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Do husbands and wives pool their incomes?

Experimental evidence

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Abstract: In this paper, we propose a direct test of income pooling within couples, which yields new insight into intra-household bargaining behaviour. For this purpose, we performed a five-round experiment with 95 real, established couples in Germany. In each round, the couples received the same amount of money, though with differing allocations between the spouses, to make consumption choices for private goods. We observed the choices to depend strongly on the spouses' relative resources for about half the sample and interpret this as a rejection of the income pooling hypothesis. Moreover, non-pooling was positively related with the homogeneity of the spouses' characteristics (in terms of age, education, working hours) and negatively with their average education and income levels.

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JEL Codes: C71, C91, C92, D13

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1 Introduction

Income pooling within the family is one of the key assumptions, not only of traditional economic theory but also of many tax-welfare systems. It eases the analysis in commonly-used models of household decision making (e.g. the unitary model and the cooperative Nash-bargaining model). Likewise, it facilitates the design of public taxes and transfers as "marital spouses are assumed to form an earnings and consumption community, in which each one shares in the earnings of the other by one half" (statement of the German Federal Constitutional Court on married couples' joint taxation, BVerfGE 1983).

In this paper, we define income pooling very broadly by classifying income as pooled if each euro that enters the household is treated equally, no matter to whom it is handed. That is, the same proportion of each euro should be spent on food, clothing, common or private goods, whether it is received as a child benefit, as female spouse's earnings, as male spouse's capital income etc. Thereby, a household's money and consumption arrangements do not necessarily have to foresee a fair or even equal split between household members. In compliance with our definition, consumption decisions simply have to be independent of the recipient of the payment.

The income pooling assumption has been widely rejected in empirical studies. However, direct evidence is only provided by field experiments carried out in developing countries (e.g. by Attanasio/Lechene 2002). For industrialized countries, analyses based on policy changes that were accompanied by a changing money allocation for the household members (Lundberg et al. 1997, Ward-Batts 2008) and surveys on money arrangements between spouses and their intentions (Chen/Woolley 2001, Ludwig-Mayerhofer 2006, Bonke/Browning 2010) indicate the rejection of the income pooling assumption. Finally, structural econometric models on specific subgroups of households have challenged the unitary model, and with it the assumption of income pooling, and provided indirect evidence against the pooling hypothesis (see for example Thomas 1990, Browning et al. 1994, Browning/Chiappori 1998 and Phipps/Burton 1998). Nonetheless, still very little is known about the heterogeneity of couples' and households' actual behaviour in European countries and particularly in Germany. A direct test of income pooling has not been proposed for industrialized countries yet.

Our paper fills this gap. It provides a direct test of income pooling between spouses, using experimental evidence from real couples' behaviour in Germany. We ran experiments with established couples (married and unmarried) to investigate how they divide money and time

under a given resource allocation and how this division changes with a varying resource allocation.

In the following we give a brief literature overview. First, we introduce studies discussing the income pooling assumption from both empirical and theoretical points of view. Second, we comment on the few existing experimental studies on real couples' behaviour. We then present our experimental approach to test the assumption of income pooling within established couples. This includes a description of the experimental design, the characteristics of the participants, the structure of the experimental sessions, and the results of the experiment. We derive our hypotheses regarding the expected behaviour of participants under the assumption of income pooling as well as the possible implications for family economics. The paper finishes off with a discussion on the limitations of the experiment and the external validity of our findings.

2 Literature review

2.1 Income pooling in household decision models

The question whether the family pools its monetary resources has received careful attention in the economic literature, although answering this question is not an easy task. Existing micro-data sets do not provide direct evidence on income pooling since consumption patterns are usually aggregated at the family level. However, different empirical approaches have been developed in order to test the income pooling hypothesis on the basis of household data. The inadequacy of this assumption has been shown frequently, for earned as well as unearned income (see e.g. Thomas 1990, Browning et al. 1994 and Phipps/Burton 1998). Bonke/Uldall-Pulsen (2007) and Bonke/Browning (2010) draw on a specific question in the Danish Expenditure Survey ─ regarding individual expenditures for some private goods ─ to conclude on income pooling within the household. Also based on Danish survey responses, Amuedo-Dorantes et al. (2010) find that the higher the wage of unskilled female workers in the region of residence, which serves as their proxy for the price of commercial domestic services, the more couples are likely to share their income completely. Alternatively Ludwig-Mayerhofer (2006) conducts statistical tests based on survey information of households' financial management.

In those tests however, as stated by Attanasio/Lechene (2002), individual incomes often reflect choices which are not independent of the outcome being investigated (as e.g. the

consumption-leisure decision). Differences in relative incomes may not be exogenous, and thus, rejections of income pooling may arise from mere misspecification of the model.

What is needed in order to test the pooling of resources by household members is an exogenous source of variation in elements which might affect choices indirectly, but not through preferences or by shifting the household budget constraint. Hence, a natural experiment is needed. A government transfer policy, which redistributes resources within the household, is an example of such exogenous variation providing a quasi-natural experiment. Lundberg et al. (1997) and Ward-Batts (2008) exploit an exogenous variation provided by the 1979 reform of the child benefit in the United Kingdom. By use of aggregate data, respectively micro-data both on income and number of children both studies found income pooling to be rejected on demand outcomes.

Another convincing approach to test for income pooling is to use the outcome of field experiments carried out in different developing countries. The general idea is to divide the population into two groups, whereof one receives additional money. Alternatively, some of the family income is transferred to the wife. In observing the different behaviour between the control and treated groups, one can draw conclusions on the incidence of the income structure for the expenditures. Using a difference-in-difference approach with Mexican panel data Attanasio/Lechene (2002) find that household expenditures depend on who receives the money in the family, rejecting therefore the hypothesis that the family pools its incomes. However, such experiments may often not be replicated in industrialized countries for legal reasons.

