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382

Susanne Elsas

**Behind the Curtain:
The Within-Household Sharing of Income**

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Behind the Curtain: The Within-Household Sharing of Income

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Abstract

The distribution of personal income in a society depends strongly on the within-household distribution of income. Nevertheless, little is known about this phenomenon. I analyze the sharing of income among household partners from a welfare economic perspective. Measures of financial satisfaction for both household partners are used to gain information about the within-household distribution of income-induced well-being. A model of satisfaction differences between household partners is developed and estimated using 10 waves (1999 to 2008) of the German Socio-Economic Panel Study. Differences in financial satisfaction within couples are generally small. However, satisfaction is not a direct measure of welfare. For this reason, covariates are included to control for the partners' different characteristics, influencing the expression of satisfaction. Using panel data allows us to account for unobserved heterogeneity at the household level, which is one major advancement of this analysis.

The results show that the partners' relative earned income has a substantial effect on the distribution of income-induced well-being, whereas the relative amount of transfer income does not.

Keywords: income pooling, personal income, welfare, family, subjective well-being

JEL Classification: D31, I32

1 Introduction

The problem with analyses of the distribution of personal income is that households are the unit of observation while individuals are the unit of analysis. To solve this problem, researchers typically calculate for each individual the equivalent income representing the amount of money this person would need to achieve the same level of welfare if he or she lived alone. A crucial assumption for these calculations is the equal sharing assumption, which supposes that all members of a household achieve the same level of welfare from the household income¹. Although the equal sharing assumption may be the best possible assumption available, several researchers have shown that it is not supported by empirical data (cf. Thomas, 1993; Browning et al., 1994; Lundberg and Pollak, 1996; Phipps and Burton, 1998; Pahl, 1989). It rather seems that sharing resources within households is not independent of the household members' characteristics, such as age, education or earned income. The results obtained from very different approaches are consistent in that the equal sharing assumption is not maintainable. In addition, the results are inconsistent with regard to the distribution factors that determine sharing within households. Whatever determines sharing within households, the within-household distribution of income has a strong influence on the distribution of personal income in a society and thereby, for example, on the extent and, even more considerably the structure of poverty (cf. Phipps and Burton, 1995).

As individuals' needs differ, it is not the distribution of money itself that is of theoretical importance, but the distribution of income-induced well-being. We will therefore speak of equal sharing if members of one household achieve the same level of well-being from the use of the household income.

Equal sharing implies that sharing is independent of any factor that itself does not influence the household members' preferences. The implication of equal sharing is used to rephrase the assumption into a hypothesis: partners share their income equally, i.e. independently. The hypothesis can be rejected if any factor is found to influence the within-household sharing of income. According to Browning et al. (1994), such factors will be called distribution factors. Beyond

¹This is also called the income pooling hypothesis. With the focus on income distribution, the expression "equal sharing assumption", used for example by Hauser (2002); Jenkins (1991); Phipps and Burton (1995) is more lucid.

testing the equal sharing hypothesis, insights are gained into the procedures of sharing between household partners.

A major challenge in analyzing the within-household sharing of income is its unobservability. This problem can be treated in different ways, e.g. analyzing the demand for assignable goods (cf. Browning et al., 1994), the access to and type of usage of (shared) bank accounts (Woolley, 2000), the differences in amounts of spending money between partners (Ludwig-Mayerhofer et al., 2006), the within-household differences in the self-reported economic position on a five-step ladder (Kalugina et al., 2009) or differences in financial satisfaction between household partners (Bonke and Browning, 2009).

In this paper, the latter approach is used to analyze the distribution of income between household partners. Note again that it is well-being from income that is of interest here, not money itself. In line with Van Praag and Frijters (1999, p.427), "the contribution to our well-being from those goods and services that we can buy with money" will be called welfare. For the following empirical analysis financial satisfaction is used to identify welfare. However, satisfaction is not an exact measure of welfare. It is well known that individual attributes such as age, education and psychological characteristics influence reported satisfaction. Differences in individual financial satisfaction are to some extent the result of differences in individual characteristics, independent of the presence of household partners and independent of the fact that household income has to be shared. In contrast to Bonke and Browning (2009) and Kalugina et al. (2009), the household members' differences in such characteristics, influencing satisfaction statements, are systematically taken into account. It is the residual difference in financial satisfaction that may be explained with different shares of the household income that are used to contribute to partners' well-being.

In order to analyze the distribution of income among household partners, longitudinal data from the German Socio-Economic Panel Study (SOEP) of the years 1999 to 2008 are to be used. This allows us to control for household-specific unobserved heterogeneity, such as the constellation of personalities living together in one household. For the analysis at hand, the income shares received by children are disregarded; likewise, the well-being from household production and non-monetary income is ignored.

First, the theoretical model to identify the distribution of income among partners will be derived (Section 2). To this end, relations between reported financial satisfaction, distribution of income among household members, distribution of

power in the household and individual attributes determining bargaining power are used. A brief description of the data is then provided (Section 3), before presenting the estimation results in Section 4. The article closes with an illustration of the results' possible scope in Section 5 and some concluding remarks.

2 Theoretical approach

Assuming that income induces material well-being and that this welfare is expressed in financial satisfaction, reported financial satisfaction may be used to analyze the distribution of income within households.

To follow this path, assumptions on two linkages need to be made. The first link is that between income and welfare, and the necessary assumptions are part of standard micro-economic theory: Individuals must be equally able to transform income into well-being; individuals must be subject to the same prices, and need to be equally informed. This is unlikely to be the case in society as a whole, but these are reasonable assumptions for partners in one household. It is not necessary to assume that partners need the same amount of money to produce the same level of well-being, i.e. common or identical utility function, because it is not the distribution of amounts of money that is of interest, but the distribution of income-induced well-being among the partners.

Second, assumptions need to be made on the linkage between income-induced well-being and financial satisfaction for the analysis at hand. Financial satisfaction depends on several individual characteristics, such as age, education, gender, individual psychological attributes, labor market status (cf. Van Praag and Ferreri-Carbonell, 2004) and somehow on income-induced well-being, i.e. welfare. It seems reasonable to assume that welfare depends on actual welfare-effective income, i.e. equivalent income, rather than on total household income (cf. Schwarze, 2003).

