Intra-Household Allocation: Evidence From A New Survey on Family Issues With Individual Consumption Data

Katherin Barg[*], Denis Beninger[†]

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Abstract

The originality of this paper is the use of the pre-test data of the project "Panel Analysis of Intimate Relationships and Family Dynamics" (PAIRFAM) in order to analyze the intra-family bargaining process. This data combines precise information on economic, sociological and psychological characteristics of the families. It is as such a world-wide novelty.

In particular, the data gives information on consumption at the individual level: the individual expenditures for eight typical private goods were collected in a separate questionnaire. The data also includes a large set of variables describing the family behaviour and preferences from a sociological and psychological point of view.

Since we observe the individual consumption, we are able to relax some of the usual restrictions in a model of household behaviour. In particular, we can fully identify the sharing rule (not up to an additive constant, as usual). Furthermore, some (not all) parameters of the preferences can be separately identified. The estimation results suggest that part of the heterogeneity in the household decisions among couples is explained by other variables than those traditionally found in similar studies (i.e. wages, unearned income, age, education, etc.). In particular female physical attractiveness and male sexual satisfaction turn out to be significant determinants in the intra-family sharing rule.

Key Words: Family behaviour, private consumption, public consumption, collective model.
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[*]Mannheim University

[†]Corresponding author. ZEW, L7 1, D-68161 Mannheim, Germany. Fax: + 49 621 1235 225. Beninger@zew.de

1   Introduction

What are the determinants of the allocation of the household resources between the family members? When investigating this question, detailed information on variables explaining the individual and household preferences as well as the intra-family decision process is crucial. However, these issues are very incompletely reported in the available data sets. In particular, expenditures for private goods are typically collected at household and not at individual level. Information on socio-demographic and socio-psychological characteristics potentially affecting the preferences or the bargaining balance inside the family is sparse too. When estimating a model of household behaviour, this lack of information leads to restrictive assumptions and limits the understanding of the family behaviour.

The originality of this paper lies in the use of the pre-test data of the upcoming family panel for Germany in order to evaluate the intra-household bargaining process. The Panel Analysis of Intimate Relationships and Family Dynamics (PAIRFAM) will provide the economist with data which allow investigating more precisely the intra-family issues. Indeed, it will include information on individual time-use and the expenditure structure of the family, as well as a large set of variables describing the family behaviour from a sociological and psychological point of view. Scheduled to be collected from 2008 on, the panel focuses on questions on the establishment and the structuring of intimate relationships, the planning of childbearing, child development and parenthood, the structuring of intergenerational relationships and the stability of intimate relationships. The pre-test data ("mini-panel") consists in a three wave survey collected in 2006 and 2007 available for the PAIRFAM project participants. Due to its unique combination of detailed economic, sociological and psychological information on family issues, this data is a world-wide novelty.

For the purpose of our study, we mainly use the third wave of the "mini-panel", which contains variables on couples' intimacy (personal and sexual satisfaction, for example) and the household money management as well as information on individual consumption. In a drop-off questionnaire, the families were asked about the expenditures structure of the household for eight typical private goods: clothes, shoes, body care services, goods for body care, leisure, communication services, furniture and other personal goods. The family reported the amount of money which was spent for each of these goods for the father, the mother, the children, others (for example gifts), and the amount which was spent for the household as a whole (expenditures on that good for a public use).[1]

We perform estimation of the intra-household sharing rule, using this

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[1] The consumption data of the pre-test panel are available for estimation purposes since october 2008 only, due to problems in data correction.

data set. Since we have information on the individual expenditures, we are able to give an original insight in this field. We first provide evidence based on simple equations. In particular, we look at determinants of the relative female expenditures for eight different private goods. In a second step, we give estimates based on a collective household model. In this context, we are able to relax some of the usual restrictions in the collective model. In particular, we fully identify the sharing rule (not up to an additive constant, as usual). We can furthermore separately identify some (not all) parameters of the preferences. The results suggest that part of the heterogeneity in the household decision among couples is explained by others variables than those traditionally found in similar studies (i.e. wages, unearned income, age, education, etc.). In particular physical attractiveness and sexual satisfaction turn out to be significant detreminants of the sharing rule, supporting empirical and theoretical findings of the of the socio-psychological literature.

The paper is organised as follows. Section 2 provides a short review on theories from the social and behavioural sciences and the existing economic literature. Section 3 describes the data. The estimation procedures and results are presented in Section 4. Section 5 concludes.

2 Literature

Household behaviour is investigated by economists using information on income, time use, education, age and other common socio-economic factors. In sociology and (social-) psychology, the behaviour of the household members is analyzed in more differentiated approaches. In the following, we summarize the key theories and models on power distribution in relationships, from both the sociological and economic point of views.

2.1 Sociological and socio-psychological theories on power distribution in relationships

Both economists and social scientists use the theory of resources to explain the heterogeneity of household decisions and the distribution of intra-family bargaining power. This approach assumes that the external income (e.g. wages, own unearned income and wealth) determines the allocation of resources within a household: the higher the earnings and wealth of one spouse, the higher his or her relative power. Blood and Wolfe (1960) show, for married couples in Detroit, that most decisions are fairly taken by both partners together (with a slight dominance of the husband though). They additionally find that the husband decision power depends positively on his income, education, status and professional prestige. König (1957) and Lupri (1969) give similar evidence for Germany. On the other hand, female earnings smooth the male bargaining power. However, new evidence shows that

women tend to invest more into the relationship. Therefore, even if both spouses have similar money earnings, the intra-family bargaining remains unequal in favour of the male (Schneider et al. 2006). This depends on whether the couple acts as a family or as two relatively independent individuals, though.

