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31 January 2009

Online at <https://mpra.ub.uni-muenchen.de/13131/>
MPRA Paper No. 13131, posted 03 Feb 2009 14:43 UTC

Pareto-Inefficiencies in Intrahousehold-Decision-Making: Empirical Evidence from Germany

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January 2009

Abstract

The present paper offers empirical evidence for pareto-inefficiencies within German households. Using a large dataset from the German income tax statistic and conducting microsimulation analysis it refutes the assumption of pareto-efficiencies underlying the unitary as well as cooperative bargaining models of the household. The analysis is based on the unique features of the German source tax on wage income which give married couples some degree of freedom when determining their total tax liability and its distribution among spouses. We interpret distributive choices that do not minimize total tax withholding as the outcome of inefficient intra-family bargaining. Our result supports the findings of previous empirical work for developing countries and call for a reconsideration of the dominant models on intrahousehold-decision-making.

Keywords: Household bargaining models, Withholding taxes, Empirics, Microsimulation

JEL Classification: D10, D31, H24, H31

Acknowledgements: Paper presented at the Conference “Income Distribution and the Family” in Kiel. I would like to thank Ray Rees and Christian Seidl for helpful comments and suggestions.

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1. Introduction

The literature on household behaviour traditionally modelled the household as one single economic agent, implying that there is a common household preference structure and family budget (Becker, 1991). In recent years, however, this unitary model has been criticised on both empirical and theoretical grounds. Extensive evidence refuting the unitary model (see e.g. Kooreman and Kapteyn, 1990; Bourguignon et al, 1993; Browning et al, 1994; Lundberg et al., 1997; Browning and Chiappori, 1998; Tiefenthaler, 1999; Attanasio and Lechene, 2002) has been accumulating. These empirical results have strengthened the standing of intrahousehold bargaining models such as those developed by Manser and Brown (1980), Chiappori (1988, 1992) and Lundberg and Pollak (1993). The above-mentioned models recognise the involvement of two or more agents with distinct preferences in determining family decision-making in a non-trivial way. However, similar to the unitary model, which ensures pareto-efficiency by definition, cooperative bargaining models still rely on the assumption of pareto-efficiency in household decision-making.

Seemingly, at least in a non-economic context, the assumption of pareto-efficiency within households is not that innocent. Especially the prevalence of destructive or wasteful phenomena such as domestic violence cast doubt on the widely used assumption of intrahousehold-efficiency. In an economic context, however, empirical evidence against efficiency is rather scarce and furthermore limited to less developed countries. Using plot-level agricultural data from Burkina Faso, Udry and others (Udry et al, 1995; Udry 1996) find that the allocation of resources within these African households is pareto-inefficient.¹ More recently, Dercon and Krishnan (2000), Duflo and Udry (2004) as well as Djebbari (2005) found similar results using data for Ethiopia, respectively Côte d'Ivoire and Mexico.

The present paper tests for pareto-inefficient decisions within German households. To the best of our knowledge, the present study is the first one that finds empirical

¹ Akresh (2007) qualifies these results to some degree by finding that pareto-inefficiencies are limited to a specific geographic region within Burkina Faso.

evidence against pareto-efficiency in the context of a developed country.² To do so, it makes use of the unique features of the German source tax on wage income which give married couples some degree of freedom when determining their total tax liability and its distribution among spouses. In most cases, a household's total tax liability can only be minimized for one specific distribution of tax payments between the two partners. This is the starting point of our analysis: If bargaining between household members is pareto-efficient, it should lead to a minimization of total tax payments. A situation in which bargaining between the two partners leads to tax payments higher than the minimum possible is a clear indicator for pareto-inefficiency. Using official income tax statistics for the year 1998 we test whether households minimize their tax payments or instead choose a different within-household distribution of taxes at the expense of a higher total tax liability.