In the context of this analysis, the welfare-effective income is assumed to be the amount of income this person would need to achieve the same level of welfare if she or he lived alone. Now, let this welfare-effective income \tilde{y}_{ih} of person i in household h be a function $g(\cdot)$ of the household's total income y_h :

$$\tilde{y}_{ih} = g(y_h) \tag{1}$$

where $i = \begin{cases} m & \text{the male partner of a household, and} \\ f & \text{the female partner of a household.} \end{cases}$

As usual, economies of scale of living together are assumed:

$$\tilde{y}_{mh} + \tilde{y}_{fh} > y_h \quad (2)$$

Actual welfare-effective income \tilde{y}_{ih} will affect financial satisfaction, specially if it is compared to expected welfare-effective income. The expected welfare-effective income is assumed to be the level of welfare a partner expects, expressed in amounts of money that he or she would need - when living alone - to achieve this level. According to the idea of adaptation (Stutzer, 2004), I assume that expectations about welfare levels are tailored towards the household's scope, i.e. expected welfare effective income y_{ih}^* is a function $f(\cdot)$ of the total household income

$$y_{ih}^* = f(y_h). \quad (3)$$

Stutzer (2004) showed that an individual's satisfaction depends mainly on expectations, formed through comparisons. In order to analyze reported satisfaction, therefore, the reference group should be known and taken into consideration. Here, we will analyze differences in satisfaction, reported by household partners. It seems reasonable to assume that the partners evaluate their household income in consideration of the same reference group. What is more, I assume that partners form their expectations about welfare-effective income with reference to each other. More precisely, I assume that partners expect equal sharing in the sense of equal welfare levels $u_{ih}(\cdot)$ from the household income. This assumption is necessary because we could otherwise only detect deviations from expected shares of income and not deviations from equal sharing. In the cultural context of present-days Germany, characterized by individualization (Beck, 1987) and post-materialism (Inglehart, 1997), this assumption is allowed. Meanwhile, research into the allocation of domestic work shows that reality often falls short of such expectations (for an overview: Peuckert, 2008).

Formally, the partners' expectation of equal sharing is expressed as:

$$u_{mh}(y_{mh}^*) = u_{fh}(y_{fh}^*). \quad (4)$$

If partners share their household income equally and the assumption holds that they expect equal sharing, then there is no difference between expected and actual welfare-effective income ($\tilde{y}_{ih} - y_{ih}^*$). The term turns positive if actual welfare-effective income is higher than expected, and is negative otherwise.

$$(\tilde{y}_{ih} - y_{ih}^*) \begin{cases} > 0 & \text{more than expected,} \\ = 0 & \text{as much as expected,} \\ < 0 & \text{less than expected.} \end{cases}$$

Receiving more than expected should have a positive effect on financial satisfaction. Financial satisfaction can therefore be explained as being dependent on the difference between actual and expected welfare effective income:

$$s_{ih} = \alpha_i + x'_{ih}\beta_i + \delta(\tilde{y}_{ih} - y_{ih}^*) + \varepsilon_{ih} \quad (5)$$

where:

s_{ih} = individual financial satisfaction

α_i = gender-specific regression constant

x_{ih} = vector with individual characteristics

β_i = vector with gender-specific effects

δ = effect of intra-household sharing on financial satisfaction

ε_{ih} = individual error term

Model (5) alone is insufficient to analyze the distribution of income-induced well-being among household partners. Rather, income sharing can be examined by comparing the partners' financial satisfaction.

If partners shared their income equally, they should *ceteris paribus* be equally satisfied. If one partner controls more income than the expected amount, he or she should report more financial satisfaction than his/her partner, given their endowment with other relevant attributes. It is the difference in reported satisfaction that provides information about the sharing of income among partners. For this reason, Eq. (5) for the female partner is subtracted from Eq. (5) for the male partner:

$$\begin{aligned} \Delta s_h &= s_{mh} - s_{fh} \\ &= \alpha_m - \alpha_f + x'_{mh}\beta_m - x'_{fh}\beta_f + \delta(\tilde{y}_{mh} - y_{mh}^* - \tilde{y}_{fh} + y_{fh}^*) + v_h \end{aligned} \quad (6)$$

where:

$v_h = \varepsilon_{mh} - \varepsilon_{fh} =$ household level error term

Regarding the differences in reported satisfaction, the term containing the within-household distribution of income is positive if the couple shares its income in favor of the man; it equals zero if they share equally, and negative if they share in favor of the woman.

$$(\tilde{y}_{mh} - y_{mh}^* - \tilde{y}_{fh} + y_{fh}^*) \begin{cases} > 0 & \text{Sharing in favor of the man} \\ = 0 & \text{Equal Sharing, i.e. } (\tilde{y}_{ih} = y_{ih}^*) \\ < 0 & \text{Sharing in favor of the woman} \end{cases}$$

Even after identifying the sharing of income among partners as influencing the partners' financial satisfaction, it still remains unobservable - but theory will provide assistance. Income sharing can be seen as determined by bargaining power, and it seems plausible to assume that the more powerful partner influences financial decisions such as to maximize his/her individual well-being. Again, this bargaining power itself is unobservable, but endogenous. It may be explained as compensation for contributions to the household's welfare (cf. Blood and Wolfe, 1960), or with the amount of welfare each partner would lose in case of disagreement (cf. Ott, 1992; Lundberg and Pollak, 1996).

These two approaches lead to similar expectations: the partner who gains more from the partnership is the one who is worse off in the event of disagreement. In order to determine who is better or worse off in a partnership, the partners' endowment with means of power is analyzed. Particular hypotheses depend on the assumptions about the threat point, i.e. the consequence of disagreement, which will be discussed in Section 4.