When explaining the intra-family allocation of resources, economists usually concentrate on measurable and objective socio-demographic and income dependent variables. In contrast, sociologists and psychologists use a far broader set of potential covariates. Wolfe (1959) already mentions the relevance of physical, intellectual and affective characteristics of the partners to be influencing the bargaining power. Safilios-Rothschild (1975a, b) emphasizes that love, emotional support and sexual gratification affect the power distribution, too. Moreover, they mention that having close friends and a good reputation might have an impact on which partner has the final say.

Waller (1951) introduced the principle of "the smallest interest". This approach suggests that the interest in the relationship and the relative power are negatively correlated, i.e. the less a partner cares, the greater his or her authority. This theory was extended by Heer (1963) in his theory of social exchange, and by Mikula (1992), who interprets the social interactions between the partners as exchange of actions. This theory is based on a utility function: the partner decides to stay or to leave the relationship whether he looses or gains in terms of utility from any alternative (i.e. being a single, another relationship). Schneider (1991) shows that values, preferences and feelings of the partners influence the utility function. Gottman (1998) finds that partners who experience an unequal distribution of power are less satisfied with their relationship. Accordingly, Kellerhals et al. (2007) show that people living in a 'fair' relationship are happier.

Safilios-Rothschild (1970b, 1976a) assumes that earnings, and love, affection and sexuality are complements (theory of love and needs). Therefore, while the man typically has a higher money income, the wife compensates this in offering more emotions and feelings. Koppetsch (2001) shows that the impact of love and affection on the power distribution depends on gender. He finds that the man's love is higher valued than the woman's.

Furthermore, on the marriage market, physical attractiveness is more important for women than for men. Beauty enhances her chances to find a partner whereas status and income augment these chances for him (Hassebrauck and Niketta 1993). Within the relationship, physical attractiveness may have an indirect or a direct effect on the distribution of power. The indirect effect is generated as attractiveness is related to status and resources. Evidence also shows that men with attractive wives are considerably more admired by other persons than men with less attractive wives (see Bar-Tal and Sax 1976, and Sigall and Landy 1973).

Eckert et al. (1989) finds that the distribution of decision power within a relationship depends on the nature of the decision. Concerning 8 of 14

issues, the couple decides together. However, each partner decides on his own clothes and professional choices. Furthermore, wives decide on food and cooking. Gujer et al. (1982) show that until the early 1980s, the husband had the authority to decide about schooling of the children, housing of the family, questions of money and other important issues. The authors also find that the attitudes of the partners are related to the distribution of power between them. Among others Keddi and Seidenspinner (1991) precise that during the 1980s the husband has lost his authority. The distribution of power in marriages became more equitable. Particularly important decisions are now taken by both partners and not only by the man.

2.2 Economic models [complete]

The lack of good data on family issues leads the economist to represent the family in a restrictive way.

–> unitary restrictions

–> collective restrictions

–> papers on income pooling (Lechene/Preston 2001, Browning/Lechene 2001, Browning/Chiappori/Lechene 2008, D'Aspremont/Dos Santos Ferreira 2008)

However, the most suitable solution for relaxing the underlying restrictions assumed in the different models of household behaviour, and therefore overcome the harsh criticisms towards the economic representations of the family, is obviously to have a data set with detailed information on the different aspects of the family behaviour. Beninger (2007) uses artificial data containing disaggregated consumption and time-use information at the individual level. He compares the estimation results as well as the predictions for the individual behaviour, for different frameworks (bargaining and collective models of household representation). The empirical evidence shows that the quality of information is essential in order to correctly estimate the family behaviour, but also that a wrong model or a bad parameterization of the functions within the models leads to high discrepancies in the predictions of the family decisions. The paper additionally suggests that some - but not all - of the restrictive hypotheses usually assumed in the models of household representation can be relaxed when using detailed information.

The only paper, in our knowledge, in which a household labour supply and consumption model using data on individual consumption is estimated, is the study (in progress) by Browning and Gørtz (2007), based on the Danish Time Use Survey. Additionally to a detailed time-use survey, this data contains a question on individual consumption of three private goods (clothes, leisure goods, and others). However, the interviewed persons only report the share of the individual expenditures between the two spouses for those goods, and do nor give any money amounts: Neither do they indicate where there are any expenditures in favour of other household members or

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people living outside the family (transfers, gifts). Unfortunately, the authors find out that the distribution of the expenditure shares are strongly modal around the values 0, 0.5 and 1 and do not find any correlation between share and income level. A second Danish data set is interesting regarding our purposes: the Danish Household Expenditure Survey. It comprises information on expenditures and money sharing within Danish families. It began in 1998 and is continuously implemented. Bonke et al. (2004) give some statistical evidence, and Bonke and Uldall-Poulsen (2005) test the income pooling hypothesis for the Danish households. Unfortunately, as far we know, no study linking both data sets has been conducted so far.

3 The data

The novelty of our paper lies in the data we use. Indeed, economic data sets usually contain only very sparse information on family issues. Economic (wages, income) and socio-demographic (age, education) variables are indeed not sufficient to describe the intra-family bargaining. There remains a lot of unobservable heterogeneity. The data we use provides us with far richer information on the decisions within the household. In particular, we know about individual consumption, time use, feelings, perceptions, satisfaction and attractiveness.[2]

3.1 PAIRFAM

The programme PAIRFAM (Panel Analysis of Intimate Relationships and Family Dynamics) aims to collect an integrated panel data on the dynamics of intimate relationships and families in Germany. The intention is to overcome the apparent limitations in the empirical studies on family issues due to lack of such a data. The approach in PAIRFAM is multidisciplinary and covers the sociological, psychological, demographic and economic aspects of the household decisions. PAIRFAM shall permit to investigate questions on the choice of partner and living arrangement, the fertility decisions, the stability and the qualitative structuring of partners' and parent-child relationships.

