Intra-household Experiments: a survey and some methodological observations.

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Abstract

Experiments with family groups are rare, but since many decisions are taken at the household level or occur within the household it is an important area to investigate. I discuss some of the methodological challenges involved in doing experiments with couples and families and consider major areas that remain yet to be explored. While general themes from the research are still emerging, there is little evidence of efficiency in intra-household decisions. Moreover, deviations from standard models of microeconomics seem to be in line with those seen in the anomalies literature of individual decision-making.

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1. Introduction.

Though increasingly there are places such as the USA or Japan where the single person household is the most common living arrangement, even in such countries the majority of people live alongside other adults with whom they make more or less shared decisions on a regular basis. Yet while, experiments have become a familiar tool for the economist, used to test many

of the fundamental models of the subject, there has been relatively little attention paid to households.[2] In fact, there are by now several thousand economic experiments on individual decision-making and on games; and until very recently there were few that examined the behaviour of collective units like the household. Nevertheless, in the last ten years or so there has been a trickle of experiments of couples, families and household units. This uncertain flow of studies has reached the point where some common results and issues are starting to emerge. As a consequence, it seems an appropriate moment to offer a survey of the field.

Before continuing, it is useful to start out by identifying the reason why we should consider experiments on families as somehow different. Household or more specifically, couples are examples of groups and obviously there is some tradition in both economics and psychology of doing experiments on groups which has become more extensive recently (e.g. Cason and Mui (1997) or Charness and Sutter (2012)). However, household groups are endogenous (i.e. willingly formed) rather than exogenous, as is typically the case with laboratory-born groups. They are also continuing groups, which represents a challenge for inference since it implies that an experiment represents the perturbation of a game with a history and a future, rather than a stand-alone event. And within households, individuals are often bound by deep feelings of duty, love and altruism which is not often the case for the hastily assembled ad hoc groups of students that might be created for laboratory experiments with teams. Typical group experiments therefore may produce results that are quite different to those based on household members.[3]

When we talk about experiments on households, we are really considering two different classes of tasks, although they may be combined within an individual setting. In the first class, the focus is on the household as a collective decision maker. There is one observation per task per household. For instance, we might compare the behaviour in a beauty contest game between individuals and couples. From this perspective, experiments with household groups provide a way of testing whether the behaviour of natural groups and individuals vary in a significant way in economic contexts. Secondly, experiments can focus on responses from individual household members, usually

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[2]Except where stated, I use the term 'household' and 'family' interchangeably, though of course there are many family ties that extend beyond the household and there are often members of the household who are not relatives. Additionally, I will treat the terms spouse and partner as equivalent. In fact most experiments have been conducted with couples (married or unmarried) and rarely with the whole household and so when papers refer to households, it usually means the head of the household and his or her spouse. If there were a bigger set of experiments with a variety of subsets of household and family members it would be useful to be more exact.

[3]See Brandts and Solà (2010) for an example of another experimental setting in which personal relationships between participants affect behaviour.

in the context of a game or at least a setting where subjects are made aware of their household links. In both cases, experiments provide a means for understanding intra-household decision-making, of testing between the numerous theories of household behaviour (see Apps and Rees (2009) for a survey) and providing the data for more refined models.

Of course within economics, theories of the household serve different purposes. The predictive accuracy of the kinds of unitary models employed in dynamic macroeconomic models for example may benefit little from a more nuanced understanding of how households make individual decisions. And with the consumption data available from national surveys on household purchases it may not be possible to go beyonnd the identification of cooperative models. However, in many policy settings a more detailed and accurate model of intrahousehold behaviour could help the design and implementation of effective policies. For this reason alone, experiments on households can be valuable.

2. Inference and validity.

Experiments with families create many of the same challenges as with the typical subject groups and arguments over many issues are well-rehearsed and probably not worth repeating here. But there are some specific methodological hurdles for household experiments and other factors that are amplified when households become the object of analysis all of which present new challenges to experimental methodology. Most of these challenges arise from the ongoing nature of the relationship between household members, meaning that actions taken within the laboratory may be at least partially offset by subsequent behaviour. This, I label the 'undoing problem'.

2.1. The undoing problem.

Experiments on households typically alter the endowments and prices faced by households rather than consumption directly (though this is in theory possible). Typically the behaviour observed in experiments also represents interim acts rather than final consumption behaviour. Thus in order to have tests of theories of household behaviour we need to make links between observed acts and theoretical predictions about consumption. To frame the arguments here and in the rest of the paper I will use a simple model of a two person household. Individual preferences of the two agents are summarized by the utility functions, u and v respectively. Household consumption in period t =0,...T, is x_t which may be vector of goods, but which I will usually think of as being a single good in each period. Period 0 is the period that includes the experiment. Each individual discounts future rewards by ρ^i, i=1,2. The household when choosing collectively, decides according to W, within which a weight of λ is attached to person 1's interests

and $1 - \lambda$ is attached to the interest of person 2.

$$W = \sum_{t=0}^{t=T} \left(\lambda \left(\rho^i \right)^t u(x_t) + (1 - \lambda) \left(\rho^j \right)^t v(x_t) \right) \tag{1}$$

Consider now a typical household experiment in which the participants are a couple and an agent chooses between the options x and x' where $x = (x_1, x_2)$ and $x' = (x'_1, x'_2)$ and x_i $i = 1, 2$ is the direct payoff to person i. Here, I use the term 'agent' to encompass both choices made by individuals and choice made jointly by the couple. After the choice is made, but prior to actual consumption it is possible that compensatory transfers may be carried out to undo or at least change the payments made in the experiment. Reducing consumption of player 1 by $\triangle$ results in a transfer of $t(\triangle)$ to player 2, where the function t is such that $|\triangle| \geq |t(\triangle)|$. In particular if costless transfers are possible then $t(\triangle) = \triangle$, and if transfers are not possible then $t(\triangle) = 0$. The agent's choice function weights the final payoffs[4] of the two people by λ and $(1 - \lambda)$ so x is chosen iff $\lambda (x_1 - \triangle) + (1 - \lambda) (x_2 + t(\triangle)) \geq \lambda (x'_1 - \triangle') + (1 - \lambda) (x'_2 + t(\triangle'))$. Meanwhile the transfers $\triangle$ and $\triangle'$ are optimally chosen according to the same choice function subject to the constraints that $x_1 \geq \triangle \geq -x_2$ and $x'_1 \geq \triangle' \geq -x'_2$. In this situation if x is chosen and t = 0 then,

$$\lambda \geq \frac{x'_2 - x_2}{x_1 - x'_1 + x'_2 - x_2} \tag{2}$$

Thus the choice reveals something about the weight placed on the individual payoffs. On the other hand if $t(\triangle) = \triangle$ then x is chosen when $x_1 + x_2 \geq x'_1 + x'_2$, in other words the agent chooses the highest aggregate payoff and this reveals nothing about λ. Inference therefore depends on knowing something about the $t(.)$ function. The issue of ex-post undoing is not a problem unique to household experiments. In estimates of inter-temporal discount rates may be biased when agents have access to capital markets. Similarly, researchers investigating the endowment effect have considered the possibility that estimates of value obtained by buy and sell prices may be censored when there is easy access to the goods in local shops.[5] The particularly worry with households is that the cost of transfers may be especially low.

When actions taken within the experiment are potentially reversible through post-experimental intra-household transfers, there are a number of ways to respond. One option is simply to take the actions in the experiment

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[4]For simplicity I take it that utility is linear in payoffs for this initial case, but the basic argument applies even if utility is non-linear.

[5]For example, in experiment 7 reported in Kahneman et al. (1990) the researchers remind subjects of this possibility by leaving price tags on the mugs.

at face value or to seek supporting evidence on behaviour by for instance, conducting a post-experimental survey which asks subjects to report undoing. A second possibility is to raise the cost of reversibility. For instance, if subjects are paid in kind (e..g. through food or clothing coupons) transfers may be made prohibitively costly. This may not eradicate the problem. A coat or pair of trousers chosen now can be a close substitute for clothing bought in one month's time. Thus, spouses may compensate actions made within the experiment with choices in the future.

For example, let us consider a small extension of the model, in which time is divided into two periods: 'now' and the future. The future is weighted by $\rho \geq 0$, while income m for the future is allocated to individual i as m_i. In the actual experiment, as before, the agent chooses between x and x'and the allocation of m is decided after the end of the 'now' period. There are no transfers and the utility function is,

$$\lambda x_1 + (1 - \lambda)x_2 + \rho \left(\lambda U(m_1, x_1) + (1 - \lambda) V(m_2, x_2)\right)$$

where U and V are the component functions for the two partners and are taken to be increasing and differentiable in their components.

If in fact consumption is inter-temporally separable then the allocation made in the future will be independent of the payoffs in the experiment. In this situation, the experimental choices reveal something about λ. Consider though the case where the utility function has the specific form,

$$\lambda x_1 + (1 - \lambda)x_2 + \rho \left(\lambda U(m_1 + x_1) + (1 - \lambda) V(m_2 + x_2)\right)$$

This might arise if the goods in the experiment represent capital goods with low depreciation rates such as clothing. In this case, x is chosen over x' only if,

$$\lambda x_1 + (1 - \lambda)x_2 + \rho \left(\lambda U(m_1 + x_1) + (1 - \lambda) V(m_2 + x_2)\right) \geq$$
$$\lambda x_1' + (1 - \lambda)x_2' + \rho \left(\lambda U(m_1' + x_1') + (1 - \lambda) V(m_2' + x_2')\right) \quad (3)$$

Taking a first-order approximation for the utility functions to be exact and noting that at an optimal allocation of future consumption, $\lambda U' = (1 - \lambda)V'$ then, equation 3 becomes,

$$\lambda x_1 + (1-\lambda)x_2 + \rho \left(\lambda \left(U(m_1) + x_1 U'(m_1)\right) + (1 - \lambda) \left(V(m_2) + x_2 V'(m_2)\right)\right)$$
$$\geq \lambda x_1' + (1 - \lambda)x_2' + \rho\lambda \left(U(m_1) + U'(m_1)(m_1' + x_1' - m_1)\right)$$
$$+ \rho(1 - \lambda) \left(V(m_2) + V'(m_2)(m_2' + x_2' - m_2)\right) \quad (4)$$

or,

$$\rho\lambda U'(m_1)\left(x_1 + x_2 - x_1' - x_2'\right) \geq \lambda\left(x_1' - x_1\right) + (1 - \lambda)\left(x_2' - x_2\right) \qquad (5)$$

Thus, if the weight $(\rho U')$ placed on future rewards is sufficiently large then the agent chooses x rather than x' when the aggregate household payoff is higher. As a result, in such circumstances the choice reveals nothing about λ even though choices made in the experiment cannot be undone directly through intra-household transfers.

