Economic incentives, home production and gender identity norms*

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Abstract

We study the role of gender identity norms in household decision making by observing changes in the time allocation of spouses, following a change in the market penalty of adopting gendered norms in the household division of labor. For a given change in spouses' relative wages, the intensity of labor reallocation is directly related to the substitutability of spousal inputs in domestic work, and inversely related to the strength of the couple's norms regarding gender roles in the household. By combining variation in after-tax wages of spouses generated by the introduction of the EITC in Sweden in 2007 and information on parental childcare time available in Swedish registry data, we estimate the elasticity of substitution in home production inputs for the overall population of parents, as well as for demographic groups possibly adhering to differently binding gender norms. We find that couples with a male first-born, married couples, male-breadwinner couples, and foreign-born couples react more strongly to tax changes that induce a more traditional allocation of gender roles, while the respective counterpart couples react more strongly to tax changes that induce a more equal gender division of labor.

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1 Introduction

The role played by gender identity norms has attracted increasing attention in the study of gender gaps (Bertrand, 2010). By prescribing appropriate behavior for men and women and inducing utility costs for deviating from underlying norms (Akerlof and Kranton, 2000), gender identity affects the payoff from several economic actions and potentially feeds into gender gaps in occupational choice, time use and earnings, among other outcomes. As such norms typically evolve very slowly, their persistence correlates well with the slowing convergence in gender gaps since the 1990s in the US and other high-income countries, and persistent gender norms are often the rational for advocating gender quotas (Bertrand et al., 2014). Indeed a number of studies have detected significant relationships between gender stereotypes and women's aspirations and marital outcomes, with consequences for their labor force participation and earnings.[1]

By the very definition of identity norms, individuals are willing to bear a cost to behave in line with their adopted norms. For example, in a couple that values the male breadwinner model, the wife may underinvest in her career, to the detriment of household income. However, the simple observation of the household and labor market investments of spouses may not be fully informative of their adopted norms, as they typically result from a combination of norms and economic incentives, most notably wage differentials. A natural test of the importance of gender norms would require to observe changes in individual behavior after a change in the market penalty for adopting those norms. For example, a narrowing of the gender wage gap gives couples the incentive to reallocate some of the wife's working time from the household to the market and, conversely, some of the husband's working time from the market to the household. The intensity of such reallocation, which is directly related to the substitutability of spousal inputs in domestic work, is inversely related to the strength of couple's norms regarding gender roles in the market and the household.

Our paper aims at reproducing this ideal setting to investigate behavioral prescriptions regarding the gender allocation of home production in general, and of childcare in particular. To this purpose, we exploit variation in after-tax wages generated by the introduction of the

[1] See, among others, Fernandez et al. (2000), Fortin (2005, 2015), Bertrand et al. (2015, 2016) and Bursztyn et al. (2017, 2018).

Earned Income Tax Credit (EITC) in Sweden in 2007, and administrative information on parental childcare time available in Swedish registry data.

The Swedish EITC reduced the marginal tax rate by about 3 percentage points (with slight variation across municipalities) for low-mid level earnings, from a baseline of about 34%. As the Swedish tax system is individual-based, the change in the tax schedule produced by the EITC generates independent changes in the marginal tax rates of spouses, depending on their respective earnings. We use these exogenous changes in spouses' tax rates to identify the effect of economic incentives on the spousal division of home production.

Information on home production is obtained from administrative sources in the form of Temporary Parental Leave (TPL), available to either spouse in order to care for a sick child during working hours.[2] Parents of children aged between eight months and twelve years are entitled to up to 120 days of TPL per year, which is compensated by the social security system at 80% of earnings (with a cap), and is recorded in administrative data for social security purposes. According to the 2000 Level of Living Survey, fathers' share of TPL is positively and significantly correlated with fathers' share of overall household work (Eriksson and Nermo, 2010), which justifies our use of TPL as a proxy for home production.

Our empirical specification is derived from a household model in which spouses jointly choose their time investments in market work and home production. Labor supplied to the market earns an after-tax wage determined by the EITC, while spouses' domestic inputs jointly produce a household public good (childcare). We argue that a couple's preferences on how spouses should contribute to the household public good stem from its gender norms. Specifically – abstracting from technological constraints, to which we come back below – the substitutability of spousal inputs in home production is the key parameter that captures the strength of gender norms. Following a change in their respective tax rates, spouses reallocate home (and market) work according to their household optimization problem. For a given tax change, the gain in disposable family income increases with the substitutability between spousal inputs in home production, which would allow couples to more elastically reallocate their time in line with changed economic incentives.

[2] TPL is distinct from Standard Parental Leave, which is used by parents to look after a baby or young child, irrespective of sickness status, and is typically taken up within two years since a child's birth.

We estimate that, in our sample of Swedish parents with children aged 3-11, the elasticity of substitution in home production inputs is about 0.8. This value is substantially lower than existing estimates of the elasticity of substitution between gender inputs in the labor market, with most values ranging between 2 and 5.[3] However, there is no obvious reason to expect that, in the absence of binding norms, the elasticity of substitution in home production should be similar to the corresponding estimate for market production, and the use of different methodologies makes it difficult to compare the household and the market.

In the absence of a clear benchmark, our discussion of gender norms will mostly hinge on the observed variation in the elasticity of substitution across the population of Swedish households. First, we look into variation in the elasticity across groups of the population that potentially differ in their attitudes towards gender roles. We consider demographic groups defined by the gender of their children, marital status, spousal shares of household income and country of origin. Previous work has often highlighted some of these dimensions as strongly correlated to gender identity norms (Warner and Steel, 1999; Bertrand et al., 2015; Fernandez, 2007; among others).

Second, we estimate distinct elasticity parameters by exploiting variation from husband's and wife's treatment in turn. The intuition for this distinction is the following. An increase in the husband's after-tax wage, generated by a fall in his tax rate, would induce some labor reallocation towards traditional gender roles, by encouraging him to work more in the market and less in the household, and vice versa for the wife. On the contrary, an increase in the wife's after-tax wage, generated by a fall in her tax rate, would induce labor reallocation away from traditional gender roles. By comparing responses to a fall in husbands' and wives' tax rates across population groups, one can shed light on the importance of "traditional" and "untraditional" gender norms.

We find that couples with a first-born son, married (as opposed to cohabitating) couples, male-breadwinner couples, and couples in which spouses grew up outside Sweden tend to react more strongly to a reduction in the husband's tax rate, while the respective counterpart couples tend to react more strongly to a reduction in the wife's tax rate. Note that, for each of the population splits considered, the wife takes more TPL days than the husband at

[3] See Hamermesh (1993), Weinberg (2000), Acemoglu et al. (2004) and Johnson and Keane (2013).

baseline. Our results thus imply that couples in the first set are more likely to exacerbate gender disparities in childcare time when incentives push in that direction, while they are not as responsive to incentives that would induce a more equal gender division of labor. The opposite is observed for counterpart couples, who appear to be characterized by less traditional gender norms.

The interpretation of our findings hinges on the assumption that the elasticity of substitution between home production inputs reflects spouses' beliefs (or preferences) about appropriate gender roles in the household. To corroborate this assumption and rule out alternative channels based on technological substitutability of home production inputs, or constraints to input substitution originating in spouses' respective workplaces, we follow a number of steps. First, we select couples whose youngest child is 3 or older, as mothers may have a biological comparative advantage in the care of younger children, and control in our regressions for parents' specialization in childcare upon childbirth, which may induce comparative advantages later in a child's life. Second, we show that our elasticity estimates are invariant with respect to children's age in the range 3-11, over which parental comparative advantages (if any) are expected to decline. Third, we show that our results are robust to the inclusion of controls for spouses' occupations and workplace characteristics predictive of a family-friendly work environment, and do not systematically vary with such measure of family friendliness.

By combining variation from tax reforms and the time allocation of spouses to detect evidence of binding gender norms, this paper makes a contribution to two strands of literature. First, it is related to a recent and growing literature on the role of gender identity norms in the marriage market. Bertrand et al. (2015) have estimated the marriage penalty of deviating from the male breadwinner/female housekeeper model, while Bursztyn et al. (2017) find that single women may avoid career-enhancing actions whenever these signal traits are possibly penalized in the marriage market. In our paper, we relate the concept of gender norms to the substitutability of gender inputs in home production, and design an empirical strategy that allows us to identify this parameter on administrative data. Also, we emphasize variation in identity norms across couples, which we relate to a few demographic characteristics, rather than across genders. If there is assortative matching in the marriage market, an important dimension of gender identity norms may be the variation in decisions and behavior across couples – with direct consequences on children's outcomes – rather than between men and women.

Second, this paper contributes to a broad literature on the relationship between taxation and home production. A strand in the macroeconomic literature has highlighted this relationship as an important factor driving structural transformation and employment growth (see, among others, Rogerson, 2007 and Ngai and Pissarides, 2007), based on time-series and/or cross-country variation in the tax wedge, coupled with self-reported time use data. The recent literature on labor supply has instead estimated the impact of taxes on earnings, by exploiting variation from tax reforms and information on taxable earnings from administrative sources (see for example Gruber and Saez, 2002). Closely related to our work, Gelber (2014) estimates the response of spouses' earned income to tax changes in Sweden. Our methodology is similar to Gruber and Saez (2002) and Gelber (2014), and complements their work with a focus on home production, which offers a direct perspective on gender identity norms. To our knowledge, this is the first study that provides causal estimates of the impact of taxation on the home production of spouses, an effect which has been theoretically studied by Alesina et al. (2011).

The paper is organized as follows. Section 2 lays out a model of home production and links the elasticity of substitution between spousal inputs to gender norms. Section 3 describes the Swedish institutional background and the data sources. Section 4 builds our econometric framework and discusses identification. Section 5 provides estimation results on both the whole sample and distinct demographic groups. Section 6 discusses alternative channels for our findings and Section 7 concludes.

2 A model of home production and gender norms

2.1 The couple's optimization problem

Households enjoy a home-produced good H and a market-produced good C and allocate spouses' time between market work and home production. The household good H is produced with a combination of spousal inputs according to the following CES specification:

$$H = \left[sH_m^{\frac{\beta-1}{\beta}} + (1-s)H_f^{\frac{\beta-1}{\beta}} \right]^{\frac{\beta}{\beta-1}}, \tag{1}$$

where $j = m, f$ denotes a spouses' gender and $0 \leq H_j \leq 1$ is the share of time devoted by spouse j to home production. s and $1-s$ are parameters related to the relative efficiency of spouses in home production and β represents the elasticity of substitution between spousal inputs. We interpret β as representing couples' *preferences* about the combination of spousal time in home production and we do not explicitly model technological substitutability between spousal inputs for two reasons. First, empirically we can only identify one substitution parameter, hence our interpretation based on preferences implicitly assumes that technological substitutability would not be binding (for example because, from a technological point of view, spousal inputs would be perfect substitutes in the care for 3-11 year olds, in which no biological comparative advantages are involved). Second, the empirical evidence that will be discussed in detail in Sections 5.2 and 6.1 speaks against a technology-based interpretation of our estimated elasticity of substitution.

In the labor market, the productivity of one unit of time of spouse j is P_j. With perfectly competitive labor markets, wages for each spouse are equal to P_j and the associate earnings Y_j decrease with the share of time devoted to home production:

$$Y_j = P_j(1 - H_j). \tag{2}$$

Each spouse faces a tax schedule $T(Y_j)$, which may be progressive.

Couples choose the optimal time allocation of each spouse in order to maximize household utility. Their optimization problem is given by:

$$\max_{H_m, H_f, C} U(H, C) \tag{3}$$

$$\text{s. to.} \quad C \leq [Y_m - T(Y_m)] + [Y_f - T(Y_f)] \tag{4}$$

where H is given by (1) and Y_j is given by (2).

The first-order conditions for this problem are:

$$\begin{aligned}
\frac{\partial U}{\partial H} s H_m^{-\frac{1}{\beta}} H^{\frac{1}{\beta}} &= \lambda P_m(1-\tau_m) && (5) \\
\frac{\partial U}{\partial H}(1-s) H_f^{-\frac{1}{\beta}} H^{\frac{1}{\beta}} &= \lambda P_f(1-\tau_f) && (6) \\
\frac{\partial U}{\partial C} &= \lambda, && (7)
\end{aligned}$$

where $\tau_j = T'(Y_j) > 0$ denotes the marginal tax rate and λ is the Lagrangean multiplier. Expressions (5) and (6) represent the compensated demands for home production inputs, as a function of utility H. At given H, home production for each spouse decreases with own labor productivity in the market and net-of-tax income share (NTS), $1-\tau_j$. The elasticity of demand for home production inputs with respect to their respective NTS represents the substitution effect of a change in the tax rate, and is given by $\partial \ln H_j / \partial \ln(1-\tau_j) = -\beta$. Combining (5) and (6) implies that the marginal rate of substitution between spousal inputs in home production equals the ratio of their opportunity costs

$$\frac{s}{1-s}\left(\frac{H_m}{H_f}\right)^{-\frac{1}{\beta}} = \frac{(1-\tau_m)P_m}{(1-\tau_f)P_f}. \tag{8}$$

Taking logs on both sides of (8), we obtain

$$h_m - h_f = \alpha + \beta(\sigma_f - \sigma_m) + \beta(p_f - p_m) \tag{9}$$

where lower case letters are used to denote logs, $\alpha = \beta \ln\left(\frac{s}{1-s}\right)$ and $\sigma_j = \ln(1-\tau_j)$. This expression shows that the relationship between the spousal gap in home production and the NTS gap hinges on the elasticity of substitution β. Note that the female-male gap in (log) NTS, $\sigma_f - \sigma_m$, increases with the male-female tax gap, $\tau_m - \tau_f$, thus:

$$\operatorname{sgn}(\beta) = \operatorname{sgn}\left(\frac{\partial(h_m - h_f)}{\partial(\sigma_f - \sigma_m)}\right) = \operatorname{sgn}\left(\frac{\partial(h_m - h_f)}{\partial(\tau_m - \tau_f)}\right). \tag{10}$$

The optimal time allocation can be represented graphically at the tangency between an indifference curve whose shape is given by equation (1), for $H = \bar{H}$, and a budget constraint representing the opportunity cost of producing $\bar{H}$, whose slope is given by the gender ratio in net wages:[4]

$$K = (1 - \tau_m)P_m H_m + (1 - \tau_f)P_f H_f. \quad (11)$$

This equilibrium is represented by point E^0 in Figure 1, where the wife supplies H_f^0 to home production, the husband supplies H_m^0, and the total cost of home production, $\bar{K}$, can be read on the intercept of the budget constraint on the vertical axis.