Despite this unambiguous empirical evidence, the question whether family members pool their incomes receives contrary answers from a theoretical perspective. The respective answer depends on the specific model of household behaviour considered. In the unitary model, household decisions are analyzed under the assumption that the household forms a single decision unit maximizing an aggregated family welfare function. Consequently, the unitary representation supposes the total pooling of all household incomes. Furthermore, as early as in Samuelson (1956), it was recognized that assuming families to behave as if they were single consumer implies strong restrictions on the properties of demand functions, e.g. the compensated price responses on demand function is symmetric (Slutsky symmetry). Many empirical applications to household data are indeed rejecting these restrictions (Deaton 1990, Browning/Meghir 1991, Banks et al. 1997, Browning/Chiappori 1998). Although the unitary model is regarded with much scepticism, it remains very popular for policy simulation

purposes, as it allows accounting for a real-world budget set. However, the couple is considered as a single decision taker in the unitary model. No conclusions on any resulting intra-household allocation and the individual welfare of the evaluated reform can thus be drawn. This might be of great political interest, as some transfers, for example those for children are often given to mothers, on the belief that additional resources to mothers improve the children's welfare.

In contrast to the unitary representation, bargaining models of the household consider the family members as individual decision-makers. As such, income pooling is not generally imposed. Non-unitary models can be divided in two categories, depending on whether household decisions are supposed to be efficient. The fully co-operative approach, resulting in Pareto-efficient decisions, was first developed on the base of game theory (Manser/Brown 1980, McElroy/Horney 1981). The household decision depends on the definition of the rules of the game (Nash-bargaining) and the specified threat point, itself possibly determined by the solution of a non co-operative game (Lundberg/Pollak 1993, Chen/Woolley 2001). In these models, income pooling is not the rule. Apps/Rees (1988) and Chiappori (1988, 1992) introduce the collective model, which results in Pareto-efficient outcomes too. However, no rules are pre-defined as for the household behaviour. This model provides a straightforward test of income pooling. It consists in testing whether the sharing rule, i.e. the equation describing the intra-household allocations of the resources depends significantly on individual income-related variables. Empirical studies frequently find a positive answer to this test (see for example Browning/Chiappori 1998, Beninger et al. 2007). However, these tests are based on cross-section data. We can thus address the same concerns as above.

The second approach is based on two types of non-cooperative games, generally leading to inefficient equilibrium outcomes. In the first type each individual is supposed to be responsible for a 'separate sphere' of joint consumption (Lundberg/Pollak 1993), i.e. each spouse specialises in a distinct task. Income pooling is therefore excluded. In the second type, each individual voluntarily contributes to at most one public good (Chen/Woolley 2001, Lechene/Preston 2005, Browning et al. 2010). In this case, there is local income pooling: the decision for the public good does not depend on who is contributing to it. D'Aspremont/Dos Santos (2009) conciliate both co-operative and non co-operative approaches in proposing a more general model including both extremes as special cases. In addition, the model allows a range of intermediate cases. This model has not been empirically tested yet, partly due to the lack of suitable information in the available data sets.

To sum up, the existing empirical tests of the income pooling assumption can be seen very controversially, since they are mainly based on non-exogenous changes of the family income structure. A notable exception using micro-data is the study by Ward-Batts (2008). However, her results are based on the sole transfer of the child benefit from the father to the mother. Hence, the study excludes the non-eligible population. Field experiments performed in developing countries are a methodologically very convincing approach to test income pooling. Unfortunately, this kind of evidence may not be obtained for Germany due to legal (and cost) reasons, and one can barely draw conclusions on the family behaviour in industrialized countries based on the existing results.

Our contribution to this literature is to provide direct evidence on the feasibility of the income pooling assumption in an industrialized country, independent of any theoretical constraints imposed by an underlying structural model. Instead, we use an experimental approach. Experiments are a convenient and widely accepted method to gain a deeper insight into questions which are difficult and very costly to be answered by survey data. Although the transferability of results gained from experiments is often considered rather limited, we see much scope for our application as we observe the behaviour of established couples (rather than student participants) in situations similar to their real lives.

2.2 Past experiments with real couples

Apart from the above-cited field experiment of Attanasio/Lechene (2002), that rejects income pooling in Mexican families, there are few other experimental studies on couples' behaviour. In Iversen et al. (2006) and Iversen et al. (2011) social dilemma games are analysed between couples in rural Uganda. The participating spouses often do not maximize surplus and thus largely fail to achieve efficiency. According to the authors households perform better when women are managing the common pool although they contribute less to it.

Peters et al. (2004) perform laboratory experiments where the participants are involved in a public good game with varying counterparts. The authors find that participants contribute more to the public good when the group consists of family members than when playing with strangers. Cochard et al. (2009) generate similar results when analysing cooperation within couples: The spouses' internal cooperation in a Prisoner's dilemma is also higher than when paired with strangers. However, cooperation within the couple is still not at its maximum. Munro et al. (2008) provide an indirect test of income pooling and Pareto efficiency. Like

Carlsson et al. (2009), Mani (2008) and Robinson (2008), they tend to find inefficiency in couples' decisions (spouses do not pool their incomes completely and particularly men discount their partner's payoffs), whereas Bobonis (2009) does not reject the efficiency assumption. Ashraf (2005) and Bateman/Munro (2005) investigate public good contributions within families/couples. They find that couples are more risk averse and follow predictions of income pooling when making choices jointly compared to when they make choices individually.

Finally, de Palma et al. (2009) assess how risk preferences of two spouses aggregate over the decision process. One of their main findings is that women gain more decision-making power over time (= experimental rounds).