The data will also serve the analysis of the whole life course and the social contexts of family formation. Finally, the developmental conditions of the next generation have to be investigated as influenced by the biographical background of its parents, their current resources and options, structures of social inequality, and the quality of family relationships.

For this research programme a long-term panel survey is necessary to get the required prospective longitudinal data. Only this will allow us to follow

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[2]The data is a pre-test data though. We are aware that the number of observations is limited and the quality of some variables may be improved. The data is not representative either.

up couple and family careers and study the dynamics of intergenerational relationships from the micro perspective of individual action and decision making. The planned panel study will start in 2008. It will be designed to allow modelling the relevant processes of intimate relationship and family dynamics and will explore the underlying decisions and mechanisms.

Moreover, relatively rare life events will be amenable to investigation because the sample size of the surveys will be sufficiently large.

The sample consists of members of three groups of birth cohorts': adolescents aged 15 to 17, young adults aged 25 to 27 and adults aged 35 to 37 (target persons), who will be interviewed once a year. Not only the target persons of the selected age cohorts will be interviewed but also their partners and – in case of the youngest cohort – their parents or – in case of the older cohorts – their children will be included in the survey. Strong emphasis is also put on the social networks of the target persons and their partners.

3.2 The "mini-panel"

The aim is to develop an improved theoretical and methodological basis to map the dynamics of non-marital and marital unions and family development in a valid, reliable and effective way. For developing appropriate instruments for the main panel, to be started in 2008, a so called "mini-panel study", based on a three waves survey, has been conducted in 2006 and 2007. For the mini-panel, 600 respondents located equally in Bremen (north), Chemnitz (east), Mannheim (south-west) and Munich (south-east) have been interviewed. They are distributed in three cohorts with ages 15-17, 25-27 and 35-37. The data is collected through four questionnaires:

- the main questionnaire, which may differ depending on age,

- a partner questionnaire, if the interviewee is married or has a stable relationship (does not apply to the younger cohort). The partners or spouses were interviewed separately and independently.

- a child questionnaire; applies to own children from age 8 on, living or not in the household,

- a parent questionnaire; only for the younger cohort.

The data collection consisted in face to face interviews, except for the module on intimate questions, as for example satisfaction in sexual life. These were asked in a drop-off questionnaire to be returned anonymously to the interviewers (wave three).

The questionnaires included a retrospective evaluation of time-use during a typical week day (working hours, time devoted to housework, to child care, etc.). In addition, half of the interviewed persons, and their partner, were asked to fill out a 7-days diary on time-use. They had to give the information in 15 minutes intervals on their current activit(y)(ies) - to be chosen among a list of 30 possibilities (wave two).

A third drop-off questionnaire on individual consumption has been organised by Jörg Althammer, Nadine Gonsior and Notburga Ott (Ruhr University at Bochum) and Denis Beninger (ZEW Mannheim) and distributed randomly to the half of the interviewed persons (wave three). It consists in a questionnaire on the family expenditures structure for eight typical private good categories: clothes, shoes, body care services, goods for body care, leisure, communication services, furniture and other personal goods. The family had to precise the amount of money which was spent for each of these goods for the father, the mother, the children, others (for example gifts and transfers), and the amount which was spent for the household as a whole (expenditures for public use).

3.3   Summary statistics

From initially 600 interviewees, 259 households answered the questionnaires in the third wave. The initial proportion of respondent is near 50 %. The panel mortality is approximately 10 %. For our study, we have to eliminate all single households, and those who did not receive or answer the drop-off questionnaire on consumption expenditures. This leaves us with 67 households (cohorts 25-27 and cohorts 35-37).

The summary table is presented in Appendix 1. We give here only statistics on the variables used in the final form of the estimation equations (see Appendix 3 and 5). More detailed statistics on all variables included in the PAIRFAM panel can be found in Barg/Beninger 2007. Table 1 gives statistical evidence on the socio-economic and socio-psychological variables. We see that women have on average a lower labour income. Their average monthly net income is 1,237 euros, whereas the male's is 2,065 euros. Men report more working hours and hours spend on repairs On average, the observed men spend 8.9 hours a day on work whereas the observed women reported 6.4 working hours a day. Females are basically more satisfied with the relationship than the men are on both overall and sexual satisfaction: for example 28% of the wives, but only less than one fifth of the male are declaring to be happy or very happy in their relationship. The wives tend also to find themselves very attractive: Almost 40% believe that they will find another partner without problem.

From Table 2 (see Appendix 2), we learn that the families consider clothes and shoes as a private good: only one household declares spending money for clothes and shoes for the household as a whole. On the contrary, furniture is mostly considered as a public good. Note that for this good, the share of expenditures devoted to children is comparatively high. For the other five goods (leisure, body care goods and services, communication services and others), the pattern is more complex. Only a part of the expenditures are devoted to one person or group of persons in particular.