For the analysis at hand, age, years of education and own income (earned income plus transfers, as far as they are individually assignable) are taken as means of power, z_{ih} . The distribution of these means of power is supposed to determine the sharing of income between household partners. Without much doubt, sharing depends on relative endowment with means of power, i.e. the distribution factors follow the form $\left(\frac{z_{mh}}{z_{mh}+z_{fh}}\right)$. Within-household sharing of income is supposed to be some function $e(\cdot)$ of the distribution factors displayed in vector d_h .

Formally:

$$(\tilde{y}_{mh} - y_{mh}^* - \tilde{y}_{fh} + y_{fh}^*) = e(d_h) \quad (7)$$

and

$$d_h = [\text{diag}(z_{mh} + z_{fh})^{-1}]z_{mh} \quad (8)$$

where:

d_h = vector of distribution factors

z_{mh} = vector of the male partner's characteristics, taken as means of power

z_{fh} = vector of the female partner's characteristics, taken as means of power

By combining Eq. (6) and (7), we obtain the model for the following estimations.

$$\Delta s_h = \alpha_m - \alpha_f + x'_{mh}\beta_m - x'_{fh}\beta_f + d'_h\gamma + v_h \quad (9)$$

where:

γ = vector containing the effects distribution factors exert on the satisfaction difference

Fig. 1 roughly outlines the underlying relation between theoretical issues and observable facts, in order to facilitate understanding of the model.

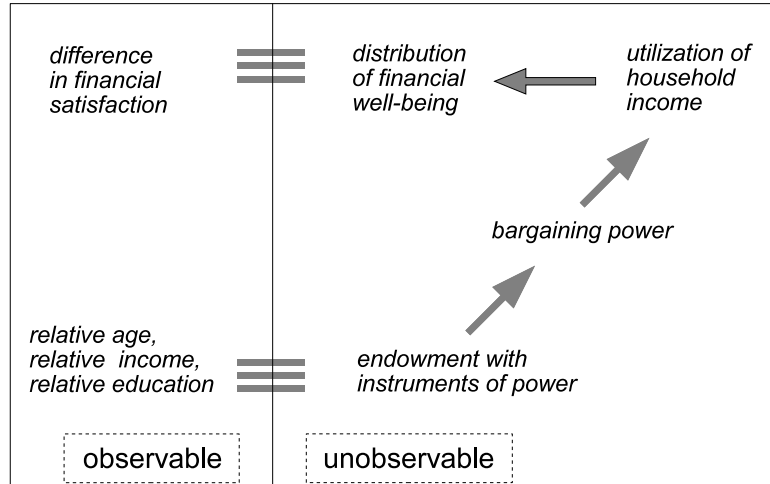


Figure 1: Overview

The model will show whether couples share their household income equally or depending on one or more distribution factors. If distribution factors significantly

influence the satisfaction differences, the equal sharing hypothesis can be rejected. Further, the significant and insignificant distribution factors provide indications of the procedure of distribution.

3 Data and empirical specification

This analysis uses data from the German Socio-Economic Panel (SOEP)² retrieved using the PanelWhiz tool³. The SOEP is a longitudinal survey of persons in households in the Federal Republic of Germany, run annually by the DIW in Berlin. It covers micro-data about demographic, economic, social and political topics, including a wide range of questions on subjective well-being.

The within-household distribution of income is relevant only in households of two or more individuals, so that this analysis focuses on couples living together, with or without children. Couples living together with other persons apart from their own children are excluded. Also, households are dropped when one of the partners leaves the household. All observations with missing values are deleted. Using the waves 1999 up to 2008, an unbalanced sample of $n = 5842$ couples ($\sum_{i=1}^n t_i = 22686$ observations) is obtained.

To determine the distribution of income among household partners, the partners difference in financial satisfaction, men minus women, ranging from -10 up to 10, is used as the dependent variable. In the SOEP, financial satisfaction is surveyed at the beginning of the questionnaire with the following question:

‘How satisfied are you today with the following areas of your life?
Please answer by using the following scale: 0 means "totally unhappy",
10 means "totally happy".
How satisfied are you with your household income?’

Satisfaction differences are not a usual dependent variable, which is why a spike plot is presented. Fig. 2 shows the distribution of the dependent variable,

²The data used in this publication were made available by the German Socio-Economic Panel Study (SOEP) at the German Institute for Economic Research (DIW), Berlin. For details, see Wagner et al. (2007); Haisken-DeNew and Frick (2005).

³The data used in this paper were extracted using the add-on package PanelWhiz v3.0 (Nov 2010) for Stata. PanelWhiz was written by John P. Haisken-DeNew (john@panelwhiz.eu). The PanelWhiz generated .do files and plugins to retrieve the SOEP data used here are available on request. Any data or computational errors in this paper are my own. Haisken-DeNew and Hahn (2006) describe PanelWhiz in detail.

the difference in financial satisfaction between husband and wife and, for comparison, the normal distribution. The generally small satisfaction difference between husband and wife is not surprising with regard to the findings of Van Praag and Ferrer-i-Carbonell (2004). They also found small differences in financial satisfaction and its determinants between women and men in Germany (Van Praag and Ferrer-i-Carbonell, 2004, 117). The slight tendency towards the left end of the scale in Fig. 2 indicates slightly higher values of financial satisfaction for the wife.