3 Our experiment

3.1 General information

Our own experiment was conducted in Mannheim, a city with 312,000 inhabitants located in the south-west of Germany. With the aim of testing intra-household income pooling, the experiment was restricted to established couples. Both spouses had to be present and participate in the experiment. We were able to recruit 95 couples.

Table 1: Key facts

- Large experimental study with 95 established couples (= 190 participants) in Germany
- Participation condition: heterosexual couple, living together for at least one year
- Conducted in May 2010, in Mannheim, a city with 312,000 inhabitants in the south-west of Germany.
- 7 sessions with groups of 11 to 15 couples
- Paper and pencil
- Duration up to 2 hours (most participants could leave after 1.5 hours)
- Monetary incentive
- (Average) compensation, paid individually and anonymously = 30 euro (compared to an average net hourly wage rate of 13 euros in West Germany)
- Toy money „Taler" (exchange rate: 10 Taler = 1 euro)

A further participation condition referred to the type of relationship. We restricted the experiment to heterosexual couples where the female and the male spouse had to be living

together for a period of at least one year. The experiment was run in May 2010. Seven sessions were conducted with groups of 11 to 15 couples each. As these groups included people of all ages, the experiment was set up as a paper-and-pencil experiment, to guarantee equal opportunities for everybody, including the elderly. A monetary incentive was provided for every task. This incentive was announced in a toy money, called "Taler" (which is the ancient currency of several Germanic countries and still associated with fairy tales) with an exchange rate of 10 Taler = 1 euro. The average compensation, rewarded individually and anonymously, amounted to 30 euro (compared to an average hourly wage rate of 13 euro – net of taxes and social security contributions – in West Germany). The participants were informed that the experiment would take up to two hours. In fact, the majority of participants could leave after 90 minutes already.

3.2 Participants

A third of the participants stemmed from an existing pool of candidates which had been recruited for another experiment taking place in Mannheim the previous year. For our purpose, only those living with a partner were re-contacted by email and asked to make an appointment where they could both participate. The sample was extended in the same way as the original recruitment (by random distribution of flyers to private households across Mannheim). The final pool of participants consists of people with different socio-demographic backgrounds representing a more or less typical sample of the Mannheim population with respect to age, income level and employment status as shown by Table 2.[1] The deviation in the educational level is largest, as the experimental group has a substantially higher percentage of university or college graduates (49%) than can be found in the overall Mannheim population (13%). It has to be noted that the average household size of the participants sample is conditional on living in a couple.

[1] Mannheim statistics restricted to couples were not available.

Table 2: Socio-demographic characteristics of the experimental sample vs. Mannheim population

	Participants in the experiment	Mannheim population
Age group (in %)		
29 or younger	37,37	31,55[1]
30-39	16,84	13,62[1]
40-49	13,16	17,15[1]
50-59	12,63	13,07[1]
60+	20,00	24,60[1]
Income (in €)		
monthly gross income/person	2.088	2.497[2]
monthly available income/person	1.219	1.484[3]
Occupation (in %)		
employed	78,82	70,20[4,5]
unemployed	2,53	6,30[6]
inactive	18,82	21,20
Household size		
average number of people	2,3	1,9[7]
Educational level (in %)		
completed apprenticeship[8]	44,07	55,70[9]
(university) graduates[8]	48,74	13,40[9]
N	190	311,969[1]

Sources:
[1] Statistisches Landesamt Baden-Württemberg 2009
[2] Baden-Württemberg, 2008; Volkswirtschaftliche Gesamtrechnungen der Länder
[3] Volkswirtschaftliche Gesamtrechnungen der Länder, 2008 (Stand Aug. 2009)
[4] Arbeitsmarktstatistik der Bundesagentur für Arbeit, 2009
[5] Erwerbstätige am Arbeitsort, 2008
[6] Agentur für Arbeit, Schnellübersicht Mannheim, Monat Mai 2010
[7] Statistisches Landesamt Baden-Württemberg 2006
[8] of all employees liable for social security contributions, proportion of all employees
[9] Statistisches Monatsheft Baden-Württemberg „Arbeitsmarkt im Fokus von Demografie und Bildung“ 10/2010, Erwerbstätige am Arbeitsort nach Berufsausbildung, 07/2009

3.3 Session structure

Each experimental session was divided into four parts, as summarized in Table 3. For the start, the spouses were seated apart and asked to make individual decisions without the possibility to communicate with each other or any of the other participants. In this first part both spouses decided independently on money and time allocation between their partners and themselves, and they made a consumption decision by choosing vouchers. Finally, they were

animated to reveal their individual wage rates in a second-price auction. The participants were asked for which price they would stay and do office work (i.e. sort, (un)fold and check letters) for ten more minutes at the end of the experiment. The person demanding the lowest wage won the auction and had to work at the second lowest wage for ten more minutes.

In the second part, the spouses sat together to again decide on money allocation, time allocation and which vouchers to consume. In both parts we exposed the spouses and the couples to several social dilemmas to discriminate between individual income maximization, household income maximization, equality, efficiency and income pooling.

Table 3: Structure of the whole experimental session

I) Separate experimental tasks for each spouse (placed separately), including
1) decision on money allocation between partner and oneself
2) decision on time allocation between partner and oneself
3) consumption decision (choice of vouchers)
4) revelation of individual wage rate in second-price auction
II) Joint experimental tasks for couples (sitting together), including
5) decision on money allocation among them
6) decision on time allocation among them
7) consumption decision (choice of vouchers)
III) Post-experiment questionnaire
IV) Labour task: sort, (un)fold and check letters (time length depending on decisions made in first two parts, by oneself and by partner)

Tasks 1 and 2 were meant to assess spouses' tradeoffs between equality and efficiency, and learn who has egoistic preferences and who pursues mutual income maximisation. Task 3, on the contrary, was aimed at investigating the individual preferences for consumption and time allocation. Task 7, in conjunction with the Task 3, was designed as a direct income pooling test.

