Tax Planning of Married Couples and Intra-Household Income Inequality

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Abstract

This paper examines tax planning of married couples under separate taxation. It shows that concerns about the intra-household income distribution prevent couples from minimizing tax payments. The empirical analysis exploits a specific feature of the German tax system, which allows married couples to save taxes by deviating from the default symmetric payroll-tax treatment and assigning favorable tax treatment to the primary earner and unfavorable tax treatment to the secondary earner. Based on a representative random sample of individual tax files, we find that a couple is less likely to choose the tax-minimizing treatment if tax planning is associated with a larger decline of the net-of-tax income of the secondary earner. This applies regardless of whether the husband or the wife is the main earner. However, couples where the wife is the main earner are generally more reluctant to assign the more favorable tax treatment to the wife.

Keywords: Tax Planning; Tax Avoidance; Tax Arbitrage; Married Couples; Separate Taxation; Family Decision Making; Gender Differences; Payroll Tax; Individual Tax Returns

JEL Classification: H26; D13

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1 Introduction

Various countries including the US impose taxes on married couples using a system of joint taxation where couples are considered as one unit for income tax purposes. Other countries like Sweden or the UK tax husband and wive separately. While joint taxation may be more favorable on equity grounds (Gordon and Kopczuk, 2014), many economists have proposed to abolish joint taxation due to adverse effects on labor supply, since the secondary earner experiences higher marginal tax rates than under separate taxation (*e.g.*, Boskin and Shehinski, 1983; for a survey of the literature see Apps and Rees, 2010). Under separate taxation, however, households can take advantage of tax-planning opportunities. In particular, they can alter the intra-household income distribution by assigning income or deductions to individual household members in order to minimize the effective tax burden (Stiglitz, 1985). This has potentially important implications for tax burden and tax revenue (Agell and Persson, 2000; Agell, Persson and Sacklen, 2004). However, it is not obvious to what extent households are willing or able to engage in tax planning.

The literature suggests that tax payers trade off tax savings from tax planning against the cost associated with sheltering taxable activities (for a survey see Slemrod and Gillitzer, 2014). This paper argues that the cost of tax planning of married couples may need a broader interpretation, which encompasses the difficulty or unwillingness of households to deal with the required changes in the intra-household income distribution. We motivate this claim by referring to the literature on non-cooperative family decision making, in particular, to Chen and Woolley (2001). Our focus lies, however, on providing empirical evidence.

A large part of the existing empirical literature on tax avoidance and tax planning has focused

on taxation of firms. For instance, differences in the tax treatment of corporate and personal income lead to income shifting (Gordon and Slemrod, 2000). Income shifting is also found among subsidiaries of multinational corporations (*e.g.*, Hines and Rice, 1994; Grubert and Slemrod, 1998; Bartelsman and Beetsma, 2003; Hong and Smart, 2010). Pirtillae and Selin (2011) discuss income shifting between capital and labor income under a dual income tax. Evidence on income shifting among married couples is rare. Using household survey data for UK residents, Stephens and Ward-Batts (2004) show that significant reallocations of investment income occur under separate taxation. But they also note that further research is needed to explain why an overwhelming majority of households do not fully exploit tax-planning opportunities. Also Alan, Atalay, Crossley and Jeon (2010) provide support for effects of separate taxation on households' portfolio choice. Stoewhase (2011) explores German income tax data to find that more than 20% of couples leave tax-planning opportunities unexploited. Recent contributions have investigated incentives to shift income to children and the effects of anti-avoidance legislation (Bauer, Macnaughton, Sen, 2015). Jones and O'Hara (2016) consider the re-assignment of dependent children among related filers.

This paper contributes to the literature on tax planning of married couples by showing that the effect of tax planning on the intra-household income distribution actually prevents households from reaping tax savings. We exploit a specific feature of the German tax system, which allows married couples to choose among three different payroll-tax treatments. The default option is to tax the spouses separately like singles. Alternatively, couples can opt for asymmetric treatment where one of the spouses faces lower and the other spouse higher tax rates. Due to the (continuous) progressivity of the tax system, the asymmetric treatment that imposes lower tax rates on the primary earner and higher tax rates on the secondary earner is generally tax-minimizing in the

sense that it is associated with the lowest overall tax burden for the couple.[1] The third option to assign lower tax rates to the secondary earner is associated with the highest tax burden for the couple. For couples with male primary earners, based on the tax files in the dataset used below, the mean annual payroll-tax savings from the tax-minimizing treatment amount to about 2,213 euros in 2017 prices.[2]

In order to explore the role of tax savings and intra-household income inequality as determinants of tax planning, our empirical analysis employs a random-utility approach. We use a representative random sample of individual tax files and relate the observed choice to indicators of the spouses' net incomes under alternative tax treatments. While our results show that tax savings are a key driver of the choice of payroll-tax treatment, we document that there is a significant number of households that do not minimize taxes. These households typically choose the default equal treatment of the spouses although they could realize tax savings by opting for asymmetric tax treatment. We show that, under otherwise identical conditions, couples tend to abstain from tax planning if this has a strong negative impact on the after-tax income of the secondary earner. The point estimates suggest that a couple with a male primary earner is indifferent between default and tax-minimizing payroll-tax treatments if total tax savings of 1,000 euros are associated with a net-of-tax income loss of the secondary earner by about 2,139 euros. For a higher income loss of the secondary earner the couple would stick to the default symmetric treatment. Though our results show that distributional concerns matter irrespective of which of the spouses is the primary earner, we find

[1]The rationale behind the German tax system's option to choose an asymmetric treatment is to bring payroll-tax payments in line with the assessed income tax and its specific tax treatment of married couples. See Proceedings of the German Bundestag (*Bundestagsdrucksache*) 260 (1958), p.58.

[2]Since the tax payments under the payroll tax are credited against the personal income tax, which is regularly due about one year after the calendar year, the effective annual tax savings are lower. However, if a couple sticks to the wrong choice over years, the present value of losses converges to the foregone annual payroll-tax savings.

that couples where the wife is the primary earner display a general reluctance to opt for the more favorable tax treatment.

The paper is organized as follows. Section 2 presents a theoretical discussion of family tax planning by choice of the payroll-tax treatment. In section 3 the data set and the methodology of the empirical analysis are discussed. Section 4 provides empirical results. Section 5 concludes.

2 Tax Planning and Household Preferences

In this section we discuss motives for household choice among different tax treatments, in order to provide guidance for the empirical analysis. We use subscripts M, F to indicate the income of husband and wife, respectively. In order to capture the options available for taxation under the German payroll-tax system, we distinguish three different tax treatments of the spouses' incomes indexed by superscripts m, f, and s. Hence, Y_M^s, Y_F^s stands for the net-of-tax incomes of husband and wife under the default treatment, respectively. Y_M^m, Y_F^m are the net-of-tax incomes under the male-favoring payroll-tax treatment that implies a favorable tax treatment of husband's income but higher tax rates for the wife – relative to the default tax treatment. Y_M^f, Y_F^f are the incomes under the female-favoring tax treatment. It assigns a lower tax burden to the wife's income and imposes higher tax rates on the income of the husband.

In our analysis we also allow for costs of changing the payroll-tax treatment δ_M, δ_F, which may differ between spouses. Thus, by deciding on the tax treatment, a couple can choose among three

possible combinations of incomes after taxes and tax planning:

$$Y_M,\, Y_F = \begin{cases} Y_M^m - \delta_M, & Y_F^m - \delta_F & \text{(male favoring)} \\ Y_M^s, & Y_F^s & \text{(default)} \\ Y_M^f - \delta_M, & Y_F^f - \delta_F & \text{(female favoring)} \end{cases} \tag{1}$$

Note that $Y_M^m > Y_M^s > Y_M^f$ and $Y_F^m < Y_F^s < Y_F^f$.

For simplicity, in the following discussion we focus on a couple with a male primary earner, *i.e.* the husband has higher income than the wife. If the couple simply maximizes joint income, it favors option m over s whenever the total net-of-tax income is higher. Formally, the corresponding condition for choosing treatment m rather than s is

$$Y_M^m - Y_M^s - \delta_M > Y_F^s - Y_F^m + \delta_F.$$

The left-hand side captures the husband's benefit from choosing the male-favoring option rather than the default symmetric treatment. The right-hand side captures the income loss of the wife under the male-favoring option compared to the symmetric choice. Due to the convexity of payroll taxation, $Y_M^m - Y_M^s$ generally exceeds $Y_F^s - Y_F^m$. As a consequence, in the absence of cost of changing the payroll-tax treatment, the couple would always choose the male-favoring option. On the contrary, when the costs of changing the payroll-tax treatment δ_M, δ_F are large, the couple will stick to the default symmetric tax treatment.[3]

[3]The couple has a third option, which is the female-favoring option. But, due tax progressivity, whenever the male-favoring treatment is preferred over the symmetric treatment, both options dominate the female-favoring treatment. To see this, note that with a male primary earner the husband's benefit under the male-favoring treatment exceeds the wife's loss relative to the symmetric treatment. Formally, $Y_M^m - Y_M^s - \delta_M > Y_F^s - Y_F^m + \delta_F$. Given the convexity of the tax, the husband's benefit under the symmetric relative to the female-favoring treatment will also be larger than the wife's loss from the symmetric relative to the female-favoring treatment $Y_M^s - Y_M^f + \delta_M > Y_F^f - Y_F^s - \delta_F$. Rearranging terms, $Y_M^s + Y_F^s > Y_M^f + Y_F^f - \delta_M - \delta_F$. Hence, family income declines under the female-favoring option.