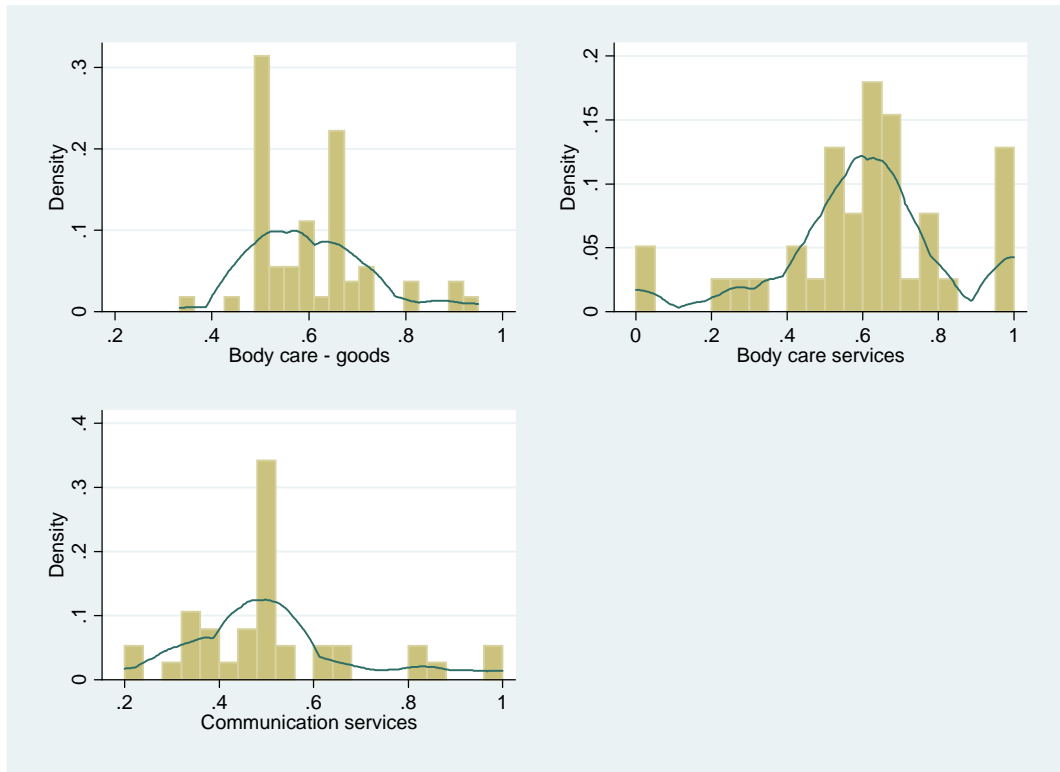Not surprisingly, women report to spend more on clothes and shoes than

Figure 1: Distribution of the female consumption share

Notes: Female consumption share in relation to sum of the male and female consumption.The full line corresponds to the Epachnikov kernel density estimates.

their partner. Interestingly, only for leisure activities, men are declaring having higher expenditures. This is reflected by Graphs 1 and 2. The distribution of the female expenditures relative to sum of the spouses' is skewed to the right, denoting higher expenses for the wives.

4   Estimations

We perform two types of estimations. Firstly, we regress different variables which may explain the intra-family decision process on the consumption share in order to find out potential correlations. In a second step, we estimate a set of eight equations, derived from a collective model. In particular, we fully identify the sharing rule (not up to an additive constant, as usual). We furthermore separately identify parameters of the preferences.

   We furthermore control for the strong convexity of the budget set due to the progressive income tax scheme in Germany, in taking account of the German tax-benefit system in our estimations. In Subsection 1, we
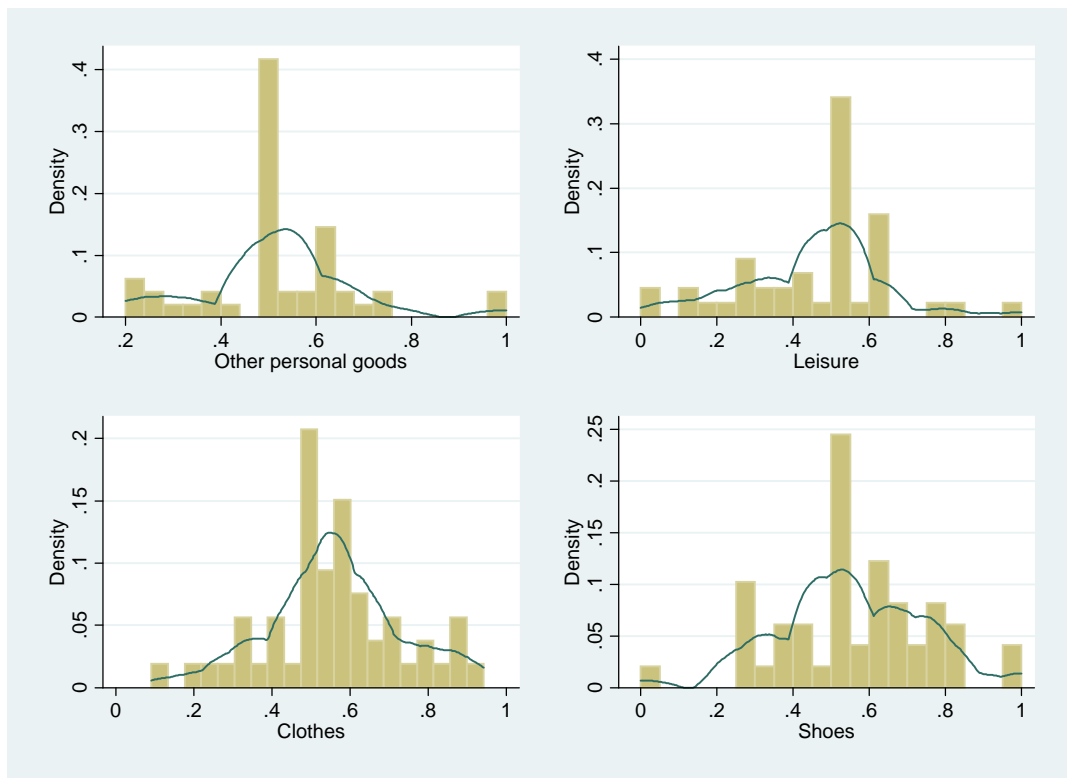
Figure 2: Distribution of the female consumption share (continued)
Notes: Female consumption share in relation to sum of the male and female consumption.
The full line corresponds to the Epachnikov kernel density estimates.