Note that a general problem with real couples is that they can re-distribute privately the gains of the experiment once the experiment is finished. To control for the possibility of redistributive acts, we chose pairs of experimental situations in which the spouses decided on the allocation of money AND on the allocation of time at the same time. Time could be allocated between leisure and labour, where labour meant staying longer to perform office work (see above) and leisure meant being off. As leisure time is consumed immediately within the experiment, it is more difficult (though not impossible) to be redistributed

afterwards. Hence, the time tasks served as robustness tests of the preceding money allocation tasks.

Furthermore, and most crucial for the research question of the present paper, the participants were forced to make consumption decisions by choosing among vouchers from different department stores. It is more difficult to reallocate vouchers, since they are, to some extent, depicting individual preferences (whereas money is more neutral).

After the joint experimental part, we asked the couples to separate again, take their original seats and to fill in a questionnaire. This questionnaire covered a wide range of socio-economic characteristics of the spouses. In addition we asked them for their attitudes towards gender roles and equality issues within couples. We were able to verify whether the couple was really established and living together by cross-checking some of the answers given separately by both spouses.

After having completed the questionnaire, the participants received a note with their individual working time – as resulting from their own and their partner's answers on the respective task and round drawn at random from all labour tasks. In part four of the experimental session the participants hence had to stay in the room and perform office work for as many minutes as indicated on their notes. When their labour time ended they were allowed to leave the room and receive their compensation. Hence, the end of the session was defined individually for each participant.

As primarily the designs of Tasks 3 and 7, in parts I and II of the experiment, were meant to test income pooling, we will describe them in more detail in the next section. As the results of Task 1 serve for a cross validation, more details on this task are provided in the appendix.

3.4 Individual consumption choice task

Each participant was allocated 200 money units, from which he/she could purchase four vouchers. He/she chose between vouchers from Saturn entertainment electronics (EE), Douglas drugstore/perfumery (DP) and Engelhorn, a fashion and sports department store (FS). Although the reader might be tempted to associate certain stores with certain gender stereotypes, it was not our intention to determine typically "female" or "male" preferences but to identify individual preferences as a benchmark for the subsequently made joint couple decision. After all, a participant might also have the preference to treat his/her spouse with a specific consumption choice.

The exact wording of the task was: “In this task you can decide on shopping options by choosing between vouchers of three different department stores. You will receive 200 Taler in 4 banknotes of 50 Taler each. You may cash these 4 banknotes in the department stores Douglas, Engelhorn and Saturn. You will get an envelope for each store. Please put your banknotes in the envelopes according to your consumption choices.

Only one decision will be chosen for your compensation. In case that the woman’s decision is chosen, you as a couple will be handed vouchers according to the woman’s consumption choice.”

3.5 Mutual consumption choice task

In the second part of the experiment, the spouses sat together and were allowed to communicate to make their mutual choices. Task 7 was divided into five rounds. In each round, the couple was confronted with a different allocation of money within the couple (for the husband and the wife, see Table 4). However, the total amount of money the couple received remained the same across the rounds. The couple was asked to choose between the same vouchers as before (in Task 3), in the same way as described above.

Table 4: Money allocation within couple (Task 7)

1st round: Both receive 100 Taler.
2nd round: Woman receives 200 Taler, man receives 0 Taler.
3rd round: Woman receives 150 Taler, man receives 50 Taler.
4th round: Woman receives 50 Taler, man receives 150 Taler.
5th round: Woman receives 0 Taler, man receives 200 Taler

Note: The order of rounds 2 to 5 was changed after half of the experimental sessions.

4 Hypothesis and tests of income pooling

4.1 General test

The revealed preferences in the consumption choice task with varying money allocation provide us with a direct test of income pooling. Under the assumption of income pooling, the partners should regard only the sum of money allocated to them. Their consumption pattern

should remain constant across rounds, no matter which allocation is chosen for each of them – as long as the sum of resources is unchanged.

Hypothesis 1: Under the assumption of income pooling, the couple should always (in each round) agree on the same consumption pattern (choice of vouchers), regardless of the allocation of income.

As income pooling is a key assumption of the German tax-welfare system, e.g. with joint taxation of married couples, we further presume that it is the more likely to occur the more established and traditional a couple is (measured by the formal marital status, the duration of the relationship and traditional attitudes towards gender roles) and the more it benefits from joint taxation. As couples have larger tax gains the more unequal their revenues, income pooling should be related to work division in the household (measured by the difference in housework and employment hours and female participation in the labour market). Empirical studies on the management and distribution of monetary resources within private households (in Germany) reveal that inequality between spouses is most pronounced where the difference in education and revenues is largest (see e.g. Ludwig-Mayerhofer et al. 2006).

Hypothesis 2: Income pooling is more likely to be observed among settled couples, that is, married couples, that have been living together for a longer time and couples appreciating and practicing traditional gender roles and division of work.