While a variety of models of household decision-making are in accordance with the hypothesis of maximization of family income, the choice of the payroll-tax treatment is less straightforward in a non-cooperative setting. In particular, if the household displays a "separation of spheres" as the spouses specialize (Lundberg and Pollak, 1993) or if neutral income transfers between spouses do not exist (Konrad and Lommerud, 1995), the allocation of income to the spouses could matter for household decisions.[4] Then, wife and husband may not be able to share the tax savings from switching to an asymmetric tax treatment and stick with the default payroll-tax treatment.

The failure to exploit tax saving opportunities can be rationalized in the non-cooperative framework provided by Chen and Woolley (2001). In this model, each of the spouses obtains utility from a private good and a household public good, given separate budget constraints. Chen and Woolley (2001) show that under certain conditions an interior equilibrium holds where both spouses contribute to the supply of the household public good. In this case, an increase in income of any spouse is associated with an increase of private consumption of both spouses as well as of the household public good. Hence, both spouses benefit from income increases, regardless of whose income grows.[5] However, given income differences between primary and secondary earner, the Nash-equilibrium may actually be a corner solution, where the spouses specialize: the household public good is provided only by the primary earner. In this situation, the secondary earner might veto a family decision that causes family income to increase if it is associated with a reduction in own income. A formal analysis of the relationships discussed here on the basis of Chen and Woolley's model is provided in the theoretical appendix (available online).

[4] See also Browning, Chiappori, and Lechene (2010). For empirical evidence, see Udry (1996), Lundberg, Pollak and Wales (1997), Attanasio and Lechene (2002) and Bobonis (2009).

[5] The irrelevance of redistribution for the choices made by the couple is a well-known finding in a setting with voluntary (private) provision of public goods (Warr, 1983, and Bergstrom, Blume, Varian, 1987).

For a couple with male primary and female secondary earner, this suggests that a couple is more likely to choose the male-favoring option, the larger the net-of-tax income increase of the husband ($Y_M^m - Y_M^s$) and the smaller the net-of-tax income loss of the wife ($Y_F^s - Y_F^m$). This prediction can be formalized using a function that assigns a value to the tax-minimizing option such that a higher value is associated with a higher likelihood that this option is chosen:

$$\begin{aligned} V^m &= (\gamma - \beta)\left[Y_M^m - Y_M^s\right] - (\gamma - \beta)\,\delta_M \\ &\quad - (\gamma + \beta)\left[Y_F^s - Y_F^m\right] - (\gamma + \beta)\,\delta_F. \end{aligned} \tag{2}$$

The first two terms capture the net-of-tax income effect for the husband; the last two terms refer to the wife. β captures the extent to which the couple's choice deviates from the maximization of the total net-of-tax income. If $\beta = 0$, the prediction is consistent with an interior equilibrium, where the income changes of the two spouses are equally weighted. In this case, the value assigned to the male-favoring treatment is a monotonous function of the net-of-tax family income. However, in a corner solution where the secondary earner does not contribute to the household public good, we have $\beta > 0$, and the value function would assign a higher weight to the net-of-tax income effect for the wife.

Based on the value function, for an arbitrary distribution of the costs of changing the default tax treatment δ_M, δ_F, we can predict that a couple is more likely to choose the male-favoring option the more the income of the husband increases and the less the income of the wife declines. If the couple specializes in the sense that the household public good is only provided by the husband, the wife would veto a pure redistribution of incomes.

Note that the formalization of the choice of the payroll-tax treatment is observationally equivalent to a model that predicts the choice of the payroll-tax treatment based on the potential tax savings allowing for inequity aversion, a concept that was introduced by Fehr and Schmidt (1999).[6] This becomes obvious by a reformulation of the value function (2):

$$\begin{aligned} V^m &= \gamma\left[(Y_M^m - Y_M^s - \delta_M) + (Y_F^m - Y_F^s - \delta_F)\right] \\ &\quad -\beta\left[(Y_M^m - Y_M^s - \delta_M) - (Y_F^m - Y_F^s - \delta_F)\right] \end{aligned} \tag{3}$$

The first term in squared brackets captures the effect of tax planning on the couple's total income. Its impact on the value function is captured by the parameter γ. The second term in squared brackets captures the effect of tax planning on the couple's income differential. The larger the income differential under tax planning, the larger this second term will be. Hence, with $\beta > 0$, the impact of tax planning on the intra-household distribution of incomes tends to lower the value assigned to the male-favoring tax treatment. Possibly, the symmetric treatment is preferred, even if this implies higher total tax payments.[7]

Following Chen and Woolley (2001), the analysis could be enriched by allowing for intra-household transfers.[8] This is of particular interest, since spouses care for each other and hence, assess outcomes not by focusing entirely on their own utility but also on the utility of the spouse. In this case, each spouse assesses the outcomes of family choice based on an individual welfare function that also

[6] In a comparative experimental study Beblo *et al.* (2016) find that German couples are more averse against intra-household inequality and less concerned with income maximization than French couples.

[7] If $\beta = \gamma$, family utility follows a Rawlsian maximin principle where the family aims at maximizing the net-of-tax income of the secondary earner.

[8] Chen and Woolley (2001) also discuss an extension with cooperative bargaining where the basic non-cooperative outcome determines the spouses' threat-points. However, in case of a corner-solution the model's predictions remain unchanged.

depends on the private consumption of the other. Chen and Woolley show that in this case a lower threshold can be determined where a voluntary transfer is paid from the primary to the secondary earner. This would suggest that if the income of the secondary earner is very small, the couple might always prefer the payroll-tax treatment that maximizes family income, as Becker's (1974) Rotten Kid theorem holds. But even in this more general framework, there is a range of incomes of the secondary earner where the redistributive effect of tax planning prevents the couple from exploiting tax planning opportunities.

While we have focused in this section on the case of a male primary earner, qualitatively identical predictions hold for tax planning in the case of a female primary earner. From a broader perspective, however, couples with a female primary earner may show quantitatively different effects. Bertrand, Kamenica, and Pan (2015) note that behavioral patterns differ between couples with a male and female primary earner. They argue that those differences may come from the violation of a social norm that "a man should earn more than the wife". In the context of payroll-tax planning, this would suggest that the costs of deviating from the symmetric payroll-tax treatment could differ. For instance, the violation of the norm could show up in higher cost of deviating from the symmetric payroll-tax treatment for a male compared to a female secondary earner. Also, preferences with regard to the household public good might be different. Bertrand *et al.* (2015) find that household production is expanded among couples with female primary earner. In our context, the female primary earner might put her resources into a household public good that in particular benefits the husband. While a more thorough exploration of the effect of the social norm on payroll-tax planning is beyond the scope of the current paper, these considerations suggest that couples with male and female primary earner should be analyzed separately.

3 Data and Empirical Methodology

To explore family tax planning empirically, we take advantage of a specific feature of the German tax system, which allows married couples to choose among three alternative payroll-tax schedules (*Lohnsteuerklassen*). Introduced in 1975, schedules are labeled as Schedule 3, Schedule 4 – the default, and Schedule 5. The other schedules (1, 2, and 6) apply only to single–person households. Schedule 4 treats both partners similarly and is the default schedule.

Relative to Schedule 4, Schedule 3 implies lower individual tax rates and Schedule 5 higher individual tax rates. Couples are restricted to choose certain tax schedule combinations: when they opt to assign the more favorable Schedule 3 to the husband, the wife is automatically assigned the unfavorable Schedule 5, and *vice versa*. Choice of Schedule 4 for both spouses corresponds to what is referred to above as the symmetric treatment s. When the couple assigns Schedule 3 to the husband and Schedule 5 to the wife, they opt for the male-favoring treatment m. When they assign Schedule 5 to the husband and Schedule 3 to the wife, the couple chooses the female-favoring treatment f.

A deviation from the default symmetric tax treatment requires the explicit consent of both spouses. Moreover, each of the spouses can withdraw the consent unilaterally with the consequence that the couple is assigned the default tax treatment. However, the choice of the tax schedule as well as the withdrawal from an option can be exercised regularly only until end of November for the upcoming year.[9]

Given tax progressivity, when the incomes of the spouses differ sufficiently, the male- or the female-

[9]See the Leaflet on the Choice of Tax Code for Employee Spouses for the Year 2004 (*Merkblatt zur Steuerklassenwahl bei Arbeitnehmer-Ehegatten fuer das Jahr 2004*), Ministry of Finance, Berlin.

favoring options minimize total tax payments, even though they are associated with a loss in net-of-tax income for one of the partners relative to the default tax treatment s. If the husband has sufficiently higher earnings, the male-favoring treatment minimizes total tax payments. The female-favoring option would actually imply a higher total tax burden even compared to the symmetric treatment in this case and is therefore dominated by the other two options. Conversely, if the wife has higher earnings, the female-favoring treatment minimizes the family tax burden. In this case, the male-favoring option is clearly dominated.