Facing the possibility of undoing, a third option for the experimenter is to mask or hide some aspect of the decision and or the winnings from the spouse. For instance, the players might make a series of dictator game decisions with different endowments. A low transfer to the partner can therefore be due to a low endowment rather than meanness. As we shall see below, masking the decision has been a common feature of household experiments. It does not solve all problems however in part because we do not always know the extent to which assets can be hidden outside of the experiment. Secondly, asymmetric information does appear to be an important part of many relationships (see Section 6), but it is not a universal feature and in many experiments we may actually wish to understand behaviour when decisions are transparent.

A fourth option is to make full undoing impossible, by offering decisions that change the feasible consumption set for the household. Risky decisions that are resolved within the experiment have this property, but also some other games. For instance, in a modified dictator game, the spouse may have to choose between a pair of payments $(50, 50)$ or $(80, 0)$. The second choice cannot be transformed into the first choice through costless transfers outside of the experiment. However, the first option can be transformed into the second choice (as long as there is free disposal). So choosing the first option cannot reveal anything about λ unless there is some information on $t(.)$ but choosing the second option shows that $\lambda \geq 5/8$ and $t(30) \geq 20$.

Although one might not trust the potentially reversible behaviour observed in an experiment to the same degree as that attached to irreversible acts, nevertheless it may be unwise to dismiss it entirely. It is clear though that when acts are reversible, no firm inferences can be made about household theories in the absence of further identifying assumptions.

2.2. Theory testing.

A prime motive for experiments in economics is the testing of formal theories. Household economics has generated a number of well-known models, including unitary, Pareto efficient and non-cooperative. When applied to a particular household, how should such a theoretical model be interpreted? Is it for instance, a summary of a binding commitment that applies to all family members in all circumstances or does it represent an equilibrium outcome that in the event of a disruption to the normal environment (e.g. an

experiment) should not be expected to apply? How should a static model for instance be sensibly tested, when the household context is clearly dynamic? Such debates about context and appropriate domain are also relevant for individual choice - witness the continuing debate over the implications of the calibration theorem in Rabin (2000) or the extended discussion about theory testing in Bardsley et al. (2009) - but while some conventions and practices have become familiar and standardized in individual choice experiments, the rules are not yet agreed for household-based tests. A particular issue with household experiments is how to interpret decisions made individually by a partner. One (possibly extreme) interpretation of household models is that they generate predictions for all choice situations faced by household members. As a consequence, individual and joint choice should match and measures of individual power will not therefore be identifiable. In fact, as we shall see below, individual and joint choices do often differ, so this perspective is not maintainable in the face of the evidence. How then should individual choice be interpreted when it is made by spouses or other linked members of a household?

2.3. Incentive compatibility.

We have some straightforward results for when choices made in experiments are incentive compatible. When individuals are part of a larger group and other members of the group are also making decisions, then what constitutes a good incentive is no longer so clear. In some experiments all subjects are paid once for an individual choice and once for a subsequent choice made jointly with a partner. It is fairly clear that this gives rise to a number of distortionary incentives, but the nature of the distortion will depend on the appropriate model of family decision-making and whether individuals are altruistic or not. In a unitary household, for instance, the three payments (once to each spouse and once for the household) will simply be an opportunity for risk reduction across tasks.

2.4. Scrutiny.

A recurring issue in the discussion of external validity is the extent to which subjects' behaviour within the lab is the result of being placed under scrutiny by researchers. In Levitt and List (2007) organising model, experimental subjects place weight on their monetary payoffs and on being moral. When scrutiny of their actions is higher they are more likely to behave morally. Similarly when stakes are relatively low, a greater weight may be placed on moral acts. If we take this model and apply it specifically to the issue of reversible acts, then it has three predictions. First acts which are moral will receive greater weight in a laboratory setting than in real contexts. Secondly, differences in behaviour between groups (e.g. men versus women) with equal scrutiny may either be the result of differences in underlying preferences or due to differences in the response to scrutiny.

A feature of experiments with couples and other household members is that in almost all cases to date, the couples are aware that they are the focus of the experiment. This heightens the scrutiny effect, but it also means that subjects are aware of two audiences: the experimenters and their spouses or other household members. From the viewpoint of external validity, the importance of scrutiny by partners is hard to judge. Individuals within relationships are usually aware that choices they make will have an impact on their partners and that some choices at least have symbolic value. If a spouse, say, chooses an equal distribution of payoffs in an experimental task rather than an unequal split with a higher aggregate payoff, this might be out of a desire to impress their partner. But if this is how she or he actually makes choices within the relationship then scrutiny is actually an aid to external validity rather than a hindrance. To identify how the kind of scrutiny has an impact on decisions one would like to have a design that manipulates the ability of one of the observers to deduce the choices on the basis of observing the winnings.

2.5. Selection.

The subjects who take part in laboratory experiments are not usually typical of the population at large (Henrich et al. (2010)) for a variety of reasons. With couples in particular we need to be aware of two other factors that can affect participation. The first is the high opportunity cost of time for getting the joint attention of parents, particularly those from nuclear families with young children. The second is that we might expect that samples will be biased in favour of couples with relatively healthy and stable relationships and who are more comfortable being the focus of an experiment. Researchers have dealt with the first issue in a number of ways: by arranging childcare (Bateman and Munro (2005)), by visiting families in their own homes (e.g. Carlsson et al. (2012), Abdellaoui et al. (2013)), by buying toys and arranging settings where accompanying children can play close to their parents (Munro et al. (2008b)) or by involving children in the experiment (Peters et al. (2004) but though the second issue has been acknowledged by researchers it remains to be seen whether it is an important factor in external validity.

2.6. Ethics.

Experiments are by definition disruptive and in the case of families, experimental interventions may bring to the surface hidden difficulties in the household. Moreover, there are reports of cases in which well-meant social interventions into family life have led to increased violence between partners (see Rahman (1999) for a discussion of the impact of micro-credit initiatives on marital violence in Bangladesh - though Bajracharya and Amin (2013) for example suggest that selection effects may be responsible for some of the measured associations). While allowing players to hide their

8

winnings may avoid issues of blame and attributions of selfishness and so on, it may not: the insecure spouse may just seek to unearth hidden information through bullying and threats. A further aspect of experiments on couples is that if a public venue is used they may bring married men and women into close proximity with non-family members of the opposite sex. In some cultures that is considered inappropriate. It may also produce selection and compliance problems for the researchers. One way to avoid the problem is to conduct experiments in the home, but this may raise issues of privacy in the experiment. Another approach would be to separate spouses before the experiment and match the gender of the researchers and the participants. While this may avoid some cultural problems it can produce issues with the identification of experimenter effects. Perhaps the greatest challenge is that many fundamental policy issues are ethically fraught. How do we reduce marital violence? What are the factors behind child neglect? From the viewpoint of generating data for effective policy, experimental interventions could be extremely valuable, but this is not an area to treat lightly.

3. Efficiency.

Household decisions are Pareto efficient if option A is chosen over B, whenever all members of the household weakly prefer A to B and at least one person strictly prefers A. Often in discussion of household efficiency, the Kaldor-Hicks variety is more relevant: those who prefer A over B could in principle compensate those who prefer B over A such that no-one in the household is worse off with A rather than B. Much of the non-experimental evidence on household efficiency concerns the Kaldor-Hicks kind and much of it comes from surveys of West African farm households, in which husbands and wives pursue separate economic activities and apparently fail to take jointly beneficial resource allocation decisions (Akresh (2008); Udry (1996)) or fail to insure each other completely (Duflo and Udry (2004)). However a limitation of most evidence based on naturally occurring data is that it may suffer from omitted variables bias, which is exceedingly difficult to avoid however carefully soil characteristics, land management and other potential confounds are controlled for. For example, the often cited study by Udry (1996) for Burkina Faso did not control for fallow duration, which is very important in the farming systems in much of West Africa and whose omission in the analysis could drive the reported result of apparent inefficiency (c.f. Goldstein and Udry (2008)). Indeed, in a natural field experiment in Mexico in which confounding factors were ruled out because women's income was varied randomly as part of an evaluation of the PROGRESA programme, the evidence favours the interpretation that husbands and wives are efficient in their resource allocation decisions (Bobonis (2009)). A further issue is that the data available for consumption and expenditure may be too noisy or sporadic to reveal whether households are efficient. Using

a Monte-Carlo analysis, Agüero (2008) for instance clearly shows that the data typically used to estimate household models may struggle to identify the correct theory.

Peters et al. (2004) represents the first clear economics experiment using household groups and is designed primarily as a test of Becker's rotten kid theorem (Becker (1974); Bergstrom (1989)). In that model of a unitary household with full information, the child is induced to behave according to the preferences of the household by the possibility of compensating transfers by the household decision maker. Assuming that preferences are positively monotonic, in a linear voluntary contribution mechanism (VCM) played by household members, the child should avoid free-riding - to do so would lower total household income and thereby lower reward to the child after subsequent transfers. In the experiment 135 family members (plus 20 university students) were recruited from a university summer programme in the USA and local primary schools. Subjects played 3 and 4 person VCM games (according to the size of the family group) either within the family (labelled 'F') or in groups of strangers that had the same adult/child combination (labelled 'S'). In the two main treatments, F-S-F and S-F-S, each group played the game 8 times then switched to the other group composition before switching back after another 8 games for a final group of 8 games played with the original set of players. Other treatments include one where the strangers group was homogeneous with respect to maturity, one where cheap talk was possible between adults and children and one comparison treatment where students played the same game with the same set of instructions in groups of 4. A theme that runs through the results is that parents contribute more to the public good compared to their children. In general players give more to the public good when the game is played within the family than with strangers, but 100% contribution to the family public good was not the median behaviour. There appears to be some differences between the F-S-F and S-F-S treatments in that behaviour in subsequent parts of the experiment was anchored on behaviour in the first part. As a result, in S-F-S, subjects in the family section of the experiment contributed less than in the F-S-F treatment and showed the same downward trend in contributions typical of finitely repeated play in VCM experiments. Conversely, in the F-S-F treatment, contributions showed no downward trend in the strangers section of the experiment. Many adults who contributed all in the family game also contributed everything in the game played with strangers. According to Peters et al. (2004) this may have been partly due to the desire to 'teach' children, but also because many of the adults were familiar with one another from the campus programme. In debriefing with participants it appears that children understood the in-game consequences of free-riding, but did not make the link between how they played the game and what adults would do after the game.