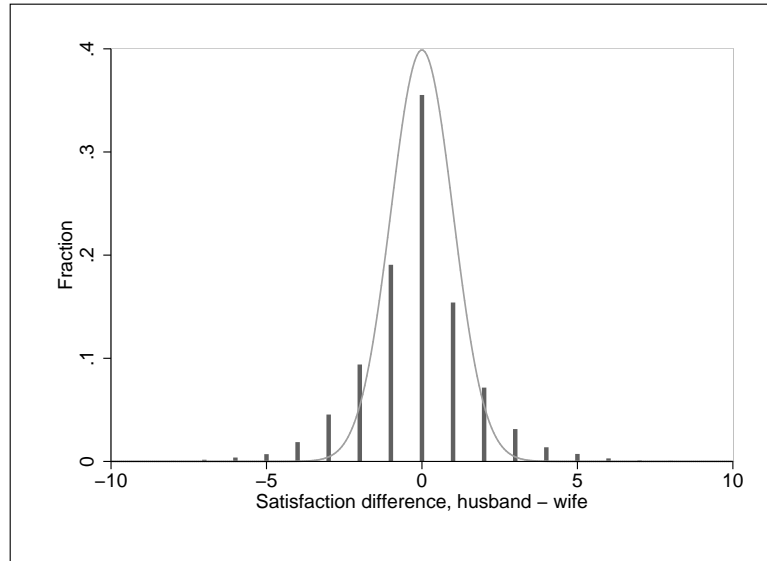


Figure 2: Differences in expressed financial satisfaction

The satisfaction differences are to be explained in order to test the equal sharing hypothesis and to gain insight into the procedure of distribution between household partners. Explanatory variables are the distribution factors, following the structure described in Eq. (8). That is: values of 0.5 indicate that both partners are equally endowed with the respective attribute; values between zero and 0.5 indicate that the man's endowment is less than that of his spouse; values between 0.5 and unity indicate that the man's endowment exceeds that of his spouse. Three distribution factors will be analyzed:

1. The relation between the partners' individual income (gross wage plus incomes from any other source, where given in gross amounts, all in log values), ranging from 0 (man having no income) to 1 (man having all income),
2. the relation between the partners' age, ranging from 0.36 to 0.7, and

3. the relation between the partners' education or earnings potential (including vocational training, expressed in years necessary to obtain such certificate) ranging from 0.28 to 0.72.

Further, the model contains independent variables to control for the partners' different endowment with characteristics, influencing satisfaction statements. Kalugina et al. (2009) used a different approach to adjust self-reported welfare to deviances from experienced welfare: they allowed small differences of self-reported welfare in their definition of equal sharing. In addition to the within-household sharing there are further attributes that are related to financial satisfaction (cf. Argyle, 1999; Van Praag and Ferrer-i-Carbonell, 2004): age, education, income and employment. To confirm these attributes, random effect estimations⁴ are run on the same sample, separated by gender, i.e. for each partner of a couple, according to the following model:

$$s_{iht} = \alpha_i + x'_{iht}\beta_i + \nu_{ih} + \tau_{iht} \quad (10)$$

where:

ν_{ih} = individual random effect

τ_{iht} = residual error term

Robust clustered standard errors are assumed for these estimations because errors τ_{iht} are neither identically nor independently distributed. The results are shown in Table 1.

Based on the results in Table 1, in the subsequent estimations the following variables will be used to control for the partners' different endowments with satisfaction-influencing characteristics: each partner's own income (for some estimations, this will be separated according to sources of income, i.e. earned

⁴As usual, when the sample size is big, and the Hausman test therefore is powerful (cf. Meepagala, 1992), fixed effects estimations are indicated. The analyses in this paper, however, do not employ fixed effects estimation due to its inefficiency and the loss of cross-sectional information. This is of importance here, because five out of six explaining variables show remarkably lower within- than between-variation. As a consequence, some of the standard errors estimated with fixed effects models are suspiciously high. Beyond this, Hahn et al. (2010) showed that the preconditions for the Hausman test may be violated if within variation is small, and therefore the test may be unreliable. Finally, the results do not change in a theoretically meaningful way.

Table 1: Determinants of financial satisfaction

Variable	Men		Women	
	Coef.	S.E.	Coef.	S.E.
Household income, log.	1.326***	(0.044)	1.575***	(0.043)
Household size, log.	-0.549***	(0.101)	-0.449***	(0.104)
Age	-0.005	(0.017)	-0.006	(0.018)
Age, squared	-0.000	(0.000)	0.000	(0.000)
Birth cohort: before 1950	0.213	(0.136)	-0.145	(0.141)
Birth cohort: 1951 - 1970	-0.041	(0.088)	-0.137	(0.085)
Years of education	0.043***	(0.007)	0.040***	(0.008)
Earned income	0.299***	(0.021)	0.098***	(0.018)
Transfer income	0.041*	(0.022)	-0.025**	(0.012)
Old age pension	0.030*	(0.015)	0.003	(0.022)
Working hours	-0.000	(0.001)	-0.009***	(0.001)
Unemployed	-0.644***	(0.184)	-0.459***	(0.125)
Control for hh heterogeneity	yes		yes	
Period effect control	yes		yes	
Constant	-6.759***	(0.459)	-6.894***	(0.457)

Note: Linear regression estimations with individual-specific random effects. Clustered robust standard errors are in parentheses. Significance level: * <0.1 , ** <0.05 , *** <0.01 . Reference category: Birth cohort: after 1970. Complete estimation results can be found in the Appendix in Table A.1.

Source: SOEP 1999 - 2008. $\sum_{i=1}^n t_i = 22686$.

income, own pension, other individual transfer income), years of education (as defined above), actual working hours and a dummy variable indicating whether someone is unemployed at the time of the interview.

The systematic control for attributes that affect satisfaction in addition to perceived welfare distinguishes this analysis from other work using a subjective approach (Bonke and Browning, 2009; Kalugina et al., 2009). Since most partners differ with regard to such attributes, unequal answers to questions of satisfaction do not necessarily express unequal welfare. For this reason, it is necessary to control for these attributes in order to examine the distribution of welfare between household partners, instead of the distribution of answers on questions of satisfaction.

To control for the household's stratum, the school-leaving certificate of the better educated partner and the combined birth cohort of the partners are used.

For this sample, I expect that scarcity evokes unequal sharing in favor of the more powerful partner. The household's income is therefore included in log values as a control variable. Ludwig-Mayerhofer et al. (2006) found that inequality between household partners occurs more frequently when household income is

higher. However, their results do not shape expectations in this case because they examined inequality in poor households and focused on amounts of spending money, not welfare. Again, the household income is adjusted to household size using the number of persons in log values (cf. Schwarze, 2003). Further heterogeneity is controlled for by family situation (childless couples, couples with children of both spouses in household, couples with children from only one of the spouses, couples with children of both spouses that live in other households), the employment situation of the household (one binary variable indicating whether both spouses have the same employment level, another indicating whether allocation of work follows the male breadwinner scheme), the legal status of the partnership, i.e. married (yes or no), and whether the partners grew up in the GDR or immigrated to Germany after 1949). Date effects are controlled for by including year dummies.

