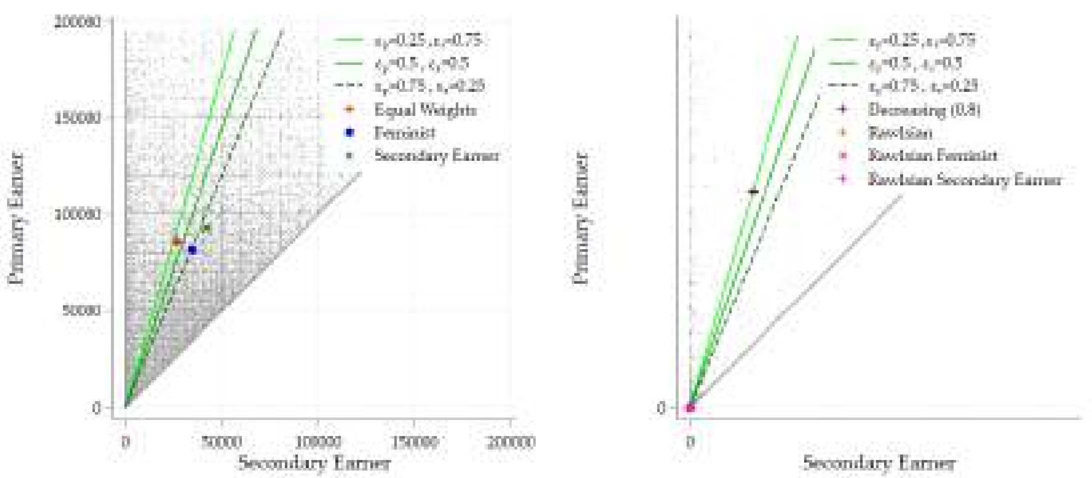


Notes: This figure replicates Figure 11 for the full adult population instead of the working age population. It shows how the political support for a revenue neutral reform towards individual taxation evolved over time. All results are displayed including extensive margin responses. The light green solid line illustrates the result under the baseline elasticity scenario of Table 1 in which the primary (resp. secondary) earner has an elasticity of 0.25 (resp. 0.75). For illustrative purposes, the dark green solid line refers to the case where primary and secondary earners' elasticities coincide (0.5) while the dashed green line shows the results under the assumption that the primary earner's elasticity (0.75) is higher than for the secondary earner (0.25). All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.57: Reform towards individual taxation: Welfare (2019), alternative sample restriction

(a) Welfare I

(b) Welfare II



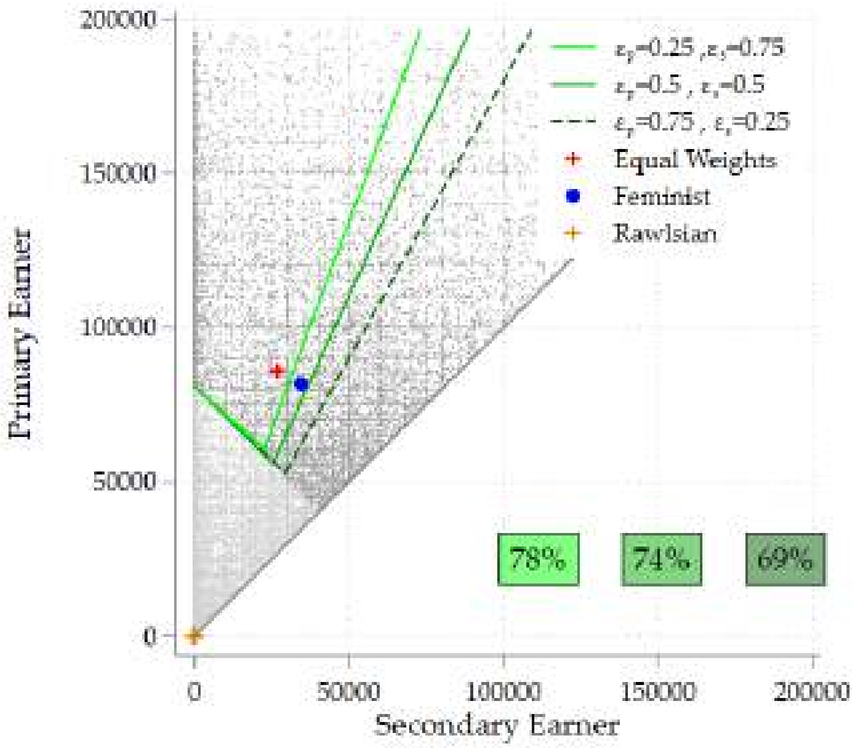
Notes: This figure replicates Figure 12 for the full adult population instead of the working age population. It shows for the current tax system, how a reform towards individual taxation is evaluated from a welfare perspective under different exogenous welfare weights. Figure G.57a (G.57b) displays welfare implications for welfare weights centered in the middle (bottom) of the income distribution. Each gray dot represents a couple in the data with specific income of the primary (resp. secondary) earner displayed on the vertical (resp. horizontal) axis. Couples that lie below (above) the green line are winners (losers) from a reform towards individual taxation. Welfare evaluations with different welfare weights are plotted as a colored dot the location of which is defined via the average welfare-weighted primary earnings (vertical axis) and the average welfare-weighted secondary earnings (horizontal axis). Welfare evaluations below (above) the green line indicate that the reform is welfare increasing (decreasing). The light green solid line illustrates the result under the baseline elasticity scenario of Table 1 in which the primary (secondary) earner has an elasticity of 0.25 (0.75). For illustrative purposes, the dark green solid line refers to the case where primary and secondary earners' elasticities coincide (0.5) while the dashed green line shows the results under the assumption that the primary earner's elasticity (0.75) is higher than for the secondary earner (0.25). All results are displayed including extensive margin responses. For detailed information on welfare weight specification, see Table F.10. The specific percentile used for Rawlsian weights is P5 and $a = 0.8$ for decreasing welfare weights. All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.

Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.58: Median share of primary and male earner, alternative sample restriction

Notes: This figure replicates Figure 13 for the full adult population instead of the working age population. It shows the median income share of the primary earner in the couple by income decile. Earnings shares are computed on the basis of non-negative wage, business and farm income. All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

Figure G.59: Reconciling Rawlsian and Feminist welfare (2019), alternative sample selection



Notes: This figure replicates Figure 14 for the full adult population instead of the working age population. It shows for the current tax system, how a partial reform towards individual taxation is evaluated from a welfare perspective under different exogenous welfare weights. A partial reform lowers marginal tax rates for all secondary earners, but raises marginal tax rates only for primary earners above the median of the couple income distribution. Each grey dot represents a couple in the data with specific income of the primary (resp. secondary) earner displayed on the vertical (resp. horizontal) axis. Couples that lie below (above) the green line are winners (losers) from the reform. Welfare evaluations with different welfare weights are plotted as a colored dot the location of which is defined via the average welfare-weighted primary earnings (vertical axis) and the average welfare-weighted secondary earnings (horizontal axis). Welfare evaluations below (above) the green line indicate that the reform is welfare increasing (decreasing). The light green solid line illustrates the result under the baseline elasticity scenario of Table 1 in which the primary (secondary) earner has an elasticity of 0.25 (0.75). For illustrative purposes, the dark green solid line refers to the case where primary and secondary earners' elasticities coincide (0.5) while the dashed green line shows the results under the assumption that the primary earner's elasticity (0.75) is higher than for the secondary earner (0.25). All results are displayed including extensive margin responses. For detailed information on welfare weight specification, see Table F.10. The specific percentile used for Rawlsian weights is P5. All estimates are based on tax units with non-negative gross income in which both spouses are at least 18 years old.
Source: Authors' calculations based on NBER TAXSIM and CPS-ASEC.

H Supplementary material: Narratives about tax reforms

The particularities of the tax treatment of couples and singles in tax reforms cannot only be observed through an analysis of the implemented tax changes, but also by how narratives among tax reforms in different times were shaped by, e.g., the concern of marriage penalties or treatment of secondary earners. We use wordclouds to get a sense of the underlying discussion around three US tax reforms (TRA69, ERTA81 and TCJA17) that lead to significant changes in penalties and bonuses. The goal of this analysis is to reconstruct the narrative surrounding these reforms and to uncover to what extent the public discussion at the time is reflected in the effects of the final tax bill on the tax treatment of couples.