In Cochard et al. (2014) 100 French couples play a Prisoners' dilemma

(PD) with their spouses followed by a PD played against a stranger of the opposite sex. Some 2/5 of the participants then replay their spouses and finally all the players take place in a distribution experiment which is separately incentivized. The main result is that levels of cooperation within a couple are not absolute, although the observed defection rate (27%) is significantly lower than that observed in the strangers' game (57%). When the game with spouses is repeated, defection falls to 14%, suggesting that further repetition might lead to mean outcomes approximating the cooperative solution. The first-period result is obviously incompatible with a universal model of household cooperation, but also (ignoring opportunities for ex post redistribution) with simple non-cooperative models where the spouse puts a relative weight, of less than 13/22 on the partner's payoffs.

Iversen et al. (2010) conduct an experiment with 240 couples using variants of a simple two person VCM in which the endowment of each partner is a secret. The location is Bufumbo sub-county and Sironko District on the slopes of Mt Elgon in south eastern Uganda, a densely settled rural area. Livelihoods in the area are predominantly agricultural, but still complex and diverse and with both joint and individual enterprises pursued by household members. In the games, each person decides how much to contribute to a common household pool which is then increased by 50%. The rules for the allocation of the common pool and the degree of asymmetric information vary by treatment. In some treatments for instance, the pool is simply split equally, while in other cases one spouse has control and even in some treatments one spouse controls the initial endowment while the other determines the allocation. Despite the fact that endowments represent 2-3 average daily wages in the area and there is a 50% premium for making public contributions to the pool, the majority of individuals keep back some money from the common account.

This paper is followed by a series of larger studies in three other countries conducted by a linked group of authors. Kebede et al. (2014) uses a similar VCM game to examine efficiency in three regions of Ethiopia with a total of 1,200 married couples. Poor sections of Addis Ababa, the capital city, formed the urban site, while the two rural communities were located in the north-east and south-west respectively. In each site, five locations were selected, either distinct villages or separate urban locations. The experiments in each area were done in five consecutive days, going to one site in one day and playing different treatments in the mornings and afternoons to avoid contamination. In the northern site centralised control of agricultural decisions by the male household head is the most common arrangement, whereas in the southern site, populated mainly by a minority ethnic group, the Hadiya, women have stronger involvement in the management of the staple crop. In all three locations both men and women rarely place all their investment into the common pool. The authors try a number of variations on the basic game, including full information, assigning control of the

Table 1: Efficiency tests.

Study	Location, sample	Method	Notable Results
Peters et al. (2004)	USA, 135 individuals	Family and strangers 4 person VCM	Parents contribute more than children, 100% efficiency is not median for family game
Bateman and Munro (2005)	Norwich, UK, 40	separate and joint choices between lotteries	Many joint choices reject Pareto efficiency
Chao and Kohler (2007)	Malawi, 240 subjects	modified dictator and trust games played within couples and with strangers	Efficiency slightly higher within couples, but still less than half endowment is given to spouse in trust game.
Iversen et al. (2010)	Uganda, 240	Intra-couple VCM	Modal contribution of 100% but most individuals keep back some money.
Munro et al. (2010)	Nigeria, 80 households	Intra-family VCM; half the sample are from 2 wife polygynous households	Median contribution is 50%; efficiency the same in polygyny
Takashima (2011)	Mongolia, 178	Joint and separate choices	Efficiency is rejected
Couprie et al. (2012)	France (87) , Germany (69)	Choice between equal and efficient in modified dictator games	Majority of individuals favour equality over efficiency
Robinson (2012)	Kenya, 142	Consumption depends on who receives the income; full insurance is rare.	Consumption depends on who receives the income; full insurance is rare.
Schröder et al. (2013)	Germany, 58	Labour supply experiment; joint and individual tax treatments	Effort does not vary with tax treatment
Munro et al. (2014)	India, 1200	Intra-couple VCM, trust and modified dictator games	Median contribution is 50-75%. Few contribute 100%
Kebede et al. (2014)	Ethiopia, 1200	Intra-couple VCM, trust and modified dictator games	Most contribute less than 100%.
Cochard et al. (2014)	Toulouse, France, 100	Prisoner's dilemma played with partner and with strangers	Defection within couples is not zero, but 30% lower than within stranger pairs.
Castilla (2014)	India, Uttarakhand, 185	Trust game between spouses	Mean amount transferred is 57%.
Lopez et al. (2015)	Colombia, Japan, 170 subjects	Simultaneous sepeated intra-couple and stranger VCM	Household efficiency close to 100% when single pool used for contributions
Couprie et al. (2015)	France, 81	Allocation of time to stereotyped (e.g. folding socks) and neutral production tasks	Doing stereotyped tasks reduces the probability of efficient division of labour.

Note: for sample size I report the number of couples in the experiment except where explicitly stated otherwise. Papers are listed in order of date, but this does not always indicate priority as I use the journal publication date where possible and some papers have a lengthy prior history of circulation as working papers.

allocation to one partner and making subjects work for their endowments using a simple matchbox assembly task. Although efficiency varies somewhat between treatments, in none of them does the level of contribution to the common pool rise above 75%.

Similar results are reported for three locations of India by Munro et al. (2014), picked to exemplify the key differences in household structure between north and south India identified by anthropologists. Across all treatments most subjects kept back at least part of their endowment from the common pool and mean contributions across most locations and treatments were in the 50-70% range. Contributions were lowest in the southern state of Tamil Nadu, for both men and women and highest in the urban location, Varanesi. Castilla (2014) plays trust games between spouses in Uttarakand, a state in northern India that used to be part of Uttar Pradesh. She finds that spouses send on 57% of their endowments on average to their partners, in line with the previous results for Uttar Pradesh in Munro et al. (2014) despite the fact that in her experiment the multiple for transferred is significantly higher. Approximately 54% of the amount is then transferred back.

A third study Munro et al. (2010) extends the experimental method used for couples in other countries to a group of polygynous households in a Muslim area of northern Nigeria. There is no evidence that cooperation (as evidenced by investment in the common pool) is higher in the three adult games, compared to the monogamous couples. However, in a treatment where husbands are allowed to control the allocation from the common pool, second wives in polygyny receive lower payouts compared to the first wives, with husbands taking the largest share. As with the other countries in the programme, in treatments involving couples efficiency levels were well below 100%, with women in particular contributing less than 50% of their endowments to the common pool.

Robinson (2012) also looks at the risk-sharing aspect of household decision-making, a different dimension of efficiency, using an experimental design which unfolds over several weeks as spouses are randomly chosen to receive small rewards. In the collective model household, shocks received by the husband should have the same consequences for the ratio of marginal utilities of the spouses as same sized shocks received by the wife. Marginal utilities and marginal rates of substitution are typically not observable for household goods, so in the experiment Robinson uses survey methods to track consumption on private goods between April and October 2006 and assumes a functional form for the utility functions which implies that the source of the shock should not matter for its impact on consumption. With this kind of experiment, internal validity of the results relies on the accuracy of subject's recall and the careful enumeration of post-intervention expenditure. If the error in measuring consumption is correlated with the receipt of winnings, then the estimates of the impact of the treatment will be biased.

In this study the sample is 142 couples, taken from a group of daily income earners in three towns in Western and Nyanza Provinces, Kenya. The men are bicycle taxi drivers, while the women typically have no market income or sell produce and other items in the marketplace. Using daily income workers is attractive for this investigation precisely because they are used to dealing with randomness in earnings. In the experiment each of the subjects faces a 50% chance of a weekly income boost of 150 Kenyan shillings, which is about 100% or 20% of female and male weekly income respectively. The individual lotteries are public within the household, and independent, meaning that there is an equal chance that no-one receives the win and that both win. Robinson (2012) rejects efficient sharing, finding through separate interviews with male and female spouses that expenditure on private consumption does not change after women receive a shock whereas when men receive extra income 17% of it goes on their private consumption expenditure. With both sexes, most of the windfall is actually saved and Robinson (2012) cannot reject a permanent income hypothesis.

A different approach is pursued in Couprie et al. (2012) which compares measures of aversion to intra-household inequality amongst French and German couples. Eighty-seven couples were recruited through adverts in Germany (Mannheim) and 69 couples in France (Toulouse). Individually and without consultation subjects face modified dictator games in which, for each task, he or she must choose between one allocation that is equal and one that favours one partner but is more efficient in the Kaldor-Hicks sense. In the some of the tasks it is the chooser who receives the higher amount while in others it is the spouse. One task per couple is selected randomly at the end of the experiment. The difference between the sexes is small, though more men tend to pick the efficient option. The clearest result though is the sharp difference between the countries: approximately 74% of couples in France are classified by the experimenters as 'income maximizers', meaning that they were always Kaldor-Hicks efficient. In Germany only 39% of individuals fall into the same category. The second largest category in both countries is what they authors term 'inequality averse symmetric' meaning that the subjects pick the equal shares outcome when the alternative is highly unequal, but do not favour themselves or their partners in their choices. This group represents 17% of French women and 13% of French men, compared to 39.1% of German women in the sample and 25.3% of their spouses. The large gap between male and female responses for Germany is mirrored in another category of inequality averse subjects wherein the choosers are asymmetric in their choices and favour their own payoffs. Approximately 40% of the difference between countries in the behaviour can be attributed to differences in sample composition, with for instance, younger and agents with more education are more likely to favour equality. But the remaining differences between countries remains unexplained by the covariates available to the researchers. It is not clear how to interpret the

results of this kind of experiment. We are used to thinking of the experimenter as the audience, but as I noted in Section 2.4 in an experiment of this kind, the subjects actually have two observers: the experimenter and the spouse. When the subjects make symbolic choices of equality over income maximization as a signal to spouses, then this may be a good reflection of how they behave within the home. In this experiment, if a subject receives Euro 10 at the end of the experiment, then she or he knows the choice made by their partner. And since the questions faced by partners were the same, then one individual can deduce what choice was made by the other individual when she or he receives the prize. A more recent experiment by Couprie et al. (2015) faces 81 French couples with production tasks, some of which are neutral (e.g. stuffing envelopes) and some of which are typically gendered (e.g. folding socks). They find that in gendered tasks, allocation of partners to the tasks is less efficient when the tasks are gender stereotyped. According to the authors, the effect seems to be driven by prior beliefs about the relative efficiency of the sexes in different tasks.