As our calculations show, more than 20 percent of the households analysed in the sample do not minimize their tax payments. The exclusion of some possible reasons other than pareto-inefficiency does not change this result significantly, giving first evidence that at least for some German households intrahousehold-decision-making leads to pareto-inefficient outcomes.

The remainder of the paper is organised as follows: In Section 2 we provide a short overview of the principles underlying the German withholding tax on wage income and derive our main proposition to test for pareto-efficiency. Section 3 describes the data used and the methodology to compute tax payments. Section 4 presents the results of the analysis. These results are discussed in Section 5 where we conduct some limited sensitivity analysis. Section 6 concludes.

2. Institutional and Theoretical Background

Under the personal income tax, taxes levied on wage income of German employees are withheld by the employer and are directly transferred to the tax authorities on a monthly basis. Similar to the US and Canada taxes withheld from monthly wage income typically do not match the final tax liability under the personal income tax. If

² Empirical studies using data from France (Bourguignon et al, 1993) and Canada (Browning et al, 1994) have found consumption patterns generally consistent with pareto-efficiency.

the sum of taxes withheld exceeds the final tax liabilities under the personal income tax at the end of the year, the difference is refunded. In cases in which the final tax liability exceeds these taxes, the individual has to make an additional payment. Apart from the level of wage income, tax liabilities primarily depend on allowances and the individual tax class specified on the tax card.³

Depending on their personal status, employees fall in one of six tax classes from which three are relevant in the case of a married couple: Tax class IV, if both spouses receive wage income; tax class III, if only one spouse receives wage income; and tax class V, if both spouses receive wage income but one has chosen to be in tax class III instead of tax class IV. As can be seen, married couples with two wage earners have some freedom in their choice of tax classes. With the combination IV/IV⁴ as default, a combination of tax class III/V or V/III is possible if both spouses agree.

While tax class IV treats spouses as if they were taxed separately⁵ such that the formal income tax schedule applies to both spouses, tax classes III and V take into account the possibility of joint filing and income splitting.⁶ In the latter case, the basic tax allowances imbedded in the income tax schedule as well as some lump sum allowances of both partners are assigned to the spouse with tax class III while the spouse with tax class V can not make use of these allowances at all. As a result, individual taxes paid under tax class III are lower; those under tax class V are higher than with tax class IV. The choice of tax classes has a significant effect therefore on the distribution of taxes among the two partners. Moreover, due to the progressivity of the German income tax schedule, total wage taxes withheld from the family may vary up to several hundred Euros per month, depending on the choice of tax classes, total wage income of the two spouses and its distribution. Typically, tax class combination IV/IV minimizes source taxes paid in cases in which both spouses have only small wage income or when income is distributed rather equally. Tax class

³ The German tax card (Lohnsteuerkarte) is somehow equivalent to the W-4 form in the US.

⁴ The following notation is used: tax class of the male/tax class of the female.

⁵ An exception is the treatment of child allowances for the solidarity surtax. While a single individual can make use of all child allowances on his tax card, child allowances for married employees are split.

⁶ The choice of tax classes is independent from the final choice of being taxed individually or joint.

Hence, it is possible to choose tax class combination IV/IV while income is jointly taxed at the end of the year.

combination III/V, V/III respectively, minimizes source taxation when wage income is distributed unequally among partners.

Even though source taxes paid on wage income are credited against the final income tax liability at the end of the year, the different timing of tax payments may lead to behavioural responses as it determines disposal income. For instance, as Shapiro and Slemrod (1995) have shown empirically, a change in the US withholding tax in February 1992, that reduced an employee's withholding tax by about \$29 per month, led to an increase in spending on consumption goods for about forty percent of the affected taxpayers.