We source data from various sources displayed in Table H.12. Among the most prevalent source types are congressional records, newspaper articles, and policy documents prepared by think tanks. The raw data is preprocessed in the following way: first, we reduce the text data to include only letters and hyphens and transform it to lowercase. We then split strings to receive a list of words and remove all stopwords.[49] The remaining words are then reduced to their roots via lemmatization.[50] Finally, we correct for obvious spelling mistakes and compile one data set for each time around a reform.[51]

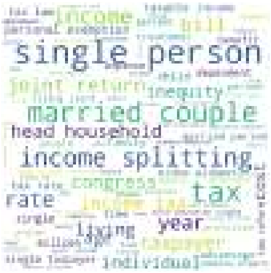
We construct three different types of wordclouds for each of the three reforms. *Type 1* includes raw unigrams (i.e. single words) and bigrams (i.e. collocations of two words). Word clouds of *Type 2* only includes raw bigrams. *Type 3* also focuses on bigrams, but involves further adjustments of the data. In particular, inversed bigrams (e.g. "rate tax" and "tax rate"), synonyms (e.g. "single person", "single individual") are grouped together. In a last step, bigrams referring to institutions or persons as well as doubled terms ("tax tax") are removed.

Across all three reforms, the treatment of singles and couples was a prominent topic in the public debate about tax reforms. Around TRA69, the arguments mainly circled around the unequal tax treatment of single persons and married couples (see Figure H.60). The displayed "income splitting" procedure in place prior to the reform was perceived to unfairly discriminate against single people (see for example "discrimination single", "burden single", "inequity single"). In later years, the focus shifted towards the concern about unfair treatment of couples as terms like "marriage penalty" (or "marriage tax penalty") become prominent in the debate (see Figures H.61 and H.62). A lingering concern to "discourage marriage" is also discernible. The term "marriage neutrality" evolves as an objective. In addition, the incentive structure for the second earner, often a married woman, was also an important part of the discussion.

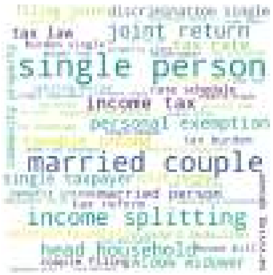
[49]The stopwords document is taken from Lisa Chalaguine's GitHub representation.
[50]In this case, we use the function WordNetLemmatizer.
[51]Tables H.13, H.14, and H.15 display the data sources compiled for each reform.

Figure H.60: Narratives for TRA69

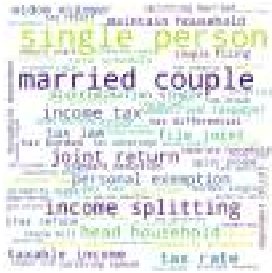
(a) Type 1



(b) Type 2



(c) Type 3



Notes: This figure shows narratives around the TRA69. Word clouds have been generated by pre-processing and compiling the textual sources displayed in Table H.13 to one large document and analyzing unigrams and bigrams within this data. Type 1 shows all unigrams and bigrams while Type 2 and Type 3 focuses on bigrams only. The wordcloud of Type 3 involves a further processing of the data by eliminating synonyms and inverse bigrams.
Source: Authors' calculations based on sources in Table H.13.

Figure H.61: Narratives for ERTA81

(a) Type 1

(b) Type 2

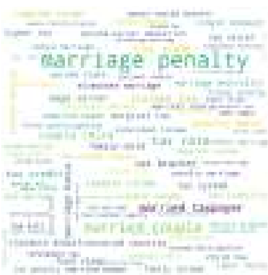
(c) Type 3

Notes: This figure shows narratives around ERTA81. Word clouds have been generated by pre-processing and compiling the textual sources displayed in Table H.13 to one large document and analyzing unigrams and bigrams within this data. Type 1 shows all unigrams and bigrams while Type 2 and Type 3 focuses on bigrams only. The wordcloud of Type 3 involves a further processing of the data by eliminating synonyms and inverse bigrams.
Source: Authors' calculations based on sources in Table H.14.

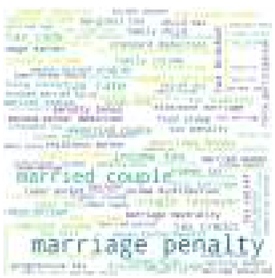
Figure H.62: Narratives for TCJA17

(a) Type 1

(b) Type 2



(c) Type 3



Notes: This figure shows narratives around TCJA17. Word clouds have been generated by pre-processing and compiling the textual sources displayed in Table H.15 to one large document and analyzing unigrams and bigrams within this data. Type 1 shows all unigrams and bigrams while Type 2 and Type 3 focuses on bigrams only. The wordcloud of Type 3 involves a further processing of the data by eliminating synonyms and inverse bigrams.
Source: Authors' calculations based on sources in Table H.13.