2.2 Gender norms and the elasticity of substitution

Let's now compare two couples, characterized by different values of β and an equal value of the parameter s. The first couple has $\beta > 0$ and its preferences can be described by the smooth indifference curve in Figure 1. The second couple has instead Leontieff preferences, with $\beta \to 0$, represented by the right-angle indifference curve. In this example we assume that the two couples have an identical time allocation at baseline, represented by point E^0.

Consider a tax reform that reduces the female marginal tax rate, τ_f, and thus increases the gender tax gap, $\tau_m - \tau_f$. The budget constraint becomes steeper and, to enjoy the initial level of utility, the time allocation for the first household moves to point E^1, with a reduction in H_f and an increase in H_m. The cost of enjoying a given level of utility has now increased, as illustrated by the higher intercept of the budget line, because the opportunity cost of one of the home production inputs has increased. The optimal time allocation for the second couple is instead unaffected by the tax change, as spouses are unwilling to alter the proportion of spousal inputs due to $\beta \to 0$. This couple faces a higher opportunity cost of home production than the first household, who is willing to make some input substitution in response to a relative wage change. This higher cost is represented by the $\Delta\bar{K}$ term on the vertical axis.

In our set-up, the differential reaction of the two households to tax changes reflects their different gender identity norms. We argue that the second couple, by not responding to economic incentives, adheres to stricter norms regarding the combination of spousal inputs in home production. In other words, the second couple is willing to bear a higher opportunity cost in order to produce H according to their preferred combination of spousal inputs. In

[4] For the ease of graphical exposition we represent a case of proportional taxation, leading to a linear budget constraint.

doing this, the second couple “leaves household income on the table”. This income is instead pocketed by the first couple thanks to its willingness to adjust time allocation in response to economic incentives. Note that this discussion on the strength of gender norms never hinges on the observed time allocation of couples at baseline, but only on the response of such allocation to changes in economic incentives. By estimating the elasticity of substitution separately for various demographic groups, we aim to shed light on couples' characteristics that are more conducive to stringent gender norms.

In the above example, the couples considered have symmetric reactions (or lack thereof) to either an increase or a decrease in the tax gap, and this follows directly from the assumed production function (1). But it may be realistic to allow for asymmetric adjustment in the time allocation of spouses, depending on whether the husband or the wife experiences a fall in their tax rate. Asymmetric reactions may themselves stem from gender norms. To see this, note that a cut in the wife's tax rate would induce her to work more in the market and less in the household, going against the traditional allocation of labor, while a cut in the husband's tax rate would induce opposite changes and thus reinforce the traditional allocation of labor. The relative strength of these two tax responses may tell about gender norms in so far as it measures a couple's willingness to go along or against the traditional allocation of labor.

An extreme example is a case in which a couple responds with an elasticity of substitution $\beta > 0$ to a cut in (say) the husband's tax rate, and with a zero elasticity to a cut in the wife's tax rate. This example can be easily introduced in our framework by setting a limit to the husband's contribution in home production, i.e.

$$H = \left[(1-s)H_f^{\frac{\beta-1}{\beta}} + s[\min(H_m, H_m^0)]^{\frac{\beta-1}{\beta}}\right]^{\frac{\beta}{\beta-1}}, \tag{12}$$

where H_m^0 represents the husband's home production time at baseline. Equation (12) implies that any increase in H_m above H_m^0 would be wasted and hence the couple is not going to substitute male to female home production whenever τ_f falls. In this case the couple's indifference curve would coincide with the smooth indifference curve in Figure 1 to the south of E^0 (for $H_m \leq H_m^0$), but would be vertical to the north of E^0 (for $H_m > H_m^0$). Thus the couple would still react to cuts in τ_m, but would not react to cuts in τ_f. Viceversa, a couple that would not increase H_f above a baseline of H_f^0 would react to cuts in τ_f, but not to cuts in τ_m. Whenever we allow for asymmetric adjustment to cuts in τ_m and τ_f we define

$$\beta^+ = \left.\frac{\partial(h_m - h_f)}{\partial(\sigma_f - \sigma_m)}\right|_{d(\tau_m-\tau_f)>0} \quad \text{and} \quad \beta^- = \left.\frac{\partial(h_m - h_f)}{\partial(\sigma_f - \sigma_m)}\right|_{d(\tau_m-\tau_f)<0}.$$

A couple conforms to a traditional gender identity norm if $\beta^+ < \beta^-$; while it conforms to an untraditional gender identity norm if $\beta^+ > \beta^-$.

A potential confounding factor in the interpretation of asymmetric adjustment to cuts in τ_m and τ_f is related to differences in the constraints that spouses face in their respective workplaces: depending on professional roles, one spouse may face higher career costs than the other following work absences. Within our framework, differences in constraints could be represented by a kink in the budget constraint in correspondence of the initial allocation E^0 in Figure 1. Imagine for example that the husband experiences a wage cut whenever he spends more than H_m^0 time in the household: the budget line would be flatter to the north of H_m^0, and again the couple would still react to a cut in τ_m, but not to (local) cuts to τ_f. While similar to the previous case, the asymmetric adjustment of the couple's time allocation in this case would be rationalized by workplace constraints rather than gendered norms. In our empirical analysis we will cater for differences in professional constraints by controlling for workplace characteristics and the occupation of individuals. We will come back to this point in detail in Section 6.

Our empirical analysis will allow for differences in the elasticity parameters both across and within couples. To summarize, for two couple types denoted by $\pi = \mathcal{T},\mathcal{U}$ we can identify β_π^+ and β_π^-. Based on within-type comparisons, $\beta_\pi^- > \beta_\pi^+$ would indicate that type-π couples respond more strongly to tax changes that reinforce a traditional allocation of labor, and viceversa for $\beta_\pi^- < \beta_\pi^+$. Based on cross-type differences, $\beta_\mathcal{T}^- > \beta_\mathcal{U}^-$ would indicate that type-$\mathcal{T}$ couples follow traditional norms more closely than type-$\mathcal{U}$ couples, while $\beta_\mathcal{U}^+ > \beta_\mathcal{T}^+$ would indicate that $\mathcal{U}$ couples follow more untraditional norms more closely than $\mathcal{T}$ couples. Finally, the double difference $(\beta_\mathcal{T}^+ - \beta_\mathcal{T}^-) < (\beta_\mathcal{U}^+ - \beta_\mathcal{U}^-)$ indicates that $\mathcal{T}$ couples behave overall more traditionally than $\mathcal{U}$ couples.

2.3 From the model to the data

Equation (9) summarizes the key model result that we bring to the data, allowing us to identify β from the response of the male-female gap in (log) home production to changes in the female-male gap in (log) NTS.

The steps leading to (9) are based on compensated demands for home production inputs (5) and (6), whose elasticity of substitution β measures (the negative of) the substitution effect of a change in the tax rate. Changes in actual (uncompensated) demand, which we measure in the data, also feature income effects of tax changes. The change in the gap in uncompensated home production demands is then given by

$$\Delta(h_m - h_f) = \beta\Delta(\sigma_f - \sigma_m) + \gamma_m \Delta\theta_m - \gamma_f \Delta\theta_f + \beta\Delta(p_f - p_m), \tag{13}$$

where $\Delta\theta_j$ approximates the income effect of a tax change for spouse j and γ_j is the associated parameter. Following Gelber (2014), we measure income effects using each spouse's virtual income, which represents the intersection of the individual's extended budget segment with the y-axis, in a space that has earnings on the horizontal axis and disposable income on the vertical axis. This is the appropriate measure of income effects in the presence of progressive taxation, leading to a nonlinear budget set (Burtless and Hausman, 1978). Changes in virtual income encompass changes in marginal tax rates, changes in (net) benefits and changes in (net) capital income – all of which are taken into account in the construction of our virtual income measures.

The change in the equilibrium time allocation (13) leads naturally to the following empirical specification for the estimation of the elasticity of substitution β, where i denotes couples and t denotes time:

$$\Delta(h_{imt} - h_{ift}) = \beta\Delta(\sigma_{ift} - \sigma_{imt}) + \gamma_m \Delta\theta_{imt} - \gamma_f \Delta\theta_{ift} + \gamma X_{it} + (u_{imt} - u_{ift}), \tag{14}$$

where time-invariant components of the home production gap are removed by the first-difference specification, X_{it} are observable determinants of the change in the gender gap in market productivity $\Delta(p_{ift} - p_{imt})$, and $(u_{imt} - u_{ift})$ captures time varying, unobservable components of the same change. To avoid dropping observations for which $H_{imt} = 0$ or

$H_{ift} = 0$ we compute the dependent variable in (14) as $\Delta(\ln(H_{imt} + 1) - \ln(H_{ift} + 1))$.[5]

We will discuss the empirical challenges that arise from estimating (14) after describing the data and discussing details of the EITC reform, which will shape our empirical strategy.

3 The Swedish institutional setting and data

Sweden represents a valuable testing ground for our approach to the study of gender identity for several reasons. First, the 2007 EITC provides exogenous variation in the NTS of spouses, and thus in the cost of following gendered norms. Second, Swedish register data contain longitudinal information on how parents share the time required to care for sick children during their regular working hours, under the TPL program. Although this is only one component of the entire set of home duties that spouses typically share, it is a good proxy for the gender division of household work (Eriksson and Nermo, 2010), and it may be measured precisely on data normally unavailable for other countries. Third, while Sweden has one of the highest female employment rates and one of the lowest mean wage gaps among OECD countries, as well as relatively strong attitudes in favor of gender equality (Olivetti and Petrongolo, 2017), it has a high degree of occupational segregation, in line with glass ceiling effects (Breen and Garcia-Penalosa, 2002; Albrecht et al., 2003, 2015), and parenthood drives large and permanent gaps between the earnings of mothers and fathers (Angelov et al., 2016). These pieces of evidence may suggest important heterogeneities in the type and strength of gender norms across different population groups. The rest of this section describes the data sources and the population under investigation, the 2007 EITC reform and the TPL scheme.

3.1 Data and sample

We use data drawn from several administrative registers compiled by Statistics Sweden, spanning the years 2004-2007. Our primary dataset is the LOUISE register, which covers the population of Sweden aged 16-75. It contains information on demographics (age, gender and detailed household composition), educational qualifications, and a large set of income-related variables. Specifically, it provides information on gross annual labor earnings, including zeros,

[5] Our results are generally robust to other choices, such as adding 0.1 or 0.5 before taking logs.

as well as all government transfers (TPL benefits, Standard Parental Leave benefits, sickness insurance, unemployment insurance, etc.) and capital income (interest payments, capital gains on stocks, property sales, etc.). Based on this information, we construct measures of both labor and non-labor income.

We link records from the LOUISE register to the multi-generational register, linking parents and children and providing the month and year of all births, and the TPL register, compiled by the Swedish Social Insurance Agency, containing start and end dates of TPL spells. Our analysis focuses on couples with dependent children, in which both parents participate in the labor market and are eligible for TPL. To this purpose we restrict our sample to individuals who:

- Live in a couple (married or cohabiting) and have labor earnings above 39,700 Swedish Kronas (SEK) in 2006.[6] This restriction ensures that both spouses have sufficient labor market attachment to be potentially affected by TPL entitlement. Non-working individuals would not be eligible, while individual working very few hours would not need to take TPL to take care of a sick child.

- Have their youngest child born between 1996 and 2003, i.e. aged 3-10 in 2006. Parents of younger children may still use SPL for childcare purposes, plus the substitutability between parental inputs in the care of younger children may reflect biological gender differences as well as preferences. Once their child turns 12, parents are no longer eligible for TPL.

We work with a sample of 172,117 couples who fulfill these criteria. Summary statistics on this sample are presented in Table 1. In the representative couple, the husband is 40 years old and the wife is 38 years old, with annual labor earnings of 366,000 and 236,000 SEK respectively. On average, couples jointly take-up 8.6 days of TPL per year, of which 2.9 are taken by the husband and 5.7 are taken by the wife. In 18% of couples, neither spouse takes TPL; in 5% of couples spouses take identical (positive) levels of TPL; in 56% of couples the

[6] For simplicity, in what follows we use the terms “spouse”, “husband” or “wife” for all cohabiting individuals, irrespective of their marital status. The earnings limit that we impose corresponds to the 2006 Basic Amount, which is set (and annually revised) by the Government to benchmark welfare benefits. As of July 2018, the USD to SEK exchange rate is 8.8 and the EUR to SEK exchange rate is 10.3.

wife takes more TPL than the husband; and in 21% of couples the husband takes more TPL than the wife.

3.2 The 2007 Earned Income Tax Credit reform

The EITC was introduced in the Swedish tax system in January 2007.[7] The political coalition in Government, Alliansen – comprising the Moderate Party, the Centre Party, the Liberal Party and the Christian Democrats – aimed to incentivize labor participation of low- and middle-income earners by lowering their marginal taxe rates. The EITC was first highlighted in the Alliansen's election manifesto in August 2006 (Riksrevisionen, 2009), and the design of the credit was outlined in October 2006 within the 2007 budget bill, after Alliansen won the election.

There are two layers of taxation in Sweden, at the municipal and national levels. Both municipal and national taxes are levied on individual taxable earnings, given by gross earnings minus a basic deduction. In 2007, the EITC introduced additional deductions for low- and middle-income earners. The EITC is solely a function of earnings and, unlike in the US and the UK, eligibility is unrelated to marital status and the presence of qualifying children in the household. An individual's tax liability is automatically reduced by the tax credit, if eligible, without need to file for it, thus its take-up is universal. After being emphasized as one of the Alliansen's flagship policies, the incidence of the EITC was salient to employees from their first 2007 pay slip.