Note that tax advantages and disadvantages only relate to the payroll tax. Since the tax payments under the payroll tax are credited against the personal income tax, which is regularly due about one year after the calendar year, the effective tax savings are lower. However, if the household sticks to an unfavorable choice over the years, then the present value of losses converges to the foregone annual payroll-tax savings.

3.1 Data Description

In order to explore the actual choices made by married couples, we use individual tax return data. More specifically, we use data from the German income tax statistics (*Lohn– und Einkommensteuerstatistik*) provided by the Federal Statistical Office. The dataset is based on a representative sample drawn from the whole population of all tax returns filed for the year 2004 in Germany. We focus on married couples where both spouses have earnings from dependent employment so the payroll tax is relevant.

Table 1 presents descriptive characteristics for the data used in this study. After dropping observations where the predicted tax payments differ from actual tax payments (see appendix) and where

Table 1: DESCRIPTIVE STATISTICS

subsample A: m minimizes tax payments		cases	mean	st. dev.	median
tax-minimizing choice	$I\,(min)$	181,022	0.795	0.404	1
husband's benefit from male-favoring choice (T€)	$Y_M^m - Y_M^s$	181,022	5.511	2.183	4.690
wife's loss relative to symmetric choice (T€)	$Y_F^s - Y_F^m$	181,022	2.979	1.372	3.045
total income (gross) (T€)		181,022	63.343	33.570	55.233
income difference (T€)		181,022	30.360	25.714	24.213
income husband (gross)		181,022	48.444	27.731	41.629
income wife (gross)		181,022	18.085	10.580	16.149
additional taxes (binary)		181,022	0.281	0.450	0
share income substitutes husband		181,022	0.000	0.002	0
share income substitutes wife		181,022	0.000	0.004	0
cost of tax consulting (T€)		181,022	0.059	0.219	0
age difference		181,022	2.505	3.759	2
age husband		181,022	45.561	7.905	46
number of children		181,022	1.151	0.973	1
children dummy		181,022	0.690	0.462	1
religious affiliation husband (binary)		181,022	0.563	0.496	1
west (binary)		181,022	0.860	0.347	1
municipality type (ordinal scale)		181,006	7.643	4.790	8
subsample B: f minimizes tax payments					
tax-minimizing choice	$I\,(min)$	25,671	0.230	0.421	0
wife's benefit from female-favoring choice (T€)	$Y_F^f - Y_F^s$	25,671	4.934	1.813	4.237
husband's loss relative to symmetric choice (T€)	$Y_M^s - Y_M^f$	25,671	3.712	1.381	3.440
total income (T€)		25,671	63.748	32.225	54.715
income difference (T€)		25,671	-18.934	13.735	-15.639
income husband (gross)		25,671	24.258	14.319	21.123
income wife (gross)		25,671	43.192	19.959	37.696
additional taxes (binary)		25,671	0.171	0.376	0
share income substitutes husband		25,671	0.000	0.007	0
share income substitutes wife		25,671	0.000	0.000	0
cost of tax consulting (T€)		25,671	0.053	0.210	0
age difference		25,671	2.331	4.366	2
age husband		25,671	46.320	8.722	47
number of children		25,671	0.792	0.873	1
children dummy		25,671	0.544	0.498	1
religious affiliation husband (binary)		25,671	0.333	0.471	0
west (binary)		25,671	0.552	0.497	1
municipality type (ordinal scale)		25,666	7.454	5.058	7

Descriptive statistics based on a random sample drawn from the whole population of the income tax returns filed for the year 2004 in Germany using sample weights. Subsample A comprises 181,022 couples where the husband has higher earnings such that the male-favoring payroll-tax treatment is the tax-minimizing choice. Subsample B includes 25,671 couples where the wife has higher income such that the female-favoring payroll-tax treatment is tax-minimizing. T€: Current values in thousand euros. See appendix for definitions of variables.

incomes are approximately similar, and after dropping observations with missing explanatory variables, the sample consists of 206,693 observations (couples). Since households where husband or wife are primary earners might display behavioral differences, the empirical analysis explores these couples separately. The subsample A comprises couples where the husband has higher earnings such that the male-favoring treatment would be tax-minimizing. It consists of 181,022 cases. Subsample B includes couples where the wife has higher income such that the female-favoring option is tax-minimizing. It consists of 25,671 cases.

As noted above, due to tax progressivity, whenever the tax treatment favoring the primary earner is preferred over the symmetric treatment, it also dominates the treatment favoring the secondary earner. This dominance of the option favoring the primary earner is also reflected in the data. In subsample A about 80% of the couples choose the minimizing option, the rest almost exclusively opts for symmetric treatment. The female-favoring schedule is chosen only by about 0.04% of households. In subsample B only 23% percent choose the female-favoring schedule, which is associated with the lowest tax payments. In this subsample, the majority of households opts for the symmetric schedule. Only 0.83% of households opts for the male-favoring schedule.

Figure 1 plots the shares of the chosen payroll-tax treatments against the (pre-tax) income difference between husband and wife. It indicates that the husband is more likely to be subject to the male-favoring schedule when he has higher earnings and the income difference is large. Similarly, if the wife has higher earnings, she is more likely to enjoy the female-favoring option if the income difference is large. These patterns are basically in accordance with tax-minimization since the couples deviate from the default treatment and opt for a tax-minimizing choice if the income differential is large and, hence, larger tax savings can be reaped. However, the graph also highlights

an asymmetry between households where the wife has higher income and households where the husband has higher income. In the latter case, the male-favoring payroll-tax schedule is the most frequent choice. In the former case, the symmetric payroll-tax schedule is chosen much more often. Compared to the male-favoring schedule in the group of households where the husband has higher income, the female-favoring schedule is clearly underrepresented in this group of households.[10]

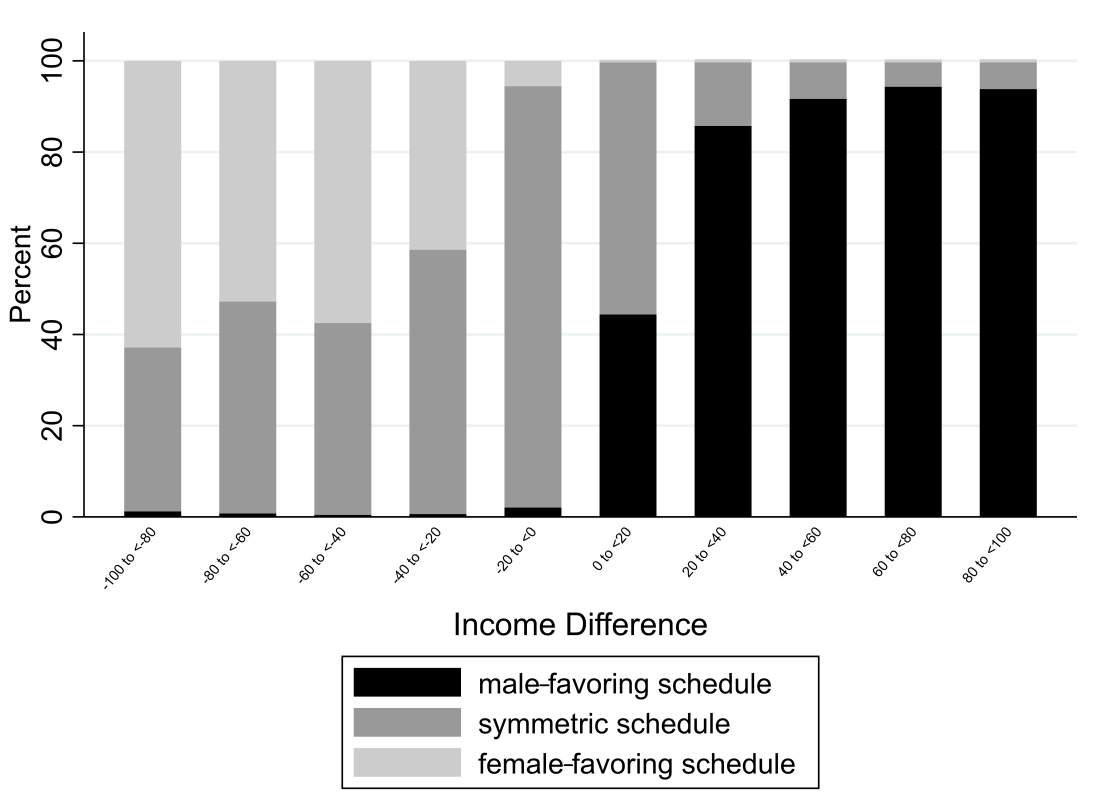
In our empirical analysis, hypothetical tax payments under the different payroll-tax schedules are calculated for each couple in the dataset. The calculated tax payments allow us to determine the benefits and losses associated with the tax-minimizing option relative to the default tax treatment for each couple.[11]

As discussed above, the net-of-tax income *benefit* for the primary earner and the net-of-tax income *loss* for the secondary earner under the tax-minimizing choice relative to the symmetric tax treatment are of special interest in our analysis. In subsample A we consider the benefit in terms of the husband's net-of-tax income under the male-favoring schedule relative to the symmetric schedule (husband's benefit from male-favoring choice). The mean is reported in Table 1 with 5,511 euros. The second variable of interest in this subsample is the loss of the wife's net-of-tax income if she is taxed under the male-favoring schedule. It shows a mean of 2,979 euros. As the former figure exceeds the latter we should expect that in subsample A couples can realize substantial tax savings.