4 Estimation and results

One major advantage of this analysis compared to other work on this topic (Bonke and Browning, 2009; Kalugina et al., 2009) is the usage of panel data. In contrast, Bonke and Browning (2009) explicitly refrain from using within-household variation over time. Instead, they used only the first wave of their panel data set, asserting that they "find it unlikely that transitory changes in the distribution of within-household income would lead to significant contemporaneous changes of private expenditures" (Bonke and Browning, 2009, p.35). Using panel data allows us to control for unobserved household heterogeneity, such as the particular constellation of individual psychological characteristics. It is well known that these stable individual characteristics have a large impact on responses to satisfaction items (Argyle, 1999; Diener et al., 1999). This means that an optimist and a pessimist will express diverging satisfaction regarding the same level of welfare, everything else held constant. The difference in self-reported satisfaction therefore depends on the particular constellation of characters of each couple. This is what is called unobserved household heterogeneity, which needs to be controlled for in order to examine the distribution of income-induced well-being.

Using random effects estimation, the household-specific error term η_h in Eq. (11) accounts for this. Adding the time dimension, the estimated model can be written as

$$\Delta s_{ht} = \beta_0 + x'_{mht}\beta_m - x'_{fht}\beta_f + d'_{ht}\gamma + \eta_h + \varepsilon_{ht}. \quad (11)$$

Stochastic errors are kept in ε_{ht} , and the intercept $\beta_0 = \alpha_m - \alpha_f$ contains the gender effect on financial satisfaction.

Responses to satisfaction items are usually used as data on an ordinal scale of measurement. The same could have been expected with satisfaction differences. Other authors proceeded in that way (Bonke and Browning, 2009; Kalugina et al., 2009), collapsing the differences to broader categories and then using ordered probit estimation. But once differences between scores of expressed satisfaction are used, a metric scale is implied. Taking the difference between 1 and -1 to be the same as the difference between 2 and 0, there is no need to imply only an ordinal scale for these differences.

Before presenting the results, the expected impact of the distribution factors will briefly be introduced. As mentioned in Section 2, expectations depend on assumptions about the procedure of distribution. If dissolution of the partnership is assumed to be the threat point, i.e. the situation impending in case of disagreement, then the partner with the smaller earnings potential will be worse off. Although earnings potential may be expressed in years of education, realized income may also be a valid and more realistic indicator of earnings potential, since gaps in employment histories cause serious, long-lasting declines in wages (Beblo and Wolf, 2002). If daily non-cooperation is assumed to be the consequence of disagreement, the partner who controls the smaller share of money in the household will be worse off. Thus, the effect will be the same for both distribution procedures: the partner with the smaller income share will be worse off in the event of disagreement and will therefore be more likely to back down in bargaining situations. The satisfaction difference (computed as the man's satisfaction minus the woman's) will *ceteris paribus* be smaller when the man's income share is smaller. The same can be expected following the resource theory of power. The more a partner contributes to the welfare of the other household members, the more often she or he can decide on matters concerning the household. The more income they contribute, the more often they can decide how to spend it. Consequently, their welfare will be higher than the respective partner's welfare.

Relative age may influence the distribution of power in a partnership if dissolution looms because age influences chances on the marriage market - by and large in favor of the younger person, as Lankuttis and Blossfeld (2003) showed

for remarriages. If the distribution of power can be explained by contributions to the household's welfare and age can be interpreted as experience, and hence the ability to enhance the household's welfare, the older partner should be better off in bargaining situations. It is also plausible to assume, however, that the younger partner contributes to the well-being of the other due to the value society attaches to youthfulness. If daily non-cooperation is assumed to be the threat point, relative age should not have any influence on the distribution of income.

Relative education is expected to have a positive effect on the income distribution if it is understood as earnings potential and if dissolution is assumed to be the threat point. The same is to be expected if education represents contributions to the household's well-being and bargaining power is understood as a compensation for that. If daily non-cooperation marks the threat point, education should not have any influence on income distribution because education does not determine control over resources, i.e. income in household.

If none of the distribution factors have a statistically significant influence on satisfaction differences, the equal sharing hypothesis, i.e. that spouses share their household income equally in the sense of equal welfare, would hold. If one or more of the distribution factors affect satisfaction differences, the equal sharing hypothesis would be rejected.

Eq. (11) was estimated assuming random effects and robust, clustered residual error terms because of heteroscedasticity and autocorrelation. First, the model was estimated using the very three explaining variables introduced in Section 3. Model 1 in Table 2 shows that only one of the theoretically interesting variables explains satisfaction differences between household partners. The relation of financial contributions to the household's income has a significant positive effect on the difference in financial satisfaction, even though difference in own income is controlled for. It would not be possible to interpret the effect size in terms of welfare-effective incomes without extensive assumptions on the individual's welfare function of income. This will not be performed here; the statistically significant effect is used to show that sharing is not independent, and therefore cannot follow an equal sharing rule. It also shows that the satisfaction difference is larger, when the man contributes more to the household income than his wife. That means, the more a partner contributes to the household income, the more the partner benefits from it. Neither relation of education nor relation of age explains differences in satisfaction. Virtually none of the household-level