Table H.12: Text data source types

Type of source	TRA69	ERTA81	TCJA17
Congressional record	15	17	6
Official	4	8	2
Newspapers	4	87	10
President statement	3	9	2
Journal	3	0	3
Think tank	0	1	40
Blog	0	0	1
Total	29	122	64

Table H.13: Underlying text data for TRA69 (1967–1975)

Type of source	Source name	URL
congressional record	May 8, 1967, 90th Congress, 1st Session, Vol.113, Part 9	Link
congressional record	June 6, 1967, 90th Congress, 1st Session, Vol.113, Part 11	Link
official	Annual Report of the Secretary of the Treasury on the State of the Finances (Fiscal Year Ended June 30, 1968).	Link
newspaper	San Bernardino Sun	Link
President statement	Richard Nixon, Letter to Senate Leaders Mike Mansfield and Hugh Scott on the Tax Reform Bill.	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
official	Tax Reform Act of 1969, Report of the Committee on Finance	Link
congressional record	August 7, 1969, 91st Congress, 1st Session, Vol. 115, Part 17	Link
congressional record	December 10, 1969, 91st Congress, 1st Session, Vol.115, Part 28	Link
congressional record	October 30, 1969, 91st Congress, 1st Session, Vol.115, Part 24	Link
congressional record	August 6, 1969, 91st Congress, 1st Session, Vol. 115, Part 17	Link
congressional record	February 19, 1969, 91st Congress, 1st Session, Vol.115, Part 3	Link
congressional record	September 11, 1969, 91st Congress, 1st Session, Vol.115, Part 19	Link
congressional record	October 2, 1969, 91st Congress, 1st Session, Vol.115, Part 21	Link
congressional record	February 5, 91st Congress, 1st Session, Vol.115, Part 3	Link
congressional record	February 17, 1969, 91st Congress, 1st Session, Vol.115, Part 3	Link
congressional record	December 3, 1969, 91st Congress, 1st Session, Vol.115, Part 27	Link
congressional record	June 5, 1969, 91st Congress, 1st Session, Vol.115, Part 11	Link
congressional record	August 13, 1969, 91st Congress, 1st Session, Vol.115, Part 18	Link
congressional record	April 15, 1969, 91st Congress, 1st Session, Vol.115, Part 7	Link
official	Annual Report of the Secretary of the Treasury on the State of the Finances (Fiscal Year Ended June 30, 1970).	Link
official	General Explanation of the Tax Reform Act of 1969, Joint Committee on Internal Revenue Taxation	Link
newspaper	San Bernardino Sun	Link
journal	Richards, 1970	Link
journal	Richards, 1971	Link
journal	Betz, 1974	Link

Table H.14: Underlying text data for ERTA81 (1978–1985)

Type of source	Source name	URL
newspaper	U.S. News and World Report	Link
newspaper	U.S. News and World Report	Link
newspaper	The Associated Press	Link
official	Annual Report of the Secretary of the Treasury on the State of the Finances (Fiscal Year Ended September 30, 1980).	Link
official	Exhibit 51.—Statement of Deputy Assistant Secretary Sunley, August 5, 1980, before the Subcommittee on Taxation and Debt Management of the Senate Finance Committee, on the tax treatment of married and single taxpayers	
President statement	Jimmy Carter tax proposals	Link
newspaper	Columbia Missourian	Link
newspaper	Catholic News Service	Link
newspaper	Desert Sun	Link
newspaper	Catholic News Service	Link
newspaper	The Broomfield Enterprise	Link
newspaper	San Bernardino Sun	Link
newspaper	Bronxville Review Press and Reporter	Link
newspaper	San Bernardino Sun	Link
newspaper	The Stanford Daily	Link
newspaper	San Bernardino Sun	Link
newspaper	Desert Sun	Link
newspaper	Desert Sun	Link