[10]The primary earner's gain and the secondary earner's loss under the tax-minimizing option relative to the default symmetric tax treatment are roughly similar in the intervals with large income differences. The means are 10.630 and 3.953 for the interval with income difference of $[-100; -80]$ and 10.816 and 3.331 for the interval $[80; 100]$ (all figures in thousand euros).

[11]It should be noted that the implemented algorithm only approximates the tax payments. One problem is, for example, that tax payments depend on the monthly earnings. If monthly earnings fluctuate, it is not possible to predict the tax payment precisely as only yearly incomes are reported. Since observations with larger discrepancies between predicted and actual treatments are dropped, for the estimation sample the algorithm provides a reasonable fit as the predicted tax payments are very close to the actual tax payments; see appendix.

Figure 1: CHOICE OF PAYROLL-TAX TREATMENT AND INCOME DIFFERENCE



Share of all households in the dataset that have chosen a male-favoring, symmetric, or female-favoring payroll-tax treatment by labor income difference between husband and wife, weighted with survey weights. The horizontal axis reports the gross labor income difference in thousand euros. Statistics are based on a random sample drawn from the whole population of the income tax returns filed for the year 2004 in Germany. The number of observations varies between income classes. The following table reports the number of observations by the respective income difference between husband and wife:

Wife is primary earner					
Income difference (in 1,000 euros)	-100 to -80	-80 to -60	-60 to -40	-40 to -20	-20 to 0
Obs.	574	1,220	2,736	6,660	20,314
Husband is primary earner					
Income difference (in 1,000 euros)	0 to 20	20 to 40	40 to 60	60 to 80	80 to 100
Obs.	38,978	38,085	32,928	30,566	22,800

Due to data protection issues, for couples with income difference beyond 100,000 euros, the choice of the payroll-tax treatment was not available for intervals of the income difference.

In fact, the actual average of tax savings for couples where the husband earns more amounts to 1,827 euros. Expressed in terms of the current consumer price level, in 2017 prices these savings amount to about 2,213 euros. In subsample B, we consider the benefit of the wife from being taxed under the female-favoring schedule and the loss for the husband both relative to the symmetric schedule. The mean values are 4,934 euros and 3,712 euros, respectively. This indicates that the potential tax savings in this sample tend to be smaller.

Note that due to the continuous progressivity of income taxation in Germany, the two variables capturing benefits and losses associated with the tax treatments implicitly capture the total labor income of the couple. As a consequence, the total labor income variable is not included as a separate determinant in the analysis below. However, the binary variable *additional taxes* indicates whether a couple has to pay further taxes when filing for the income tax (1=additional taxes, 0=no additional taxes). If the couple expects to get a refund anyway, it might be less keen on minimizing the payroll taxes.[12] The variable is calculated based on the difference between the assessed income tax and the payroll tax due under the tax-minimizing schedule.

The *share of income substituting transfers* for husband and wife are used as controls since the choice of the payroll-tax schedule may have effects on unemployment and parental-leave benefits. Since these benefits tend to depend on the net-of-tax income, households may choose the payroll-tax schedule in order to elicit higher benefits in expected unemployment or parental-leave spells. Controlling for the current amount of income substituting transfers helps to identify individuals that have a larger propensity to receive these benefits. *Cost of tax consulting* is included in order to capture differences in the (perceived) complexity of taxation as couples might hire a tax agent

[12]Rees-Jones (2017) provides evidence using US data that tax payers put a lot of effort in tax sheltering, if they can avoid additional tax payments.

if they find it difficult to file their income tax return. The other variables describe demographics of the married couples in the samples, including the number of children in the household.

3.2 Empirical Methodology

The empirical analysis employs a random-utility approach and relates the observed choice to the indicators of the spouses' net incomes under alternative tax treatments. As discussed in the previous section, the data is organized in two subsamples, A and B, where either m or f are the tax-minimizing choices.

We utilize a model where the value assigned to the tax-minimizing schedule relative to the symmetric schedule is the latent variable. The dependent variable $I\left(min\right)$ is a binary variable, which has a value of one if the tax-minimizing schedule is implemented. When the symmetric option is chosen, it has a value of zero. Since the third option is dominated, we can focus on two options.

Consider subsample A, where tax schedule m is minimizing. The above value function (2) indicates that the male-favoring option is, *ceteris paribus*, assigned a higher value the larger the net-of-tax income increase of the male primary earner and the smaller the loss in the female secondary earner's net-of-tax income. The empirical analysis treats the cost of deviating from default payroll-tax treatment (δ_M, δ_F in the theoretical model) as a random variable and focuses on the income benefit of the husband and the income loss of the wife as basic determinants. Hence, the value function underlying the empirical analysis is

$$V^m = (\gamma_A - \beta_A)\left[Y_M^m - Y_M^s\right] - (\gamma_A + \beta_A)\left[Y_F^s - Y_F^m\right] + \epsilon_A,$$

where ϵ_A is the random component in the assessment of the payroll-tax treatment capturing the cost of deviating from the default symmetric tax treatment. For subsample B, the value function is

$$V^f = (\gamma_B - \beta_B)\left[Y_F^f - Y_F^s\right] - (\gamma_B + \beta_B)\left[Y_M^s - Y_M^f\right] + \epsilon_B.$$

The empirical estimation employs a logit model, which assumes that ϵ_A, ϵ_B are logistically distributed. In subsample A, the probability of choosing the tax-minimizing schedule is expected to increase with the benefit of the husband under the male-favoring schedule relative to the symmetric schedule $(Y_M^m - Y_M^s)$ and to decline with the loss of the wife if the male-favoring rather than the symmetric schedule is chosen $(Y_F^s - Y_F^m)$. Formally,

$$P\left(I_A\left(min\right) = 1\right) = \frac{\exp\left[\left(\gamma_A - \beta_A\right)\left(Y_M^m - Y_M^s\right) - \left(\gamma_A + \beta_A\right)\left(Y_F^s - Y_F^m\right) + b_A X\right]}{1 + \exp\left[\left(\gamma_A - \beta_A\right)\left(Y_M^m - Y_M^s\right) - \left(\gamma_A + \beta_A\right)\left(Y_F^s - Y_F^m\right) + b_A X\right]},$$

where X is a vector of control variables. The coefficients are obtained by maximum likelihood estimation, taking account of the sampling weights of the observations. For subsample B we proceed analogously.

To test and control for possible confounding factors, the empirical analysis uses a set of variables that capture differences in the likelihood to switch away from symmetric tax treatment unrelated to the payroll-tax savings. This includes incomes from other sources, cost of tax consulting, the age of the spouses, the number of children, liability to church taxes and region dummies.

The data captures a single cross-section of taxpayer couples. As a consequence, we cannot follow the spouses incomes and their choice of the payroll-tax treatment over time. Hence, income fluctuations

can only be captured indirectly, *e.g.* by including transfer incomes as a control variable. Also other controls like age, age difference, and number of children are likely to capture differences between couples in the fluctuation of labor market outcomes.

4 Results

Table 2 provides estimation results for the probability that the male-favoring schedule is chosen. The sample focuses on couples where this is actually the tax-minimizing choice as the wife has lower earnings (subsample A). The table provides average marginal effects; the coefficient estimates are provided in the appendix (see Table B.1).

The variables of main interest show effects that are significantly different from zero at a 1 percent level. A larger benefit for the net income earned by the husband is associated with a significantly larger probability to choose the male-favoring schedule. The point estimate in specification (1) indicates that tax savings on the husband's earnings of 1,000 euros raise the probability of choosing the tax-minimizing payroll-tax schedule by 7.1%. The loss in the net-of-tax income for the wife, if the male-favoring rather than the symmetric schedule is chosen, exerts a significant negative effect. The point estimate suggests that a loss in the wife's net-of-tax income by 1,000 euros relative to symmetric tax treatment reduces the probability of choosing a tax-minimizing payroll-tax schedule by about 18.0%. This suggests that the loss in the wife's net-of-tax income under the tax-minimizing relative to the default symmetric tax treatment exerts a stronger effect on the choice of the tax treatment than the benefit of the husband. Given a certain amount of total potential tax savings, therefore, it becomes more likely that the household sticks to the symmetric schedule if the loss in the wife's income relative to the symmetric tax treatment increases.