In many cases, the regulations described above lead to the condition that minimization of the household's total tax liability is only possible if both spouses accept a certain distribution of individual wage taxes. Once a household does not follow the unitary approach, spouses have to negotiate about tax class choices. Depending on the tax class combination chosen, individual net income of the two spouses will differ. Lessen the tax burden of one spouse will inevitably raise the tax burden of the other. If households follow the life-cycle hypothesis (see e.g. Modigliani and Brumberg, 1954) and prefer higher actual income to a tax refund in the following year, pareto-optimality implies to choose tax classes such that total withholding of the family is minimized. Possible differences between the outcome of this tax class choice and the bargaining solution can then be balanced with means of side-payments between the two partners. Contrary, if a household does not minimize its actual tax payments, this is a clear indicator for an inefficient bargaining outcome.

To give an example, think of a situation where minimization of taxes withheld from the household leads to tax payments of 20 Euros for the first person and 80 Euros for the second person. Family members instead prefer a solution where both spouses have equal tax payments. Such a distribution could be achieved with an alternative tax-class combination where each person pays 60 Euros on taxes. If the household chooses the less preferred distribution and person one makes a side-payment of e.g. 30 Euros, both spouses would be better-off, compared to the choice of the non-minimizing tax class combination.

This leads us to the main proposition of our analysis:

Conjecture: *Household decisions are pareto-efficient whenever a household minimizes its total tax payments. Household decisions are pareto-inefficient whenever a household chooses a tax class combination that does not minimize current withholding.*

Calculating a household's total tax liability for all three possible tax class combinations and comparing it with those under the tax class combination actually chosen by this household thus allows us to identify cases in which non-optimal decisions have been made.

3. Data and Methodology

Our investigation on whether married couples in Germany minimize their tax withholding from wage income relies on official tax returns for the year 1998. The German Federal Statistical Office provides us with a representative 10 percent sample of the entire taxpayer population that accounts for approximately 3 Million tax returns. In addition to a number of variables essential for the calculation of the final income tax liability, the dataset includes information about individual wage incomes, wage taxes actually paid and the tax class chosen by the taxpayer on an annual basis. For the purpose of our analysis we constrain the given dataset in a first step to married couples where both spouses earn income from wages. This leaves us with 443.000 observations representing approximately six million taxpayer units, respectively twelve million wage earners.

For each individual case, we compare the amount of wage taxes withheld under the three possible tax class combinations, IV/IV, III/V and V/III. We do so by simulation analysis. Using the personal information on wage income from the tax statistics we calculate theoretical taxes withheld for each of the combinations mentioned above. These calculations are not clear of difficulties: First, tax class changes during the year are possible. Second, due to monthly withholding and the progressive tax schedule, the precise amount of taxes withheld depends on the distribution of wage earnings during the year, such that equal annual incomes may lead to quite different tax liabilities within the same tax class. As this information is not included in our database, we make the assumption that income is distributed equally and that there has been no change in the tax class during the year as well.

Finally, our statistics provide no information about additional allowances on the tax card which may reduce the tax liability.⁷ Particularly the last problem may bias the results of a comparison between tax payments under different tax class combinations. We deal with these shortcomings by a further reduction of our sample that guarantees the accuracy of the simulated tax burden: Contrasting taxes calculated under the assumptions made above (and disregarding allowances) with taxes actually withheld under the chosen tax class combination, we exclude those cases from the analysis for which our simulation model does not yield comparable results.⁸ Thus, our database only includes those cases for which the above made assumptions hold. Excluding as well taxpayers for which tax liabilities do not differ with the tax class combination chosen, this approach leaves us with about 108.000 observations representing 1.6 Mio. taxpayer units.

By comparing tax payments as calculated by our simulation model under the three possible tax class combinations we are able to state whether the tax class combination actually chosen minimizes taxes withheld. For those cases in which the actual combination does not minimize withholding, the difference between actual and minimal withholding can be calculated. Note that the analysis ignores the solidarity surcharge and church taxes since this would further complicate our calculations. These taxes are surcharges on the amount of taxes paid and their inclusion has no effect on whether a given tax class combination is tax minimizing or not. Their inclusion will, however, increase any difference between minimal tax payments and taxes actually paid up to fourteen percent (depending on whether church taxes and the solidarity surcharge have to be paid).