4.2 Test of income pooling based on the collective model

In Tasks 3 and 7 of our experiment, the decisions are Pareto-efficient by construction. An appropriate model to represent the participating couples' consumption choices is therefore the collective model by Browning/Chiappori (1998):

$$(1) \qquad \begin{aligned} &\max_{c_f, c_m} U = U_f\left(c_f\right) + \lambda U_m\left(c_m\right) \\ &s.t.\ p'\left(c_f + c_m\right) \leq B \end{aligned}$$

where λ is the male relative power. Prices p are set to one. B is the budget set (equal to 200 Taler). By solving the maximisation problem (1), we obtain a set of equations describing the individual female and male consumption choices, c_f and c_m. However, usually these are not observed in the data. Browning/Chiappori (1998) propose to estimate the household

consumption depending on the spouses' individual incomes. In this way, they identify the resource allocation within the household.[2]

In our experiment, we asked for the individual decision choices (Task 3), c_{fs}, c_{ms}, to reveal individual preferences. We use this original information in order to find out to which part individual preferences and to which the spouses' relative incomes explain the couple's consumption decisions. We are thus estimating the equation:

(2) $$c = \alpha_0 + \alpha_f c_{fs} + \alpha_m c_{ms} + r\left(\alpha_r + \alpha_{rf} c_{fs} + \alpha_{rm} c_{ms}\right) + \alpha_s' s + \alpha_d' d ,$$

where $\alpha_k = \begin{pmatrix} \alpha_k^{DP} \\ \alpha_k^{FS} \\ \alpha_k^{EE} \end{pmatrix}$ is the matrix of estimates. $c = \begin{pmatrix} c^{DP} \\ c^{FS} \\ c^{EE} \end{pmatrix}$ and $c_{is} = \begin{pmatrix} c_{is}^{DP} \\ c_{is}^{FS} \\ c_{is}^{EE} \end{pmatrix}$ are the couple's and individuals' *(i = f,m)* expenditures for cosmetics, electronics and fashion. *r* is female relative allocation, *s* are socio-demographic variables and *d* are distribution factors. Taking the derivative of Equation (2) with respect to *r* yields us the H_0 hypothesis for income pooling:

(3) $$\alpha_r + \alpha_{rf} c_{fs} + \alpha_{rm} c_{ms} = 0 .$$

Hypothesis 3: Within the collective model framework, income pooling implies that the derivatives to relative income in the consumption equations sum up to zero (Equation (3)), that is the consumption decisions do not depend on the money allocation.

5 Results

5.1 General test results

According to our definition of income pooling given in the introduction, "income is seen as pooled if each euro that enters the household is treated equally, no matter to whom it is handed", the consumption pattern should not change across the five rounds in Task 7 if the couple is pooling its income.

We further define indicators of income pooling ip_n and consumption changes ic_n across the five rounds of the mutual consumption choice task for each couple *n*. If a couple's voucher

[2] The identification procedure relies on restrictive assumptions summed up in the 'SR1' hypothesis, i.e. the matrix of compensated price responses is the sum of a symmetric matrix and a matrix of at most rank 1 (see Browning/Chiappori 1998 for details). Note that we are not able to test the validity of the model as suggested by Browning/Chiappori (test of the 'SR1' Hypothesis) since the prices are set to one and we have only three consumption goods. However we can test the income pooling assumption using the estimation results of the model equations.

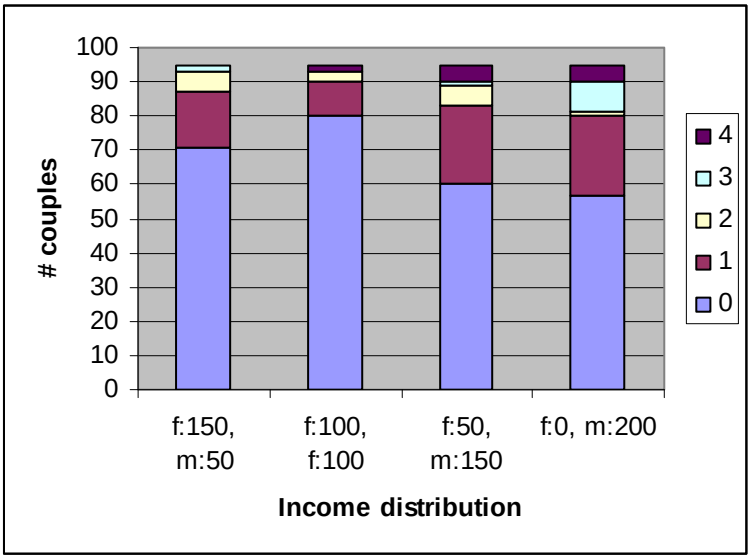
choices remain constant regardless of the money allocation given in these five rounds (ic_n = 0), we diagnose the couple as an income pooler (ip_n = 1). If it instead chooses different vouchers conditional on the money allocation (ic_n > 0), we declare it as a non-pooler (ip_n = 0). ic_n measures the average number of vouchers chosen for different stores across rounds. Therefore this variable varies from 0 to 4:

$$(4) \quad ic_n = \frac{1}{K-1}\sum_{l=1,l\neq k}^{K-1}\left(\frac{1}{2K}\sum_{k=1}^{K}\left(\left|c_{kDP}^{nc}-c_{lDP}^{nc}\right|+\left|c_{kFS}^{nc}-c_{lFS}^{nc}\right|+\left|c_{kEE}^{nc}-c_{lEE}^{nc}\right|\right)\right)$$

$$(5) \quad ip_n = \begin{cases} 1 \; if \; ic_n = 0 \\ 0 \; otherwise. \end{cases}$$

Graph 1 illustrates, for each income distribution, whether the couples' choices differ across rounds. As a reference allocation we choose that one where the woman receives all the money. Compared to the reference, we observe that the number of couples not changing their decision is decreasing with increasing relative male income. E.g. for the symmetric allocation 100 Taler each, as many as 80 couples make the same consumption choices as in the reference situation. However, when the man receives the whole money, only 57 couples take the same decision as when the woman was the sole recipient.

Graph 1: Average differences in voucher choices across rounds



Note: In the reference allocation the woman receives 200 Taler and the man receives 0 Taler. For each alternative income distribution the graph indicates the number of vouchers distributed differently compared to the reference.