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describe the 2007 German tax and benefit system and how we introduce it in the equations. In Subsections 2 and 3, we present our model and give the results of the estimations of the 'simple' equations and of the collective model, respectively.

4.1 The German tax-benefit system

Although, from an economic point of view, gross income is the most valuable variable, the perception of the household members may be different. In the intra-household decision process, the spouses may negotiate based on their disposable income. Furthermore, due to the high tax payments and the strong convex income tax scheme in Germany, the household disposable income differs significantly from the gross income. Therefore, we decide to consider the German tax and benefit system in our estimations.

Germany has a personal income tax system administered at the federal level and regulated by the Personal Income Law (Einkommensteuergesetz). The German tax system is characterized by a comprehensive tax which covers labour earnings as well as income from other sources such as capital investment etc. and by joint taxation for married couples. For couples, taxes are paid and benefits are received independently of the intra-household allocation. The function applied to the tax base is progressive, but in contrast with the systems of most other countries, the tax function is smooth and not piece-wise linear (see Table 1). Gross taxable income forms the base from which all further allowances are deducted. In particular the tax relief for each working spouse is 920 euros. In 2006 the top rate applied was 42 percent for yearly earnings in excess of 52,152 euros. Earnings below the basic personal allowance of 7,664 euros are tax free. The tax schedule used is the same for singles and for couples, but for couples, the "splitting method" is applied: the tax rate is applied to one-half of the joint taxable income, and the outcome is doubled to obtain the total income tax liability of the spouses. Germans pay an additional 5.5 percent tax termed "solidarity supplement for the reconstruction of East Germany" ("Solidaritätszuschlag"). This tax is based on the individual amount of income tax using a specific taxable income measure which, among other items, includes the "Kinderfreibetrag", whether the parents opt for this allowance or the perception of children benefit (154 euros monthly per child).

Since we concentrate on double earner couples, we do not take into account potential social subsidies for low earning families. Double full-time working couples are typically not eligible for revenue dependent social benefits. Of course, we take account for all means-tested benefits the family is eligible for (for example child benefit). Therefore, in our paper, the households face a convex budget constraint.

German employees pay compulsory social contributions (for health insurance, etc.) which are about 21 percent of the gross income. The tax law

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considers the social contributions as an income. These are, for their main part, not deductible from the taxable income.[3]

4.2 The 'simple' regressions

We regress socio-demographic variables, as well as 'soft' variables (like satisfaction) on the relative female expenditure variables using ordinary least squares.

We decide to perform the estimation only for seven goods and exclude 'furniture' from the procedure, due to the low number of observations (12). The final estimates were obtained using a descending procedure: We include in the estimation the variables on female and male sexual satisfaction, satisfaction of the relationship, the physical attractiveness, the household net income, the female relative contribution to the family income, the female and male education levels and a dummy variable indicating if there are any children living in the household. We eliminate step by step the less significant variable. The final estimation results are given in Table 3 (Appendix 3).[4]

Although the number of observations is low (67), we obtain some interesting estimation results: Neither the level of the household income, nor the relative contribution of the wife to the family wealth have any significant impact of the female relative expenditures of body care goods. However, the male sexual satisfaction and the female attractiveness seem to influence that variable. We obtain a similar feature the clothes expenditures. Nevertheless, for this variable, the higher the household income is, the more unequal the expenditures for clothes between female and male are. This is a surprising result and is in contradiction with other empirical findings (see for example Bourguignon/Browning/Chiappori/Lechene 1993). On the contrary, the expenditure share of shoes is exclusively depending on income related variables ad is positively correlated with both he household income and the female relative contribution to it. The presence of children in the household has a negative impact of the female expenses, especially for clothes and body care services.

The most interesting result of these estimations is that 'soft' variables seem to explain a part of the gap in consumption behaviour, in particular for the expenditures for personal care and clothes: the higher her attractiveness and his sexual satisfaction are, the higher her expenditures are. These results confirm in part the theories exposed in part 2.

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[3] There is a lump sum deduction for the social contributions though. This deduction is revenue dependent for low work income.

[4] We tried different original specification. However, the variables which are given in the final estimation (Table 3) are those remaining significant all the time.

4.3 A collective model of household behaviour

4.3.1 Representing the household behaviour

Browning and Chiappori (1998) justify the assumption of Pareto-efficiency
with the repeated-game character of the household decisions, so that co-
operation emerges as a long-term equilibrium of a repeated non-cooperative
framework. In other words, one can argue that the household members know
each others' preferences perfectly. Suppose that the household is composed
of two decision makers, the wife (f) and the husband (m), the household
optimization problem is:

$$\max_{\mathbf{q}} U^f (\mathbf{q}) \tag{1}$$

$$s.t. \begin{cases} U^m (\mathbf{q}) \geq \overline{U}^m \\ g (\mathbf{p}'\mathbf{q} - B) \leq 0, \end{cases}$$

where U^i is a twice continuously differentiable strongly concave utility func-
tion. $\mathbf{q} = (\mathbf{q}_f, \mathbf{q}_m, \mathbf{Q})$ is the $n-$vector of the household commodities. $\mathbf{q}_i$)
are commodities exclusively for i. $\mathbf{Q}$ are public goods and may be used by
both household members. Vector $\mathbf{p}$ represents the price of the commodities.
$\overline{U}^m$ corresponds to the male threat point in the intra-household negotiation
process. The Pareto frontier can be drawn in varying $\overline{U}^m$ over its defin-
ition set. B is the household budget set. g depicts the tax and benefit
system. Leisure (or alternatively labour supply) is not formally modelled
here. However, vector $\mathbf{q}$ may include leisure. The corresponding price is the
wage rate.