For modified dictator games played within households in rural Malawi, Chao and Kohler (2007) recruit 240 subjects from 60 households. In each case the four person group consisted of a wife, her husband and his parents - reflecting the patrilineal nature of the region. Each session consisted of one family group from one village and two family groups from another village, with groups separated into two different rooms by village. Subjects played face-to-face triple dictator and trust games with others in the same room and played the same games with the strangers from the other room without coming face-to-face. In a triple dictator game, any amount transferred to the other player is multiplied by three. According to efficiency models of the household, subjects should allocate all their endowments to their partners in both the trust and triple dictator games. For other interactions the predictions are less clear cut, but standard stories about altruism suggest that individuals will give less to their partners the greater the social distance. The results indicate that subjects were only weakly influenced by social distance. Spouses, for instance were allocated 39.9% of the endowment in the triple dictator game, while strangers got 32.6 with relatives and acquaintances somewhere in-between. In case of the trust game, individuals entrust slightly more to their relatives than they do to non-relatives (approximately 45% compared to 41%), but the difference is not significant. Moreover, individuals seem to entrust the same amount on average to spouses as they do to parents or adult children. According to bivariate and linear regression tests, health and HIV status do not seem to be significant factors in the experimental behaviour, but the amount passed to the partner in the triple dictator game is related to beliefs about relative wealth as well as age and relative ages. One issue in an experiment of this type, is whether the close presence in the experiment of neighbours and relatives might limit individual's ability to discriminate according to social distance, but that

15

would still not explain why the amounts passed to strangers in the other room were only slightly smaller than the amounts passed to spouses.[6] Since the amount passed to spouses is typically well short of 100% in both types of games, overall therefore the evidence is strongly against intra-household efficiency.

In Germany, Schröder et al. (2013) conduct a tax and labour supply experiment with 58 couples who engage in piece-work under different tax and compensation schemes. They find that the tax system (individual or joint) does not affect effort in the experiment. In Mongolia, Takashima (2011) with a sample of 174 couples in Ulan Bator also rejects efficiency and income pooling using a set of lotteries wherein household risk is always zero and one lottery dominates the other at the household level. Using an accompanying survey of household decision-making she finds that efficiency is rejected even for the sub-sample of couples who report that all income is shared. One instance where household efficiency is nearly achieved appears to be in the recent experiment by Lopez et al. (2015) where couples from Japan and later Colombia play repeated VCM games with their partners. Repetition itself seems to have little effect on contribution rates, which may allay some of the worries over the results from one-shot games. However, in both countries subjects simultaneously play a VCM against a stranger in the same venue. In one treatment there are separate pools for the two games, but in the other treatment subjects make contributions to the household and stranger games from a single pool. In this game, household efficiency achieves close to 100% in both locations. In fact total efficiency rises in the treatment with a single pool, as subjects keep back less from the public goods, compared to the treatment where there are separate pools. This is a single result, but it suggests that household efficiency may arise when spouses are in a situation where 'us and them' is highly salient.

4. Bargaining and Power.

Faced with a decision individually, one spouse chooses option A from the set A, B. Meanwhile the other spouse chooses B. Asked to make a joint decision from the same set of options the couple choose A, suggesting that it is the first spouse who holds more power. As I noted above, this interpretation may not be correct for a number of reasons, including the possibility of later transfers between spouses, altruism and mispredictions of the partner's preferences.

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[6]Eckel et al. (2006) in a similar experiment conducted in Mexico also report a small difference between the amounts passed to fellow villagers and to strangers from other villages. However, the amounts passed between spouses is significantly higher. In Holden and Bezu (2013) there is a quite a large difference between the way individuals treat spouses and non-spouses in a dictator game in Ethiopia.

Within social psychology and marketing, ample hypothetical experiments on intra-household power can be found (e.g. Williams and Chen (2013)), much of traceable back to the influential work of Davis (1976). Within this literature, recognisably economic concepts of bargaining and power are prominent, but much of the focus is on the process of decision-making or on the perspectives and motives of the individuals involved.

In this tradition, the widely cited Corfman and Lehmann (1987) represent an early approach that has some clear parallels to methods used in economic experiments, but still differs in important ways most notably in the absence of monetary incentives. In the original paper, Corfman and Lehmann (1987) recruit a sample of US couples. Both partners are first presented separately with a series of 54 hypothetical dichotomous decisions and asked to make a choice. From their answers the researchers selected a subset of decisions over which the partners differed. This set, which would differ between households, was then shown to the couples who were asked to come to a joint resolution of the conflict. Corfman and Lehmann (1987) found a small but significant ($p < 0.05$) tendency for partners who 'won' on one question to have a lower probability of winning a subsequent disputed question. The hypothetical nature of the choices make the incentives unclear in this experiment. Moreover if the subjects do take the questions seriously, there is may be some advantage to being strategic in the first stage in order to influence the set of questions faced jointly. Similar approaches can be found in a number of marketing studies, including Curry et al. (1991) who consider power in a series of hypothetical household decisions. Later work by Munro et al. (2008b) with real incentives also finds that couples resolve disputed allocations through a process of turn taking. Using a sample of established couples, they conduct an experiment on household decision-making. Individual partners first make a series of dichotomous choices between household goods and vouchers for experiences (e.g. karting or a visit to a London theatre) and then the couple jointly face the same choices. A random lottery device is used to incentivize the decisions. They find clear evidence of turn-taking as a method of resolving disagreements. In other words, when one partner wins one disputed question, it raises the probability that the other partner wins the next dispute.

Table 2: Bargaining.

Study	Location, sample size	Method	Notable Results
Corfman and Lehmann (1987)	Canada	Hypothetical individual and collective choices	Some alternation of winning a dispute
Dosman and Adamowicz (2006)	Canada, 543	Hypothetical and actual campsite choices	Majority of collective decisions reflect woman's preferences
Munro et al. (2008b)	UK, 50	Real dichotomous decisions over non-monetary prizes made individually then jointly	Evidence of turn-taking in the winning of disputed decisions.
Lindhjem and Navrud (2009)	Norway, 473	Hypothetical choices on biodiversity preservation	Answers are similar whether subjects are asked as individuals or on behalf of the family
Beharry-Borg et al. (2009)	Trinidad, 45 tourist couples	Hypothetical choice experiment on water quality	No clear pattern of individual influence in joint decisions
Bateman and Munro (2009)	Norwich, UK, 120 couples	Hypothetical choice experiment on food qualities	No support for representative agent model.
Miller and Mobarak (2011)	Bangladesh, 2228 households	Decisions on improved cooking stoves	Men's decisions dominate final choices.
De Palma et al. (2011)	Jena Germany, 22	Risk decisions	Mouse-holder has more say in joint choices.
Marcucci et al. (2011)	Italian families, 78	Hypothetical location decisions	No support for representative agent model but best predictors of household choices are generally wives' choices.
Scarpa et al. (2012)	Northern Italy, 266	Hypothetical choice experiment on tap water quality	Only small differences in male and female preference once scale is allowed to vary by gender
Wiig et al. (2012)	rural Peru, 255 couples	Games played separately and jointly	Inherited land predicts influence in joint play.
Beblo and Beninger (2012)	Mannheim, Germany, 95	Choice of department store vouchers after experimental winnings paid	Where preferences differed, 50% of couples were income poolers and 50% were not.
Holden and Bezu (2013)	Southern Ethiopia, 380	Dictator games with partners and non-family villagers	Equal sharing with spouses in about 65% of cases. Wives (husbands) allocated zero to spouses in 23% (15%) cases .
Carlsson et al. (2013)	China, Guizhou province, 117 couples	Comparing individual and jointly made risky choices	Choices most similar to those made by husband. Women have more weight if they earn more or are party members.
Braaten and Martinsson (2015)	Andean Peru, 287	Comparing individual and jointly made risky choices	Choices more similar to husbands'
Dasgupta and Mani (2015)	India, Delhi, 105	Choices between private and household good voucher. Earned versus unearned endowment	Men more likely to choose individual voucher after effort task. Women unaffected by treatment

Note: the list of experiments with hypothetical choices is not comprehensive.

Dosman and Adamowicz (2006) consider a mix of actual camping choices and hypothetical choices made by 543 Canadian couples and use individual and collective choice data to measure influence. They conclude that, "In fact, the majority of the households' preference structures more closely reflect the women's preferences than the men's. For approximately 5% of the households this decision seems to be a compromise between both partners because their holiday choices do not clearly reflect either the male's or the female's preferences." Similar exercises have been conducted for a number of non-market choice experiments though without the accompanying revealed preference data that Dosman and Adamowicz (2006) use. For instance, Marcucci et al. (2011) look at power in residential decisions in a hypothet-

ical experiment played with family members in Italian cities. Meanwhile, Beharry-Borg et al. (2009) examine preferences for beach and water quality amongst 90 visitors to tourist resorts in Trinidad and Tobago. As with earlier studies individual expressions of preference are compared to jointly expressed attitudes to see which member of the partnership held views closest to the joint view. Beharry-Borg et al. (2009) do not find a clear pattern. One reason for the lack of a clear pattern of revealed power is that some individuals may answer the individual questions purely from a personal point of view, whereas other participants may anticipate the views of other people in the household and try to speak for the household. In the research by Lindhjem and Navrud (2009) on preserving biodiversity in Norwegian forests, the researchers compare the responses when 473 individuals are asked to speak as individuals to the values expressed when respondents are asked to speak on behalf of the household. In a split sample test, they find no significant difference in the figures from the two perspectives, but in a within sample test (i.e. when subjects are asked to give responses from more than one perspective), they find significantly higher willingness to pay from the household perspective. Bateman and Munro (2009) meanwhile compare individual and joint perspectives on willingness to pay for improved food quality or safety amongst 120 couples in a UK city. While they find that couples frequently differ in their responses, they do not find that one gender has more power; nor do they find evidence that expertise - in the form of the day-to-day food purchaser - is a good predictor of who has more influence in joint choices. Of course if individuals within the household have identical preferences, then issues of power become irrelevant from the viewpoint of predicting choices. Scarpa et al. (2012) analyse data on attitudes to tap water quality and argue that, if differences in scale are allowed for in the estimation procedure then there is only a small difference in the preferences of the sexes in their sample. Hensher et al. (2011) gather data on the dimensions of car preferences from 244 respondents from Sydney, Australia and come to the same view: preferences within the group do not differ substantially. Using a computer interface to present the options, individuals face 8 hypothetical questions about cars with different attributes, while dyads see four questions of the same type. In the latter case, both partners must express preferences, on the same screen and this joint and public entry, though possibly a realistic feature of actual choices may drive the high level of congruence between the answers received from the partners. Whatever the cause of the correlation, the researchers are unable to estimate a reliable model of individual influence in the joint decisions. Comparing jointly-made and individually answered questions, they find a significant difference once heterogeneity in scale is allowed for and like the earlier work by Bateman and Munro (2009) conclude that group decisions were different to those made by a representative household-decision maker. The issue of scale raised by Hensher et al. (2011) points to a important feature of econometric as opposed to theoretical