Table 2: Determinants of differences in financial satisfaction

Variable	Model 1		Model 2		Model 3	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Age relation	-0.691	(0.676)	-0.570	(0.681)	-0.578	(0.674)
Income relation	1.254***	(0.239)				
Relation earned income			1.084***	(0.232)	1.034***	(0.222)
Relation pension			1.063**	(0.528)	1.011**	(0.512)
Relation transfer income			-0.417	(0.466)	-0.098	(0.083)
Education relation	3.509	(2.398)	3.455	(2.400)	3.603	(2.382)
Husband's years of education	-0.069	(0.046)	-0.068	(0.046)	-0.080*	(0.045)
Wife's years of education	0.083*	(0.045)	0.082*	(0.046)	0.080*	(0.045)
Husband's income	-0.062	(0.044)				
Wife's income	0.116***	(0.031)				
Husband's earned income			-0.038	(0.040)	-0.060*	(0.035)
Wife's earned income			0.081***	(0.030)	0.070**	(0.029)
Husband's old age pension			-0.001	(0.017)		
Wife's old age pension			0.152**	(0.065)	0.146**	(0.062)
Husband's transfer income			0.027	(0.031)		
Wife's transfer income			-0.058	(0.079)		
Husband's working hours	-0.002	(0.002)	-0.002	(0.002)		
Wife's weekly working hours	0.005***	(0.002)	0.005***	(0.002)	0.006***	(0.002)
Husband unemployed	-0.237	(0.236)	-0.241	(0.252)		
Wife unemployed	0.124	(0.167)	0.084	(0.171)		
Household income, log.	-0.071	(0.054)	-0.064	(0.053)		
Household size, log.	-0.066	(0.100)	-0.070	(0.100)		
Control for hh heterogeneity	yes		yes		no	
Period effect control	yes		yes		partially	
Constant	-2.194	(1.351)	-2.776*	(1.534)	-3.427**	(1.393)

Note: Linear regression estimations with household-specific random effects. Clustered robust standard errors are in parentheses. Significance level: * <0.1 , ** <0.05 , *** <0.01 . Complete estimation results can be found in the Appendix in Table A.2.

Source: SOEP 1999 - 2008. $\sum_{i=1}^n t_i = 22686$. $n = 5842$.

control variables are significantly related to satisfaction differences. This may be surprising, but it is in line with the findings of Bonke and Browning (2009).

The influence of various sources of income on satisfaction differences is analyzed in a second step, since several considerations lead to the expectation of different effects for the various sources of income. For example, Oswald and Winkelmann (2008) showed that different sources of income have distinct effects on satisfaction. In light of the briefly discussed theories above, distinct effects of different sources of income may be interpreted as an indication of one or the other distribution procedure. If the amount of income a partner controls were the distribution factor, as bargaining theory with the threat point of daily non-cooperation supposes, all sources of income should exert nearly the same influence on satisfaction differences. Likewise, bargaining with the threat of the dissolution of the partnership would predict nearly the same effects for all sources of income because the individually assignable transfer income does not depend on the structure and needs of the household. According to the findings of Oswald and Winkelmann (2008), we could expect income of different sources to be perceived unequally as individual contribution to the welfare of the household members. If this is the case, with the resource theory of power we could expect income from different sources to be compensated unequally with rights to decide how to spend the income. The effects of income from different sources on satisfaction differences would differ: the earned income would have the largest effect and transfer income the smallest, because the latter flows without effort. The effect of own pensions would be somewhere in between, because retirement income also comes without further effort, but is strongly dependent on former contributions. Model 2 in Table 2 therefore includes different sources of income: instead of the distribution factor ‘income relation’, three distribution factors are included: ‘relation of earned income’, ‘relation of old age pensions’ and ‘relation of transfer income’. Following the idea to control for satisfaction-influencing attributes, the control variables are adjusted to the explaining variables, i.e. separated in the same categories. The results clearly show that transfer income does not act as a means of power, the coefficient of ‘relation of transfer income’ is not systematically different from zero. Only earned income and pensions, which are strongly related to former earnings, have a statistically significant impact on differences in financial satisfaction between household partners and, hence, can be interpreted as influencing the within-household sharing of income.

Since many of the covariates do not exert any significant influence on satisfaction differences, for a third estimation (Model 3 in Table 2) insignificant variables were dropped stepwise to reach a more parsimonious specification. The effects of the significant distribution factors diminish slightly, but as the size of these effects is not interpretable, the main result is stable despite this change. Furthermore, the effects of the husband's years of education and the husband's earned income approximate the respective effect of the wife's and become statistically significant. The standard errors of the explanatory variable 'education relation' are rather high. This could be caused by collinearity with the control variables 'years of education' of both partners, leading to the imprecise estimation of the coefficients (cf. Greene, 2008). For this reason, a further estimation was run without these covariates (results not shown); standard errors decreased and the coefficient changed, but remained insignificant. Other coefficients did not change substantially.

The estimation results provide an indication of distribution factors or means of power: partners share their household income according to their contributions to this income. This finding is not adequate to discriminate between one or the other procedure of distribution - all three theories predicted this result. The results of the second estimation, which distinguishes between different sources of income, are contrary to both bargaining theories. They are in line with the resource theory of power, which explains decision rights as compensation for individual contributions to the other's welfare. If the results of Oswald and Winkelmann (2008) are interpreted liberally, transfer income might be perceived as individually assignable contribution that does not need to be compensated because of the less effort required to obtain it. Further research into the meanings of income from different sources will help to assess this interpretation.

The results do not support any unambiguous statement about distribution procedures, but in sum provide evidence against the equal sharing assumption. This is in line with other work on this topic (Bonke and Browning, 2009; Ludwig-Mayerhofer et al., 2006; Kalugina et al., 2009; Browning et al., 1994; Bourguignon et al., 1993).

5 Simulation

The results shown in Section 4 imply that equivalent income calculated under the assumption of equal sharing does not represent the individual's welfare position. Further, the results indicate that income sharing between household partners depends on each partner's contributions to the household income. However, the results do not allow statements to be made about how unequal partners share their income. This would require further specifications of the utility function, i.e. on the transmission from income to welfare.

To outline the possible scope of misrepresentation, a straightforward simulation is executed. The spouses mean welfare-effective income is calculated based on assumptions of dependent sharing. To enable interpretation to be made, equivalent income, computed under the assumption of equal sharing, will also be displayed.