4.3.2 Considering the tax-benefit system

For the estimation, we consider the tax and benefit system as described in
Section 4.1. Suppose that the household budget is:

$$\mathbf{p}\mathbf{q}_f + \mathbf{p}\mathbf{q}_m + \mathbf{p}\mathbf{Q} = g (w_f, w_m, h_f, h_m, y) ,$$

where h_i and w_i are i's labour supply and wage rate respectively. y is the
unearned income. Since the households face a convex budget set, we are
able to linearize the budget constraint at the optimum (there is a unique
solution). Define $\tilde{w}_f$, $\tilde{w}_m$ and $\tilde{y}$ as the perceived wages, and the virtual

Table 1: Tax schedule: Tax rate applied to the tax base (marital splitting method) in 2006

Income (X) bracket	Income tax liability
0-7,664	0
7,665-12,739	$(883.74 \cdot Y + 1{,}500) \cdot Y$
12,740-52,151	$(228.74 \cdot Z + 2397) \cdot Z + 989$
>52,152	$0.42 \cdot X - 7914$

Note: X=rounded taxable income, Y=(X-7,664)/10,000, Z=(X-12,739/10,000)

unearned income:

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\begin{aligned}
\tilde{w}_i &= \frac{\partial g\left(w_f, w_m, h_f, h_m, y\right)}{\partial h_i} \qquad i = f, m \\
&= \frac{\partial g\left(ginc\right)}{\partial h_i} \\
&= \frac{\partial ginc - \partial f\left(ginc - dtn\right)}{\partial h_i} \\
&= \frac{\partial ginc}{\partial h_i} - \frac{\partial f\left(X\right)}{\partial h_i} \\
&= w_i - \frac{\partial f\left(X\right)}{\partial X}\frac{\partial X}{\partial h_i} \\
&= w_i \left(1 - \frac{\partial f\left(X\right)}{\partial X}\right) \\
\tilde{y} &= \mathbf{p}\mathbf{q}_f + \mathbf{p}\mathbf{q}_m + \mathbf{p}\mathbf{Q} - \tilde{w}_f h_f - \tilde{w}_m h_m,
\end{aligned}
$$

where $ginc$, dtn and X are respectively the household's gross income ($ginc = w_f h_f + w_m h_m + y$), the deductions, and the gross taxable income ($X = ginc - dtn$). $f\left(.\right)$ is the function describing the tax liability. Note that we consider the social security contributions as an income.[5] Figure ?? illustrates the 2007 German tax system, as we take it into account. We clearly see that the budget constraint is strongly convex, and the tax liability (difference between the dashed and solid lines) is high. The solid line illustrates the linearized budget constraint for a family earning 30,000 euros a year. In our estimation, we use the perceived wages $\tilde{w}_i$. They correspond to the marginal increase of i's earning income for an increase of i's working input. A similar technique has been used in order to take into account a progressive income tax in a collective model (see Donni 2003, and Beninger 2003 for theoretical considerations, and Donni and Moreau 2004, for an empirical application on French data). Note that we assume that the deflation factor

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[5]If we considered the social contributions as a tax, we would have: $\tilde{w}_i = w_i \left(1 - s - \frac{\partial f\left(X\right)}{\partial X}\right)$, with $s = .21$.

(i.e. $1 - \frac{\partial f(X)}{\partial X}$) is the same for the wife and the husband when computing the perceived wages $\tilde{w}_i$. However, this assumption, which relies on the characteristics of the German tax system (joint taxation of the household incomes), may be criticized. In particular, when considering a collective model with egoistic agents, it implies that the intra-couple share of the tax liability is proportional to the spouses' income. This is clearly in defavour of the lowest earning spouse (indeed, he would virtually pay less taxes if an individual income tax applied), and may be the source of conflicts within the household (see Beninger 2003 for further discussion).

4.3.3 Presentation of the estimated model

For the application, we consider a collective model with public and private consumption. For matters of simplicity, we suppose there are two private goods: clothes/shoes, and body care goods/services. We suppose that the remaining consumption is public consumption.[6] The couple maximization problem is:

$$\max_{\left(c_i^j, l_i, c_p\right)_{i=f,m}^{j=1,2}} U_f + \overline{\kappa}_m U_m \qquad (2)$$

$$s.t. \begin{cases} c_f^1 + c_f^2 + c_m^1 + c_m^2 + c_p^1 + c_p^2 + C_{pu} \leq \tilde{w}_f h_f + \tilde{w}_m h_m + \tilde{y} \\ h_f + l_f = T \\ h_m + l_m = T, \end{cases}$$

where c_i^j, c_p^j, C_{pu}, l_i and h_i are i's consumption of good j, the part of both private goods which are considered to be public consumed, the household consumption of public goods, i's leisure and worktime. p^j is the relative price of good j. T is the total disposable time. $\overline{\kappa}_m$ is the male relative power function. Suppose that the individual utility functions have following form:

$$U_i = \alpha_i^1 \ln c_i^1 + \alpha_i^2 \ln c_i^2 + \beta^1 \ln c_p^1 + \beta^2 \ln c_p^2 + \gamma C_{pu} + \left(1 - \alpha_i^1 - \alpha_i^2 - \beta^1 - \beta^2 - \gamma\right) \ln l_i. \qquad (3)$$

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[6] Prices are considered to be fixed and normalized to one.