Among the couples who pool their incomes as defined by Equation (5), we have to consider those in which both spouses have the same outcome – and thus, the same revealed preferences – in Task 3. Indeed, if the spouses have the same individual consumption patterns, we do not expect their common decisions to vary according to the money allocation. Among these couples, we are not able to distinguish the true income poolers from an artefact due to identical individual preferences of the spouses. We observe this situation for a non-negligible number of 16 couples.[3]

Table 5: Summary statistics

	Non-poolers		Poolers ≠ ind. preferences		Couples with identic. individual preferences	
	mean	std. dev.	mean	std. dev.	mean	std. dev.
Age woman	42.3	17.2	36.1	13.0	43.3	17.4
Difference in ages	2.44	4.18	1.47	4.57	1.12	3.24
Years living together	17.1	15.1	11.5	11.2	12.1	13.7
Married	.63	-	.36	-	.56	-
Children	.50	-	.28	-	.56	-
Female does more housework	.46	-	.36	-	.56	-
Labour market particip. woman	.63	-	.86	-	.62	-
Difference in employment hours	9.5	23.7	2.2	29.0	9.3	21.9
Separate money management	.46	-	.47	-	.25	-
Mutual savings	.59	-	.38	-	.56	-
Man has higher income	.49	-	.50	-	.44	-
High hh net income	.23	-	.39	-	.50	-
University degree man	.33	-	.58	-	.56	-
Cooperative behavior in Task 1	.26	-	.50	-	.50	-
Lower exp. when lower inc., man	.37	-	.58	-	.56	-
Agree with breadwinner model	3.23	.89	3.22	.90	3.44	.89
N	43		36		16	

Summary statistics on the main characteristics of the different subgroups are displayed in Table 5. Whereas 43 couples choose consumption patterns depending on the allocation of money, 36 couples pool their incomes, according to our definition, though having differing

[3] Among those 16 couples, 5 are even changing their consumption pattern across rounds (though slightly, i.e. $ic_n \leq .2$).

individual preferences. These couples are less settled, more often unmarried and of younger age on average, which is a rejection of Hypothesis 2. An explanation of this result is that elder couples are more likely to have already established their decision processes and spending habits. This would lead them, more than inexperienced younger couples, to manage separate spheres in the sense of Lundberg/Pollack (1993). They are thus less willing to co-operate and re-negotiate the allocation of (extra) resources.

Furthermore, couples who are pooling their incomes in our experiment are more educated and have higher household incomes. We observe also that the female labour market participation, as well as her labour supply is significantly higher among the poolers. The pay-offs of the experiment are individual and have to be considered as additional unearned income. Spouses with lower income may behave more egoistic due to the scarcity of their own resources. On the contrary, it may be more likely for couples with high income to invest this extra money in a public good, which means pooling their incomes. The statistics on the household's money management are even more surprising. Spouses have separate bank accounts among approximately half of both non-pooling and pooling couples. Interestingly, this is only the case for 25 percent of the couples in which the spouses have identical individual preferences. Furthermore, these couples have incomes above the average, though the female spouses exhibit rather low labour market participation.

It also has to be pointed out that the selection of our sample is biased with respect to satisfaction within the couple. In the questionnaire almost all participants report being highly or very highly satisfied with their relationship, whereas the distribution of similar variables in large survey data is far less concentrated (see e.g. the PAIRFAM data, Huinink et al. 2011). A certain satisfaction level may well have been a precondition for joint participation in the experiment. However, we may suppose that satisfaction within the couple is positively related with the spouses' co-operation and altruistic behaviour. Therefore, the willingness to invest in a common good independent of the income structure may be higher for this population than for a representative sample. We conclude that our results tend to over-estimate the true level of income pooling, supporting any evidence we might find against the income pooling assumption.

Table 6 presents the estimation results of the logit regression on the dichotomous income pooling indicator ip_n. Whether the couple pools its resources is positively related to female employment, household income and the education level. Age and duration of the relationship are hardly related with income pooling, although the statistics reveal pair-wise correlations

between the variables. Note that the regression results are robust to the introduction of variables describing the income pooling a priori (compare regression equations 2 and 1). The estimation results are also very similar when considering the whole sample (see Appendix 2) instead of the subsample excluding those couples in which both spouses have the same individual consumption preferences.

Table 6: Logit regression of the income pooling indicator
(excluding couples with identical individual preferences)

	Estimation 1		Estimation 2	
	Coeff.	Std. error	Coeff.	Std. error
Age woman	-.009	.048	.007	.058
Difference in ages	-.010	.076	-.104	.099
Years living together	**-.093**	.057	-.080	.073
Married	-1.11	.927	-.521	.996
Children	.789	.652	.628	.769
Female does more housework	-.031	.658	-.537	.780
Labour market particip. woman	-.473	.852	.519	1.07
Difference in employment hours	**-.036**	.017	**-.035**	.017
Separate money management	.202	.701	-.070	.830
Mutual savings	.005	.761	-.527	.868
Man has higher income	**1.42**	.757	**1.26**	.714
High hh net income	**1.67**	.864	**1.55**	.919
University degree man	**1.33**	.665	**1.57**	.776
Cooperative behavior in task 1			**1.08**	.704
Lower exp. when lower inc., man			**1.65**	.849
Agree with breadwinner model			**-.863**	.500
Constant	.289		.931	2.93
N	68		67	
Log-Likelihood	-34.51		-29.83	

Note: Bold coefficients indicate a significance level of at least 10%.

5.2 Test results based on the collective model

As we observe each couple making five choices, one for each money allocation r (r = 0,.2,…,1), we posses of a panel of consumption decisions. Furthermore, the consumption

choice variable takes integer values between zero and four. We therefore choose a multi-logit panel-data estimation procedure to estimate Equation (2).