In the illustrative simulation it is therefore assumed that partners share parts of their income corresponding to their income contribution, i.e. the within-household economies of scale are unequally shared. Other assumptions are possible, too (cf. Phipps and Burton, 1995; Jenkins, 1991). For this simulation, an equivalence scale with an elasticity of $e=0.3$ is used to adjust the monthly household net income y_h for economies of scale⁵. Instead of assigning every household partner the same welfare effective income \tilde{y}_{ih} , however, the adjusted household income is allocated according to the following sharing rule:

n_h denotes the household size (number of persons) and p_h is the income share the husband contributes to the household's income, i.e. one of the elements of the vector of distribution factors d_h , explained in Section 3.

The man's welfare-effective income can be computed as

$$\tilde{y}_{mh} = \frac{y_h}{n_h} + 2 \left(\frac{y_h}{n_h^e} - \frac{y_h}{n_h} \right) p_h \quad (12)$$

⁵Equivalence scales can be compared regarding their elasticity (Buhmann et al., 1988). The higher the elasticity, the lower the assumed economies of scale. The OECD equivalence scale, for example, can be approximated with an elasticity of 0.5. Due to the assumptions made here to compute the welfare-effective income under dependent sharing, the difference between the husbands' and the wives' mean income will be smaller when equivalence scales with higher elasticity are used.

and the wife's as

$$\tilde{y}_{fh} = \frac{y_h}{n_h} + 2 \left(\frac{y_h}{n_h^e} - \frac{y_h}{n_h} \right) (1 - p_h). \quad (13)$$

Using these welfare effective incomes, the mean incomes of husbands and wives in the sample at hand were computed. It should be kept in mind that the precise assumption about the extent of dependent sharing is not an estimation result but a somehow arbitrary setting. Estimation results only allow us to state that the more income a partner contributes, the more she or he gets out of the household income. Table 3 shows the mean and the standard deviation of the monthly welfare-effective income for male and female household partners, computed under the assumption of equal sharing and under the assumption of dependent sharing, as outlined above.

Table 3: Personal welfare-effective monthly income in Euro in 2008 computed under different assumptions

	Husbands	Wives
	Computed under equal sharing assumption	
Mean	2409.78	2409.78
Standard deviation	1086.94	1086.94
	Computed under dependent sharing assumption	
Mean	2848.72	1970.83
Standard deviation	1418.57	1001.08

Note: Observations are frequency-weighted using household weights. *Source:* SOEP 2008, $n = 2093$ couples, $N = 4669688$ households.

Under the assumption of equal sharing, the mean incomes of household partners are the same. However, under the assumption of dependent sharing as defined above, husbands' mean income is nearly 50 percent higher than wives' mean income. This holds for the whole distribution of personal income. Fig. 3 shows the kernel density estimation for the distribution of personal income, computed under the equal sharing assumption, and the respective estimations for the distribution of income, computed under the dependent sharing assumption, separated by gender.

This may serve as an illustration of the possible magnitude of misrepresentation of people's welfare position if the equal sharing assumption is used to compute equivalent income.

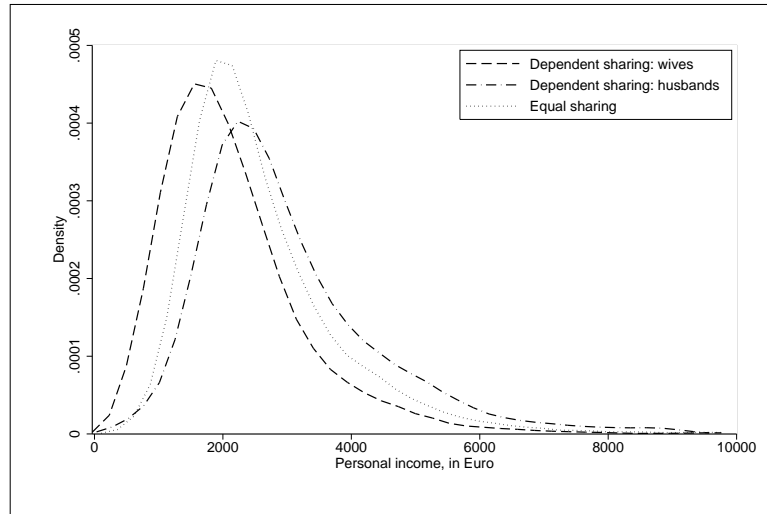


Figure 3: Distributions of personal income computed under different assumptions

6 Concluding remarks

In this analysis, components of differences in financial satisfaction between household partners are interpreted as welfare differences. The well-being from the household's income should be equally distributed among household members if they shared their household income following an equal sharing rule.

The results clearly show that the equal sharing hypothesis can be rejected. The estimated effects of the distribution factors are stable for different vectors of control variables. Observable household heterogeneity did not have statistically significant effects on the satisfaction differences. Neither the legal status of the partnership nor the presence of children or the amount of the household's income itself determine intra-household sharing.

Adding to the literature, a theoretical model was developed that allows us to distinguish between 1) variables explaining welfare differences between household partners, and 2) variables required to control for the household partners' different endowment with satisfaction-influencing attributes. Another novelty is the use of panel data so that random effects estimation could be employed, enabling controlling for unobserved heterogeneity.

For all analyses of the personal income distribution, these results imply that equivalent income, computed under the assumption of equal sharing, will lead to misrepresentation of the welfare position, ascribed to most persons in households of two or more individuals.