4. Simulation Results

Table 1 summarizes the results of our simulation analysis. It is shown that, for a total of more than 30.000 observations, tax payments under the tax class

⁷ Allowances could be calculated in principle from the data. However, such a calculation would need information about tax class changes and monthly income as described above.

⁸ We judge a result to be “comparable” if the difference between calculated taxes and taxes actually withheld is smaller than three Euros per month. This is less than two percent of the average household’s tax liability.

combination actually chosen are higher than those computed for alternative tax class combinations. The share of these non-minimizing observations on all observations is larger than 28 percent. On average, these taxpayer units pay an extra of €164 on wage taxes each month which are only (partially) refunded after filing the tax return at the beginning of the following year. As becomes evident from a comparison with the average additional monthly tax saving of \$29 reported by Shapiro and Slemrod (1995) for the US - which led to a significant increase in consumption -, these differences in tax withholding are remarkable. Even if we use the much lower median value of about €70, it can be argued that taxpayers may have to change their consumption behaviour or forego sizeable amounts of interest payments.

Table 1: *Minimizing and non-minimizing tax class combinations*

Tax class combination is...	unweighted sample	weighted sample
tax minimizing	76.992	1.257.432
non-minimizing	30.803	386.851
% non-minimizing	0.286	0.235

To project these figures to the entire taxpayer population, we have to use case specific weighting factors included in our data set. According to Table 1 almost 387.000 or approximately 23.5 percent of all households choose a tax class combination that does not minimize withholding. As high-income households, for which potential tax savings are often larger, are overrepresented in the unweighed sample, the average and the median amount of taxes that could be potentially saved decrease to €51, respectively €23, per month in the weighted sample. Nevertheless, these numbers are quite high as potential tax savings of these households amount to a total of approximately 240 Mio. Euro per year. In fact, this amount is given as an interest-free short-term credit to the government. With respect to our conjecture from Section 2, these results provide evidence that decisions of some German two wage earner households are pareto-inefficient.

Using geographical information on taxpayer units included in our dataset, a worthwhile point for analysis is the potential heterogeneity between the eastern and the western part of Germany. Several studies have shown that people in the eastern part of Germany still behave differently from their West German counterparts. For the case of tax evasion, Torgler (2003) shows that tax morale in East Germany was