19

models of choice. In the typical random utility model of individual choice, the value of of x to the individual is, $u(x) + \varepsilon$ where ε is a random variable with mean 0 and variance, σ_ε^2. Random utility for the partner is $v(x) + \eta$ where η has mean 0 and variance σ_η^2. How should we think of jointly made choices in this context? One simple option is to suppose that household utility is simply a weighted sum of individual random utility. This gives us,

$$W = \lambda \left(u(x) + \varepsilon \right) + (1 - \lambda) \left(v(x) + \eta \right) \tag{6}$$

Consider for an example a household where person 1 always prefers x to y and has certain preferences, so that $\sigma_\varepsilon^2 = 0$. Meanwhile for person 2 $v(x) < v(y)$ but the random element means that in a fraction p of occasions the expressed individual preference is x preferred to y. Now, actually $\lambda = 0$, meaning that person 1 has no power. Over a large number of repetitions, we observe that individually person 2 chooses y over x on a fraction $(1 - p)$ occasions. In joint decisions, x is chosen in a fraction p of decisions where individuals have expressed different opinions. Erroneously, it appears that person 1 has power. Indeed the more randomness there is in person 2's decisions, the more power person 1 appears to hold. Identification of λ from joint and individual choices is therefore by assumption on the scale parameters for individual and joint choice. In addition, there is the possibility that the error term for household choices is correlated with that for individual decisions. A further issue, discussed in Scarpa et al. (2012)'s paper on tap water preferences, is that is some cases the stated choices of the couple are more extreme than those of the individual components. This suggests that a 'weighted average' model of household random utility is not always correct: households, just like other groups, might make decisions in an interactive manner that does not reflect individual preferences.[7] As such interpreting estimates for λ as measures of power can be mistaken.

Lerouge and Warlop (2006) report that individuals are not particularly accurate in their predictions about partner's choices (a result echoed in Bateman and Munro (2005) in the context of choices between lotteries). Thus, a third issue making interpretation of power estimates difficult is that altruistic individuals may take their partner's well-being into account when making choices, but may make predictive errors. If these errors are systematic, then when they are corrected in jointly made choice this may be confounded with estimates of power.

Income pooling is the property that the choices made by the household do not depend on the identity of the person who receives the income. It is an implication of the unitary model, while it is also compatible with some

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[7]The issue of group polarization has a long history in social psychology with many researchers finding that group decisions are more extreme than those made individually, Isenberg (1986).

versions of the non-cooperative model of the household. At a theoretical level it is not generally compatible with cooperative models, since what distinguishes these models from the unitary model is that the weights placed on the utilities of the partners may depend on the identity of who receives the income. However, for the kinds of payoffs that are a feature of some experiments, it would be a surprise if the weights were significantly altered by income received during an experiment. As such therefore, provided payoffs are sufficiently low compared to income, we might expect behaviour indistinguishable from income pooling even for cooperative families.

With a sample of 95 couples from Mannheim, Beblo and Beninger (2012) conduct experiments to test income pooling. Specifically they examine whether couples' joint choice of department store vouchers depended on how the winnings from the experiment were allocated to the individual partners. They conclude that out of the 76 couples where individual preferences differed, 36 pairs were income poolers in the sense of having consumption choices that were independent of the intra-household distribution of income, whereas the remaining subjects had joint choices which varied according to the distribution, usually in a way that reflected individually-revealed preferences.

With 22 couples from Jena in eastern Germany, De Palma et al. (2011) conduct a series of tests of attitudes to risk. Individuals make choices over investment in risky lotteries for the household and then couples make the same decisions jointly. They find that couples' choices are more likely to reflect the risk attitudes of the male partner. De Palma et al. (2011) also find evidence that the person holding the mouse in the computerized experiment has more relatively more power in the joint tasks.

As with other types of experiments one issue with experiments within the family is whether the effects observed have some external validity. Wiig et al. (2012) conducts public good, risky choice and trade game experiments individually and jointly at the homes of a sample of 255 couples from rural Peru. After an initial explanation one spouse made decisions while the other was out of the room. Then the other spouse made choices and finally, in a twist that was not announced before-hand, the couples made joint choices. The public good game is a 4 person linear VCM played with other, anonymous non-household members. Details of the other games are not in paper. The choices made in the individual and jointly played public good games are compared and used to construct a measure of relative influence in joint decision-making. The authors find that the inheritance of land (as a proxy for domestic bargaining power) is associated with positive power in the experimental decision. Meanwhile in Ethiopia Holden and Bezu (2013) run dictator games within 380 couples. In the dictator game subjects are asked how they would split 40 EB (Ethiopian Birr) (roughly US$2.5 or, according to the authors, about two days wages for unskilled workers in locality) with a spouse (or in some cases another family member) and 40 EB with a random

participant from the same village. Recipients of the dictator's generosity did not know whether the money came from the spouse or another randomly chosen participant. Equal sharing with the spouse was the most common response by both men and women, while zero was the modal allocation to the non-family member.

These experiment typically use money, but that is not always the case. Miller and Mobarak (2011) conduct a field trial in rural Bangladesh in which improved cooking stoves are offered (either free or subsidized) to one spouse in each household selected at random. Subjects must decide between a safer stove, a more efficient stove or no stove. Many households eventually back out of a decision to buy the household so it is not clear whether the experimental conditions represent 'real' or 'hypothetical' choices, but what is notable is that the preferences of men and women differ particularly in the case where there is a charge for the stove. Men are more likely to favour more efficient stoves over healthier stoves and when intention to purchase is compared to actual purchase it is the choices made initially by women that are more likely to be reversed, especially when there is a charge for the stove.

The willingness of one individual in a household to favour his or her own consumption may depend not just on who receives income as in Beblo and Beninger (2012) but also on how that income is received. Dasgupta and Mani (2015) conduct an experiment with 105 couples from Bhogal a poor section of Delhi, India. One randomly selected person in each couple makes a choice between a private good (coupons for gender specific clothing) and a joint consumption good (coupons for rice and lentils). In one treatment the subjects must do a simple task to 'earn' the coupons which involves sorting disks into bowls. They find that 22.7% of subjects choose the joint consumption bundle in the no-effort treatment, while 9% pick the same bundle in the effort treatment. In fact though the private good is the overwhelming choice of both sexes, Dasgupta and Mani (2015) find a difference in the sensitivity of the genders to treatment. When the reward is unearned the proportions who choose the joint good is approximately the same (23.6% for women and 21.8% for male participants). When endowments are earned the joint consumption bundle is chosen less frequently by both sexes. However, while 14% of women choose the joint bundle, only 4% of the male participants choose the same option. As a result the treatment effect is significant at the 99% level for men, but not for women (the p-value for Fisher's exact test is 0.21).

An interesting take on love and power is offered in the experiment by Goerges (2013) in the context of a group of 20 couples and 40 strangers (with equal numbers of either sex) recruited at the University of Warwick in the UK. Participants first make a joint decision on how to play: One person can perform an unpaid task that triples the pay rate for the partner or they can both do a paid task. After the tasks are completed subjects

receive information about their payoffs privately then decide how much to place in a common pool which is then distributed equally amongst the team. In both treatments (games played within couples and games played between strangers) both men and women sometimes take on the unpaid task. However its relative prevalence is higher amongst women when they play with partners. With men the prevalence is the same with both partners and strangers.

5. Risk.

The experimental literature on risk preferences is large and sophisticated. Much of that literature has been devoted to investigating the adequacy of the standard, expected utility theory (Starmer (2000)) for individuals. In contrast, though households often have to make risky decisions we have little experimental evidence on the subject. Though the detailed results vary between experiments, a typical finding is that subjects exhibit common-ratio and common consequence effects, particularly when one of the lotteries involves a large element of certainty about the payoff. In the typical common ratio effect, subjects choose lottery A over B, but then choose D over C, where C is a compound lottery, consisting of some chance p of receiving the lottery A and some chance $(1 - p)$ of receiving another amount, x and D is constructed from B in the same manner and with the same values of p and x. Meanwhile in the common consequence effect there are three possible outcomes and C (D) is constructed from A (B) by transferring some probability mass to the worst outcome from the middle outcome. Bateman and Munro (2005) test expected utility theory for individuals and couples. In that experiment subjects make choices first separately and then jointly over a sequence of 12 lotteries in which payoffs are defined for each partner. The main focus is on whether couple deviate from expected utility and indeed they find evidence of both common ratio effect and common consequence effect in the choices made by individuals and couples. They also find that couples often play the same lottery in a more risk averse manner compared to both the individual partners. As a result, in many cases the choices made collectively contradict the individual choices, meaning that Pareto efficiency is rejected. By manipulating who receives the payoff, while keeping the household level payoff constant, the experiment provides a series of tests of income pooling. Income pooling is rejected for the individuals in the experiment, but not for the jointly made choices. [8] In the original experiment, subject choices and payoffs are hidden from their partners, but in a follow-up experiment using similar protocols (Munro et al. (2008a)) their main results

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[8] A finding echoed in research on group attitudes to lotteries reported in Masclet et al. (2009) or Viscusi et al. (2011) .

are unchanged, suggesting that it is not information that is behind the the source of subject's behaviour, a point I return to in the next section of the paper. They speculate that avoidance of blame or reject may be a factor.

Table 3: Risk.

Study	Location, sample size	Method	Notable Results
Bateman and Munro (2005)	Norwich, UK, 40	individual and collective choices over lotteries with individual payoffs	joint choices more risk averse than individual; preference reversals
Munro et al. (2008a)	London, UK, 40	individual and collective choices over lotteries with individual payoffs	joint choices more risk averse than individual; behaviour unaffected by transparency of decisions
De Palma et al. (2011)	Jena, Germany, 22	risky decisions with couple-level payoffs	women more risk averse than male partners
Abdellaoui et al. (2012)	Paris, France, 64	risky decisions with couple-level payoffs	risk attitudes are not highly correlated; mean weight on women's preferences is 0.4
He et al. (2012)	China, 100	student couples; risky choice elicited using Holt-Laury	joint choices are less risk averse than individuals
Carlsson et al. (2013)	China, Guizhou province, 117 couples	individual and joint risky decisions	Choices more similar in richer households. Generally joint decision look like husband's individual preferences.
Braaten and Martinsson (2015)	Andean Peru, 287	Holt-Laury with both individual and joint choice	joint choices reflect the more risk averse partner

Meanwhile, in a more recent experiment conducted with 64 couples from Paris, Abdellaoui et al. (2012) use 6 high stakes tasks to elicit attitudes for risk for both individuals and the couple. Unlike Bateman and Munro (2005) but in common with De Palma et al. (2011) payoffs are shown for the couple as a whole and not for individuals. Individual preferences are elicited first then those for couples. The authors find little evidence of correlation between individual risk attitudes but generally men in their sample are less risk averse than their spouses. They find evidence for an inverse 'S' shaped probability weighting function similar to that typically found for individuals. Meanwhile the mean weight placed upon women's choices in jointly made choices is estimated to be approximately 0.4, which given the standard errors in the experiment, is not significantly different from 0.5.