Municipal tax rates are proportional, and in 2006 they ranged between 28.89% and 34.24%. The national tax rate is progressive and kicks in at 20% for earnings above 306,000 SEK, rising to 25% for earnings above 460,600 SEK. The solid line in both panels of Figure 2 plots marginal tax rates in 2006 for a representative municipality with a local tax rate of 31.6%. Earnings below 306,000 SEK are only subject to municipal taxes, but due to a complex system of deductions (described in detail in Appendix A) the tax schedule between 0 and 306,000 SEK has the irregular shape represented by the solid line in Figure 2. Beyond 306,000 SEK, state taxes are added to municipal taxes, yielding a 51.6% marginal tax rate

[7] The EITC was later modified and reinforced in 2008, 2009 and 2010. We end our sample period in 2007 to focus on clean variation from a single tax change.

between 306,000 and 460,600 SEK, and 56.6% thereafter.

The introduction of the EITC in 2007 allowed for additional deductions that lowered the marginal tax rate in two intervals of the earnings distribution, as represented by the dashed line in Figure 2.[8] For low earnings between 17,000-32,000 SEK the marginal tax rate was cut to 0. For intermediate earnings between 123,500-306,000 SEK, the marginal tax rate was decreased by 3.2 percentage points on average around the country (3.16 points in the representative municipality depicted in Figure 2). Given our sample selection criteria, we are not exploiting variation from large tax changes for very low earners, but only from small tax changes for middle earners. On the other hand, one may run into issues of statistical power, especially in the identification of income effects, and this will be largely an empirical matter, to which we come back below. To have a sense of magnitudes, consider an individual with earnings between 123,500-306,000 SEK, residing in the representative municipality, characterized by a marginal tax rate of 31.6%, and a tax credit of 3.16%. Before the EITC, this person would give up 13.7% of her daily income for taking up one day of TPL. After EITC, she would give up 16.8% of her daily income.[9] This 23.1% increase in the opportunity cost of TPL may induce the household to reallocate TPL from the treated spouse to the untreated one. On the other hand, given that the average couple takes 8.6 days of TPL a year, the change in the opportunity cost of TPL represents a negligible component of household annual earnings, thus leaving several dimensions of household finances largely unaffected (household wealth, consumption smoothing, spousal bargaining power, etc.), and we would not need to model these dimensions explicitly in our analysis.

The left panel in Figure 2 superimposes the distribution of female labor earnings to the tax schedule, showing that the treatment range that we consider is centered around median female earnings. For men (right panel), most of the treated incomes lie below the median. Given individual taxation, Swedish couples may have experienced an increase, decrease or no change at all in their tax gaps, depending on spouses' baseline earnings. To show evidence of the extent of treatment, we compute changes in simulated tax rates, given by the tax change

[8] Appendix A gives further detail on the incidence of the EITC along the distribution of taxable earnings and shows how marginal tax rates are computed before and after its introduction.

[9] A person with daily earnings equal to y would give up $(1 - 0.316)y - 0.8(1 - 0.316)y = 0.1368y$ before EITC, where 0.8 represents the (uncapped) TPL replacement rate, and $(1-0.316+0.0316)y-0.8(1-0.316)y = 0.1648y$ after EITC.

an individual would experience at constant earnings. This enables us to measure treatment independently of changes, if any, in individuals' labor supply, which may be endogenous to the reform (see Gruber and Saez, 2002 and Gelber, 2014).

Simulated tax changes are computed by applying the 2007 tax schedule to 2006 earnings,

$$\Delta\tilde{\tau}_{ij07} = \tilde{\tau}_{ij07} - \tau_{ij06} = T'_{ij07}(Y_{ij06}) - T'_{ij06}(Y_{ij06}) \tag{15}$$

and can be used to construct simulated changes in the net-of-tax shares (NTS)

$$\Delta\tilde{\sigma}_{ij07} = \ln[1 - \tilde{\tau}_{ij07}] - \ln[1 - \tau_{ij06}]. \tag{16}$$

Figure 3 shows the distribution of changes in the simulated tax gap (top panel) and in the simulated NTS gap (bottom panel). We define as control units couples for whom the tax gap (or, equivalently, the gap in NTS) is unaffected by the EITC ($\Delta(\tilde{\tau}_{im} - \tilde{\tau}_{if}) = 0$). These represent 51% of our sample, as shown by the central spike in the distribution, and refer to situations in which neither spouse is affected by the EITC, or both spouses are affected in the same way, as shown graphically in the example of Figure 4, in which the earnings of spouses belong to the same earnings range.

49% of couples are instead treated. Among these, some experience an increase in the tax gap of 3.2 percentage points on average (ranging between 2.9 and 3.4 points across municipalities), following a corresponding reduction in the female tax rate. These couples represent 42% of our sample, as shown by the mass on the right-hand side of the distribution in Figure 3. Their tax status is shown graphically in Panel A of Figure 5, in which the wife's income falls within the EITC treatment range, and the husband's income falls outside it. In this example, the husband's income lies to the right of the treated range, but the same change in the tax gap would be observed if it lay just to its left.

The remaining 7% of couples (represented by the mass on the left-hand side of the distribution in Figure 3) experience a symmetric reduction in the tax gap, following a reduction in the male tax rate. Their tax status is depicted in Panel B of Figure 5, in which the husband's income falls within the EITC treatment range, and the wife's income falls outside it.

In Section 4, we will use this variation in tax treatment and TPL across groups of couples to identify the elasticity of substitution between spousal inputs in home production.

3.3 The Temporary Parental Leave insurance

The Swedish institutional setting allows us to extract a measure of home production from register data. This is given by TPL, which either parent can use to care for a sick child aged between eight months and twelve years during their regular working hours. While representing only a portion of overall home production, TPL take-up is directly linked to parenthood and work-life balance considerations, which are one key driver of the gender earnings gap in Scandinavian countries (Angelov et al., 2016; Kleven et al., ming).

TPL is administered by the Swedish Social Insurance Agency and provides parents with an 80% compensation rate for foregone labor earnings up to a cap.[10] Compensation is provided from the first day of sickness and parents are jointly eligible for a maximum of 120 days per child per year, though they are not allowed to take TPL at the same time (with minor exceptions, like cases of major illnesses and/or hospitalization). To receive TPL benefits, a parent needs to register a child as sick on the first day of the sickness spell, by phone or online, and from the eighth day of a spell a doctor's certificate is required. While the contemporaneous, monetary cost of TPL to employees is arguably small, it represents the only component of home production that is clearly visible to employers. Thus it may signal patterns of spousal specialization in home production and shape employers' beliefs about productivity and job attachment.

The use of TPL in Sweden is widespread. In 2016, 458,260 mothers and 353,289 fathers used TPL, respectively, for a total of over 6.3 million days. TPL is more equally shared between parents than Standard Parental Leave (SPL), with about 60% of TPL currently taken by mothers, against three quarters of SPL. TPL is an important component of home production, and – unlike other components typically observed in time-use surveys – is measured on administrative sources for social security purposes. This allows us to build longitudinal information on TPL and to link it to earnings and tax rates. In our sample, men and women take on average 2.9 and 5.7 TPL days per year, respectively, and 82% of couples have positive TPL (see Table 1). While TPL represents only a small reduction to individuals' annual

[10] In 2007, the cap was applied to monthly incomes of 24,800 SEK and above. TPL can be taken for a full day or for 75%, 50%, 25% or 12.5% of a day. If parents are unable to provide care, for instance because they are sick themselves, TPL can be transferred to a third person if s/he has to stay home from her/his job.

labor supply, its take-up is at an employee's discretion and is less likely to be constrained by optimization frictions that typically interfere with working hours adjustment (see, among others, Chetty, 2012). Importantly, there seems to be little or no competition to TPL use from the market childcare sector in Sweden. Specifically, only 1.4% of private expenditure for household services in 2016 was accounted for by childcare services (with cleaning and gardening jointly accounting for 94.7%).[11] This amounts to about 103 million SEK of private expenditure on childcare, against 146 billion SEK of Government expenditure.

4 The econometric framework

We bring specification (14) to the data described above. Note that the error term in (14), $u_{ift} - u_{imt}$, is likely to be correlated with the the substitution effect $\Delta(\sigma_{ift} - \sigma_{imt})$ and income effects $\Delta\theta_{ijt}$, as it absorbs the change in the productivity gap $\Delta(p_{ift} - p_{imt})$. Under progressive taxation, $\Delta(p_{ift} - p_{imt})$ is negatively correlated to $\Delta(\sigma_{ift} - \sigma_{imt})$, as higher productivity feeds into higher incomes and marginal tax rates. For the same reasons, $\Delta(p_{ift} - p_{imt})$ is negatively correlated to $\Delta\theta_{ift}$ and positively correlated to $\Delta\theta_{imt}$. More generally, the actual marginal tax rate faced by an individual is endogenous to his or her labor supply choices, which may in turn be affected by the tax reform.

The 2007 EITC reform generated exogenous changes in spouses' marginal tax rates that can in principle be used to obtain valid instruments for changes in NTS and income effects, i.e. uncorrelated to individuals' labor supply decisions. Conditional on base-year earnings and pre-treatment characteristics of spouses, the change in the simulated NTS gap, $\Delta(\tilde{\sigma}_{ift} - \tilde{\sigma}_{imt})$, provides a potential instrument for the change in the actual NTS gap $\Delta(\sigma_{ift} - \sigma_{imt})$ in equation (14). Similarly, simulated income effects $\Delta\tilde{\theta}_{ij07} = \tilde{\theta}_{ij07} - \theta_{ij06} = \ln[Y_{ij06} - T_{ij07}(Y_{ij06})] - \ln[Y_{ij06} - T_{ij06}(Y_{ij06})]$ could be used as instruments for actual income effects $\Delta\theta_{ij07}$. This strategy, however, opens up two challenges, discussed below.

[11] Figures based on tax deductions of individuals purchasing household services on the market.

4.1 Monotonicity

The first issue in using simulated tax changes from the EITC as instruments for actual tax changes in our setting is the violation of the assumption of monotonicity for some ranges of earnings. In fact we find that individuals whose 2006 earnings are just below the 306,000 SEK threshold highlighted in Figure 2 on average experience some earnings growth between any two consecutive years, which pushes them above such threshold. Some of these individuals, who would be eligible for a *cut* in their marginal tax rate of about 3 percentage points via the EITC, experience ex-post an *increase* in their actual tax rate of about 10 percentage points. Vice versa for individuals immediately above the same earnings threshold. This source of non-monotonicity in our instrument is illustrated in Figure 6, which plots the actual and simulated marginal tax changes by 20,000 SEK bins of the earnings distribution. Panel A refers to men and Panel B refers to women. Grey dots indicate simulated tax changes, and white and black dots indicate actual tax changes between 2005 and 2006 and between 2006 and 2007, respectively.[12] For both men and women, in a few bins below the 306,000 SEK threshold, individuals would have experienced a reduction in their tax rate had their income remained at the 2006 level (grey dots), but experienced instead an increase in their actual tax rate due to their increased earnings (black dots). Vice versa, immediately above the same threshold, the change in the simulated tax rate is null but the actual change is negative. Note that analogous discrepancies between actual and simulated tax changes can be observed in the vicinity of each taxation threshold, and they are not specific to the reform year but also present in 2005-06 (as shown by the white dots). As one would expect, the vertical distance between the 2006-07 and 2005-06 lines is positive where the simulated tax falls, and tends to zero in the other relevant intervals of the earnings support.

Given the violation of the monotonicity assumption in some ranges of the earnings distribution, we identify the impacts of interest from the following intention-to-treat specification, in which we regress the change in the TPL gap on (functions of) simulated tax changes:

$$\Delta(h_{im07} - h_{if07}) = \beta\Delta(\tilde{\sigma}_{if07} - \tilde{\sigma}_{im07}) + \gamma_m\Delta\tilde{\theta}_{im07} - \gamma_f\Delta\tilde{\theta}_{if07} + \gamma X_{it} + (\tilde{u}_{im07} - \tilde{u}_{if07}). \quad (17)$$

[12] 2005-06 changes are obtained on a sample selected based on the same criteria as our main 2006-07 sample.

4.2 Controlling for the evolution of earnings

Estimation of (17) identifies the causal effects of interest if, conditional on an appropriate set of controls, the assignment of couples to alternative tax ranges could be considered as good as random. In particular, one would like to compare couples with similar earnings, which would call for the inclusion of rich controls for base-year earnings. Such controls, however, may impair identification, as tax variables on the right-hand side are themselves deterministic functions of earnings (see also Gruber and Saez, 2002 and Gelber, 2014 for a discussion of this problem).

To address this issue, note that the error term in 17 embodies the change in the TPL gap that would have occurred in the absence of tax changes, $\Delta(h_{im07} - h_{if07}|\text{no reform})$, which may in turn depend on changes in spouses' earnings. In order to construct a counterfactual TPL change for couple i, we follow two alternative approaches.

The first approach, which we adapt from Gelber (2014), consists in estimating $\Delta(h_{im07} - h_{if07}|\text{no reform})$ from a parametric relationship between TPL and earnings over the period 2005-06, during which no tax change occurred. We select a 2005 cohort sample based on the same inclusion criteria defined for our main 2006 cohort sample. This includes individuals living in couple in 2005, whose youngest child is aged 3-10. We then estimate the following specification for the change in TPL of each spouse in the 2005 cohort:

$$\Delta(h_{ij06}) = g(y_{if05})\xi_y^{jf} + g(y_{im05})\xi_y^{jm} + g(z_{if05})\xi_z^{jf} + g(z_{im05})\xi_y^{jm} + X_{if05}\xi_x^{jf} + X_{im05}\xi_x^{jm} + v_{06},$$

where y_{ij05} denotes log real earnings in 2005 for spouse j in a generic couple i of the 2005 cohort, z_{ij05} denotes log real taxable income, including capital income and benefits, $g(.)$ denotes a ten-piece spline (with knots at the deciles), and X_{ij05} are observable characteristics.[13] The estimated coefficients $\hat{\xi}_y^{jf}$, $\hat{\xi}_y^{jm}$, $\hat{\xi}_z^{jf}$, $\hat{\xi}_z^{jm}$, $\hat{\xi}_x^{jf}$ and $\hat{\xi}_x^{jm}$ calibrate the evolution of TPL in the absence of tax changes and are used to predict TPL changes for each spouse in the 2006

[13] These are: age, education and municipality fixed effects, capital income and government benefits and number of eligible children.

cohort:

$$\Delta_G(h_{ijt}|\text{no reform}) = g(y_{if06})\hat{\xi}_y^{jf} + g(y_{im06})\hat{\xi}_y^{jm} + g(z_{if06})\hat{\xi}_z^{jf} + g(z_{im06})\hat{\xi}_z^{jm} + X_{if06}\hat{\xi}_x^{jf} + X_{im06}\hat{\xi}_x^{jm}, \tag{18}$$

where the G subscript denotes the Gelber (2014) procedure.