The model is exactly identified (see Appendix 4). We estimate the system of equations:

$$\alpha_f^1 = G\left(X_{\alpha f1}\gamma_{\alpha f1}\right) + \varepsilon_{\alpha f1}, \tag{4}$$
$$\alpha_f^2 = G\left(X_{\alpha f2}\gamma_{\alpha f2}\right) + \varepsilon_{\alpha f2},$$
$$\alpha_m^1 = G\left(X_{\alpha m1}\gamma_{\alpha m1}\right) + \varepsilon_{\alpha m1},$$
$$\alpha_m^2 = G\left(X_{\alpha m2}\gamma_{\alpha m2}\right) + \varepsilon_{\alpha m2},$$
$$\beta^1 = G\left(X_{\beta 1}\gamma_{\beta 1}\right) + \varepsilon_{\beta 1},$$
$$\beta^2 = G\left(X_{\beta 2}\gamma_{\beta 2}\right) + \varepsilon_{\beta 2}, \tag{5}$$
$$\gamma = G\left(X_{\gamma}\gamma_{\gamma}\right) + \varepsilon_{\gamma}, \tag{6}$$
$$\overline{\kappa}_m = \exp\left(X_{\kappa}\gamma_{\kappa}\right) + \varepsilon_{\kappa},$$

where X_q, γ_q and ε_q are the covariates, the coefficients and independent normally distributed error terms. G is the logististic function: $G(t) = \frac{1}{1+\exp(-t)}$.

Since we observe the individual consumption, we are able to relax some of the usual restrictions in the collective model. In particular, we fully estimate the sharing rule (and not up to an additive constant, as usual). We furthermore separately estimate some (not all) parameters of the preferences. We have to impose that leisure and private consumption are complements and the preference for public consumption is the same foe both spouses, though.[7]

4.3.4 Estimation results [complete]

We estimate the system of eight equations (4). Good 1 is clothes/shoes. Good 2 is body care goods/services. The estimation results are given in Table 4 (Appendix 5).

Table 4 shows the estimation results. As for the intra-household sharing rule, we see that if the woman earns more, the relative male power decreases. Interestingly, female attractiveness as well as male sexual satisfaction explain part of the heterogeneity observed in the household decisions. Believing these results, a husband who has a beautiful wife has a lower bargaining power (ceteris paribus). The more a spouse is attractive, the more he is able to negotiate a higher share as for the intra-family allocations. Note that the number of observation is very small. This may explain the small number of significant variables (non-significant variables are not reported in Table 4).

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[7]Browning and Gørtz (2007) estimate a set of two equations, derived from a collective model, representing the consumption share inside the household and the spouses' relative time devoted to own leisure, which depend both of the sharing rule $\overline{\kappa}_m$. If the expressions of the consumption and leisure shares are obviously similar in both paper (see Appendix 4), Browning and Gørtz (2007) do not propose separate estimates for the preferences.

5 Conclusion

The novelty of our study is the use of an original data set containing rich information on what may drive the household decisions. In contrary of comparable studies, we are able to introduce in our estimation others variables than the traditional economic and socio-demographic ones, which potentially describe the household decision process. In particular, we use information on individual consumption and 'soft' information on satisfaction, feeling and attractiveness in order to explain the intra-household negotiation rule. Female attractiveness and male sexual satisfaction seem to explain some of the intra-household power gap.

Finally, we estimate a model of household behaviour. Since we observe the individual consumption for several private goods, we fully identify the sharing rule (not up to an additive constant, as usual). We can furthermore separately identify detreminants of the preferences. This is clearly an improvement with regards to the existing household models in the literature (for example, the collective model à la Chiappori). Therefore, more effort should be devoted to the collect of 'better' household data, with the goal of a better understanding of the family decision process.

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Appendix 1: Summary statistics (Table 1)

Variable	obs	mean	std.dev	min	max
female sexual satisfaction (dummy)	67	.239	.429	0	1
male sexual satisfaction (dummy)	67	.089	.288	0	1
female satisfaction in relationship (dummy)	67	.284	.454	0	1
male satisfaction in relationship (dummy)	67	.194	.398	0	1
female physical attractiveness (dummy)	67	.388	.490	0	1
male physical attractiveness (dummy)	67	.253	.438	0	1
female net income	67	1236.731	822.786	0	3300
male net income	63	2065.238	2105.24	0	15000
household net income	63	3261.444	2250.209	1000	17000
female relative contribution to the net income	63	.402	.258	0	1
children (dummy)	67	.448	.501	0	1
female working time	67	6.4	3.453	0	9.4
male working time	67	8.9	1.975	0	12.9

Appendix 2: Distribution of the expenditures shares inside the family (Table 2)

goods	percentiles			mean	std.dev	# obs
	10%	50%	90%			
body care goods						
female share	.166	.341	.666	.390	.198	54
male share	.095	.250	.400	.256	.155	54
children share	.111	.270	.590	.313	.158	28
public consumption share	.125	.250	1	.382	.283	41
body care services						
female share	.250	.600	1	.616	.267	47
male share	0	.354	.588	.378	.244	41
children share	.150	.269	.500	.293	.117	14
public consumption share	.097	.200	.472	.254	.149	5
communication services						
female share	.06	.275	.500	.292	.212	41
male share	.102	.313	.538	.313	.234	44
children share	.05	.188	.333	.199	.110	8
public consumption share	.357	.75	1	.723	.263	35
furniture						
female share	0.141	.5	.5	.342	.266	13
male share	0.048	.333	.5	.249	.245	12
children share	.059	.25	1	.339	.288	18
public consumption share	.385	1	1	.815	.272	45
clothes						
female share	.25	.456	.8	.485	.227	67
male share	.167	.345	.5	.361	.181	67
children share	.125	.389	.583	.338	.149	34
public consumption share	-	-	-	-	-	-

shoes						
female share	.175	.5	.8	.481	.257	67
male share	.167	.333	.625	.369	.211	67
children share	.172	.403	.667	.409	.177	33
public consumption share	.259	.259	.259	.259	-	1
leisure goods						
female share	.025	.236	.5	.276	.217	64
male share	.067	.333	.795	.374	.266	63
children share	.167	.4	.75	.412	.215	32
public consumption share	.1	.478	1	.517	.361	22
other personal goods						
female share	.121	.3	.571	.343	.208	61
male share	.121	.333	.633	.359	.225	60
children share	.1	.2	.969	.298	.283	34
public consumption share	.054	.311	.955	.439	.308	33