Table 2: CHOICE OF TAX TREATMENT: HUSBAND IS PRIMARY EARNER

Controls	(1)	(2)	(3)
husband's benefit from male-favoring choice	0.071***	0.065***	0.058***
	(0.002)	(0.002)	(0.002)
wife's loss relative to symmetric choice	-0.180***	-0.166***	-0.160***
	(0.003)	(0.003)	(0.003)
share income substitutes male	-0.552	-0.811	-0.455
	(1.440)	(1.384)	(1.236)
share income substitutes female	-0.850*	-0.646	-0.547
	(0.436)	(0.542)	(1.050)
additional taxes (yes/no)	-0.009	-0.000	-0.010
	(0.007)	(0.007)	(0.007)
cost of tax consulting	-0.004	-0.013	-0.016*
	(0.008)	(0.009)	(0.009)
age difference		0.003***	0.002**
		(0.001)	(0.001)
age male		0.001	0.001
		(0.003)	(0.003)
age male (squared)		-0.000	-0.000
		(0.000)	(0.000)
number of children		0.046***	0.044***
		(0.005)	(0.005)
children dummy		0.000	0.013
		(0.010)	(0.010)
religious affiliation male		0.070***	0.022***
		(0.005)	(0.005)
west dummy			0.179***
			(0.004)
municipality type			-0.002***
			(0.001)
N	181,022	181,022	181,006

The dependent variable is a binary indicator with value unity if the tax-minimizing payroll-tax schedule has been chosen. Logistic regression results based on a random sample from the German income tax statistics of 2004. The estimation uses sampling weights and the sample consists of couples where the husband has higher earnings such that the male-favoring schedule would be tax-minimizing. The table reports average marginal effects; the coefficient estimates are provided in the appendix. Standard errors obtained using the Delta-method in parentheses. Stars denote level of significance according to $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The controls in specification (1) include a dummy for additional taxes, indicators of the share of income substitutes for husband and wife and of the cost of tax consulting. The significantly negative effect of the share of income substitutes in the wife's income supports the view that couples where the wife has a higher risk of receiving welfare payments have an incentive to increase her net earnings in order to increase expected future benefits. Specifications (2) and (3) include various further control variables that capture household characteristics, such as the age difference (age of husband minus age of wife), age of the husband, squared age of the husband, number of children, a dummy for the existence of children, and church affiliation. Since the tradition of income taxation is different in the two parts of unified Germany, and since preferences also regarding gender roles differ between east and west (*e.g.*, Campa and Serafinelli, 2018), we also include a dummy for West Germany. To control for urbanization effects, we include an indicator of the municipality type (small number indicates higher degree of urbanization).

Significant effects are found for the age difference. They suggest that age heterogeneity makes it easier for the couple to cooperate and to make a tax-minimizing choice. Tax-minimizing choices are also more likely if the household includes children. This may point to a higher level of cooperation, but may simply reflect the fact that the gains from a tax-minimizing choice are larger if a tax allowance for children can be claimed in church-taxes and the federal solidarity surcharge, which are both piggybacking on the payroll tax. Similarly, the religious affiliation could reflect differences in the family decision process or, alternatively, reflect the fact that paying church taxes increases the benefit from a tax-minimizing choice.

Table 3 shows the average marginal effects obtained for families where the wife earns more such that the female-favoring schedule is tax-minimizing (subsample B). For the coefficients of the logit

Table 3: CHOICE OF TAX TREATMENT: WIFE IS PRIMARY EARNER

Controls	(1)	(2)	(3)
wife's benefit from female-favoring choice	0.093***	0.090***	0.079***
	(0.005)	(0.004)	(0.004)
husbands's loss relative to symmetric choice	-0.202***	-0.197***	-0.189***
	(0.008)	(0.007)	(0.007)
share income substitutes male	0.154	0.464	0.641
	(0.615)	(0.594)	(0.585)
share income substitutes female	37.113	33.526	39.342
	(44.99)	(44.65)	(49.22)
additional taxes (yes/no)	-0.015	0.006	-0.008
	(0.018)	(0.017)	(0.017)
cost of tax consulting	0.060*	0.071**	0.045
	(0.034)	(0.034)	(0.030)
age difference		-0.001	-0.002
		(0.002)	(0.002)
age male		-0.008	0.003
		(0.008)	(0.008)
age male (squared)		0.000	-0.000
		(0.000)	(0.000)
number of children		0.012	0.016
		(0.012)	(0.012)
children dummy		-0.020	0.004
		(0.023)	(0.023)
religious affiliation male		0.060***	0.017
		(0.015)	(0.015)
west dummy			0.146***
			(0.015)
municipality type			-0.001
			(0.001)
N	25,671	25,671	25,666

The dependent variable is a binary indicator with value unity if the tax-minimizing payroll-tax schedule has been chosen. Logistic regression results based on a random sample from the German income tax statistics of 2004. The estimation uses sampling weights and the estimation sample consists of couples where the wife has higher income such that the female-favoring schedule is tax-minimizing. The table reports average marginal effects, the coefficient estimates are provided in the appendix. Standard errors obtained using the Delta method in parentheses. Stars denote level of significance according to $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

estimation see Table B.2 in the Appendix. Qualitatively, the results are similar to those found for the subsample A, where the husband has higher income. If the wife has higher income, we find that a larger benefit for the net income earned by the wife is associated with a higher probability to opt for the female-favoring schedule. Distributional concerns also matter in this subsample, since the loss in the husband's income if the couple chooses the female-favoring rather than the symmetric schedule exerts a stronger effect in absolute terms than the wife's benefit from the female-favoring tax treatment.

Besides effects of levels and distribution of net incomes, it is interesting to note that the age differential, the number of children and the religious affiliation that exerted positive effects in subsample A do not exert significant effects in subsample B, *i.e.* for households where the wife is the primary earner. However, the lack of significance could be caused to some extent by the smaller sample size.

Table 4 provides the implied estimates of the parameters of the value function for the different specifications. For subsample A, according to the point estimates, depending on the specification, γ has a value between 1.018 and 1.059 and the parameter β capturing the effect of the increased inequality in net incomes between husband and wife has a value between 0.446 and 0.489. Quantitatively, taking the estimates of specification (3), the point estimates indicate that a household is indifferent between default taxation or engaging in tax planning with tax savings of 1,000 euros if these savings would require the secondary earner to accept a net income loss of 2,139 (=1,000 $\times$ 1.046/0.489) euros.

For subsample B, the figures are similar. In fact, according to the test statistics based on joint estimation of the logit models for both subsamples, the effect of the increased disparity in net-of-tax

incomes is the same regardless of whether the primary earner is the husband or the wife. In the light of the theoretical discussion, this suggests that the increase in the secondary earner's utility from an increase in his/her income relative to the utility increase due to the increase in the primary earner's income does not differ by gender. However, the coefficient that captures the propensity to realize tax savings differs and shows higher values in subsample B. This suggests that couples with a female primary earner are more willing than couples with a male primary earner to switch towards the tax-minimizing option if the tax savings increase, *ceteris paribus*. Since the mean of the total incomes is similar across subsamples, it seems difficult to explain this difference by a higher marginal utility of income. In the light of the theoretical analysis, a possible explanation is that the expanded consumption of the household public good is more valuable for the secondary earner in families with female primary earner than in traditional families where the husband is the primary earner.

It is tempting to relate the differences in the valuation of marginal changes in family income if the wife is the primary earner to Bertrand, Kamenica and Pan (2015). While they show that couples avoid situations where the married women earns more than her husband, they also provide evidence that if the wife earns more, she increases home production. Whereas in Bertrand *et al.* (2015) the female primary earner engages in household production, the rationale for the different valuation of family income in the light of the above theoretical discussion would be that the wife as primary earner uses the tax savings to purchase a bundle of goods that is considered more valuable by the husband. Hence, if the income of the female primary earner increases, the husband is more likely to agree to tax planning, *ceteris paribus*.

Even though the analysis shows that the probability of the tax-minimizing choice increases more

Table 4: ESTIMATES OF VALUE FUNCTION PARAMETERS

	(1)	(2)	(3)
γ_A	1.059 ***	1.018 ***	1.046 ***
	(0.020)	(0.021)	(0.022)
β_A	0.461 ***	0.446 ***	0.489 ***
	(0.008)	(0.008)	(0.009)
Controls as in Table 2:	column (1)	column (2)	column (3)
γ_B	1.265 ***	1.289 ***	1.285 ***
	(0.061)	(0.060)	(0.061)
β_B	0.465 ***	0.481 ***	0.528 ***
	(0.024)	(0.025)	(0.026)
Controls as in Table 3:	column (1)	column (2)	column (3)
F-statistic $\gamma_A = \gamma_B$	10.13 ***	17.97 ***	13.34 ***
(P-value)	(0.002)	(0.000)	(0.000)
F-statistic $\beta_A = \beta_B$	0.020	1.74	1.89
(P-value)	(0.875)	(0.188)	(0.169)