Much of the pioneering work in this area is associated with a research group from the University of Gothenburg. Using 100 student couples from China and choices between lotteries in a Holt-Laury mechanism, He et al. (2012) find that the group is generally less risk averse than the individuals within it. Their results are in line with some previous results from ad-hoc group experiments (though in contrast to Bateman and Munro (2005)) and they interpret the outcome as providing some validation of the usefulness of ad-hoc groups in experiments. Also in China, the team in Carlsson et al. (2013) go from house to house conducting risky choice experiments with

spouses find that the choices made by spouses in richer households are more likely to be similar than those made in poorer households. This might reflect greater risk sharing or be due to assortative mating. In an experiment with a similar methodology from Andean Peru, Braaten and Martinsson (2015) find evidence that it is the more risk averse spouse who is apparently more influential in joint decisions. As with Munro et al. (2008a) they suggest that a desire to avoid blame or regret may behind the pattern of joint choices.

In the section on bargaining I have argued that scale may be confounded with measures of power. For risky choices, another theoretical consideration is risk-sharing - a point already emphasized in the discussion of Robinson (2012). If subjects pool all their risk, then revealed risk attitudes (i.e. the pattern of choices in lotteries) should be the same for both spouses and for joint choice. The experiments listed in Table 3 suggest that there is imperfect risk sharing in households but they also suggest that in some cases, the preferences of the unit may not be a convex combination of the individual choices.

6. Information and Hiding.

Most of the basic models of the household surveyed for example in Vermeulen (2002) and Apps and Rees (2009) take it as a simplifying assumption that there is no asymmetric information within the household. In support of this Browning et al. (2011) argue, 'Asymmetric information, however, is probably less problematic in households than in other types of relationship (say, between employers and employees or insurers and insurees), because the very nature of the relationship often implies deep mutual knowledge and improved monitoring ability.' On the other hand, it seems to be widely accepted that in many different kinds of societies husbands and wives routinely hide consumption and income from their spouses (Munro (2014)). In other words, there is both ignorance of what the other partners is doing, but also active attempts to misrepresent the scale of income and consumption in some households. A feature of the available evidence is that spouses often hide resources, but hidden assets and consumption are concentrated in a few goods. Dagnelie and LeMay (2008) report on a survey of 572 husbands and wives in Benin on the outskirts of the city of Cotonou. They find that 79% do not know their spouse's income and 76% believe that their partner does not know their income. They argue that secrecy and a norm of not enquiring too deeply about a partner's income helps spouses hide their income and retain control over how it is spent. The results are similar to those from Clark (1994) study of trading women in west African cities, where shared budgets between husbands and wives were rare. She states that amongst the Asante of Kumasi in Ghana, "virtual ignorance of the husband's amount and sources of income is not uncommon and some of the women openly recommended it. As long as he contributed adequately to

the children's expense, it was better not to know about the rest. Besides, he was more likely to pay his share if he did not know the full extent of your own income." P. 340. She notes that some women state that it was better to live with their husbands in order to monitor their income.

Recent experimental data strongly supports the notion of intra-household hiding though possibly not in Western countries. In follow-up interviews with 51 couples that participated in their Ugandan experiments, Iversen et al. (2006) find imperfect knowledge of spousal finances to be common, at least in wives' accounts. Some 72 percent of men claim full knowledge of wives' finances, and 92 percent that their wives fully know theirs. In wives' accounts these figures are startlingly different: 21 and 14 percent, respectively. In related studies for India, Nigeria and Ethiopia respectively, Kebede et al. (2014), Munro et al. (2014) find similar tales of hiding and ignorance.

Ashraf (2009)'s experimental investigation of saving and consumption decisions in the Philippines is motivated by the practices of local households. Working in combination with a local bank, individual spouses receive an endowment from the experimenter that must be invested in a joint account, in a private account or taken as a private gift certificate. In one treatment choices are entirely private; in a second treatment partners can observe each other's choices, but not intervene, while in the third treatment, the spouses make choices together after having an opportunity to discuss and negotiate the options. Ashraf finds men's saving behaviour to be strategic, but complex: they are more willing to place money in a private account or spend it on personal consumption if the decision is not discussed with the spouse. Switching from the private to observable treatment, male choice of the gift token rises sharply, while placing the sum in a private account falls. In the negotiated outcome, the money is more likely to be deposited in a joint account. Women's behaviour shows the same qualitative patterns, but in contrast to men, the differences between treatments when viewed separately, are statistically insignificant. In further analysis she shows that the difference in responses to treatment is linked to the control individuals have over household savings in real life. Where women have control their response to treatment is similar to that for men who have control.

Further experimental evidence on hiding is provided by Jakiela and Ozier (2011). In this Kenyan based study, 2145 individuals from 26 rural villages play an investment game. Though endowments (which can be high or low) are private knowledge in some treatments, winnings are made public. Further, subjects in one treatment had opportunities to hide (at a cost) experimental winnings. At a low price for hiding nearly 50% of women chose to hide their winnings, while in the treatment where hiding was not feasible, investment was lower than in treatments where choices and winnings were hidden. From the perspective of household experiments, the key result is that women who had relatives present (not necessarily spouses) in the ex-

periment were willing to pay more to hide their winnings. Men's willingness to pay to hide, on the other hand generally does not seem to be sensitive the presence of kin. Mani (2011) reports on a similar kind of game conducted in the Anantpur district of Andhra Pradesh, India in October 2005, but one focused entirely on family members. The sample consisted of 300 households, recruited by means of an NGO, well-established in the area. In this case, male and female subjects face four investment decisions to be made separately, one of which is implemented using a random lottery device. In all cases, subjects chose between two options for investment with a certain payoff. One investment dominated the other, paying off 100% compared to 50%. An important feature of the design is that the household income maximizing strategy is always straightforward: place everything in the dominating investment. Mani (2011) finds instead that men and women place around only 80% of their funds in the high return investment. Moreover the amount decreases as the control rights of the spouse increase. Information treatment has some effect but it is not generally statistically significant. Even in the case where shares are fixed, many individuals do not place all the funds in the high return investment. Mani interprets this as 'spite', meaning that subjects are deliberately and at personal cost refusing to earn money that will be shared with their partners but this might represent some misunderstanding on the part of participants. Mani (2011) though notes that investing all is more common when men's pre-assigned share is greater than 0.5.

Another experiment based on 250 couples from the Siaya district of eastern Kenya, finds that on average both men and women give less to their partners in a dictator game, when the transfer is anonymous, compared to the situation where the source of transfers were identifiable. Adult subjects were recruited through local administrators and played three modified dictator games (with one picked at random for implementation): secret and public games with their spouse and a standard dictator game played with someone else taking part in the experiment. The design enables the researcher to hide from the spouse the exact source of any receipts he or she might receive, although of course she or he will be know that there is some chance that their spouse was the source. To test for efficiency, a token passed to a partner is worth 50% more than a token kept for the self. To mask the decision more thoroughly and also to generate more data, each spouse makes six dictator decisions towards their wife or husband with differing total endowments. Hoel (2015) finds that when considering mean behaviour, men give a 9.2 percentage points more in public game than in private, while wives give 6.9 percentage points more under the same circumstances. However, the modal effect is zero: women give the same amount in 50% of games and men given identical proportions in 49% of cases. A possibly surprising feature of the data is that around 14% of subjects consistently give more to their partners in the secret treatment. Efficiency is rare. The option of passing the entire

endowment to the spouse is chosen in less than 3% of cases and on average participants give up 16% of total household earnings, by reserving some of the payoff for themselves. Interestingly, Hoel (2015) reports that individuals who state that their partners know their expenditures are more likely to behave strategically in the experiment. She argues that this transparency in the household may be the equilibrium response to opportunistic behaviour. In other words, when partners trust and are trustworthy transparency is unnecessary.

While most of these experiments use money, Ashraf et al. (2014) consider how the presence of husbands in a briefing about family planning affects subsequent uptake of a free voucher for contraceptives. When both spouses had to sign for the voucher contraceptive use was lower compared to the situation where only the wife was present and required to sign. In rural Ghana, Castilla and Walker (2013) use goods as well as money. They report that, in southern Ghana where the experiment is held, the implicit rules of marriage mean that husbands must provide cash in the form of 'chop money' to their spouses to cover the daily costs of the household. The wives choose how this money is spent and whether to divert some of the money into private goods. Moreover the chop money the wives receive is normally decreasing in the amount the wife earns, giving them an incentive to hide earnings. In the experiment, four rounds of games followed by individual surveys about chop money, household expenditure and consumption were conducted over several months in 2009. In each round, individuals subjects took part in a lottery with prizes paid out either in the form of cash or in-kind (chickens or female goats). In one treatment, the cash lotteries were private and in the other treatment cash prizes were publicly observed. In their analysis, the authors assume that animal prizes were observable but here there were two treatments too: one with higher visibility and publicly announced prizes and one where the actual lottery was conducted in private. The analysis suggests that women's receipt of a large prize lowers chop money subsequently, with some evidence of lagged effects. Meanwhile for men, whether a lottery is public or private has little impact on chop money behaviour. However, for both sexes the public/private nature of the prize does seem to be reflected in subsequent expenditure, with spending on publicly observable forms of consumption (e.g. ceremonies) more likely when the lottery win was public. In this kind of behaviour therefore men and women are taking the opportunity afforded by private winnings to mask consumption from both their spouses and other members of the surrounding community. Some of the impacts of earnings may only be observed with a lag (of a few months) leading Castilla and Walker (2013) to conclude that, "especially among wives, loans and delayed spending of prize money suggest that the information asymmetry may have a greater effect on inter-temporal allocations than on inter-good allocations, possibly in a way which counteracts the power balance within the household and increases women's capacity to save and self-insure."

Table 4: Information.