The second approach builds on a non-parametric prediction of $\Delta(h_{imt} - h_{ift}|\text{no reform})$, which we obtain by matching couples across the 2005 and 2006 cohorts according to their position in the earnings distribution. For each spouse j in couple i in the 2006 cohort, we select the S_{ij} set of spouses in the 2005 cohort whose earnings fall in the same bin (of size 1/25) of the distribution, and live in the same municipality. The predicted changes in TPL for the 2006 cohort in the absence of tax reforms is then given by

$$\Delta_M(h_{ijt}|\text{no reform}) = \mathbb{E}\{\Delta(h_{ij06}|ij \in S_{ij}\}, \tag{19}$$

where the subscript M stands for the matching procedure.

Based on either counterfactual (18) or (19), we construct $\Delta_k(h_{imt} - h_{ift}|\text{no reform})$, $k = G, M$, which we use to residualize the dependent variable in (17) and estimate:

$$\hat{\Delta}_k(h_{im07} - h_{if07}) = \beta\Delta(\tilde{\sigma}_{if07} - \tilde{\sigma}_{im07}) + \gamma_m\Delta\tilde{\theta}_{im07} - \gamma_f\Delta\tilde{\theta}_{if07} + \gamma X_{it} + \epsilon_{i07}, \tag{20}$$

where $\hat{\Delta}_k(h_{im07} - h_{if07}) \equiv \Delta(h_{im07} - h_{if07}) - \Delta_k(h_{imt} - h_{ift}|\text{no reform})$.

Whether one uses the Gelber (2014) or matching approaches to construct counterfactuals, the procedure described amounts to a triple difference identification strategy, in which differences across control and treated couples before and after the EITC introduction are benchmarked against the corresponding differences in a period without tax changes. Identification of the effects of interests requires that a parallel trends assumption is satisfied. That is, in the absence of tax reforms, the evolution of the change in the TPL gap should differ at most by a constant between treated and control couples. This assumption holds if $\beta_p = \gamma_{pj} = 0$ in the following placebo regression:

$$\hat{\Delta}_k(h_{im06} - h_{if06}) = \beta_p\Delta_k(\tilde{\sigma}_{if06} - \tilde{\sigma}_{im06}) + \gamma_{pm}\Delta\tilde{\theta}_{im06} + \gamma_{fm}\Delta\tilde{\theta}_{if06} + \gamma X_{it} + \epsilon_{i06}, \tag{21}$$

(with $k = G, M$), where the dependent variable is obtained on the 2005 cohort sample, following the same steps described above to construct $\hat{\Delta}_k(h_{im07} - h_{if07})$.

4.3 Asymmetric responses

Given the above discussion, specification (20) allows us to identify β, which is inversely related to the strength of gender norms.

We next allow for asymmetric responses in a couple's TPL gap to an increase or decrease in the tax gap, generated by a reduction in the wife's or husband's tax rates, respectively. We argued in Section 2.2 that a couple's reaction to the wife's tax cut is indicative of the strength of its untraditional gender norms, while its reaction to the husband's tax cut is indicative of the strength of its traditional gender norms. To identify these mechanisms we estimate the following variant of equation (20):

$$\begin{aligned}\hat{\Delta}_k(h_{m07} - h_{f07}) &= \beta^{+}\Delta(\tilde{\sigma}_{f07} - \tilde{\sigma}_{m07})|_{\Delta(\tilde{\tau}_{m07}-\tilde{\tau}_{f07})>0} + \beta^{-}\Delta(\tilde{\sigma}_{f07} - \tilde{\sigma}_{m07})|_{\Delta(\tilde{\tau}_{m07}-\tilde{\tau}_{f07})<0} \\ &+ \gamma_m \Delta\tilde{\theta}_{im07} - \gamma_f \Delta\tilde{\theta}_{if07} + \gamma X_{it} + u_{07} \qquad (22)\end{aligned}$$

by imposing a spline in $\Delta(\tilde{\sigma}_{f07} - \tilde{\sigma}_{m07})$, with a knot at 0. $\beta^{+} < \beta^{-}$ is suggestive of traditional norms, while $\beta^{+} > \beta^{-}$ is suggestive of untraditional norms. Equation (22) is fitted on the whole sample as well as on various sub-samples, described in the next section.

5 Results

5.1 Whole sample

Table 2 presents estimates for the whole sample of couples. Each column in Panels A and B is obtained from a separate regression. Panel A estimates specification (20) with symmetric adjustment and a single β estimate for the elasticity of substitution between spouses' TPL. The vector of couples' characteristics X_{it} includes: age fixed-effects, seven education dummies and 2-digit industry fixed effects for each spouse; a dummy for marital status; fixed-effects for the number of children aged 3-10 in 2006; municipality fixed-effects; the total number of days of Standard Parental Leave (SPL) taken by the couple before 2006 and the share taken by the mother; capital income and taxable benefits for each spouse. In column 1, the dependent variable is the raw change in the (log) TPL gap, i.e. unadjusted for the evolution of earnings, and the resulting β estimate is about 1.4 and highly significant. This corresponds to a double-difference estimate, in which we exploit differences over time across treated and control couples. Column 2 introduces an extra layer of differences, by residualizing the change in the TPL gap with respect to its evolution in the absence of tax changes, based on the Gelber (2014) method, and the β estimate falls to about 0.8. A similar estimate is obtained in column 3, in which the dependent variable is residualized using the matching method. All estimates of income effect parameters γ_j are virtually zero (and all β estimates were not sensitive to the exclusion of income effects).

We are not aware of comparable estimates for gender substitutability in the home, but the literature contains a number of estimates for the elasticity of substitution between male and female inputs in the labor market. Hamermesh (1993) reviews various studies and suggests values of such elasticity of 2 for the U.K. and 2.3 for Australia. For the U.S., Weinberg (2000) obtains an estimate of 2.4, Acemoglu et al. (2004) obtain a slightly higher estimate around 3, and Johnson and Keane (2013) obtain a much higher estimate just above 5.[14] Despite the existence of variation across them, all these studies detect an elasticity of substitution significantly above 1. Our estimate and existing labor market estimates for the elasticity of substitution between male and female work are obtained on different methodologies and contexts, but – with these qualifications in mind – the comparison between them hints that the "direct" substitutability of spousal inputs in home production is lower than their "potential" substitutability in the labor market at large.

Columns 4-6 report results from the corresponding placebo regressions, estimated over the period 2005-06. We detect a significant placebo estimate in column (4) on the double-difference specification, implying that couples whose earnings lie in the treated ranges – but receive no treatment – display systematically different TPL behavior from other couples in the absence of tax reforms, and only when these systematic differences are taken into

[14] The approach in most of these papers consists in regressing the gender gap in (log) wages in the aggregate economy (or partitions within it) on the gender gap in (log) labor supply, having imposed a constant increase in the relative demand for female labor. Acemoglu et al. (2004) use individual wages and instrument relative female labor supply in 1940s US with the male mobilization rates.

account with the Gelber (2014) or matching adjustments in columns (5) and (6) is the placebo estimate very close to zero and statistically insignificant.

Panel B in Table 2 allows for asymmetric responses to changes in tax gaps generated by wife's and husband's tax cuts, which identify β^{+} and β^{-}, respectively, as in equation (22). In column 1, based on the double-difference specification, the response of couples' TPL gap to a decrease in the female tax rate is significantly smaller than its response to a decrease in the male tax rate, but this differential is much reduced and not-significantly different from zero once the dependent variable is benchmarked, in columns 2 and 3, against evolutions of the TPL gap in the absence of tax reforms.

The evidence discussed here aggregates behavior over different groups in the population, possibly concealing heterogenous patterns of adherence to gender identity norms. We explore these patterns in the next section, where we only report results based on the Gelber (2014) triple-difference approach, as the matching adjustment procedure delivers similar estimates.

5.2 Heterogeneous effects

We consider heterogeneity in spousal responses to tax incentives along a number of dimensions that are possibly correlated to gender identity norms, namely gender of children, household income shares, marital status, and country of origin.

5.2.1 Gender of children

We first relate TPL adjustments to the gender of children, borrowing from the "female socialization" hypothesis of Warner and Steel (1999), who suggest that a child's gender can shape parental attitudes towards gender equity. In the economic literature, there is evidence that the gender of children has an impact on parents' political views (Washington, 2008; Oswald and Powdthavee, 2010), as well as their corporate decisions (Cronqvist and Yu, 2017), and we illustrate next how the presence of daughters affects the substitutability of parents' time in home production.

Columns 1 and 2 of Table 3 shows separate estimates by the gender of the first-born child in the household. These are obtained in a single regression, including an interaction between the tax variables and a dummy for the gender of the first-born. While TPL days of parents may indistinguishably cover first-born or any other child's sickness (something on which we have no information), the gender of the first-born provides an interesting source of between-couple variation in behavior, because it is both related to the overall gender composition of children and is randomly assigned to couples. This allows us to observe whether a random shock to otherwise identical couples leads them to make different choices about the provision of child care.

Estimates reported in columns 1 and 2 of Panel A show that the elasticity of substitution for couples with a first-born girl (column 2) is about 50% higher than for couples with a first-born boy (column 1), and this difference is significant at the 10% level (column 3). Panel B fits different slopes for wife's and husband's tax cuts. Estimates in row 2 show that couples with a first-born girl respond much more strongly to a female tax cut than couples with a first-born boy. Respective β^+ estimates are 1.094 and 0.448, and their difference is significant at the 1% level. Differences in the β^+ estimates across the two subsamples are indeed driving the difference between the β estimates reported in Panel A. Estimates in row 3 show evidence of reversed β^- estimates: couples with a first-born boy react more strongly than couples with a first-born girl to husband's tax cuts, although this difference is not significant at conventional levels.

Note that the TPL gap in 2006 is virtually identical across types of couples, with wives taking on average 2.8 more TPL days than husbands. Therefore, starting from identical baselines, couples with a first-born girl are relatively more prone to close their TPL gap, and move towards a more equal division of labor, than couples with a first-born boy. Indeed the β^+ and β^- estimates for couples with a first-born boy tend to widen their TPL gap and reinforce a traditional division of labor, although they are not statistically difference from each other. The double difference across types of couples and tax cuts is reported in column 3, row 4, and is negative, large and significant.

Columns 4-6 in Table 3 distinguish between all-girl and all-boy households, having dropped mixed households from our sample. Most estimates are close to those reported in columns 1-3, but having dropped about half of our sample we lack power to identify with precision several effects of interest. The interpretation is that boy-only households are significantly more reluctant than all-girl households to respond to wife's tax cuts, in a way that makes the household allocation of labor less equal. We obtain again a very similar picture by using the whole sample, allowing the elasticity of substitution to vary continuously with the share of girls in the household. This share significantly raises the overall elasticity of substitution by increasing the β^+ estimate, without a discernible impact on the β^- estimate (estimates not reported).

5.2.2 Marital status

We look next at couples' marital status and the income shares of each spouse. Columns 1 and 2 in Table 4 show separate results for married and non-married couples. About 30% of couples in our sample are not married, among whom young and/or first-time parents are over-represented. Estimates in Panel A show that unmarried couples have an overall elasticity of substitution in home-production twice as large as that of married couples, and this difference is significant at the 1% level (column 3). Allowing for asymmetric responses in Panel B shows that this difference is entirely driven by the higher response of unmarried couples to a fall in the female tax rate (β^+), while β^- estimates are very close in the two subsamples. Starting from similar baselines in their TPL gaps (row 4), non-married couples are more prone to move towards a more equal division of labor by responding more strongly to the wives' tax cuts.

5.2.3 Household income shares

Columns 4-6 in Table 4 investigate differences between male and female breadwinner households, according to spousal shares of labor earnings. Bertrand et al. (2015) suggest that male breadwinner norms in the US induce couples – actual or prospective – to avoid a situation in which the wife earns more than her husband. This results in a "missing" mass of households in which the wife's income just exceeds the husband's income. While the Swedish distribution of the wife's income share does not display such feature (Eriksson and Stenberg, 2015), we investigate whether couples on either side of the equal income share cutoff are characterized by different gender norms.

Columns 4 and 5 show that female breadwinner couples have an overall elasticity of substitution β that is about half the corresponding elasticity in male breadwinner couples. While female breadwinner couples have a somewhat higher propensity to react to female tax cuts (although the corresponding column difference is not significant), male breadwinner couples have a much higher propensity to react to male tax cuts, and this difference is significant at the 1% level. Thus male breadwinner households are significantly more prone than female breadwinner households to move towards a more traditional allocation of labor.

5.2.4 Country of origin

Table 5 compares Scandinavian-born couples (in which at least one spouse was born in Sweden, Norway, Finland or Denmark) and couples in which both spouses are migrant from a non- Scandinavian country. According to the World Value Survey, respondents in Scandinavian countries tend to express attitudes more in line with gender equality than most other countries, and the epidemiological approach of Fernandez (2007) and Fernandez and Fogli (2009) has shown evidence that the family and work decisions of immigrants in the host country are shaped at least in part by cultural norms prevailing in the country of origin. From the estimates reported in columns 1-3 of Table 5 it emerges that the most important difference between Scandinavian and immigrants is the much higher propensity of Scandinavians' time allocation to respond to a fall in the wife's marginal tax rate (β^+), while the corresponding elasticity for immigrants is both very low and not statistically significant. However, differences across the two samples are very imprecisely estimated.