Estimation results are given in Table 7. They confirm a consistency between individuals' and couples' behaviour, as the couples' consumption choices are positively related to the spouses' individual preferences. However, the women seem to have a significantly larger impact on the couples' decisions for cosmetics and fashion,[4] whereas male preferences determine electronics consumption significantly more (0.570 versus 0.508, given equal interaction effects in absolute terms).

The income pooling hypothesis (Equation (3)), i.e. H_0: $\alpha_r + \alpha_{rf} c_{fs} + \alpha_{rm} c_{ms} = 0$, is clearly rejected for electronics and fashion expenditures ($\chi^2 = 1.45$ and $\chi^2 = 2.76$, respectively). For cosmetics expenditures the test statistic is at the margin of 5%-significance ($\chi^2 = 5.76$). The test statistic leads to a rejection of the income pooling assumption in its generalizing sense, although, in our case, half of the couples may eventually be poolers. As this test is based on estimates of a consumption decision model, it provides only an indication of couples' mean behaviour, and hides the fact that the population is split between poolers and non-poolers. It does therefore not allow to analyse couples' behaviour in discriminating for systematically differing choices between population groups.

Table 7: Multinomial logit regression on couples' consumption choices, adjusted standard errors

	Cosmetics		Electronics		Fashion	
	Coef.	Std. err.	Coef.	Std. err.	Coef.	Std. err.
Female ind. consumption (c_{fs})	**.635**	.044	**.508**	.033	**.508**	.029
Male ind. consumption (c_{ms})	**.390**	.043	**.570**	.035	**.417**	.027
Female relative allocation (r)	-.065	1.25	-.120	.439	.042	.463
Fem. rel. alloc. x fem. ind. cons. (rc_{fs})	**.148**	.071	**.266**	.052	**.272**	.045
Fem. rel. alloc. x male ind. cons. (rc_{ms})	**-.148**	.070	**-.264**	.053	**-.191**	.041
N	420		420		420	
Log-Likelihood	-393.4		-488.8		-499.7	

[4] Compare the coefficient estimates for c_{fs} and c_{ms} given the absolute magnitudes of the interaction effects, i.e. $\alpha_f + r\alpha_{rf} > \alpha_m + r\alpha_{rm}$.

Note: Control variables include age, education, income, employment hours, children and attitudes. Bold coefficients indicate a significance level of at least 5%.

6 Cross validation

6.1 Inequality aversion, efficiency concerns and income pooling

Our experimental design in the voucher choice task differs considerably from the design of previous studies who have drawn indirect conclusions on income pooling within couples (e.g. Munro et al. 2008, de Palma et al. 2009, and Cochard et al. 2009). These conclusions are often derived from behaviour in a dictator-type co-operation game where participants have the choice between two pay-off schemes for themselves and their partners which differ in terms of equality and total outcome. As a typical result, many spouses pick the more egalitarian over the income-maximizing option for the couple, which is a suboptimal choice for an income-pooling couple. We also applied such a game as the first task of our experiment. The task consisted of five rounds, each with two options to choose from. In option A, the outcome for both spouses was the same. Option B offered unequal payments for the spouses, but the cumulated pay-off for the couple was higher than in option A. The most unequal split was offered in round five (see Appendix 1 for a detailed description of Task 1).

The assumption of rationality and income-maximizing behaviour would imply that a spouse who opts for the more egalitarian but lower-paying option A is not a member of an income pooling couple. Identically, we would expect spouses who pool their income in Task 7 to choose option B, even in the most unequal split in Round 5.

Table 8: Cross-check Task 1 / Task 7 – female / *male* participants

Task 7 Task 1, round 5	Non-poolers	Poolers	Total
Option A (Egalitarian outcome)	31 / *28*	18 / *18*	49 / *46*
Option B (Pay-off maximizing outcome)	11 / *14*	18 / *18*	29 / *32*
Total	42	36	78

However, Table 8 shows that only half of both women and men in our sample optimize household revenue. Table 8 also highlights that the correspondence between choosing option A or B in Task 1 and being a pooler in Task 7 is rather ambiguous. Choosing the efficient

outcome in Task 1 may be rationally consistent with both being member of a pooling or a non-pooling couple. Conversely, non-poolers could have chosen any option in Task 1. Therefore, drawing conclusions about income pooling from the participants' behaviour in this type of game may be misleading.

6.2 Using survey information on income pooling

As yet another way of investigating income pooling behaviour, survey information is often used on how individual spending intentions are related to individual resources allocation within the household. For instance, the Danish Expenditure Survey included a question on whether the respondent is willing to spend less money on own private consumption if he or she earns 1,000 Danish crowns less a month, and the spouse 1,000 crowns more – with a positive answer implying evidence against income pooling. For a validation check we used an identical item replacing 1,000 crowns by 100 euro in our post-experimental questionnaire. This allowed us to compare stated and actual behaviour of the same person. Surprisingly, the proportion of men answering positively to this question is significantly higher among the members of a pooling couple (58%) than among non-poolers (37%). For one thing, stated and revealed preferences may well diverge when it comes to the distribution of money. For another, of course the money transfers cannot really be treated equivalently, because we have an increase in *unearned* income on the one hand, the experiment, and an increase in *earned* income on the other, the survey questionnaire. Nonetheless, we can conclude that answers in surveys to questions on income pooling may differ significantly from the participants' real behaviour. This may lead to wrong conclusions when using survey data.

7 Conclusion

In this paper, we exploit an experimental setting to develop a test of income pooling within couples. To the best of our knowledge, we are the first who provide direct evidence on this issue in an industrialized country. Our main result is that more than half of the participating couples make consumption choices which do depend on the allocation of resources between the spouses. This is a clear rejection of household models which represent the family as a single consumer. It is also a clear rejection of the basic assumption underlying most tax-transfer systems, namely that the source and the recipient of any money entering the household has no impact on the household choices. However, couples with higher income and higher education levels in our experiment were more likely to take decisions independent of

the given money allocation. Income pooling as a general assumption is therefore rejected, though younger and well-off couples do share resources in our experiment while established and less well-off couples do not. Interpreting these findings in the sense of Browning et al. (2010), the first group seems to be in a Nash equilibrium with local income pooling whereas the second rather acts in separate spheres.