Parameter estimates are obtained by linear combinations of estimated parameters of the two logit regressions model estimated jointly. Results reported for subsample A correspond to parameter estimates for specifications (1), (2) and (3) of Table B.1. Results reported for subsample B correspond to parameter estimates Table B.2. γ is defined as $\frac{1}{2}\left(\widehat{b}_1 - \widehat{b}_2\right)$. β is defined as $\frac{1}{2}\left(\widehat{b}_1 + \widehat{b}_2\right)$. In subsample A $\widehat{b}_1$ is the coefficient of the husband's benefit from the male-favoring choice and $\widehat{b_2}$ measure the effect of the wife's loss from symmetric choice. In subsample B $\widehat{b}_1$ is the coefficient of the wife's benefit from the female-favoring choice and $\widehat{b_2}$ is the husband's loss relative to the symmetric choice. The table also reports Wald tests and P-values testing whether the equality of parameters γ and β across subsamples can be rejected. Standard errors in parentheses. Stars denote level of significance according to $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

strongly with the tax savings, the share of tax-minimizing choices is much smaller for couples with female earners compared to couples with male primary earners. As we noted above, almost 80% of the couples in subsample A, with husbands being primary earners, make tax-minimizing choices compared with only 23% in subsample B, where wives are primary earners. This may be explained partly by the differences in the magnitude of income gains and losses between subsamples. As noted above, the total tax savings are smaller in the sample where the wife is the primary earner. At the same time, the loss in income of the secondary earner when a tax-minimizing choice is made, is larger in this sample. However, Figure 1 shows that even if the income difference is large and, hence, the potential tax savings are large, a sizeable fraction of couples with female primary earner fail to choose the tax-minimizing treatment. We cannot rule out that this reflects unobserved characteristics such as higher income fluctuations of female primary earners in subsample B. But if higher fluctuation in female income explained the reluctance to opt for the female-favoring option, couples in this subsample should not only display a higher propensity to opt for a symmetric treatment but also for a treatment that favors the secondary earner. However, as is noted in section 3.1, the share of couples with a tax treatment favoring the secondary earner is below one percent in this subsample – similar to subsample A.

In terms of the theoretical discussion, the large share of symmetric choices among couples with female primary earner points to higher costs of these couples to change the default payroll-tax treatment. As the administrative process of changing the payroll-tax treatment is the same, regardless of whether a male or female-favoring option is chosen, this suggests that a broader interpretation of the cost of changing the payroll-tax treatment is required: other things including incomes being equal, couples seem to attach a value to the payroll-tax treatment *per se* and assign a higher value to the default treatment in cases where the wife is the primary earner.

5 Summary and Conclusions

This paper has provided an analysis of tax planning by married couples under separate taxation. More specifically, it has explored whether the effect on the intra-household income distribution prevents married couples from minimizing taxes. Theoretical considerations based on a family decision model with a household public good suggest that this is a possible outcome if the secondary earner uses all income for private consumption. In this case, the secondary earner might not benefit from joint income maximization and veto tax planning even if this would allow the household to save taxes.

The empirical analysis exploits a specific feature of the German tax system that allows married couples to choose the payroll-tax treatment of both partners. Depending on the level and the distribution of earnings, choosing the adequate tax schedule could save substantial tax payments. In order to realize these tax savings, however, households need to assign the income of the primary earner to a favorable tax treatment and the earnings of the second earner to an unfavorable tax treatment. Using a representative random sample of individual tax returns, we employ a random-utility approach and empirically explore the role of tax savings and intra-household income inequality as determinants of tax planning.

While our findings confirm that tax savings are a key driver of the choice of the payroll-tax treatment, our results also show that there is a significant number of households where the chosen payroll-tax treatment does not minimize the tax burden. These households typically choose equal treatment of both income earners although they could realize significant tax savings by opting for an asymmetric tax treatment. The failure to choose the tax-minimizing payroll-tax treatment is partly

explained by the effects of tax planning on the intra-household income distribution. In order to realize tax savings for the family, the partner with the lower income would have to face net-income losses due to higher taxes whereas the partner with higher income enjoys a tax reduction and an increase in net income. Our results indicate that the secondary earners' losses exert strong and significant effects on households' tax planning choices, indicating that households are less willing to reap tax savings if this requires a stronger increase in intra-household income inequality, *ceteris paribus*. Quantitatively, the point estimates suggest that a couple with male primary earner is indifferent between default and tax-minimizing payroll-tax treatment if tax savings of 1,000 euros are associated with an income loss of the secondary earner by about 2,139 euros.

Our results indicate that tax planning of married couples is not well captured by the standard view on tax planning and avoidance. Rather than the real cost associated with tax sheltering activities, the consequence for intra-household income distribution is found to prevent households from engaging in tax planning. This suggests using a broad concept of the cost of tax planning and avoidance in the context of household taxation, which encompasses the difficulty or unwillingness of households to deal with the required changes in intra-household income distribution.

From a theoretical perspective, the concerns about intra-household distribution reflect the lack of contractual arrangements that would help to share tax savings among the spouses. It is tempting to compare this with multinational tax avoidance, which requires changes in the distribution of profits among separately taxed affiliates. The empirical literature indicates that profit shifting is less pronounced with shared ownership (Desai, Foley and Hines, 2004, Hebous and Weichenrieder, 2010, Kraemer, 2015). This may be another example where tax avoidance is mitigated by difficulties to find contractual arrangements between tax-paying agents.

Our results show that distributional concerns matter irrespective of which of the spouses has higher earnings. However, comparing couples where husband or wife are primary earners, we find that there is a widespread reluctance to assign the more favorable tax treatment to the female primary earner. Thus, even though the probability of a tax-minimizing choice increases if tax savings rise, couples with a female primary earner more often stay with the default symmetric tax treatment than couples with a male primary earner. This indicates that couples attach a value to the payroll-tax treatment *per se* and assign a higher value to the default treatment in cases where the wife is the primary earner.

Appendix A: Data

A.1 Individual Tax Files

The data consists of individual income tax files, which report actual tax payments including the payroll tax. The basic data consists of a 10% random sample drawn from the whole population of all income tax returns filed for the year 2004 in Germany. A specific advantage of the data for 2004 is that it includes the payroll-tax files provided by the employers (Buschle and Schwabbacher, 2010).

We keep only married couples where both spouses report earnings from dependent employment where the payroll tax is relevant and where these earnings differ.[13] The files include information about personal taxpayer characteristics and incomes by source of the spouses. Based on this information, for each couple the annual payroll-tax payments are computed under the alternative options for the payroll-tax treatment. Thus, for each couple and each spouse, payroll taxes are computed under symmetric, male-favoring, and female-favoring options.

A.2 Computation of Payroll Tax Payments

Table A.1 shows the basic tax function according to the tax law in 2004. Y is the taxable income after allowances are deducted from gross income (except of the basic tax-free allowance which is part of the tax schedule). Table A.2 provides the allowances associated with each of the three schedules. To compute the tax payments we adopted the algorithm from the program chart published by the

[13] Due to some fixed deductions, male or female favoring schedules are tax minimizing only, if the income difference is larger than a certain threshold level. However, the dataset reports only relatively few cases where the income difference is so small that the symmetric tax treatment is the tax-minimizing choice.

Federal Ministry of Finance for the tax period 2004.

The data reports not only the couple's choice of the payroll-tax treatment but also the actual payroll-tax payments. This enables us to compare actual with computed tax payments. In a large number of cases, discrepancies have been encountered. This likely comes from the fact that the payroll tax is paid monthly, and without information about the actual variation of incomes and determinants within the year it is not possible to perfectly reproduce annual payroll-tax payments for all couples.

Table A.1: TAXABLE INCOME AND TAX FUNCTION IN EUROS IN 2004.

Y	$T(Y)$
$0 - 7,664$	0
$7,665 - 12,739$	$(Y - 7,664) * \left[(793.10 * 10^{-8}) * (Y - 7,664) + 0.16\right]$
$12,740 - 52,151$	$(Y - 12,739) * \left[(265.78 * 10^{-8}) * (Y - 12,739) + 0.2405\right] + 1,016$
$52,152 - \infty$	$0.45 * Y - 8,845$

Basic income tax function $T(Y)$ for taxable income Y as determined by the income tax law of 2004 (§32a EStG 2004). With asymmetric schedules, the more favorable treatment is based on the splitting formula which replaces Y by $\frac{Y}{2}$ and results in tax payments of $2T\left(\frac{Y}{2}\right)$. The unfavorable treatment is based on $\max\left[2\left(T\left(1.25Y\right) - T\left(0.75Y\right)\right), 0.16Y\right]$. Note that further piggyback taxes of 9% and 5.5% are levied on income taxes by the church ("*Kirchensteuer*", *i.e.* Church Tax) and the federal government ("*Solidaritätszuschlag*", *i.e.* Solidarity Surcharge).

For those couples where it proved difficult to reproduce accurately the annual payroll-tax payments the lack of information sheds doubt also on the accuracy of the computation of gains/losses under the various payroll-tax treatments. Therefore, we dismiss observations with large discrepancies between actual payroll-tax payments and the reproduced figures. The analysis proceeds as follows. First based on the information in the tax files, we compute annual payroll-tax payments. Second, the discrepancies between these computed tax payments and the actual tax payments are calculated separately for the spouses. In a third step, observations are dropped where the discrepancy relative

to actual payments exceeds +5% for any spouse – or where the discrepancy is below -5%.

After dropping observations with larger discrepancies between actual and calculated tax payments, 223,405 observations are left in the sample.[14] In the resulting sample, the mean discrepancy between computed/predicted and actual tax payments is close to zero. Actually, the mean discrepancy relative to actual tax payments is 1.45 % for the husband and 0.28% for the wife. Half of all observations display discrepancies between -0.06% and 0% for the husband and between -0.008% and +0.01% for the wife.