These differences become sharper, however, if one selects into the immigrants' subsample those who migrated to Sweden as adults, i.e. aged 18 or older, as shown in columns 4-6 of Table 5. While the β^+ and β^- estimates very close to one other for Scandinavians (and foreign-born who migrated into Sweden as children), they are markedly different for foreign-born who migrated to Sweden as adults. For this subsample of couples, the elasticity of substitution following a wife's tax cut is very small and not statistically significant, while the elasticity following a husband's tax cut (2.6) is highly significant, and three times higher than the corresponding estimates for Scandinavian couples (0.88). The comparison between results in columns 1-3 and columns 4-6 suggests that time spent in the host country may be a significant determinant of gender norms for immigrants. This is in line with the "impressionable years" hypothesis, discussed by Giuliano and Spilinbergo (2014), according to whom "culture and norms crystallize during a period of great mental plasticity in early adulthood and remain largely unaltered thereafter".

We take another look into international differences by country of origin by letting the elasticity estimates vary continuously with various country-level indicators of economic and/or gender development, which are typically correlated to the conservativeness of gender norms. We use several such indicators, depending on their cross-country consistency and availability across the largest possible number of countries, and we match them to individuals in the Swedish registry data according to their country of origin (proxied by their country of residence at age 18). One issue is that Swedish registry data group immigrants' countries of origin into 28 macro-regions. We therefore match the macro-region of origin in the registry data to country-level indicators from various international databases by taking their averages at the macro-region level, with weights given by country shares in the Swedish immigrant population in 2000, obtained from Statistics Sweden. This inevitably discards useful variation in the data and limits our statistical power. Whenever spouses originate from different macro-regions, we use the average value of indicators across the respective macro-regions.

Results are reported in Table 6. In column 1, we proxy norms using the 2016 Global Gender Gap Index (GGGI) in the origin country, developed by the World Bank to capture gender gaps in economic participation and opportunity, educational attainment, health and survival, and political empowerment. The index varies between 0 (least unequal environment) and 1 (most unequal). We multiply this by 100 and – as for all indexes considered below – we re-center it around the Swedish value by subtracting the Swedish average from all country-level values. The β, β^+ and β^- estimates thus refer to Swedish couples, while the respective interactions with the GGGI index represent the change in elasticities for couples originating from countries that are (typically) more unequal than Sweden. We note in column 1, Panel A, that the overall β estimate does not vary significantly with the GGGI index, but Panel B shows that both interaction terms are statistically significant, and β^+ and β^- vary with the index in the expected direction. That is, couples originating from more unequal countries react relatively less to tax changes that would induce a more egalitarian allocation of spousal labor, and relatively more to tax changes that would induce a more traditional allocation of labor. These estimates imply that if one compares a Swedish couple to a couple originating from a country with a median value of the index (e.g. former Yugoslav republics), their corresponding β^+ falls from 0.843 to -0.077, and their corresponding β^- rises from 0.850 to 2.0. For a couple originating from a country at the 90th percentile of the index (e.g. Yemen), β^+ falls further to -0.984, and β^- rises further to 3.134.

In column 2 we let estimated elasticities vary with the 2016 Social Institution and Gender Index (SIGI, https://www.genderindex.org/), an indicator of discriminatory social institutions, which aggregates subscores relating to women's discrimination in the family, restricted physical integrity, restricted access to productive and financial resources, and restricted civil liberties. The index varies between 0 (least discriminatory environment) and 1 (most discriminatory), and we multiply it by 100. In column 3 we introduce GDP per head (PPP-adjusted, measured in 2016 in thousand USD), and we take its negative, such that at higher levels of GDP per head would correspond a more gender-equal environment. Column 4 uses a measure of gender attitudes obtained from the World Value Survey (2010-2014 wave), represented by the percentage of respondents who agree with the statement "when jobs are scarce, men should have more right to a job than women". Note that we lose about 6% of observations due to imperfect country coverage in the WVS. Finally, column 5 uses an index of gender inequality in home production for EU-28 countries, measured by the difference in the percentage of women and men doing some positive amount of home production every day in 2016 (www.eige.europa.eu). All columns 1-5 deliver results that are qualitatively very similar, with β^+ falling and β^- rising when the environment of origin is less favorable to gender equality.

The indicators of gender norms used in this exercise are quite heterogeneous in the way they are constructed, the aspects of gender development they reflect, and the purpose for which they are originally obtained. Despite these drawbacks, and limited variation in those indicators due to aggregation at the macro-region level, Table 6 provides a coherent picture of couples' responses to tax incentives which is in line with predictions from gender norms in the country of origin.

6 Alternative mechanisms

6.1 Gender comparative advantages

One mechanism that naturally comes to mind as an alternative driver of parents' childcare inputs is the existence of gender comparative advantages – whether innate or acquired – in the childcare production function. We have taken on board concerns about a "technological" interpretation of our findings in three steps.

First, it is difficult to see why the spouse with a comparative advantage in child raising should systematically differ between subgroups in the population. If technology matters it should play the same role independently of the sex of the first child, of the marital status of the couple, of who is the breadwinner and on whether spouses are natives or immigrants.

Second, we select couples whose youngest child is three or older, as mothers may have a comparative advantages with the upbringing of younger children. Third, as mothers' comparative advantages at child birth may lead them to specialize in childcare and become less substitutable in the care for older children, we have introduced controls for parents' specialization soon after birth, as proxied by the shares of SPL taken by the mother for all children in the household (as well as the the total amount of SPL jointly taken by parents). All the results discussed above control for these SPL variables, but estimates for the elasticity of substitution were virtually unaffected by their exclusion across the board of specifications (results not reported).

Finally, to further probe our interpretation of results, we note that, if technological factors behind spousal substitutability were an important issue in our sample (and they were not adequately controlled for by our proxy of parental specialization at birth), one should expect the elasticity of substitution in childcare to gradually increase with the age of the child, reflecting a decline in the mother's primary role in childcare as a child grows. We then test for heterogeneous effects, if any, by the age of the couple's youngest child. Table 7 reports separate estimates for couples with pre-school kids, aged 3-6, and couples with older kids, aged 7-11. Both the overall β estimates, as well as the β^+ and β^- estimates, are very similar (and never statistically different) across the two types of couples, and we detect no evidence of asymmetric adjustment for each type of couple. Overall these findings speak against interpretations of our estimates based on technological substitutability.

6.2 Workplace constraints

Another factor that would possibly affect the substitutability between parents' childcare time is the presence of respective workplace constraints. While the law leaves complete discretion to employees on the use of TPL, individuals may take into account disruption effects generated by their work absences and potential career consequences. These considerations are likely to vary systematically across occupations, according to the substitutability and divisibility of the tasks involved, and with workplaces' culture of accommodating employees' family commitments.

Information on occupation is available from the Wage Structure Statistics, which we match to our main dataset. The sample covered by the Wage Structure Statistics, however, differs from our main sample as it covers workers with positive hours in the survey month (typically September) and, among those, it covers all public-sector workers, private-sector workers in firms with 500+ employees, and a stratified sample (based on industry and firm size) of private-sector workers in firms with less than 500 employees. As a result, in any given year, information on occupation is available for approximately 50% of private-sector workers. In Table 8 we report estimates of the elasticity of substitution that control for 3-digit occupation, for three main population splits based on the gender of the first-born, the gender shares of household income, and the country of residence at 18, respectively. All point estimates stay very close to the values obtained without occupational controls (see columns 1-3 in Table 3, columns 4-6 in Table 4 and columns 4-6 in Table 5). However, given the much reduced sample size, we clearly lack power to identify precisely the elasticity differentials across demographic groups.

While we have no direct information on whether a workplace is family-friendly, we use as proxies of a workplace's family culture the gender composition of employees and the share of employees with young children and thus eligible for TPL. Table 9 reports estimates of the elasticity of substitution that control for these workplace composition indicators for the three main population splits. The added regressors are the share of female employees in the wife's and husband's workplace, respectively, and the corresponding shares of employees with children aged 0-11. All results are extremely robust, in terms of both point estimates and their statistical significance, to the inclusion of workplace controls.

Next, in Table 10 we look into heterogeneous effects by the presence of mothers of kids aged 0-11 in the spouses' workplaces. Columns 1 and 2 look separately at couples in which the share of mothers in the wife's workplace is above and below the median, respectively. Columns 4 and 5 look at the corresponding split in the husband's workplace. The differences in the elasticity estimates across the subsamples considered are small in magnitude and never significantly different from zero (columns 3 and 6). The substitutability in home production inputs seems thus invariant with respect to workplace characteristics possibly related to a family-friendly culture.

In summary, from estimates reported in this section, we do not detect evidence of any strong role played by job or workplace characteristics (albeit along a limited number of available dimensions).

7 Conclusions

This paper proposes a test of gender identity norms based on the response of husbands' and wives' home production to changes in their post-tax wages, which alters the cost of adopting gendered norms in the division of household tasks.

Based on a standard household decision model, we show that the concept of gender norms is closely related to the elasticity of substitution between spouses' inputs in home production, and that asymmetries in such elasticity following cuts in husbands and wives tax rates are informative about the specific norm – traditional or untraditional – that a couple intends to adhere to. In other words, we conclude that a certain norm is binding for a population subgroup in so far as couples in this group are willing to bear a higher opportunity cost of home production following changes in economic incentives.

We bring this methodological framework to the data by combining variation in post-tax wages following the introduction of the EITC in Sweden in 2007 with administrative information on the childcare time of parents within the TPL scheme. Our empirical setting allows us to identify the elasticity of substitution between spousal inputs in home production, distinguishing between cases of husbands and wifes treatment. To our knowledge, this analysis provides the first causal estimates of the impact of economic incentives on the household division of home production.

We estimate an overall elasticity of substitution of about 0.8, and find evidence of systematic variation in such elasticity across subgroups of the population and gender of spouse treated. We find that couples with a first-born son, married couples, male-breadwinner couples, and couples in which spouses grew up outside Sweden tend to react more strongly to a reduction in the husband's tax rate, while the respective counterpart couples tend to react more strongly to a reduction in the wife's tax rate. The interpretation is that couples in the first set are more likely to exacerbate gender disparities in childcare time when incentives push in that direction, while they are not as responsive to incentives that would induce a more equal gender division of labor. The opposite is observed for counterpart couples, who appear to be characterized by less traditional gender norms. We thus detect evidence of both traditional and untraditional norms in different subgroups of the Swedish population.

A Appendix: Swedish marginal tax rates

We compute marginal tax rates by combining information on tax schedules and annual gross earnings (Y). The earnings variable available in the database LOUISE is the same concept on which the Swedish tax authority computes individual tax liabilities.

We proceed as follows. First, we obtain taxable earnings by subtracting the basic deduction from gross earnings. The relationship between the basic deduction (BD) and gross earnings for 2006 and 2007 is summarized in Table A–1. The income thresholds for tax deductions are expressed as a function of a base amount (BA), which is revised every year according to inflation (see notes to Table A–1 for 2006 and 2007 values).

Table A–1: Basic deduction 2006-2007

Gross earnings (Y)	Basic deduction (BD)
$0 \leq Y < 0.99\times$BA	$0.423\times$BA
$0.99\times$BA $\leq Y < 2.72\times$BA	$0.423+0.20\times(Y$-$0.99\times$BA)
$2.72\times$BA $\leq Y < 3.11\times$BA	$0.77\times$BA
$3.11\times$BA $\leq Y < 7.88\times$BA	$0.77\times$BA-$0.10\times(Y$-$3.11\times$BA)
$7.88\times$BA $\leq Y$	$0.293\times$BA

Notes. The table shows how to calculate the basic deduction for the years 2006 and 2007. The base amount (BA) is equal to 39,700 SEK in 2006 and 40,300 SEK in 2007.

In 2007, we also subtract the EITC from gross earnings. The design of the EITC is displayed in Table A–2. Note that the income thresholds for determining the applicable tax credit are also based on the basic amount and the basic deduction introduced above.

Table A–2: Deductions introduced by EITC 2007

Gross earnings (Y)	EITC
$0 \leq Y < 0.79\times$BA	(Y-BD)$\times$MT
$0.79\times$BA $\leq Y < 2.72\times$BA	$(0.79\times$BA$+0.2\times(Y$-$0.79\times$BA)-BD)$\times$MT
$2.72\times$BA $\leq Y$	$(1.176\times$BA-BD)$\times$MT

Note: This table presents the design of the 2007 EITC in Sweden and how the credit varies with gross earnings levels. BD is the basic deduction from Table A1 and MT is the municipal tax rate.

We compute taxable earnings before 2007 as gross earnings in each year, minus the tax deductions in Table A–1; and taxable earnings in 2007 as gross earnings in 2007 minus the tax deductions in Tables A–1 and A–2.

In a second step, we compute tax payment as a function of taxable earnings. Taxes include municipal and state level taxes. The municipal tax is proportional. In 2006, the corresponding rate was on average 32% across municipalities, ranging between 28.89% and 34.24%. For taxable earnings above a certain threshold (306,000 SEK in 2006), national taxes are levied on top of municipal taxes. The added marginal tax rate is 20% up to the next threshold. (460,600 SEK in 2006), and 25% beyond that.[A–1]

[A–1] The lower and upper thresholds in 2007 are 316,700 SEK and 476,700 SEK, respectively.