Compared to studies using survey data on couples' stated financial management and consumption choices, our experimental evidence bears the advantage of being based on the participants' real actions – revealing their true preferences – instead of mere intentions. Furthermore, the topic and the design of the experiment are very close to situations in the participants' real life, even if the experiment took place in a controlled environment. We investigated consumption choices made for additional unearned income, and the participants eventually received extra money depending on their decisions. Therefore, we may well have captured the true behaviour of the participating couples regarding their spending habits for additional unearned income. However, we would refrain from extending our conclusions to couples' behaviour on expenditures related to labour earnings.

Finally, the participants of our experiment are quite selective with respect to their satisfaction within the couple and their educational level. However, this selection of rather happy and highly educated couples, who are likely to cooperate and share more than the average, may explain why we observed still almost 50 percent treating their unearned income as pooled. At the same time, it adds emphasis to our evidence against a general income pooling assumption.

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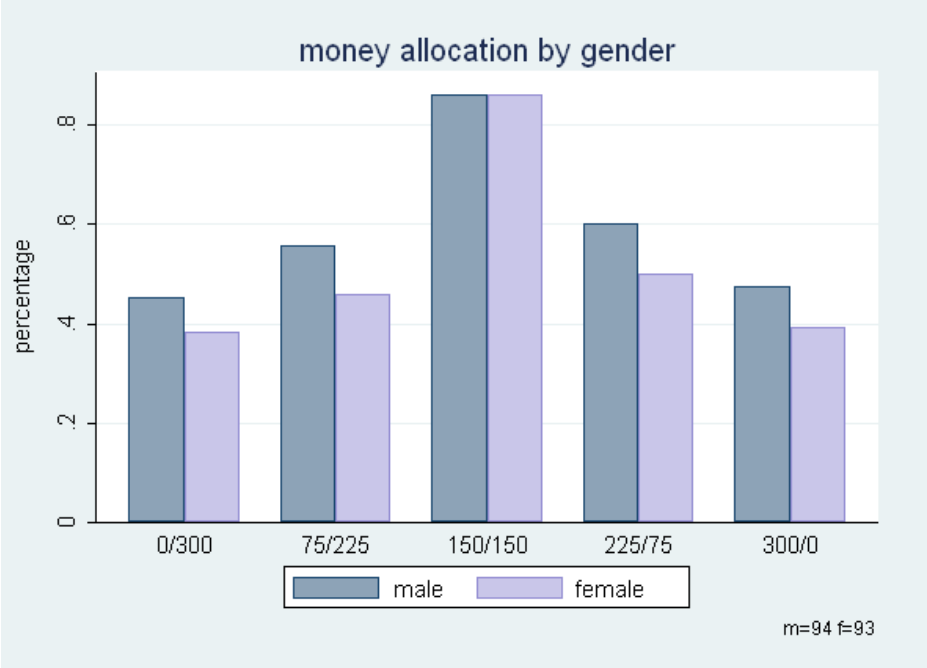
Appendix 1: Task 1 - Inequality aversion and efficiency concerns

Each participant had to choose between two pay-off schemes for her/himself and the partner in five subsequent rounds. In each of the rounds, there was a low pay option (where the amount X = 200 Taler is split equally between spouses; option A) and a high pay option which implies an unequal split of the amount αX (with α = 1.5; option B), but the distribution of the higher option varied across decisions. An income-maximizing and efficient choice would always require the higher pay-off in option B, which is less equal. Hence, participants' decisions unveiled their individual tradeoffs between equity and efficiency. This task has been studied before by Cochard et al. (2009) on the behaviour of French couples.

Graph A1: Female and male decisions in Task 1



Note: The Graph represents the percentage of individuals choosing option B in each of the five decision rounds. Option B, for the columns most to the right, is: "My partner receives 300 Taler, I receive nothing." The individual answers to this decision are included as an explanatory variable in the logit-regression of income pooling (Tables 6 and A2).

Graph A1 shows the outcome of Task 1. Approximately half of the individuals, in particular women, prefer the equal option over the income-maximizing one. However, the symmetric feature of Graph A1 shows that this issue barely depends on the split of the pay-off between spouses in option B. Models supposing efficiency of the household decisions (unitary, collective and Nash-bargaining models for instance) would obviously not fit for these households. A dictator model with equal split of the resources or a non-cooperative model,

with an additional restriction on egalitarian contribution to the public goods, may far better predict this outcome.

Appendix 2

Table A2: Logit regression of the income pooling indicator (all couples)

	Regression 1		Regression 2	
	coefficient	sign. level	coefficient	sign. level
Age woman	-.047	*	-.026	
Difference in ages	-050		.108	*
Years living together	-.005		-.014	
Married	-1.13	*	-.766	
Children	.746	*	.901	*
Female does more housework	-.299		-.445	
Labour market particip. woman	.791		1.96	***
Difference in employment hours	-.026	**	-.014	**
Separate money management	-.523		-.612	
Mutual savings	-.073		-.440	
Man has higher income	.580		.364	
High hh net income	.883	*	.967	*
University degree man	.983	**	1.42	***
Cooperative behavior in task 1			*1.96*	***
Lower exp. when lower inc., man			*1.87*	***
Agree with breadwinner model			*-.896*	**
Constant	1.24		1.10	
N	83		82	
Log-Likelihood	-44.58		-37.24	

Note: *, ** and *** indicate significance levels of 10%, 5% and 1%.

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