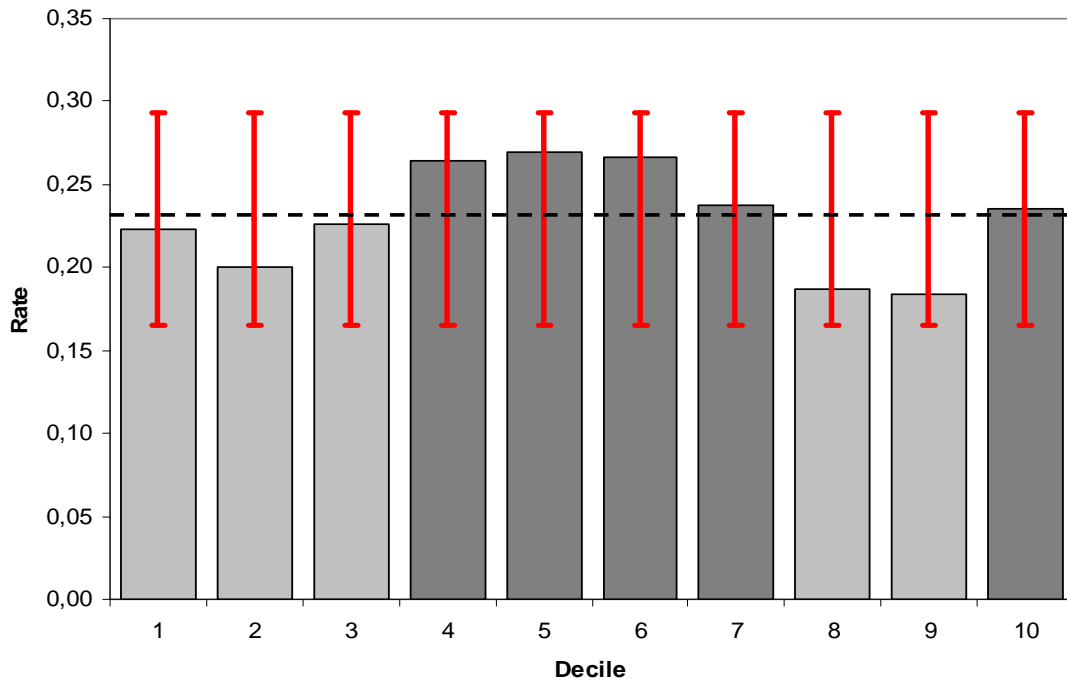
significantly higher than in West Germany in the first years after reunification. Moreover, using plot-level data from Burkina Faso, Akresh (2007) finds that pareto-inefficiencies in intrahousehold allocations are limited to certain regions. In Table 2 we therefore distinguish between households residing in the eastern and the western part of Germany. It becomes visible that with a fraction of about 34 percent, far more East than West German couples chose a non-minimizing tax class combination. While the fraction of non-minimizing households in West Germany is approximately 26 percent in the unweighted sample, this number reduces to less than 19 percent in the weighted sample. The comparable high value for East Germany thereby primarily stems from the fact that most households chose tax class combination IV/IV irrespective whether this minimizes source taxation or not. While we can give no ad hoc explanation for the differences between East and West Germans with our data, it may be possible that West Germans are more likely to follow the male-bread-winner principle, while socialistic up-bringing of East Germans produced more emancipated woman that try to minimize their personal rather than total tax payments even if this is pareto-inefficient from the perspective of the entire household.

Table 2: *Minimizing and non-minimizing tax class combinations by region*

Tax class combination is...	unweighted sample		weighted sample	
	West Germany	East Germany	West Germany	East Germany
tax minimizing	54.608	22.384	906.545	350.887
non-minimizing	19.071	11.732	207.848	179.003
% non-minimizing	0.259	0.344	0.187	0.338

Finally, we analyse whether the fraction of non-minimizing tax class choices differs between income groups. Figure 1 displays the rate of non-minimizing tax class choices by income deciles in the weighted sample. Households are classified according to their total wage income. With rates ranging from a minimum of 0.183 to a maximum of 0.269 there is indeed some heterogeneity between income groups. However, neither is there a systematic correlation between non-minimizing households and income, nor do rates for individual deciles significantly deviate from the average. It indicates that our results are not driven by specific groups of taxpayers but can instead applied to the whole taxpayer population analysed.

Figure 1: *Non-minimizing tax class combinations by income group*



5. Discussion and Sensitivity Analysis

Our simulation analysis revealed that the tax class combination actually chosen does not minimize withholding in a remarkable number of cases. Following our conjecture from Section 2 above, this result implies that intra-household decision-making of some households leads to pareto-inefficient outcomes. However, there may be some alternative explanations why households choose a tax class combination other than those minimizing tax withholding.