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Table 1: Summary Statistics

		Mean	SD	Min	Max
Males:	Age	40.4	5.4	21	70
	Education (%)	0.40	0.49	0	1
	Labor earnings	366	246	40	29,495
	Capital earnings	10	1,042	-3,348	400,010
	Benefit payments	10	104	0	294
	Marginal tax rate (%)	45.4	9.5	23.1	59.2
	Days of TPL	2.9	5.0	0	180
Females:	Age	38.1	4.8	19	58
	Education (%)	0.48	0.50	0	1
	Labor earnings	236	123	40	3,955
	Capital earnings	-9	108	-488	18,236
	Benefit payments	17	28	0	315
	Marginal tax rate (%)	37.9	7.5	23.1	59.2
	Days of TPL	5.7	7.4	0	259
Couples:	Nr. of children aged 3–10 in 2006	1.6	0.6	1	6
	Age of youngest child in 2006	6.3	2.3	3	10
	Male-female gap in taxes (%)	7.4	10.9	-31.6	31.7
	Combined days of TPL	8.6	10.0	0	290
	Male-female gap in TPL	-2.8	7.7	-257	172
Share couples with:	$\text{TPL}_m + \text{TPL}_f = 0$	0.18			
	$\text{TPL}_m = \text{TPL}_f > 0$	0.05			
	$\text{TPL}_m < \text{TPL}_f$	0.56			
	$\text{TPL}_m > \text{TPL}_f$	0.21			
Observations		172,117			

Notes. The table summarizes couples' characteristics as of 2006. All monetary values are expressed in thousand SEK. "Education" takes value one if an individual has two years or more of post-secondary education, zero otherwise. "Benefit payments" include SPL payments, TPL payments, sickness benefits, care allowance, training allowance, unemployment benefits, and rehabilitation compensation.

Table 2: Baseline estimates on the whole sample and the placebo sample

	Raw 2006–07 (1)	Gelber (2014) 2006–07 (2)	Matching 2006–07 (3)	Raw 2005–06 (4)	Gelber (2014) 2005–06 (5)	Matching 2005–06 (6)
Panel A						
β	1.437***	0.821***	0.739***	0.806***	-0.068	0.070
	(0.107)	(0.107)	(0.110)	(0.108)	(0.108)	(0.111)
γ_f	-0.001	0.000	0.000	-0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
γ_m	-0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Panel B						
β^+: $(\tau_m - \tau_f) \uparrow$	1.252***	0.762***	0.704***	0.688***	-0.061	0.059
	(0.124)	(0.124)	(0.128)	(0.127)	(0.127)	(0.130)
β^-: $(\tau_m - \tau_f) \downarrow$	2.032***	1.009***	0.851***	1.178***	-0.090	0.105
	(0.251)	(0.250)	(0.257)	(0.253)	(0.252)	(0.260)
Row difference	-0.781***	-0.247	-0.147	-0.491	0.030	-0.046
	(0.291)	(0.290)	(0.298)	(0.294)	(0.294)	(0.303)
Mean $(H_{m06} - H_{f06})$	-2.845	-2.845	-2.845	-2.749	-2.749	-2.749
N	172,117	172,117	172,117	164,555	164,555	164,555

Notes. Panel A estimates specification (20). The dependent variable in column 1 is the raw change in the TPL gap over 2006-2007; in column 2 it is the residualized change in the TPL gap based on the Gelber (2014) method; in column 3 it is the residualized change in the TPL gap based on the matching method. Columns 4 to 6 report corresponding placebo specifications over the period 2005-06, based on specification (21). Panel B estimates specification (22) with the same dependent variables and samples as in Panel A. All regressions also control for age fixed-effects for each spouse, education fixed-effects for each spouse (7 categories), industry fixed effects for each spouse (58 categories), municipality fixed-effects (289), the number of children aged 3-11 (5 dummy variables), marital status, capital income and benefit payments for each spouse, total days of SPL taken by the couple for spells before 2006, and the share of days of SPL taken by the mother. Regressions in Panel B also control for changes in virtual income for each spouse. The sample is described in Table 1. Standard errors are reported in brackets. Significance: * = 0.1; ** = 0.05; *** = 0.01.

Table 3: Elasticity of substitution by gender of children

	Gender of first-born:			Gender of all children:		
	Boy	Girl	Difference	Boys	Girls	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
<u>Panel A</u>						
β	0.658***	0.992***	-0.334*	0.481***	1.026***	-0.545**
	(0.139)	(0.143)	(0.185)	(0.198)	(0.205)	(0.264)
<u>Panel B</u>						
β^+: $(\tau_m - \tau_f) \uparrow$	0.448***	1.094***	-0.647***	0.279	1.057***	-0.779**
	(0.166)	(0.171)	(0.228)	(0.239)	(0.247)	(0.329)
β^-: $(\tau_m - \tau_f) \downarrow$	1.310***	0.697**	0.613	1.087**	0.954*	0.133
	(0.341)	(0.349)	(0.476)	(0.468)	(0.492)	(0.661)
Row difference	-0.862**	0.398	-1.260**	-0.808	0.103	-0.911
	(0.402)	(0.413)	(0.572)	(0.558)	(0.585)	(0.803)
Mean $(H_{m06} - H_{f06})$	-2.831	-2.860	0.030	-2.739	-2.821	0.082
N	88,495	83,622		44,154	40,442	

Notes. Panel A estimates are based on specification (20) and Panel B estimates are based on specification (22). The dependent variable in all regressions is the residualized change in the TPL gap based on the Gelber (2014) method. Coefficients in columns 1 and 2 are estimated in a single regression, including an interaction between the tax variables and a dummy for the gender of the first-born. Column 3 reports differences between coefficients in columns 1 and 2. Coefficients in columns 4 and 5 are estimated in a single regression, including an interaction between the tax variables and a dummy for the gender of all children in the household. Column 6 reports differences between coefficients in columns 4 and 5. Row 4 reports differences between β^+ and β^- estimates for each type of couple in columns 1, 2, 4 and 5, and the corresponding double differences in columns 3 and 6. Row 5 reports the mean male-female TPL gap in 2006 for each type of couple in columns 1, 2, 4 and 5, and the corresponding differences in columns 3 and 6. All regressions also control for variables listed in the notes to Table 2, and gender of first-born (columns 1 and 2) or gender of all children in the household (columns 4 and 5). The sample is described in Table 1. Standard errors are reported in brackets. Significance: * = 0.1; ** = 0.05; *** = 0.01.

Table 4: Elasticity of substitution by marital status and income shares of parents

	Marital status:			Higher earner:		
	Married	Unmarried	Difference	Husband	Wife	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
β	0.654***	1.203***	-0.550***	0.903***	0.457*	0.446
	(0.123)	(0.178)	(0.204)	(0.118)	(0.254)	(0.280)
Panel B						
β^{+}: $(\tau_m - \tau_f) \uparrow$	0.532***	1.276***	-0.743***	0.691***	1.079**	-0.387
	(0.145)	(0.215)	(0.250)	(0.128)	(0.538)	(0.554)
β^{-}: $(\tau_m - \tau_f) \downarrow$	1.023***	0.987**	0.036	2.267***	0.184	2.084***
	(0.294)	(0.443)	(0.521)	(0.418)	(0.313)	(0.524)
Row difference	-0.491	0.289	-0.780	-1.576***	0.895	-2.471***
	(0.344)	(0.527)	(0.626)	(0.454)	(0.657)	(0.799)
Mean $(H_{m06} - H_{f06})$	-2.757	-3.048	0.291	-3.287	-0.945	-2.343
N	119,813	52,304		139,638	32,479	

Notes. Panel A estimates are based on specification (20) and Panel B estimates are based on specification (22). The dependent variable in all regressions is the residualized change in the TPL gap based on the Gelber (2014) method. Coefficients in columns 1 and 2 are estimated in a single regression, including an interaction between the tax variables and a dummy for marital status. Column 3 reports differences between coefficients in columns 1 and 2. Coefficients in columns 4 and 5 are estimated in a single regression, including an interaction between the tax variables and a dummy for the gender of the higher earner in the couple. Column 6 reports differences between coefficients in columns 4 and 5. Row 4 reports differences between β^{+} and β^{-} estimates for each type of couple in columns 1, 2, 4 and 5, and the corresponding double differences in columns 3 and 6. Row 5 reports the mean male-female TPL gap in 2006 for each type of couple in columns 1, 2, 4 and 5, and the corresponding differences in columns 3 and 6. All regressions also control for variables listed in the notes to Table 2, and the gender of the higher earner in the couple (columns 4 and 5). The sample is described in Table 1. Standard errors are reported in brackets. Significance: * = 0.1; ** = 0.05; *** = 0.01.

Table 5: Elasticity of substitution by country of origin

	Birthplace of spouses:			Residence of spouses before age 18:		
	Elsewhere (1)	Scandinavia (2)	Difference (3)	Elsewhere (4)	Scandinavia (5)	Difference (6)
Panel A						
β	0.627	0.835***	-0.207	1.170***	0.802***	0.368
	(0.416)	(0.109)	(0.427)	(0.472)	(0.109)	(0.482)
Panel B						
β^{+}: $(\tau_m - \tau_f) \uparrow$	0.236	0.791***	-0.556	0.352	0.778***	-0.426
	(0.565)	(0.123)	(0.576)	(0.645)	(0.126)	(0.655)
β^{-}: $(\tau_m - \tau_f) \downarrow$	1.326	0.978***	0.348	2.627***	0.875***	1.751*
	(0.811)	(0.262)	(0.851)	(0.911)	(0.259)	(0.947)
Row difference	-1.091	-0.187	-0.904	-2.274*	-0.097	-2.177*
	(1.079)	(0.302)	(1.121)	(1.219)	(0.299)	(1.256)
Mean $(H_{m06} - H_{f06})$	-2.529	-2.867	0.338	-2.273	-2.874	0.602
N	11,013	161,104		8,328	163,789	

Notes. Panel A estimates are based on specification (20) and Panel B estimates are based on specification (22). The dependent variable in all regressions is the residualized change in the TPL gap based on the Gelber (2014) method. Coefficients in columns 1 and 2 are estimated in a single regression, including an interaction between the tax variables and a dummy for both spouses being born out of Scandinavia. Column 3 reports differences between coefficients in columns 1 and 2. Coefficients in columns 4 and 5 are estimated in a single regression, including an interaction between the tax variables and a dummy for both spouses residing outside Scandinavia before age 18. Column 6 reports differences between coefficients in columns 4 and 5. Row 4 reports differences between β^{+} and β^{-} estimates for each type of couple in columns 1, 2, 4 and 5, and the corresponding double differences in columns 3 and 6. Row 5 reports the mean male-female TPL gap in 2006 for each type of couple in columns 1, 2, 4 and 5, and the corresponding differences in columns 3 and 6. All regressions also control for variables listed in the notes to Table 2, and a dummy for both spouses being born out of Scandinavia (columns 1 and 2), or a dummy for both spouses residing out of Scandinavia before age 18 (columns 4 and 5). The sample is described in Table 1. Standard errors are reported in brackets. Significance: * = 0.1; ** = 0.05; *** = 0.01.

Table 6: Varying elasticities with gender norms in the country of origin

	GGGI	SIGI	GDP	WVS	EU
	(1)	(2)	(3)	(4)	(5)
Panel A					
β	0.866***	0.849***	0.857***	0.818***	0.803***
	(0.109)	(0.108)	(0.109))	(0.112)	(0.114)
$\beta \times Index$	-0.026	-0.007	-0.007	-0.004	-0.016
	(0.026)	(0.015)	(0.009)	(0.013)	(0.018)
Panel B					
β^+	0.843***	0.812***	0.838***	0.793***	0.780***
	(0.126)	(0.125)	(0.126)	(0.129)	(0.129)
$\beta^+ \times Index$	-0.084***	-0.033*	-0.030**	-0.030*	-0.050**
	(0.031)	(0.018)	(0.012)	(0.016)	(0.024)
β^-	0.850***	0.915***	0.806***	0.846***	0.780***
	(0.261)	(0.256)	(0.262)	(0.268)	(0.272)
$\beta^- \times Index$	0.105**	0.049*	0.050**	0.048**	0.079**
	(0.049)	(0.028)	(0.021)	(0.024)	(0.040)
N	172,111	172,111	172,111	161,598	160,910

Notes. Panel A estimates are based on specification (20) and Panel B estimates are based on specification (22), having included an interaction between the tax variables and alternative indexes of gender equality, as indicated at the top of each column. The dependent variable in all regressions is the residualized change in the TPL gap based on the Gelber (2014) method. The indexes considers are: the 2016 Global Gender Gap Index, varying from 0 (most equal) to 100 (most unequal); the 2016 Social Institution and Gender Index, varying from 0 (least discriminatory) to 100 (most discriminatory); (the negative of) the 2016 GDP per head in thousand USD; the percentage of respondents in the 2010-2014 WVS agreeing with the statement "When job are scarce, men should have more right to a job than a woman"; the difference in the percentage of women and men doing some positive amount of home production every day, according to the 2016 EU survey of gender equality. All indexes refer to the macro-region of residence of spouses at age 18, and are re-centered around Swedish values. When spouses originate from different macro-regions, the mean of the two region-level indexes is used. All regressions also control for variables listed in the notes to Table 2. The sample is described in Table 1. Standard errors are reported in brackets. Significance: * = 0.1; ** = 0.05; *** = 0.01.

Table 7: Elasticity of substitution by age of youngest child

	3–6 (1)	7–11 (2)	Difference (3)
Panel A:			
β	0.906***	0.719***	0.187
	(0.142)	(0.140)	(0.185)
Panel B:			
β^+: $(\tau_m - \tau_f) \uparrow$	0.832***	0.678***	0.154
	(0.168)	(0.169)	(0.228)
β^-: $(\tau_m - \tau_f) \downarrow$	1.142***	0.854***	0.287
	(0.352)	(0.334)	(0.474)
Row difference	-0.310	-0.177	-0.133
	(0.412)	(0.398)	(0.570)
Mean $(H_{m06} - H_{f06})$	-3.451	-2.130	-1.321
N	93,194	78,923	

Notes. Panel A estimates are based on specification (20) and Panel B estimates are based on specification (22). The dependent variable in all regressions is the residualized change in the TPL gap based on the Gelber (2014) method. Coefficients in columns 1 and 2 are estimated in a single regression, including an interaction between the tax variables and a dummy for the youngest child in the household being aged 3-6. Column 3 reports differences between coefficients in columns 1 and 2. Row 4 reports differences between β^+ and β^- estimates for each type of couple in columns 1 and 2, and the corresponding double differences in column 3. Row 5 reports the mean male-female TPL gap in 2006 for each type of couple in columns 1 and 2, and the corresponding differences in column 3. All regressions also control for variables listed in the notes to Table 2, and a dummy for the youngest child in the household being aged 3-6. The sample used is described in Table 1. Standard errors are reported in brackets. Significance: * = 0.1; ** = 0.05; *** = 0.01.