newspaper	Desert Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	Lancaster Farming	Link
newspaper	Santa Cruz Sentinel	Link
newspaper	The Steamboat Pilot	Link
newspaper	Santa Cruz Sentinel	Link
newspaper	Santa Cruz Sentinel	Link
official	Administration'es (Carter) tax proposal	Link
newspaper	U.S. News and World Report	Link
newspaper	The Christian Science Monitor	Link
newspaper	The New York Times	Link
newspaper	The Associated Press	Link
newspaper	U.S. News and World Report	Link
newspaper	The Associated Press	Link
newspaper	The New York Times	Link
newspaper	The Christian Science Monitor	Link
newspaper	The Associated Press	Link
official	Economic Report of the President, 1981	Link
official	General Explanation of the Economic Recovery Tax Act of 1981, Joint Committee on Taxation	Link
President statement	Jimmy Carter, Budget Message Message to the Congress Transmitting the Fiscal Year 1982 Budget.	Link
President statement	Jimmy Carter, Annual Message to the Congress: The Economic Report of the President	Link
President statement	Ronald Reagan, Address Before a Joint Session of the Congress on the Program for Economic Recovery	Link
President statement	Ronald Reagan, Remarks on Federal Tax Reductions Following Meetings With Members of Congress	Link
President statement	Ronald Reagan, The President's News Conference	Link
President statement	Ronald Reagan, Remarks About Federal Tax Reduction Legislation at a Meeting With State Legislators and Local Government Officials	Link
President statement	Ronald Reagan, Address to the Nation on Federal Tax Reduction Legislation	Link
newspaper	Lancaster Farming	Link
newspaper	The Daily Collegian	Link
newspaper	The Daily Collegian	Link
newspaper	Desert Sun	Link
newspaper	Catholic News Service	Link
newspaper	Catholic News Service	Link
newspaper	Desert Sun	Link
newspaper	Catholic News Service	Link
newspaper	Desert Sun	Link
newspaper	Douglas County News-Press	Link
newspaper	Calexico Chronicle	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	Healdsburg Tribune, Enterprise and Scimitar	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	Recorder	Link
newspaper	Desert Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	San Bernardino Sun	Link
newspaper	Desert Sun	Link
newspaper	Santa Cruz Sentinel	Link

newspaper	Desert Sun	Link
newspaper	Santa Cruz Sentinel	Link
newspaper	Desert Sun	Link
newspaper	Santa Cruz Sentinel	Link
newspaper	Santa Cruz Sentinel	Link
newspaper	Santa Cruz Sentinel	Link
newspaper	Santa Cruz Sentinel	Link
official	Economic Recovery Tax Act of 1981, Report of the Committee on Finance	Link
newspaper	Cherokeean	Link
congressional record	July 18, 1981, 97th Congress, 1st Session, Vol.127, Part 12	Link
congressional record	July 29, 1981, 97th Congress, 1st Session, Vol. 127, Part 14	Link
congressional record	March 11, 1981, 97th Congress, 1st Session, Vol.127, Part 3	Link
congressional record	February 5, 97th Congress, 1st Session, Vol.127, Part 2	Link
congressional record	April 10, 1981, 97th Congress, 1st Session, Vol.127, Part 6	Link
congressional record	July 27, 1981, 97th Congress, 1st Session, Vol.127, Part 13	Link
congressional record	March 24, 1981, 97th Congress, 1st Session, Vol.127, Part 4	Link
congressional record	February 26, 1981, 97th Congress, 1st Session, Vol.127, Part 3	Link
congressional record	July 15, 1981, 97th Congress, 1st Session, Vol.127, Part 12	Link
congressional record	January 6, 1981, 97th Congress, 1st Session, Vol. 127, Part 1	Link
congressional record	January 20, 1981, 97th Congress, 1st Session, Vol. 127, Part 1	Link
congressional record	August 3, 1981, 97th Congress, 1st Session, Vol.127, Part 15	Link
congressional record	June 10, 1981, 97th Congress, 1st Session, Vol.127, Part 9	Link
congressional record	January 5, 1981, 97th Congress, 1st Session, Vol. 127, Part 1	Link
congressional record	April 30, 1981, 97th Congress, 1st Session, Vol.127, Part 6	Link
congressional record	July 22, 1981, 97th Congress, 1st Session, Vol.127, Part 13	Link
congressional record	November 12, 1981, 97th Congress, 1st Session, Vol.127, Part 21	Link
newspaper	The Christian Science Monitor	Link
newspaper	The Associated Press	Link
newspaper	The Associated Press	Link
newspaper	The New York Times	Link
newspaper	The New York Times	Link
newspaper	The Associated Press	Link
official	Economic Report of the President, 1982	Link
President statement	Ronald Reagan, The President's News Conference	Link
newspaper	The Daily Collegian	Link
newspaper	The Daily Collegian	Link
newspaper	Desert Sun	Link
newspaper	Desert Sun	Link
newspaper	The Louisville Times	Link
newspaper	Rappahannock Record	Link
newspaper	San Bernardino Sun	Link
newspaper	Indianapolis Recorder	Link
newspaper	Desert Sun	Link
newspaper	Rappahannock Record	Link
newspaper	Smithfield Times	Link
newspaper	San Bernardino Sun	Link
official	The Treasury Department Report to the President, Volume 2: General Explanation of the Treasury Department Proposals	Link
thinktank	American Enterprise Institute, Feenberg	Link
newspaper	Santa Cruz Sentinel	Link