Strategic Choices

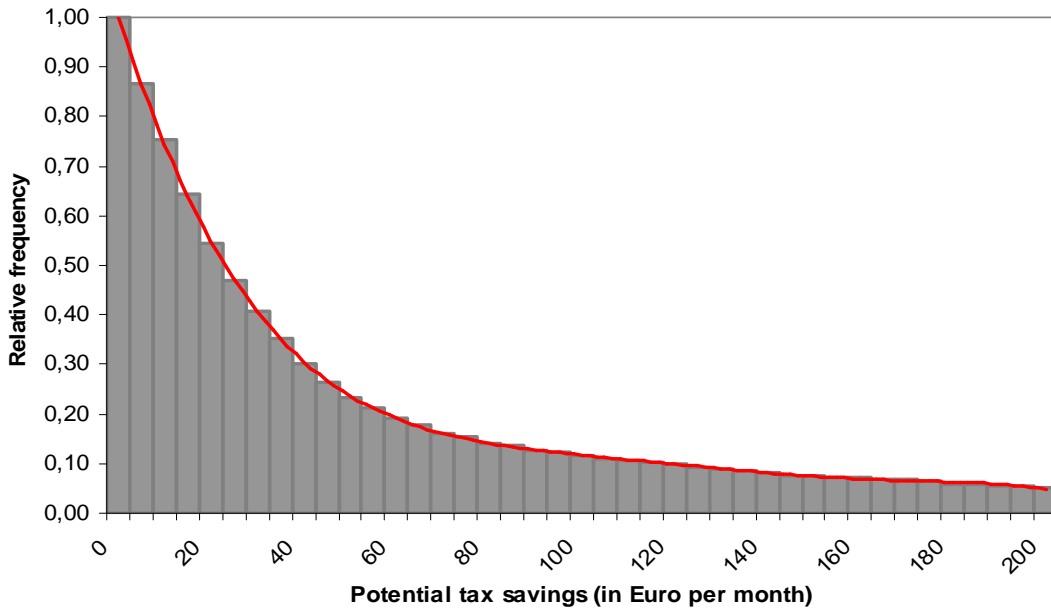
One possibility stems from the regulations of the German social security and transfer system. As a matter of fact, maternity as well as individual benefits from mandatory unemployment insurance are tied to last year's net income from wages. As net income is highest under tax class III and lowest under tax class V, it can be optimal in some cases not to choose the tax class combination that minimizes taxes withheld but instead to choose the tax class combination that maximizes expected future transfer payments. For example, in order to take full advantage of maternity benefits,

it would be optimal for the wife to choose tax class III as this maximizes her net income from wages. While our data does not allow for a formal test, the restrictions applied on the data set used make such a strategic choice of tax classes quite unlikely: As noted in Section 3, our sample does only include those households for which actual tax payments could be recalculated on the basis that tax classes have not been changed and that income is distributed equally across the year. For those planning to receive maternity benefits, this implies that the wife was already pregnant or planning to become pregnant at the beginning of the year but that no child was born. For those expecting to get unemployed, it implies that the appointment was already insecure at the beginning of the year but remained unchanged throughout the whole year. Otherwise, a tax class change or an evident change in wage income had led to the exclusion of this observation from our database. Therewith, the probability to observe strategic tax class choices in the dataset analysed can be believed to be quite low.

Transaction costs

A second point that can be made against pareto-inefficiency is that any change of tax classes incurs some, perhaps minimal, transaction costs. If, for instance, a household's income changes from one year to the other, this may require an adjustment of tax class choices in order to sustain minimal withholding. Provided that the extra gains from tax minimization are rather small when compared to the transaction costs of a tax class change, a non-minimizing combination of tax classes may still be optimal, at least in the short-run. In order to test for this possibility in the weighted sample, Figure 2 depicts the relative frequency of households with potential tax savings above a certain threshold. As can be seen from this figure, even if we introduce some kind of marginality rule and judge household-decisions as being efficient in cases in which tax savings do not exceed €10 per month, still more than 75 percent of all households with a non-minimizing tax class combination (or more than 17 percent of all households) can be classified as households with an pareto-inefficient outcome. In order to achieve a rate of less than 10 percent, one has to interpret all cases with tax savings less than €30 per month as behaving pareto-efficient.