Table 8: Elasticity of substitution by type of couples, controlling for occupation

	Gender of 1^{st} child:			Higher income share:			Residence before age 18:		
	Boy	Girl	Diff.	Husband	Wife	Diff.	Else.	Scand.	Diff.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A									
β	0.390	1.031***	-0.640*	0.680***	0.789	-0.109	1.171	0.670***	0.501
	(0.265)	(0.273)	(0.332)	(0.227)	(0.539)	(0.579)	(0.843)	(0.215)	(0.856)
Panel B									
β^{+}: $(\tau_m - \tau_f) \uparrow$	0.055	1.000***	-0.945**	0.467**	0.392	0.075	0.180	0.525**	-0.345
	(0.303)	(0.310)	(0.393)	(0.238)	(1.677)	(1.692)	(1.050)	(0.239)	(1.065)
β^{-}: $(\tau_m - \tau_f) \downarrow$	1.675**	1.190*	0.485	3.075***	0.837	2.238*	3.740**	1.254**	2.486
	(0.668)	(0.717)	(0.944)	(1.033)	(0.581)	(1.186)	(1.892)	(0.523)	(1.953)
Row difference	-1.620**	-0.190	-1.430	-2.608**	-0.445	-2.163	-3.560	-0.729	-2.831
	(0.761)	(0.810)	(1.093)	(1.081)	(1.810)	(2.100)	(2.323)	(0.580)	(2.389)
Mean $(H_{m06} - H_{f06})$	-2.743	-2.771	0.028	-3.293	-0.023	-3.270	-2.362	-2.778	0.416
N	27,573	25,816		44,635	8,754		2,744	50,645	

Notes. Panel A estimates are based on specification (20) and Panel B estimates are based on specification (22). The dependent variable in all regressions is the residualized change in the TPL gap based on the Gelber (2014) method. Coefficients in columns 1 and 2 are estimated in a single regression, including an interaction between the tax variables and a dummy for the gender of the first-born. Column 3 reports differences between coefficients in columns 1 and 2. Coefficients in columns 4 and 5 are estimated in a single regression, including an interaction between the tax variables and a dummy for the gender of the higher earner in the household. Column 6 reports differences between coefficients in columns 4 and 5. Coefficients in columns 7 and 8 are estimated in a single regression, including an interaction between the tax variables and a dummy for both spouses residing outside Sweden before age 18. Column 9 reports differences between coefficients in columns 7 and 8. Row 4 reports differences between β^{+} and β^{-} estimates for each type of couple in columns 1, 2, 4, 5, 7 and 8 and the corresponding double differences in columns 3, 6 and 9. Row 5 reports the average mean male-female TPL gap in 2006 for each type of couple in columns 1, 2, 4, 5, 7 and 8 and the corresponding differences in columns 3, 6 and 9. All regressions also control for variables listed in the notes to Table 2, and the gender of the first-born child (columns 1 and 2), the gender of the higher earner in the household (columns 4 and 5), or a dummy for both spouses residing outside Sweden before age 18 (columns 6 and 7). The sample used is described in Table 1. Standard errors are reported in brackets. Significance: * = 0.1; ** = 0.05; *** = 0.01.

Table 9: Elasticity of substitution by type of couples, controlling for workplace composition

	Gender of 1^{st} child:			Higher income share:			Residence before age 18:		
	Boy	Girl	Diff.	Husband	Wife	Diff.	Else.	Scand.	Diff.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A									
β	0.666***	1.000***	-0.334*	0.916***	0.447*	0.469*	1.173**	0.811***	0.362
	(0.139)	(0.143)	(0.185)	(0.118)	(0.255)	(0.281)	(0.472)	(0.109)	(0.482)
Panel B									
β^+: $(\tau_m - \tau_f) \uparrow$	0.460***	1.103***	-0.644***	0.705***	1.040*	-0.335	0.356	0.789***	-0.433
	(0.166)	(0.171)	(0.228)	(0.129)	(0.540)	(0.556)	(0.645)	(0.126)	(0.655)
β^-: $(\tau_m - \tau_f) \downarrow$	1.304***	0.702**	0.602	2.274***	0.186	2.089***	2.629***	0.877***	1.752*
	(0.341)	(0.349)	(0.477)	(0.419)	(0.313)	(0.524)	(0.912)	(0.259)	(0.947)
Row difference	-0.844**	0.402	-1.246**	-1.569**	0.854	-2.423***	-2.273*	-0.088	-2.185*
	(0.402)	(0.413)	(0.572)	(0.454)	(0.659)	(0.800)	(1.219)	(0.299)	(1.256)
Mean $(H_{m06} - H_{f06})$	-2.831	-2.860	0.030	-3.287	-0.945	-2.343	-2.273	-2.874	0.602
N	88,495	83,622		139,638	32,479		8,328	163,789	

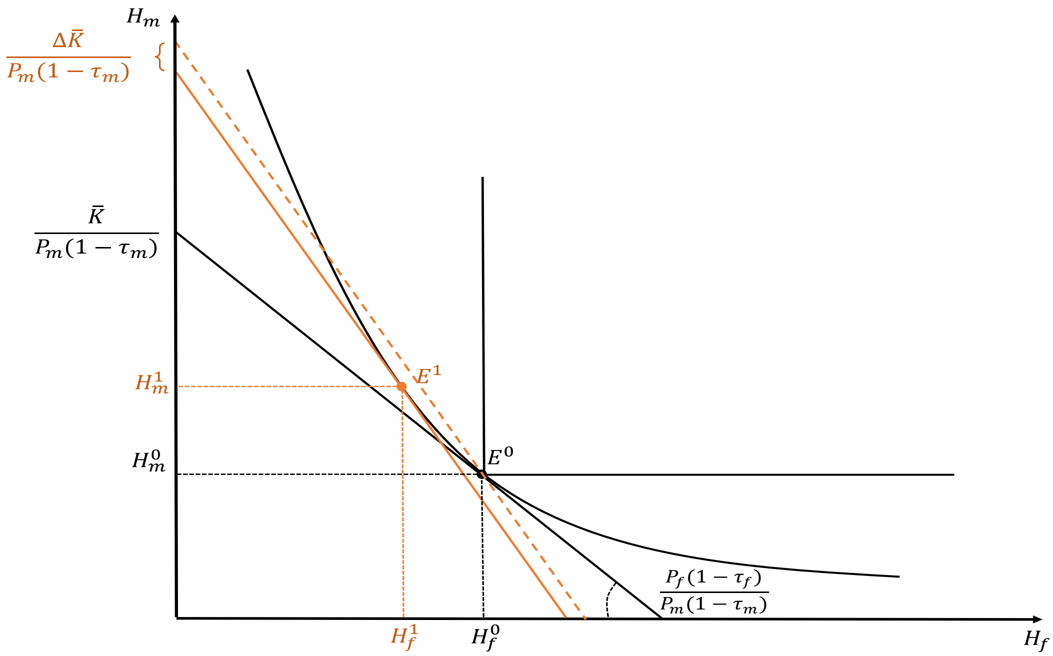
Notes. Panel A estimates are based on specification (20) and Panel B estimates are based on specification (22). The dependent variable in all regressions is the residualized change in the TPL gap based on the Gelber (2014) method. Coefficients in columns 1 and 2 are estimated in a single regression, including an interaction between the tax variables and a dummy for the gender of the first-born. Column 3 reports differences between coefficients in columns 1 and 2. Coefficients in columns 4 and 5 are estimated in a single regression, including an interaction between the tax variables and a dummy for the gender of the higher earner in the household. Column 6 reports differences between coefficients in columns 4 and 5. Coefficients in columns 7 and 8 are estimated in a single regression, including an interaction between the tax variables and a dummy for both spouses residing outside Sweden before age 18. Column 9 reports differences between coefficients in columns 7 and 8. Row 4 reports differences between β^+ and β^- estimates for each type of couple in columns 1, 2, 4, 5, 7 and 8 and the corresponding double differences in columns 3, 6 and 9. Row 5 reports the average mean male-female TPL gap in 2006 for each type of couple in columns 1, 2, 4, 5, 7 and 8 and the corresponding differences in columns 3, 6 and 9. All regressions also control for variables listed in the notes to Table 2, and the gender of the first-born child (columns 1 and 2), the gender of the higher earner in the household (columns 4 and 5), or a dummy for both spouses residing outside Sweden before age 18 (columns 6 and 7). The sample used is described in Table 1. Standard errors are reported in brackets. Significance: * = 0.1; ** = 0.05; *** = 0.01.

Table 10: Elasticity of substitution by workplace characteristics

	Woman's workplace Share mothers of 0-11 year olds			Man's workplace Share mothers of 0-11 year olds		
	Above p50	Below p50	Difference	Above p50	Below p50	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
β	0.846***	0.799***	0.047	0.673***	0.950***	-0.277
	(0.147)	(0.137)	(0.188)	(0.144)	(0.140)	(0.188)
β^+: $(\tau_m - \tau_f)\uparrow$	0.897***	0.650***	0.247	0.653***	0.857***	-0.204
	(0.175)	(0.164)	(0.230)	(0.172)	(0.167)	(0.230)
β^-: $(\tau_m - \tau_f)\downarrow$	0.689*	1.241**	-0.543	0.747**	1.248***	-0.501
	(0.377)	(0.321)	(0.485)	(0.343)	(0.348)	(0.477)
Row difference	0.199	-0.590	0.790	-0.094	-0.392	0.297
	(0.442)	(0.381)	(0.580)	(0.405)	0.409)	(0.573)
Mean $(H_{m06} - H_{f06})$	-2.852	-2.839	-0.013	-2.689	-2.989	0.300
N	79,044	93,073		82,634	89,483	

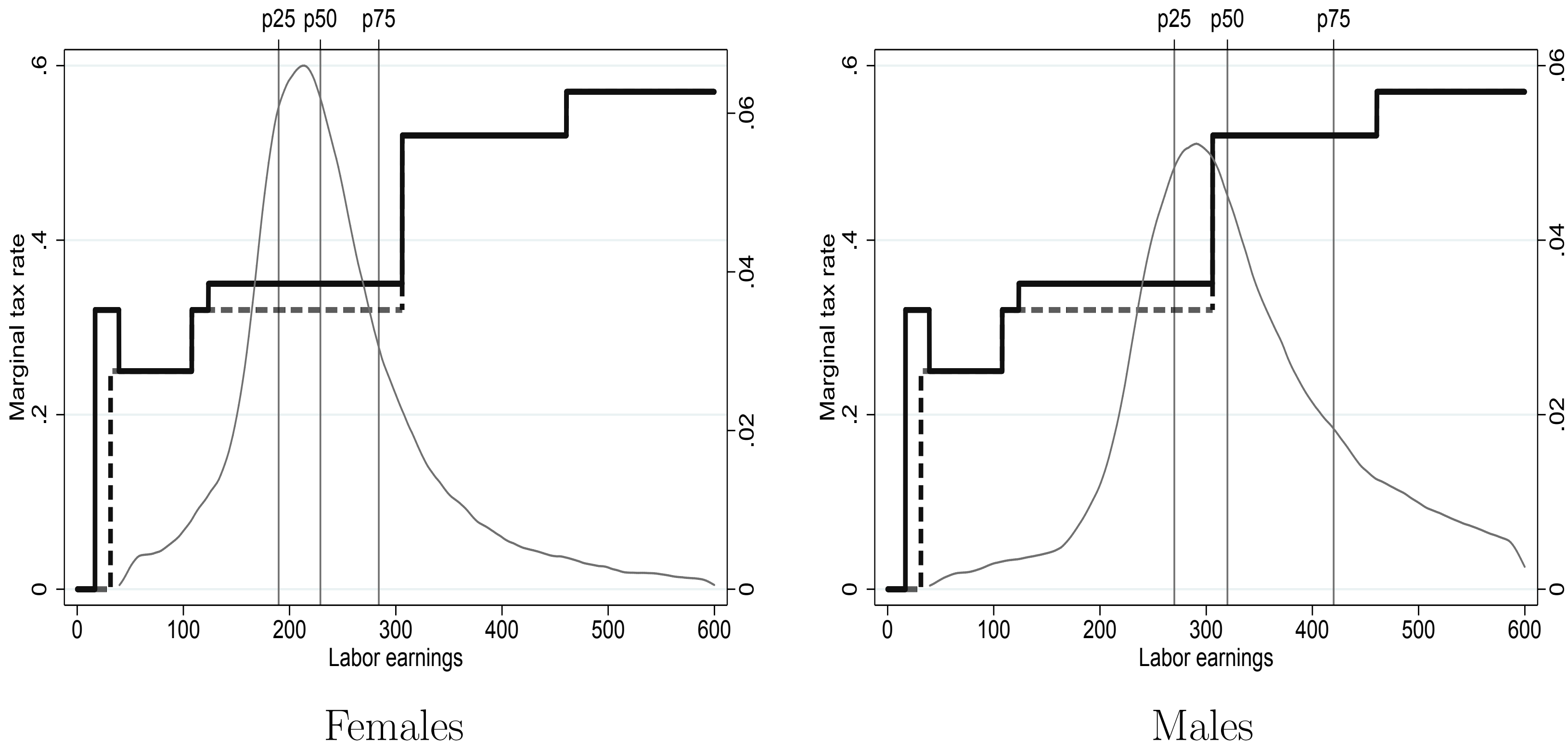
Notes. Panel A estimates are based on specification (20) and Panel B estimates are based on specification (22). The dependent variable in all regressions is the residualized change in the TPL gap based on the Gelber (2014) method. Coefficients in columns 1 and 2 are estimated in a single regression, including an interaction between the tax variables and a dummy for the wife's workplace having an above-median share of employees with children aged 0-11. Column 3 reports differences between coefficients in columns 1 and 2. Coefficients in columns 4 and 5 are estimated in a single regression, including an interaction between the tax variables and a dummy for the husband's workplace having an above-median share of employees with children aged 0-11. Column 6 reports differences between coefficients in columns 4 and 5. Row 4 reports differences between β^+ and β^- estimates for each type of couple in columns 1, 2, 4 and 5, and the corresponding double differences in columns 3 and 6. Row 5 reports the average mean male-female TPL gap in 2006 for each type of couple in columns 1, 2, 4 and 5, and the corresponding differences in columns 3 and 6. All regressions also control for variables listed in the notes to Table 2, and a dummy for the share of mothers of 0-11 year olds in the wife's workplace being above the median (columns 1 and 2), or a dummy for the share of mothers of 0-11 year olds in the husband's workplace being above the median (columns 4 and 5). The sample used is described in Table 1. Standard errors are reported in brackets. Significance: * = 0.1; ** = 0.05; *** = 0.01.