Notes: female share = expenditures for the female / total expenditures

male share = expenditures for the male / total expenditures

children share = expenditures for the children / total expenditures

public consumption share = expenditures for the whole family (public use) / total expenditures

obs = number of non-zero observations

Appendix 3: Estimation results – OLS estimates (Table 3)

good	coef.	std.err.	obs
body care goods			54
age difference	.007	.004	
male sexual satisfication	.163	.086	
female physical attractiveness	.054	.033	
_cons	.589	.022	
body care services			37
female relative contribution to the net income	.489	.151	
net income	-.000042	.000	
presence of children	-.045	.033	
_cons	.940	.093	
communication services			37
net income	.000005	.000	
_cons	.351	.067	
clothes			49
net income	-.00003	.000	
male sexual satisfaction	.167	.086	
male physical attractiveness	-.107	.086	
Presence of children	-.105	.078	
_cons	.688	.056	
shoes			45
net income	.00002	.000	
female relative contribution to the net income	.283	.119	
_cons	.359	.088	
leisure time			
net income	.00001	.000	
female relative contribution to the net income	.077	.117	
_cons	.377	.093	
other personal goods			45
age difference	.009	.006	
net income	.00002	.000	
female relative contribution to the net income	.192	.114	
_cons	.368	.084	

Appendix 4

In Appendix 4, we show that the model we use is identified. The couple's maximation problem is:

$$\max_{\left(c_i^j, l_i, c_p\right)_{i=f,m}^{j=1,2}} U_f + \overline{\kappa}_m U_m \qquad (7)$$

$$s.t. \begin{cases} c_f^1 + c_f^2 + c_m^1 + c_m^2 + c_p^1 + c_p^2 + C_{pu} \leq \tilde{w}_f h_f + \tilde{w}_m h_m + \tilde{y} \\ h_f + l_f = T \\ h_m + l_m = T, \end{cases}$$

where $U_i = \alpha_i^1 \ln c_i^1 + \alpha_i^2 \ln c_i^2 + \beta^1 \ln c_p^1 + \beta^2 \ln c_p^2 + \gamma C_{pu} + \left(1 - \alpha_i^1 - \alpha_i^2 - \beta - \gamma\right) \ln l_i$. The solution set of Problem (7) is:

$$c_f^j = \frac{\alpha_i^f R_{tot}}{1 + \overline{\kappa}_m} \qquad \forall j = 1, 2 \qquad (8)$$

$$c_m^j = \frac{\alpha_i^m \overline{\kappa}_m R_{tot}}{1 + \overline{\kappa}_m} \qquad \forall j = 1, 2$$

$$c_p^j = \beta^j R_{tot} \qquad \forall j = 1, 2$$

$$C_{pu} = \gamma R_{tot}$$

$$l_f = \frac{\left(1 - \alpha_f^1 - \alpha_f^2 - \beta^1 - \beta^2 - \gamma\right) R_{tot}}{1 + \overline{\kappa}_m}$$

$$l_m = \frac{\left(1 - \alpha_m^1 - \alpha_m^2 - \beta^1 - \beta^2 - \gamma\right) \overline{\kappa}_m R_{tot}}{1 + \overline{\kappa}_m},$$

where R_{tot} is the household maximum total income: $R_{tot} = \tilde{w}_f T + \tilde{w}_m T + \tilde{y}$. Inverting System (8) towards the coefficients, we obtain (we have to exclude the public consumption C_{pu}, since C_{pu} is a linear combination of the other variables):

$$\alpha_i^j = \frac{c_i^j \Gamma_p}{\Gamma_{pi} R_{tot}} \qquad \forall i = f, m; j = 1, 2 \qquad (9)$$

$$\beta^j = \frac{c_p^j}{R_{tot}} \qquad \forall j = 1, 2$$

$$d = \frac{R_{tot} - \Gamma_p}{R_{tot}}$$

$$\overline{\kappa}_m = \frac{\Gamma_{pm}}{\Gamma_{pf}},$$

where Γ_{pi} represents spouse i's total private consumption: $\Gamma_{pi} = c_i^1 + c_i^2 + \tilde{w}_f l_f$. $\Gamma_p = \Gamma_{pf} + \Gamma_{pm}$.

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Appendix 5: Estimation results - collective household model (Table 4)

Consumption clothes female α_f^1			Public consumption of private goods β		
Constant	-2.25	.218	Constant	-0.62	.010
Diff. in age	-.071	.032	Age male	-.015	.005
Children	.026	.011	Children	.026	.011
Education female	-.037	.020	Education male	-.014	.007
Male sexual satisfaction	-.041	.023	**Public consumption γ**		
Consumption leisure activities female α_f^2			Constant	-.210	.100
Constant	-2.01	.137	Education male	-.002	.002
Children	.034	.017	Children	.041	.031
Education female	-.068	.022	Diff. in age	-.004	.003
Satisfaction	-.012	.008	**Male bargaining power κ**		
Consumption clothes male α_m^1			Constant	-.414	.200
Constant	-3.58	.589	Children	-.024	.019
Education	-.028	.022	Unearned income	-.013	.010
Consumption leisure activities male α_m^2			Female relative income	-.057	.029
Constant	-2.15	.812	Diff. in age	-.0054	.0048
Children	.011	.006	Education female	-.010	.007
Education female	-.029	.013	Female attractiveness	-.018	.009
Female satisfaction	-.008	.005	Male sexual satisfact°	-.011	.006