Table A.2: ALLOWANCES UNDER PAYROLL TAXATION

Schedule	3	4	5
Gross income			
– Pension allowance (*Versorgungsfreibetrag §19 II EStG*)	yes	yes	yes
– Increment to pension allowance (*Zuschlag zum Versorgungsfreibetrag*)	yes	yes	yes
– Standard deduction for pensions (*Versorgungsbezuege-Pauschbetrag §9a I EStG*)	€102	€102	€102
– Allowance for elderly retired persons (*Altersentlastungsbetrag §24a*)	yes	yes	yes
–/+ Registered allowance/additional amount (*Freibetrag/Hinzurechnungsbetrag §39 a I EStG*)	yes	yes	yes
– Standard deduction for employees (*Arbeitnehmer-Pauschbetrag §9a EStG*)	€920	€920	€920
– Standard deduction for special expenes (*Sonderausgaben-Pauschbetrag §10c EStG*)	€72	€36	–
– Provisional lump sum (Vorsorgepauschale)	yes ×2	yes	–
– Child allowance*	€5,808×c	€2,904×c	–
= Taxable income			

* Child allowance is only considered for the piggyback taxes, *i.e.* Solidarity Surcharge and Church Taxes. c denotes the number of children. For employees in the public sector, a child subsidy is paid by the employer on behalf of the government. In this case, if no child allowance is claimed, the person in Schedule 3 receives the total amount for all children and the person in schedule 5 receives no child benefits. If the spouses opt for Schedules 4, the child subsidy is split. Source: §39b EStG 2004.

[14]The estimation samples use slightly less observations due to missing explanatory variables.

Table A.3: DEFINITION OF CONTROL VARIABLES.

husband's benefit from male-favoring choice	Tax savings in payroll taxes on husband's earnings under male-favoring payroll-tax schedule relative to the symmetric schedule. Only for subsample A.
wife's loss relative to symmetric choice	Tax increase in payroll taxes on wife's earnings under the male-favoring relative to the symmetric payroll-tax schedule. Only for subsample A.
wife's benefit from female-favoring choice	Tax savings in payroll taxes on wife's earnings under female-favoring payroll-tax schedule relative to the symmetric schedule. Only for subsample B.
husbands's loss relative to symmetric choice	Tax increase in payroll taxes on husband's earnings under female-favoring relative to the symmetric payroll-tax schedule. Only for subsample B.
share income substitutes	Share income substitutes is the sum of unemployment benefits, parental-leave allowance, sickness benefits, "bad weather" payments, etc. of the high income earner related to the individual gross income.
additional taxes	Binary variable indicating whether assessed income taxes (*Festzusetzende Einkommensteuer*) are higher than payroll taxes (1) or not (0).
cost of tax consulting	Cost of tax consulting is the amount paid to a tax adviser by the couple.
number of children	Number of children of the couple. Only those children counted that have required legal status (assigned to the household and below 27 years of age).
religious affiliation	Religious affiliation is a dummy variable that is 1 if the husband is either member of the Protestant or the Catholic Church and zero otherwise. The religious affiliation of husband and wife is equal for 82% of the couples in this sample.
age male, age difference	Age of husband and age differential between husband and wife at the end of 2004.
west dummy	Binary indicator for residence in former west Germany
municipality type	Density indicator following the standard classification of the federal regional planning office. 1 characterizes metropolitan areas, 7 characterizes rural areas in peripheral regions.

Appendix B: Further Results

Table B.1: COEFFICIENTS OF THE LOGIT ESTIMATION: SUBSAMPLE A

	(1)	(2)	(3)
husband's benefit from male-favoring choice	0.598 ***	0.573 ***	0.557 ***
	(0.016)	(0.016)	(0.017)
wife's loss relative to symmetric choice	-1.520 ***	-1.464 ***	-1.535 ***
	(0.027)	(0.027)	(0.029)
share income substitutes male	-4.670	-7.157	-4.358
	(12.18)	(12.22)	(11.85)
share income substitutes female	-7.189 *	-5.704	-5.241
	(3.689)	(4.789)	(10.06)
additional taxes (yes/no)	-0.0757	-0.000	-0.092
	(0.059)	(0.061)	(0.064)
cost of tax consulting	-0.0303	-0.112	-0.156 *
	(0.069)	(0.079)	(0.084)
age difference		0.024 ***	0.018 **
		(0.007)	(0.007)
age male		0.006	0.014
		(0.029)	(0.030)
age male (squared)		-0.000	-0.000
		(0.000)	(0.000)
number of children		0.403 ***	0.420 ***
		(0.478)	(0.051)
children dummy		0.002	0.129
		(0.088)	(0.094)
religious affiliation male		0.618 ***	0.207 ***
		(0.046)	(0.051)
west dummy			1.720 ***
			(0.051)
municipality type			-0.017 ***
			(0.005)
constant	3.421 ***	2.348 ***	1.303 *
	(0.070)	(0.643)	(0.671)
N	181,022	181,022	181,006

The dependent variable is a binary indicator with value unity if the tax-minimizing payroll tax schedule has been chosen. Logistic regression results using a random sample from the German income tax statistics of 2004. Results refer to the subsample (A) of married couples where husbands have higher labor earnings. Maximum likelihood estimates of a logit model using sampling weights. Standard errors in parentheses. Stars denote level of significance according to $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B.2: COEFFICIENTS OF THE LOGIT ESTIMATION: SUBSAMPLE B

	(1)	(2)	(3)
wife's benefit from female-favoring choice	0.800 ***	0.808 ***	0.757 ***
	(0.049)	(0.047)	(0.049)
husbands's loss relative to symmetric choice	-1.730 ***	-1.769 ***	-1.812 ***
	(0.080)	(0.079)	(0.081)
share income substitutes male	1.322	4.173	6.163
	(5.265)	(5.344)	(5.618)
share income substitutes female	317.713	301.379	378.067
	(385.2)	(401.4)	(472.9)
additional taxes (yes/no)	-0.127	0.054	-0.074
	(0.150)	(0.156)	(0.162)
cost of tax consulting	0.514 *	0.636 **	0.433
	(0.262)	(0.299)	(0.287)
age difference		-0.013	-0.016
		(0.184)	(0.017)
age male		-0.072	0.030
		(0.071)	(0.075)
age male (squared)		0.000	-0.001
		(0.001)	(0.008)
number of children		0.111	0.157
		(0.105)	(0.112)
children dummy		-0.181	0.041
		(0.209)	(0.217)
religious affiliation male		0.542 ***	0.161
		(0.136)	(0.146)
west dummy			1.403 ***
			(0.142)
municipality type			-0.011
			(0.013)
constant	0.875 ***	3.585 **	0.759
	(0.179)	(1.535)	(1.618)
N	25,671	25,671	25,666

The dependent variable is a binary indicator with value unity if the tax-minimizing payroll tax schedule has been chosen. Logistic regression results using a random sample from the German income tax statistics of 2004. Results refer to the subsample (B) of married couples where wives have higher labor earnings. Maximum likelihood estimates of a logit model using sampling weights. Standard errors in parentheses. Stars denote level of significance according to $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Tax Planning of Married Couples and Intra-Household Income Inequality

Appendix C: Theoretical Analysis

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A couple with male primary and female secondary earner can choose among the three combinations of income after taxation at given pre-tax incomes as in equation (1) in the paper. Each of the spouses obtains utility from a private good x and a household public good x^h with utility function

$$U_i = u\left(x_i\right) + v\left(x^h\right) \text{ with } i = M, F. \tag{C.1}$$

Denoting the contribution of spouse i to the household public good with x_i^h, the total household public good supply is $x^h = x_M^h + x_F^h$. Each of the spouses has a separate budget constraint $Y_i = x_i^h + px_i$, where Y_i is the income net-of taxes determined by equation (1) in the paper and p is the price of the private good. Utility maximization by spouse i requires that the following set of conditions holds:

$$\frac{\partial U_i}{\partial x_i^h} = v'\left(x_i^h + x_j^h\right) - \frac{1}{p}u'\left(\frac{Y_i - x_i^h}{p}\right) \leq 0 \tag{C.2}$$

$$x_i^h \geq 0 \tag{C.3}$$

$$x_i^h \frac{\partial U_i}{\partial x_i^h} = 0 \tag{C.4}$$

If equation (C.2) holds with equality, spouse i contributes to the household public good. If the condition also holds with equality for spouse j, the Nash equilibrium is characterized by

$$v'\left(x_M^h + x_F^h\right) = \frac{1}{p}u'\left(\frac{Y_i - x_i^h}{p}\right), \text{ for with } i = M, F. \tag{C.5}$$

In this case, the equilibrium is an interior solution in the sense that both spouses contribute to the household public good. Any tax planning that contributes to an increase in family income net-of-taxes will increase the utility of both spouses, even if one of the spouses faces a decline in net-of-tax income (see section C.1 below for a proof).