Figure 1: The impact of a cut in τ_f on couples' time allocation under weak and strong norms



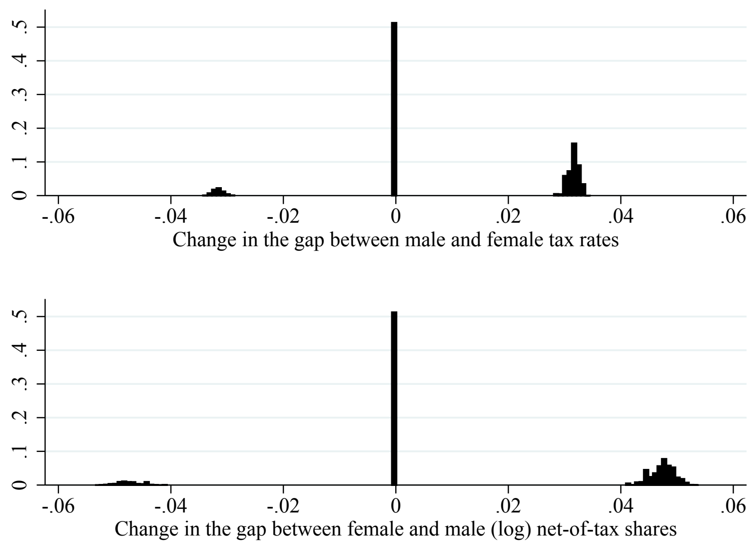
Notes. The figure illustrates the optimal time allocation of two couples, characterized, respectively, by $\beta > 0$ (smooth indifference curve) and $\beta \to 0$ (right-angle indifference curve). Their initial time allocation is identical, and is represented by point E^0. Following a cut in τ_f, the time allocation of the $\beta > 0$ couple moves to position E^1, while the time allocation of the $\beta \to 0$ couple remains unchanged.

Figure 2: Marginal tax rates before and after the EITC and the distributions of female and male earnings



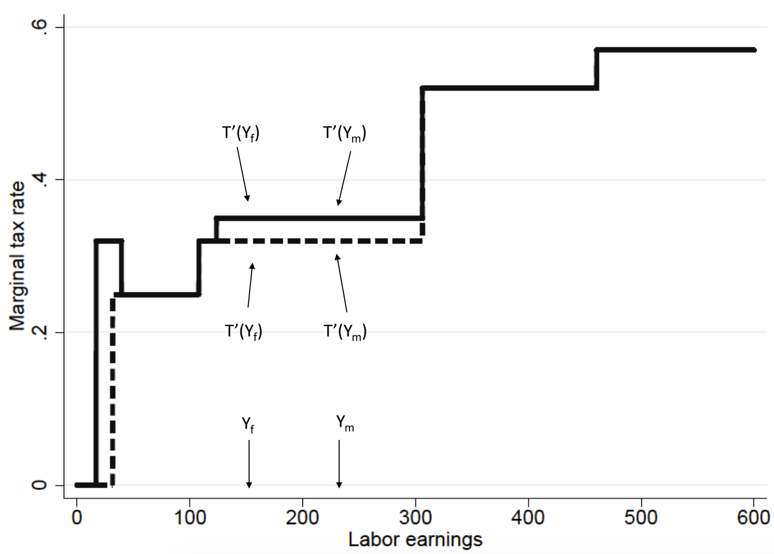
Notes. In both panels the marginal tax rate is displayed on the y-axis and labor earnings are displayed on the x-axis (in thousand SEK). The solid line represents the tax schedule before the 2007 EITC reform. The dashed line shows changes to the tax schedule introduced in 2007 by the EITC reform. All marginal taxes are calculated based on a 31.6% municipal tax rate. The left and right panels superimpose the distribution of female and male earnings, respectively, to the tax schedule. Vertical lines indicate the 25th, 50th and 75th percentiles in the earnings distributions, respectively.

Figure 3: The distribution of simulated changes in marginal tax rates



Notes. The histogram in the upper panel represents the distribution of changes in the simulated male-female tax gap, and in the lower panel it represents the corresponding distribution of changes in the simulated female-male (log) net-of-tax share.

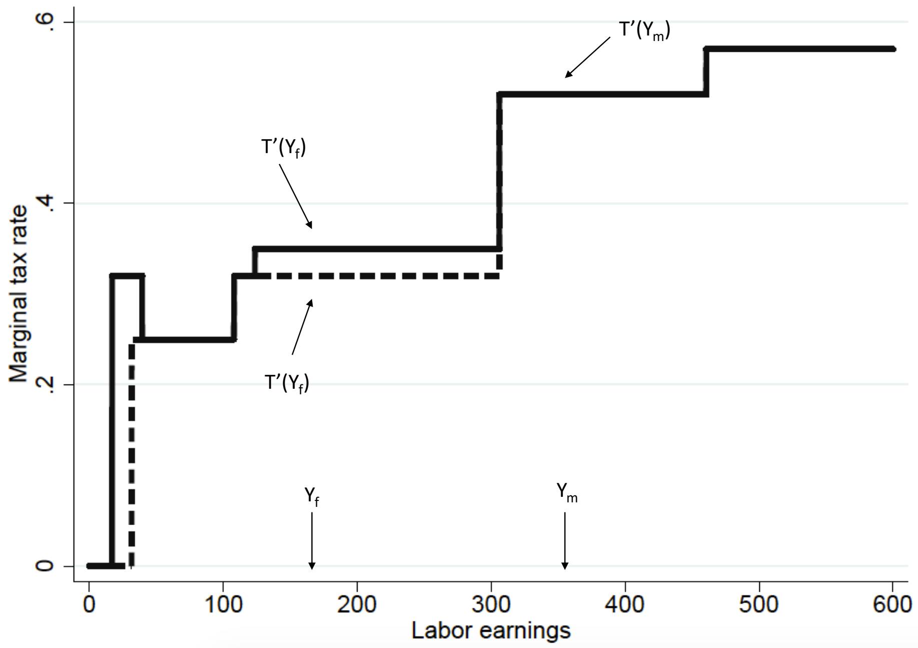
Figure 4: The case of control couples (tax gap stays unchanged)



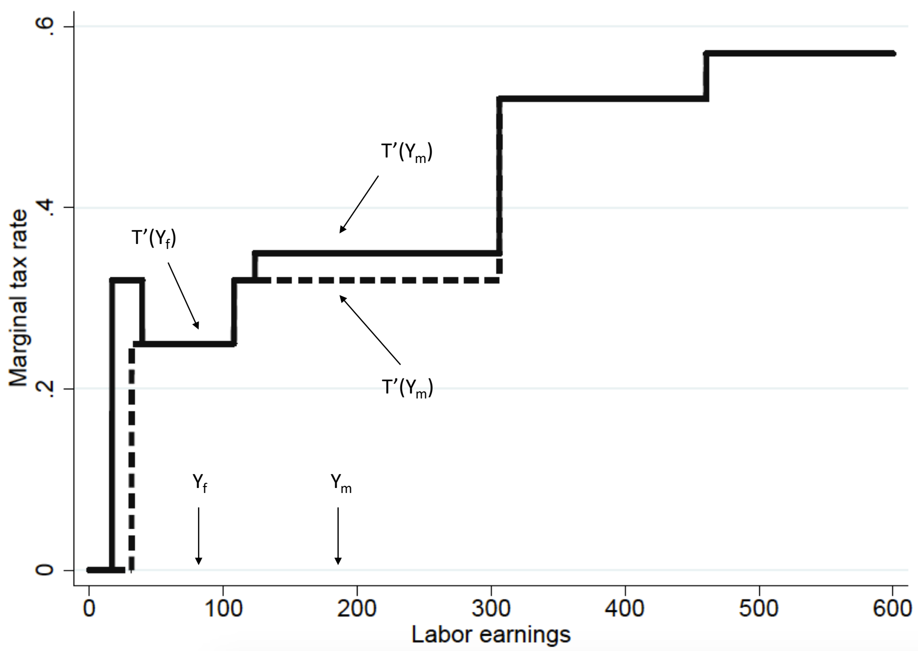
Notes: The marginal tax rate is displayed on the y-axis and labor earnings are displayed on the x-axis (in thousand SEK). The solid line represents the tax schedule before the 2007 EITC reform. The dashed line shows changes to the tax schedule introduced in 2007 by the EITC reform. All marginal taxes are calculated based on a 31.6% municipal tax rate. The figure indicates earnings and tax rates of spouses in a hypothetical couple experiencing no change in their tax gap, as the husband and the wife experience identical cuts in their marginal tax rates.

Figure 5: The case of treated couples

Panel A: "Treated +" couples (tax gap increases)

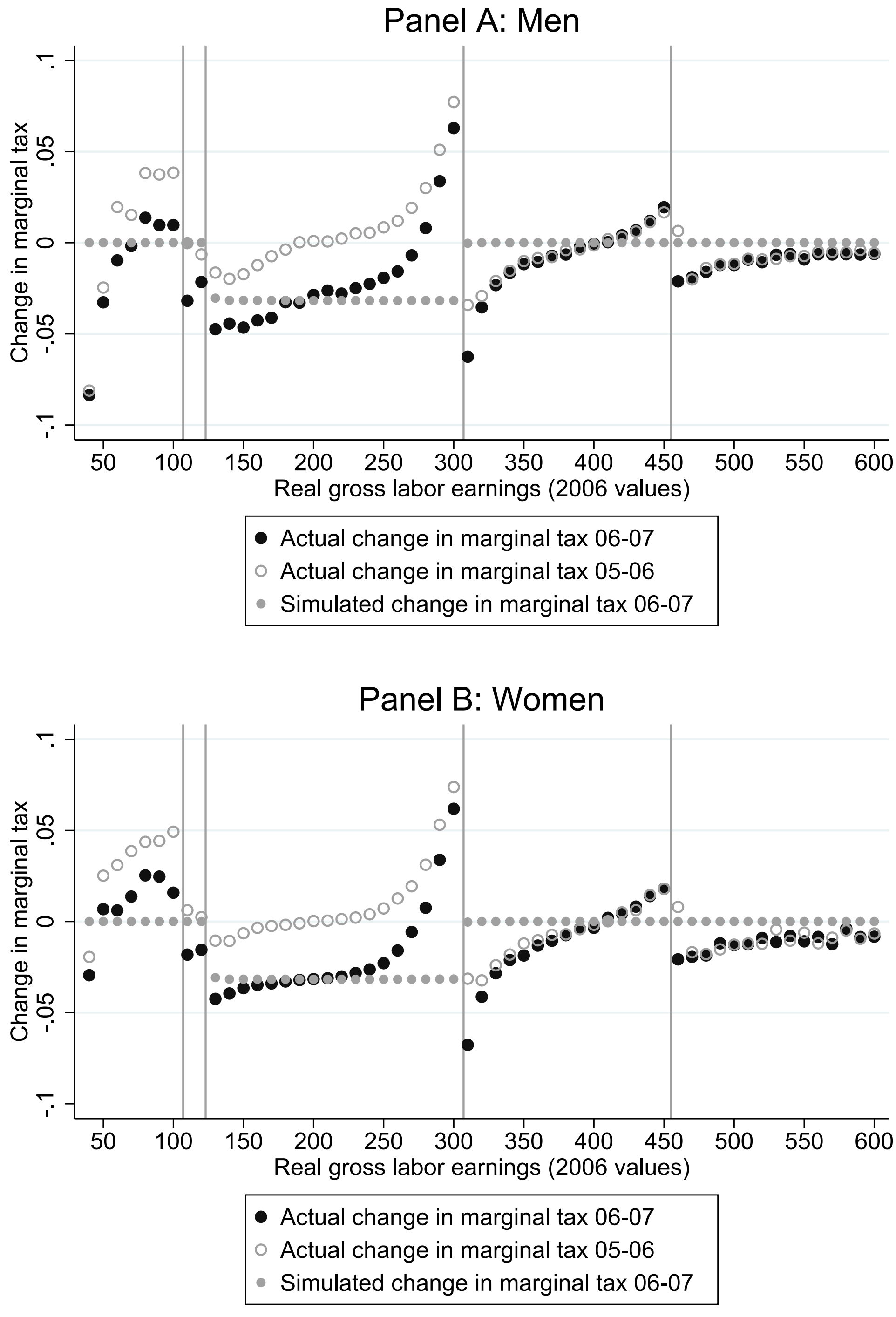


Panel B: "Treated –" couples (tax gap decreases)



Notes. The marginal tax rate is displayed on the y-axis and labor earnings are displayed on the x-axis (in thousand SEK). The solid line represents the tax schedule before the 2007 EITC reform. The dashed line shows changes to the tax schedule introduced in 2007 by the EITC reform. All marginal taxes are calculated based on a 31.6% municipal tax rate. Panel A indicates earnings and tax rates of spouses in a hypothetical couple experiencing an increase in their tax gap (via a cut in the wife's tax rate), while Panel B indicates earnings and tax rates of spouses in a hypothetical couple experiencing a decrease in their tax gap (via a cut in the husband's tax rate).

Figure 6: Actual and simulated marginal tax changes



Notes. Changes in marginal tax rates are displayed on the y-axis and real labor earnings (in thousand SEK) are displayed on the x-axis.