Study	Location, sample size	Method	Notable Results
Ashraf (2009)	Mindanao, Philippines, 146	Subjects choose between joint account, private account or private gift certificate. Treatments vary in the degree of spousal interaction.	Men and women follow the same pattern (for men the pairwise comparisons are significant): less willing to place money in a joint account if the decision is not negotiated.
Mani (2011)	Andhra Pradesh, India, 300 households	Subjects choose between high and low return investment. In some treatments low return investment is kept by subject and secret while high return is shared.	Subjects rarely invest all in the high return investment (the efficient strategy). Investment falls as control rights fall, but information has little effect.
Jakiela and Ozier (2011)	Western Kenya, 2145 individuals	Subjects receive high or low endowments; public or privately make investment in risky good. In some treatments privacy could be purchased.	Women especially willing to pay to hide endowment and winnings, particularly when relatives were in the same session.
Munro et al. (2014)	Uttar Pradesh and Tamil Nadu, India, 1200	Intra-couple VCM with and without full information.	Men invest less when there is full information; women in the south invest less.
Castilla and Walker (2013)	Southern Ghana, 600 individuals	Private and public lotteries for cash and chickens; follow up household surveys.	Publicly observable spending higher when lottery win is public; men cut back transfer to women after women win a lottery.
Kebede et al. (2014)	Ethiopia, 1200	VCM with and without full information.	Information has no systematic effect on contribution rates.
Munro et al. (2013)	Uttar Pradesh, India, 344 individuals	Field experiment - digging in 4 person mixed sex teams.	Teams are more productive in treatment where couples work together.
Ashraf et al. (2014)	Zambia, 749 married women	Half the sample receive free contraceptive voucher in presence of husband that requires his signature; half receive voucher alone.	Contraceptive use (particularly injectable) higher when women alone receive the voucher
Hoel (2015)	Eastern Kenya, 250	Modified dictator game (50% premium for giving) with variation in identifiability of donor	Men donate more to partners when the source is identifiable. Full donation (i.e. efficient level) is rare for both sexes.

An important question concerns how information affects productivity in the household. Here we have little evidence to date, but Munro et al. (2013) in Uttar Pradesh, India compare the productivity of several hundred mixed sex teams of four in a digging task performed under NREGA - a workfare programme designed to assist the rural poor in India. In one treatment spouses are in the same four person team while in the control spouses work for separate teams. In each case teams dig real water storage tanks for three hours with men doing the digging while women transport the soil to a nearby location. Productivity is nearly 50% higher when spouses work in the same team. This result may be due to the improved monitoring of work effort that can occur when spouses are in the same team. However, it is also compatible with a free-riding interpretation: when spouses work together they represent 50% of the total team, whereas when they work separately each makes up only one quarter of a team. Thus, even with full monitoring of a partner's effort and a unitary household, we would expect lower productivity when partners are separated.

7. Time.

How do the expressed intertemporal preferences of households or couples compare to the preferences made by individuals? From a theoretical perspective, Hertzberg (2011) or Zuber (2011) or Jackson and Yariv (2010) argue that in general, aggregating choices across individuals with different inter-temporal discount rates can lead to time inconsistent preferences at the level of the group. The issue can be illustrated using a slight extension of the earlier model. Suppose that subscripts $t = 1, .., 3$ refer to time periods. Individual i has preferences summarized by the following utility function, where ρ^i is the discount factor for person i.

$$U^i = \sum_{t=0}^{t=3} \left(\rho^i\right)^t u(x_t) \tag{7}$$

Meanwhile the household chooses according to,

$$W = \sum_{t=0}^{t=3} \left(\lambda \left(\rho^i\right)^t u(x_t) + (1-\lambda)\left(\rho^j\right)^t v(x_t)\right) \tag{8}$$

In this situation, preferences are time consistent if the preference between two consumption plans is independent of time period. Preferences of the form expressed in 7 are time consistent: an individual who prefers plan x to plan x' at time 0 will also have the same preferences at $t > 0$. However, this is not necessarily true of the household preferences summarized in 8. For instance suppose $u = v = x$ and consider preferences between consuming 1 unit in period 1 and 1+r units in period 2. Let $\rho^1 = 1$ and $\rho^2 = 0.5$. In this case, at time zero, consuming in period 1 is preferred as long as,

$$\lambda + (1 - \lambda)0.5 \geq (\lambda + (1 - \lambda)0.25)(1 + r)$$

Or

$$r \leq \frac{1 - \lambda}{1 + 3\lambda}$$

However in period 1, the household prefers to consume in period 1 provided,

$$1 \geq (\lambda + (1 - \lambda)0.5)(1 + r)$$

Or,

$$r \leq \frac{1 - \lambda}{1 + \lambda}$$

In other words, there are values of r where the household prefers consumption in period 2 at time 0, but prefers immediate consumption when period 1 is reached. The reason is that as long as individual discount rates differ and some weight is placed on the utility functions of both individuals then the weighted discount factor is not geometric and hence preferences can be time inconsistent.

As with static choice, making inferences about λ or other indices of relative power can be problematic with dynamic choice experiments. Let us confine attention to two periods and suppose that preferences for an individual are:

$$U^i = \lambda^i \left(u(x_1) + \rho^i u(x_2) \right) + \left(1 - \lambda^i \right) \left(v(x_1) + \hat{\rho}^j v(x_2) \right)$$

In this expression, λ^i represents the weight placed by person i on their partner's well-being when making choices while $\hat{\rho}^j$ is their belief about the other person's discount factor. Meanwhile joint preferences are summarized by the household utility function,

$$W = \lambda \left(u(x_1) + \rho^i u(x_2) \right) + (1 - \lambda) \left(v(x_1) + \rho^j v(x_2) \right)$$

The difference between these two expressions is composed of two parts: $\left(\lambda - \lambda^i \right)$ and $\left(\hat{\rho}^j - \rho^j \right)$ - the difference between the weight placed on the partner's preferences by the individual and household and the difference between the beliefs of the individual about the partner's discount factor and the reality. Even if the individual correctly predicts the intertemporal preferences of the partner, it may not possible to separate altruism from power in the determinants of household choice.

Some careful experimental evidence can be found in Carlsson and Yang (2013) who faced a group of 164 rural Chinese couples with inter-temporal

decisions of the kind typically found in experiments on individual discounting. In their own homes, the participants faced individual and joint choices between time-dated payments using a convex budget method for eliciting preferences. The order of individual versus collective decisions was randomized across couples and subjects were informed that in the joint treatment each spouse would receive half the payoff. Prior to making the actual decisions each subject went through two practice trials. Yang and Carlsson (2012) reports on the same data showing that 11% of couples in the sample are more impatient than the component individuals while 81% had discount rates lying between those for the individual spouses and 9% of couples were more patient than either individual. Couples were less prone to make time inconsistent choices, but overall the authors conclude "a majority of the observed shifts are impatient and time-inconsistent shifts".

Meanwhile, Abdellaoui et al. (2013) take 64 couples recruited from public adverts in Paris, and at the participant's homes conduct discounting experiments alongside the risk experiments discussed earlier (Abdellaoui et al. (2012)). As with the risk questions, individual values were obtained before couples were interviewed together. Values were elicited through a three stage bracketing procedure: subjects were first given a choice between a fixed amount at time t, and a series of 11 amounts to be received one week after the experiment. This defined an upper and lower point of indifference which was used to refine the switching point in the second and third stages of the computer-based procedure. Potential payments were up to 1200 Euros. On the whole couples were more patient than their constituent individuals, with only 52% of couples having discount rates that lay between the individual values. The authors conduct a regression model to relate household discount rates to individual rates and conclude that the weight placed on each spouse's discount rate is not significantly different from 0.5. The higher patience of the collective is consistent with that found by Shapiro (2010) in his laboratory investigation of US students, asked to make inter-temporal preferences separately and as members of a group. Though the questions were unfortunately purely hypothetical, the results collected by Ziegler and Tunney (2012) are interesting. They question people about their intertemporal choices on behalf of others and find that as social distance (e.g. kinship) rises, individuals become more patient in their choices.

With a sample of 598 couples from a Western region of Kenya, near to the town of Busia which is close to the Ugandan border, Schaner (2012) investigates savings strategies when preferences differ between spouses, by inviting each couple to open three savings accounts (one joint and two individual) which offered potentially different interest rates. The costs of opening the accounts was covered by the experimenter while at the same time, subjects faced individual tests of inter-temporal discount rates for a period of 6 months following the experimental intervention. Overall, approximately 43% of couples open at least one account. Of these when the joint account

Table 5: Time.

Study	Location, sample size	Method	Notable Results
Carlsson et al. (2012)	China, Guizhou province 117	18 pairwise individual and joint choices over timing	Most elicited joint discount rates are in between individual rates; in nearly all joint decisions husbands have more weight.
Schaner (2012)	Busia, Kenya, 598	Savings accounts with varying access rules and interest rates	couples with similar discount rates make generally efficient choices
Ziegler and Tunney (2012)	61 female and 9 male UK students	450 hypothetical choices	higher discount rates when choosing on behalf of closer relatives.
Abdellaoui et al. (2013)	Paris, France, 64	In-home interviews	couples generally more patient than their individuals
Carlsson and Yang (2013)	China, 164 couples	Convex time budgets	9% of couples more impatient than either individual; 11% more patient

offers the highest interest rate, 7/180 'well-matched' fail to save efficiently, while 23/183 of mismatched couples save in a way that does not maximize total household returns. More generally, the results indicate that partners with close discount rates were more likely to place savings in the account with the highest interest rate, whereas couples with mismatched discount rates were relatively insensitive to interest rates and tended to favour savings by means of individual accounts.

8. Framing and Judgement and Behavioural Economics.

Households and the individuals within them may make choices that depart from the standard model of consistent, complete and context-free preferences. With individual choice, the standard model is usually interpreted in terms of rationality. Hence deviations from the standard model imply a form of irrationality and are often labelled as "anomalies". As Arrow's impossibility theorem demonstrated, with collective decisions, choices involve some form of aggregation and thus a failure to be consistent or transitive may be due to the method by which preferences are aggregated rather than the irrationality of the underlying partners. In its original form Arrow's theorem requires at least three participating individuals, but as the example of the previous section showed even with a two person household, straightforward methods of aggregation can produce inconsistent household choices even when individual preferences are consistent and complete. Making inferences about rationality on the basis of household choices is therefore always going to be problematic, but nevertheless there is an obvious interest in knowing whether collective choices show some of the same patterns as individual choice. One particular reason concerns external validity: if choices made at the household level do not show the same features as individual choice ex-

33

periments, then the relevance of the anomalies literature for understanding market behaviour might be limited.