However, with income inequality it is not necessarily the case that the above interior equilibrium holds. Chen and Woolley (2001) show that the Nash-equilibrium may actually be a corner solution where only one of the spouses provides the household public good. Suppose the wife is the secondary earner. There is a lower threshold Y_a of net-of-tax income such that

$$v'\left(x_M^h\right) - \frac{1}{p}u'\left(\frac{Y_a}{p}\right) = 0,$$

which involves a zero contribution of the secondary earner to the household public good $x_F^h = 0$ (for the determination of Y_a see section C.2 below). If the income of the secondary earner is below this threshold, the marginal utility from private consumption is higher than the marginal utility from the household public good. Spouse F specializes and uses all her income for private consumption; the household public good is then provided only by the primary earner M. Formally, the following set of conditions hold in this case:

$$v'\left(x_M^h\right) = \frac{1}{p}u'\left(\frac{Y_M - x_M^h}{p}\right) \tag{C.6}$$

$$v'\left(x_M^h\right) \quad < \quad \frac{1}{p}u'\left(\frac{Y_F}{p}\right). \tag{C.7}$$

In this equilibrium, at low fixed costs of deviating from the default tax treatment, a switch to the tax-minimizing male-favoring tax treatment is always associated with higher utility of the primary, but not necessarily of the secondary earner. To see this, consider first the male primary earner. The above utility function (C.1) assigns a higher value to the male-favoring option, whenever the consumption of both the private and the household public good increases. Actually, as shown in section C.3 below, this is the case if the net-of-tax income of the husband increases under this option. The net-of-tax income of the husband increases, if

$$Y_M^m - \delta_M > Y_M^s.$$

This condition simply requires that the tax savings of the husband exceed his cost of switching away from the default treatment. Intuitively, equation (C.6) suggests that a higher net-of-tax income at given supply of the household public good would be associated with a decline in the marginal utility from private consumption. Restoring the optimum condition requires to expand also the supply of the household public good.

However, option m is only chosen by the couple, if also the utility of the female secondary earner increases. Although the expansion of the household public good benefits the wife, option m is associated with lower net-of-tax income for the secondary earner. This tends to cause a veto of the secondary earner against a switch to the male-favoring option, since from equation (C.7) the marginal utility derived from an expansion of the household public good is smaller than the marginal utility associated with an increase in funds available for private consumption.

Assuming that the changes in incomes due to tax planning are small, the effect on the utility of

the secondary earner in the corner solution characterized by (C.6) and (C.7) can be determined by a local approximation that focuses on marginal changes starting from the default tax treatment. More specifically, a total differential of the above utility function (C.1) suggests that the change in utility depends on the magnitude of changes in the household public good and the private good, formally

$$dU_F = v'\left(x_M^h\right) dx_M^h + u'\left(x_F\right) dx_F.$$

The change in the supply of the household public good is related to the change of the husbands's net-of-tax income via equation (C.6). The change in private consumption is related to the change of the wife's net-of-tax income through the budget constraint. Therefore, we can derive the utility effect as

$$dU_F = \left[v'\left(x_M^h\right)\frac{\partial x_M^h}{\partial Y_M^s}\right]\left(Y_M^m - Y_M^s - \delta_M\right) - \left[\frac{1}{p}u'\left(\frac{Y_F^s}{p}\right)\right]\left(Y_F^s - Y_F^m + \delta_F\right). \tag{C.8}$$

The first term in squared brackets captures the utility gain due to higher net-of-tax income of the husband. It is positive, since $\frac{\partial x_M^h}{\partial Y_M^s} > 0$, as noted above. The second term in squared brackets captures the utility gain due to an increase in the net-of-tax income of the wife. As this term is positive, a decline in the wife's income is associated with a decline in utility. The total effect of switching to the male-favoring tax treatment on the wife's utility is ambiguous.

If the loss in the wife's net-of-tax income including her cost of switching from the default payroll-tax treatment is small, utility of the wife increases. So the wife will not always veto a tax-minimizing choice. But note that if the increase in the male's net income were just equal in absolute terms to the loss in the female's net income $Y_M^m - Y_M^s - \delta_M = Y_F^s - Y_F^m + \delta_F$, the utility of the wife would decline, since $0 < \frac{\partial x_M^h}{\partial Y_M^s} < 1$ (see section C.3 below) and $v'\left(x_M^h\right) < \frac{1}{p}u'\left(\frac{Y_F^s}{p}\right)$ (from equation C.7). Hence, in the corner solution, pure redistribution would always lead to a veto.

In the case of an interior equilibrium where both spouses contribute to the household public good, the male-favoring treatment or the symmetric tax treatment always dominate the female-favoring option. This follows from the fact that, due to tax progressivity, with a male primary earner the net-of-tax family income declines under the female-favoring option relative to the symmetric option (see above, footnote 2). The female-favoring option is also dominated in case of a corner solution when the household public good is provided only by the husband. More specifically, the husband would veto the female-favoring option. To see this, note that the net-of-tax income of the male primary earner declines under the female-favoring tax treatment relative to the symmetric tax treatment. As a consequence, both consumption of the household public good as well as consumption of the male private good decline. With consumption declining, the male primary earner would suffer a loss in utility and would, therefore, veto a switch to the female-favoring option.

For a couple with male primary and female secondary earner, equation (C.8) allows us to derive empirical predictions for the case where the household public good is only provided by the husband. Given the fixed costs of changing the default payroll-tax treatment, a couple is more likely to choose the male-favoring option, the higher is the gain in the husband's income ($Y_M^m - Y_M^s$) and the smaller is the loss in the wife's income ($Y_F^s - Y_F^m$). If only the primary earner contributes to the household public good, the utility of the secondary earner increases more with the net-of-tax income of the secondary earner than with the net-of-tax income of the primary earner.

C.1 Proof: Utility Increase of Secondary Earner in Interior Equilibrium

Without loss of generality we focus on the case with the wife as secondary earner. The utility of the wife is

$$U_F = v\left(x^h\right) + u\left(x_F\right).$$

To see how utility changes when the wife agrees to the tax-minimizing payroll-tax treatment, we use a linear approximation around the symmetric option and consider the effects of the resulting changes in consumption

$$dU_F = v'\left(x^h\right) dx^h + u'\left(x_F\right) dx_F. \tag{C.9}$$

If an interior equilibrium is obtained, the first-order condition (C.2) requires

$$v'\left(x^h\right) = \frac{1}{p} u'\left(x_i\right), \quad i = M, F. \tag{C.10}$$

Using a total differential we can derive the change in private consumption dx_F as a function of the change in public consumption dx^h as

$$dx_F = \left[\frac{pv''\left(x^h\right)}{u''\left(x_F\right)}\right] dx^h. \tag{C.11}$$

As the term in squared brackets is positive, private consumption increases when the consumption of the household public good expands. Hence, from equation (C.9) we know that the utility of the wife increases if the switch to the male-favoring treatment results in an expansion of the consumption of the household public good.

In fact, x^h expands when the net-of-tax family income increases. To see this consider the individual budget constraints

$$x_i^h = Y_i - px_i, \quad i = M, F.$$

Adding up the changes in the individual contributions to the household public good

$$dx^h = dx^h_M + dx^h_F = [Y^m_M - Y^s_M] + [Y^m_F - Y^s_F] - p\,(dx_M + dx_F) - \delta_M - \delta_F.$$

Using the above relationship between the change in private and household public good (C.11), noting from (C.10) that $x_F{=}x_M$ and rearranging terms

$$dx^h \;=\; \left(\frac{u''(x_F)}{u''(x_F) + 2pv''(x^h)}\right)[(Y^m_M + Y^m_F) - (Y^s_M + Y^s_F) - \delta_M - \delta_F]\,. \tag{C.12}$$

Since the term in parenthesis is positive, consumption of the household public good increases whenever the family income increases.

C.2 Determination of the Threshold Level of Income

Suppose the income of the secondary earner, say the wife, is equal to the threshold level $Y_F = Y_a$. Since the first-order condition (C.2) holds with equality we have

$$\frac{1}{p}u'\left(\frac{Y_M - x^h_M}{p}\right) = \frac{1}{p}u'\left(\frac{Y_a}{p}\right).$$

Therefore, the total supply of the household public good is

$$x^h_M = Y_M - Y_a,$$

and the threshold level of income Y_a can be determined from first-order condition (C.2)

$$v'(Y_M - Y_a) = \frac{1}{p}u'\left(\frac{Y_a}{p}\right).$$

Note that Y_a increases in Y_M. Thus, if the couple switches from the default to the male-favoring tax-treatment, the threshold level increases.

C.3 Primary Earner's Income Effect in the Corner Solution

Equation (C.6) suggests that the provision of the household public good increases also in the corner solution with the income of the primary earner. Without loss of generality we focus on the case with male primary earner. Differentiation yields

$$\frac{\partial x_M^h}{\partial Y_M} = \left[\frac{u''\left(\frac{Y_M - x_M^h}{p}\right)}{u''\left(\frac{Y_M - x_M}{p}\right) + p^2 v''\left(x_M^h\right)} \right]. \tag{C.13}$$

Note that the expression on the right-hand side is larger than zero but smaller than unity. Therefore, if Y_M increases by one unit, the provision of the household public good increases by less than one unit. This implies that private consumption of the primary earner x_M increases as well.

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