Table H.15: Underlying text data for TCJA17 (2016–2019)

Type of source	**Source name**	**URL**
thinktank	Center on Budget and Policy Priorities	Link
thinktank	Cato Institute	Link
thinktank	Tax Foundation	Link
thinktank	Indpendent Institute	Link
thinktank	Manhattan Institute	Link

thinktank	Urban Institute	Link
thinktank	American Enterprise Institute	Link
thinktank	American Enterprise Institute	Link
thinktank	R Street Institute	Link
thinktank	Urban Institute	Link
thinktank	Demos	Link
thinktank	American Enterprise Institute	Link
thinktank	American Enterprise Institute	Link
thinktank	Brookings Institution	Link
thinktank	Brookings Institution	Link
thinktank	Cato Institute	Link
thinktank	Center on Budget and Policy Priorities	Link
thinktank	The Century Foundation	Link
thinktank	Manhattan Institute	Link
thinktank	R Street Institute	Link
thinktank	Tax Foundation	Link
thinktank	Urban Institute	Link
thinktank	American Enterprise Institute	Link
newspaper	USNEWS.com	Link
thinktank	Institute for Family Studies	Link
thinktank	American Enterprise Institute	Link
thinktank	American Enterprise Institute	Link
thinktank	American Enterprise Institute	Link
thinktank	The Heartland Institute	Link
thinktank	Hudson Institute	Link
thinktank	Hudson Institute	Link
thinktank	Hudson Institute	Link
thinktank	Urban Institute	Link
newspaper	Deseret Morning News	Link
newspaper	States News Services	Link
journal	National Law Review	Link
journal	The ANNALS of the American Academy of Political and Social Science	Link
official	Joint Economic Committee	Link
thinktank	Brookings Institution	Link
thinktank	The Heritage Foundation	Link
thinktank	Manhattan Institute	Link
thinktank	Niskanen Center	Link
thinktank	American Enterprise Institute	Link
congressional record	October 17, 2017, 115th Congress, 1st Session, Vol.163, No.167	Link
congressional record	November 29, 2017, 115th Congress, 1st Session, Vol.163, No.194	Link
congressional record	October 11, 2017, 115th Congress, 1st Session, Vol.163, No.163	Link
congressional record	November 15, 2017, 115th Congress, 1st Session, Vol.163, No.187	Link
congressional record	December 1, 115th Congress, 1st Session, Vol.163, No.196	Link
congressional record	November 16, 2017, 115th Congress, 1st Session, Vol.163, No.188	Link
newspaper	Tribune Review	Link
newspaper	Tampa Bay Times	Link
newspaper	States News Services	Link
newspaper	Western Free Press	Link
newspaper	Western Free Press	Link
President statement	Donald J. Trump, The President's Weekly Address	Link
President statement	Donald J. Trump, Remarks at the Family Research Council's Values Voter Summit	Link
official	Economic Report of the President, 2018	Link
official	General Explanation of Public Law 115-97, Joint Committee on Taxation	Link
thinktank	Tax Foundation	Link
newspaper	The Oregon Catalyst	Link
thinktank	Georgia Center for Opportunity	Link
newspaper	The American Prospect	Link
blog	Newstex Blogs	Link
thinktank	Baker Institute	Link