Figure 2: *Distribution of potential tax savings*



Forced savings

Up to this point of our analysis, we have assumed that households follow the life-cycle hypothesis and prefer monthly payments to a year-end lump-sum. As shown by Romich and Weisner (2000) in the context of the Earned Income Tax Credit, this may not always be true. They provide evidence that some low income households in the US – even though they face severe budget constraints - prefer an end of the year lump-sum payment to monthly payments. One possible explanation for such behaviour comes from the behavioural life-cycle model (Thaler and Shefrin, 1981). If, for example, households lack self-control when saving money, they may see the source tax on wage income as a device to force themselves to save. By choosing a tax-class combination that does not minimize their actual tax payments, they increase their tax refund after filing the tax return, which can then be used to purchase durable goods. Again, a direct test for or against the behavioural life-cycle model is not possible. However, if we follow the argumentation from above, the fraction of non-minimizing households should crucially depend on whether the tax return results in a refund or not. For those households for which the final tax liability exceeds taxes withheld (households with additional income sources such as interest payments or rent income) such a forced savings mechanism does not exist. Therefore, if households use tax withholding as a savings device, the fraction of non-minimizing households should be significantly larger among those expecting a refund than among those who have to make a supplementary tax payment. As shown by Table 3, this is not the

case as the share of non-minimizing tax-class combinations is virtually the same between households in a tax rebate and a tax due position.

Table 3: *Non-minimizing tax class combinations by tax position*

	weighted cases minimizing	weighted cases non-minimizing	% non-minimizing
tax rebate position	985.682	306.688	0.237
tax due position	271.750	80.163	0.228

Non-rational behaviour

Excluding strategic choices, transaction costs and forced savings, the sole point that can be made against our interpretation that household decision making is pareto-inefficient is completely non-rational household behaviour. A clear sign for a non-rational behaviour may be the choice of tax class combination III/V if V/III is optimal and vice-versa. As becomes evident from Table 4, with about 3.000 weighted cases, the number of households with such an extreme tax class choice is quite low. Excluding these cases from our analysis has virtually no effect on the rate of non-minimizing households and our main result that household decision-making is pareto-inefficient for a sizeable fraction of families does still persist.

Table 4: *Non-minimizing tax class combinations and extreme cases**

Non-minimizing	weighted cases	% non-minimizing
extreme cases*	3.190	0.002
remaining cases	383.661	0.233

* Tax class combination III/V if V/III is optimal and vice-versa.

As our discussion has shown, the interpretation of a non-minimizing tax class choice as indicating that the outcome of intra-household decision-making is pareto-inefficient is problematic in several ways. Nevertheless, with respect to the sensitivity analysis conducted and bearing in mind the structure of our data sample, these problems can be qualified to a certain degree. We therefore interpret our results as indirect evidence that at least for some German two wage earner households, the bargaining solution is inefficient.

6. Conclusion

Virtually all models of the household, including the unitary model as well as cooperate bargaining models, assume pareto-efficiency in intrahousehold-decision-making. Against this background, the present paper provides first (indirect) evidence for pareto-inefficiencies in intrahousehold-decision-making within a more developed country.

To do so, it makes use of the unique features of the German source tax on wage income, which give married couples some degree of freedom when determining their tax payments and its distribution among spouses. Using a large dataset from the German income tax statistics, and conducting simulation analysis, our results reveal that more than 20 percent of the observed taxpayer population does not minimize their monthly tax withholding, even though this has a significant impact on disposal income. On average, affected households pay an extra of about €50 per month on taxes that could be avoided otherwise. As the distribution of tax payments among spouses depends on bargaining between household members where some solutions – which could be prevented with means of side-payments - lead to a higher total tax load, we interpret household decisions as being inefficient whenever we observe tax payments higher than the minimum possible.

Using this appealingly simple approach which clearly differs from those of other studies, we confirm the results of previous empirical work that found inefficiencies within households in less developed countries. It has to be noted that this approach is not clear of difficulties as there might be other reasons than inefficiencies that may lead to tax payments higher than the minimum possible for which we can not completely control. Therefore, we believe that further empirical work is necessary in order to validate our results. Nevertheless, if taken serious, our results imply that even the more general approach of cooperative bargaining in household-decision-making can be misleading in certain contexts. Future theoretical work should therefore reconsider the dominant models on intra-household-decision-making.

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