A Appendix

Table A.1: Determinants of financial satisfaction

Variable	Men		Women	
	Coef.	S.E.	Coef.	S.E.
Household income, log.	1.325***	(0.044)	1.573***	(0.043)
Household size, log.	-0.550***	(0.101)	-0.444***	(0.104)
Current age	-0.005	(0.017)	-0.006	(0.018)
Current age, squared	-0.000	(0.000)	0.000	(0.000)
Birth cohort: before 1950	0.212	(0.136)	-0.145	(0.141)
Birth cohort: 1951 - 1970	-0.042	(0.088)	-0.136	(0.085)
Years of education	0.043***	(0.007)	0.040***	(0.008)
Earned income	0.299***	(0.021)	0.098***	(0.018)
Transfer income	0.041*	(0.022)	-0.025**	(0.012)
Old age pension	0.030*	(0.015)	0.003	(0.022)
Working hours	-0.000	(0.001)	-0.009***	(0.001)
Unemployed	-0.644***	(0.184)	-0.460***	(0.125)
Male breadwinner household	-0.201***	(0.064)	-0.048	(0.066)
Equal employment level	-0.016	(0.025)	0.011	(0.028)
Married	0.118**	(0.048)	0.175***	(0.049)
Childless	-0.018	(0.077)	0.077	(0.078)
Children in hh, not shared	-0.147**	(0.058)	-0.088	(0.059)
Children out of hh	-0.047	(0.072)	0.098	(0.074)
Changing family situation	0.004	(0.057)	-0.037	(0.058)
East German origin	-0.371***	(0.049)	-0.424***	(0.050)
Immigrated	-0.088	(0.064)	-0.142**	(0.065)
d2000	-0.006	(0.043)	0.100**	(0.044)
d2001	0.071	(0.044)	0.072	(0.045)
d2002	0.971***	(0.050)	0.994***	(0.052)
d2003	0.851***	(0.052)	0.770***	(0.053)
d2004	0.715***	(0.053)	0.727***	(0.055)
d2005	0.724***	(0.055)	0.708***	(0.057)
d2006	0.700***	(0.057)	0.664***	(0.058)
d2007	0.643***	(0.059)	0.622***	(0.060)
d2008	0.672***	(0.062)	0.612***	(0.063)
Constant	-6.756***	(0.458)	-6.882***	(0.456)

Note: Linear regression models with individual specific random effects. Standard errors are in parentheses. Significance level: * <0.1 , ** <0.05 , *** <0.01 . Reference category: Birth cohort: after 1970.

Source: SOEP 1999 - 2008. $\sum_{i=1}^n t_i = 22862$.

Table A.2: Determinants of differences in financial satisfaction

Variable	Model 1		Model 2		Model 3	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Age relation	-0.691	(0.676)	-0.570	(0.681)	-0.578	(0.674)
Income relation	1.254***	(0.239)				
Relation earned income			1.084***	(0.232)	1.034***	(0.222)
Relation pension			1.063**	(0.528)	1.011**	(0.512)
Relation transfer income			-0.417	(0.466)	-0.098	(0.083)
Education relation	3.509	(2.400)	3.455	(2.402)	3.603	(2.383)
Husband's years of education	-0.069	(0.046)	-0.068	(0.046)	-0.080*	(0.045)
Wife's years of education	0.083*	(0.045)	0.082*	(0.046)	0.080*	(0.045)
Husband's income	-0.062	(0.044)				
Wife's income	0.116***	(0.031)				
Husband's earned income			-0.038	(0.040)	-0.060*	(0.035)
Wife's earned income			0.081***	(0.030)	0.070**	(0.029)
Husband's old age pension			-0.001	(0.017)		
Wife's old age pension			0.152**	(0.065)	0.146**	(0.062)
Husband's transfer income			0.027	(0.031)		
Wife's transfer income			-0.058	(0.079)		
Husband's weekly working hours	-0.002	(0.002)	-0.002	(0.002)		
Wife's weekly working hours	0.005***	(0.002)	0.005***	(0.002)	0.006***	(0.002)
Husband unemployed	-0.237	(0.236)	-0.241	(0.252)		
Wife unemployed	0.124	(0.167)	0.084	(0.171)		
Household income, log.	-0.071	(0.054)	-0.064	(0.053)		
Household size, log.	-0.066	(0.100)	-0.070	(0.100)		
Birth cohort: before 1950	0.009	(0.069)	0.022	(0.070)		
Birth cohort: 1951 - 1970	-0.008	(0.054)	0.002	(0.054)		
At most, basic school leaving certificate	-0.039	(0.051)	-0.037	(0.051)		
University degree	-0.068	(0.057)	-0.068	(0.058)		
Male breadwinner household	-0.047	(0.080)	-0.064	(0.080)		
Spouses with equal employment level	-0.000	(0.032)	-0.004	(0.032)		
Married	-0.075	(0.052)	-0.067	(0.052)		
Childless, equal empl.level	-0.028	(0.073)	-0.030	(0.073)		
Children in hh, not shared	-0.030	(0.053)	-0.036	(0.053)		
Children out of hh, and other childless	-0.100	(0.077)	-0.098	(0.077)		
Changing hh situation	0.047	(0.049)	0.047	(0.049)		
One spouse grew up in GDR	-0.087	(0.117)	-0.083	(0.117)		
Both grew up in GDR	0.055	(0.046)	0.051	(0.046)		
Both spouses immigrated	0.163***	(0.058)	0.162***	(0.058)		
One spouse immigrated	-0.120	(0.085)	-0.117	(0.085)		
d2000	-0.114**	(0.049)	-0.112**	(0.049)	-0.106***	(0.036)
d2001	-0.026	(0.050)	-0.025	(0.050)		
d2002	-0.034	(0.055)	-0.037	(0.056)		
d2003	0.055	(0.057)	0.054	(0.057)		
d2004	-0.049	(0.056)	-0.050	(0.057)		
d2005	-0.033	(0.057)	-0.033	(0.057)		

Table A.2: (continued)

Variable	Model 1		Model 2		Model 3	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
d2006	-0.022	(0.058)	-0.023	(0.058)		
d2007	-0.044	(0.057)	-0.044	(0.058)		
d2008	-0.019	(0.057)	-0.019	(0.058)		
Constant	-2.194	(1.351)	-2.776*	(1.534)	-3.427**	(1.393)

Note: Linear regression models with household-specific random effects. Clustered robust standard errors are in parentheses. Significance level: * <0.1 , ** <0.05 , *** <0.01 . Reference categories: Birth cohort: after 1970; Intermediate education; Spouses with intermediate unequal employment level and female breadwinner households; Couple living together with at least one joint child.

Source: SOEP 1999 - 2008. $\sum_{i=1}^n t_i = 22862$. $n = 5915$.

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