Tests in this area are unusual, but Munro and Popov (2012) conduct a series of experiments on U.K. couples at a variety of venues, including a school Christmas fair and a university open day. They test for a variety of framing effects including the endowment effect (e.g. Knetsch (1989)), asymmetric dominance, compromise effects. A compromise effect occurs in the context of comparisons between choices made from two sets of goods, $\{A, B\}$ and $\{A, B, C\}$ Simonson (1989). Like the endowment effect, it is commonly found in individual choice experiments with or without incentives. In the choice set, B is chosen to be a convex combination of A and C. A strong compromise effect is said to occur if the probability B is chosen is higher when C is present in the choice set. The strong effect is a rejection of the notion of complete preferences since it implies that for some decision-makers, the ranking of A versus B depends on the presence or absence of option C. A weak compromise effect occurs if the probability that A is chosen falls when C is in the choice set. Such a result is incompatible with consistent preferences if those preferences are convex, because by convexity someone who prefers A to B will also prefer A to C. Parallel experiments are run with non-student individuals and with students. Couples show endowment effects to the same extent as individuals. Behaviour in tasks involving a compromise effect is also similar across the sub-samples, which both individuals and couples favouring a compromise good over extremes. The results of Bateman and Munro (2005) on risky choice are compatible with households having non-expected utility preferences, a view supported and extended by the results in Abdellaoui et al. (2012) based on work with French couples.

Some recent group experiments have investigated whether "two heads are better than one" in questions of logic, probability and game theoretic reasoning. Kocher and Sutter (2005) considers beauty contests where pairs outperform individuals, Charness et al. (2007) finds groups less likely to choice first order stochastically dominated options and Cooper and Kagel (2005) find dyads' choices conform more closely to the predictions of standard game theory than individuals in signalling games and for a general review see Kugler et al. (2012). This kind of comparative information is not yet available for couples either in the experimental economics literature or in the wider field of social psychology research. Still, Yang and Carlsson (2012) for instance in the experiments with Chinese spouses discussed in the previous section, do find that present bias is present for jointly made intertemporal choices as well as for individual choices - suggesting that a taste for immediate gratification is not tempered by joint responsibility for decisions.

9. Non-spousal experiments.

Most of the experiments discussed so far involve spouses as participants, although some such as Jakiela and Ozier (2011) had a mixture of friends, relatives and strangers. In theory and in practice other members of the household can affect decisions either indirectly (e.g. one parent seeking resources to pass on to the children) or directly. Even more so than experiments with couples, the settings, designs and samples are even more disparate for this category. In the original economics experiment, Peters et al. (2004), mixes families in the public goods games. In Brazil, Reynolds (2013) conducts a trust experiment played between 153 teenage mothers and their mothers in Salvador, North-Eastern Brazil and finds in favour of a cooperative (joint payoff maximizing) model. Also in Brazil, Bursztyn and Coffman (2012) consider the effect of cash versus conditional payments to parents on schooling decisions. Meanwhile in Istanbul, Brañas Garza et al. (2013) use social choice experiments to examine the correlation between the preferences of parents and those of their children. Ambler (2012)'s sample of 1,300 migrant householders in the USA and their relatives covers a range of intra-household relationships. In the experiment migrant workers must decide what portion of a $600 cash windfall to remit back to El Salvador to a high school or college age relative selected by the participant. Choices were restricted to units of $100 and across the whole sample, two actual windfalls were available, paid out through a subsequent lottery. Recipient subjects are randomly assigned to one of four groups defined by two treatments that manipulate the information available to the pairs. On average, migrants sent approximately US$20 more when they believed that the recipient would be informed of the identity of the sender (US $ 465 rather than US $ 441) and more migrants transferred the whole amount. Within the recipient group the response to treatment was quite small perhaps reflecting the limited opportunities for verification, but there is some evidence that recipients would spend more on educational expenses and less on daily expenses when the information about their choices was not revealed to donors. The clearest effect is that stated intentions for expenditure were more closely aligned to donor's preferences when that information was revealed to potential recipients. On trust, Vollan (2011) compares the results of a trust game from experiments conducted with 215 friends and relations in South Namibia and South Africa. In the absence of third party punishment individuals trust family and friends more than other village members, but there is no significant difference between the attitudes expressed towards family and friends. When third party punishment is possible, the pattern of results is similar, but the presence of TPP seems to raise trust towards friends and strangers but lower it towards family members.

In a recent experiment, Sinan Ünür et al. (2013) compare transfers made by a group of 45 US parents to their teenage children in a moral hazard

context where the children make risky choices. They find that when children (12-18 year olds) are passive recipients of random endowments, parents tend to equalize final resources amongst their two children. When children can undertake risky actions, by opting to place their endowment in an unfair bet, parents are less likely to equalize final payoffs and more likely to make an equal transfer. Children are more likely to choose the risky bet if it can be hidden from their parents. Meanwhile, Munro and Tanaka (2014) take a group of 500 adolescent children in rural Uganda and compare their risk and discounting attitudes to those of a randomly chosen parent (only the risk preferences are incentivized). As with Sinan Ünür et al. (2013) children are less risk averse than their parents. They also report that children have higher loss aversion wherease for discounting, the parents are more impatient.

A modified dictator game is used by Ünür et al. (2007) at a twins fair in the USA where they recruit 113 people placed into 22 groups. The groups are quite heterogeneous, with identical twins in some groups and not others, parents in some groups and not others and so on. In the experimental sessions, subjects can pass money to other members of the group as they wish, by allocating from a budget of 100 tokens. The authors conclude that, in broad terms the results are consistent with less giving to individuals with greater social distance, but it is not the case that all the tokens are typically passed to family members. In fact, a significant minority of subjects simply split the budget equally while siblings receive relatively less than might be predicted on the basis of Hamilton's rule.

10. Conclusions and next steps.

Incentivized intra-household experiments have now taken place in over 20 different countries including Bangladesh (1), Benin (1), Brazil (2), P.R. China (3), Colombia (1), Ethiopia (2), France (5), Germany (2), Ghana (1), India (5), Japan (1), Kenya (3), Nigeria (1), Malawi (1), Mongolia (1), Peru (2), Turkey (1), Uganda (2), UK (4), USA (3) and Zambia (1)). The diversity of environments, coupled with sample sizes and differences in designs make it all-but impossible to draw general lessons about the results. Bluntly though, evidence of joint payoff maximization between spouses is rather thin on the ground. With some experimental subjects playing unfamiliar one shot games there is evidence of misunderstanding after practices have been completed but before the actual game is played. Nevertheless, there are a number of experiments with full information and clear evidence of subject understanding where the majority of spouses do not make choices that maximize total household income. Possibly the simplest explanation of the general pattern of failure is that physical control of an endowment gives a spouse greater bargaining power over how that resource is to be used. To surrender the endowment to the partner or to a common pool is to give up

some bargaining rights and for an individual the loss might outweigh the gain from having a larger total income for the household.

From a policy perspective the widespread failure to attain efficiency has mixed implications. On the one hand, inefficiency in an important economic institution represents a potential loss to society. Against this, the evidence of many of these experiments suggests that money or resources received by one partner sticks to that partner (at least in part). A worry with many policies aimed at changing the balance of power between the sexes is precisely the opposite: that resources directed towards female spouses will be taxed or claimed by their male partners. Income pooling is the enemy of economic policies aimed at particular individuals within the household.

Another prominent theme that emerges is the demand for secrecy by individual partners, a result that chimes with much of the anthropological literature though not particularly with standard economic models of the household. In part this desire to hide winnings from partners is one source of inefficiency, but as the results of VCM games show it is not the whole issue. And a third theme is that often the joint choices, whether about risk, timing or immediate consumption are often not some weighted average of partner's separate decisions. As is well-known for groups, couples and households do not necessarily behave like their constituent parts. It is possible that part of the reason why joint choice is not always a convex combination of individual choices may be due to some randomness in household utility, which suggests a need for some theoretical developments in this area.

With household experiments, there remains much in the way of unexplored terrain, some of it methodological, some of it policy orientated. For instance, there are no same-sex couples in the samples reported in this survey. Burns et al. (2008) is one of a number of papers that have reported some differences in the typical management of financial affairs between same-sex and heterosexual couples. It would be useful to know if these differences extend to behaviour in the kinds of experiments presented above.

Another feature of most experiments to date is the exogenous manner in which decisions have to be made. In a typical experiment a couple is forced to make decisions together, to share information or they are asked to make decisions separately. In reality, some spouses may delegate particular decisions while others aim to make all but the non-trivial decisions collectively. The heterogeneous nature of household decision-making arrangements means that forcing a household to adopt a particular way of making its decision may not be externally valid meaning that experiments where households can choose how they solve decision problems may be more predictive of world choice. At the same time, it would be interesting to know if they were experimentally manipulable factors that influence whether a decision is taken by one spouse or the other or made jointly. And while a handfull of experiments (e.g. discussed here used production, it has not so far been common. Nevertheless, understanding issues such as household

division of labour (e.g. as inCouprie et al. (2015)), may require it.

As reported above the existence of decision-making anomalies within households has not received much attention and as I have emphasized, the key aspects of household as groups is that they are ongoing and that some of the ties within the household are based on emotions of love, altruism and so on. Given this, what sort of household-specific anomalies could we expect? My expectation is that in many households the adult protagonists in any decision will have one eye on the long-run implications for the health of the relationship. As a result, there may be a high emphasis on equality and mutual concessions in bargaining decisions (as in Corfman and Lehmann (1987)) plus an aversion to individual losses within the household. Meanwhile many of the group experiments referred to in the introduction find that group are better at solving puzzle-based decisions compared to inviduals. I wonder whether this is an area where household-based groups will do less well than other types of groups because of 'interference' from emotions and considerations about group harmony and so on. The desire for harmony and consensus may also produce intertemporal anomalies when delaying choice is a possible way to resolve conflict.

Much of the recent literature on public goods has emphasized the means such as punishment and communication through which cooperation can be supported. In some cases, punishment and reward is monetary while in other well-known experiments, communication is symbolic for instance by the use of happy and sad faces. Symbolic communication can be surprising effective amongst on-going groups (e.g. amongst fisherman as reported in Carpenter and Seki (2011)), but it is an open question how cooperation is most effectively sustained within households.

In some societies, the two-generation nuclear family represents the most common living arrangement for working age adults. There are though, many societies where three generations live together or extended families live close by and share some or all responsibility for family decisions. Some of the motives for hiding money and keeping money from the common pool in the experiments surveyed above, might not be to keep money away from spouse; it might be aimed at stop in-laws, siblings and children making a claim on the winnings. Just as studying individual choice may tell us little about how couples make decisions, studying couples may be relatively uninformative when other members of the household have influence.

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