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Parental Decision-Making and Educational Investments

The Intergenerational Cost of Noncooperation

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Abstract

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Keywords: intra-household decision-making, gender, educational investments, income pooling

JEL codes: D13, D14, O12, O15

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1. Introduction

Spouses are often required to reach collective economic decisions for the household, but may disagree or hold unequal decision-making power. In low-income contexts, household efficiency in the outcomes of such preference aggregation has been rejected for several decision domains, such as risk-sharing (Dercon & Krishnan, 2000a; Doss, 2001; Robinson, 2012a), task specialization (Udry, 1996a), and income pooling and savings (Anderson & Baland, 2002; Ashraf, 2009; Schaner, 2015).[1] Why spouses often appear unable to cooperate in their decision-making to achieve optimal outcomes is an important research question with significant implications. One explanation for some of these findings is that women try to avoid bargaining with their more powerful spouses to shield their financial resources. Instead, they seek alternative strategies to individually finance expensive durable or indivisible goods outside the core household, such as through income hiding (Ashraf, 2009; Castilla, 2019) or informal saving groups (Anderson & Baland, 2002), thereby sacrificing potential gains from income pooling and coordination of expenditures with their spouses.

Educational investment in children is one of the most crucial domains of decision-making affected by this behavior. Mothers frequently disagree with their spouses about such investments (Thomas, 1990; Hoddinott & Haddad, 1995; Lundberg *et al.*, 1997; Duflo, 2012) and attempt to finance them outside the family. For example, (Anderson & Baland, 2002, p.968) report that in Kenya many women join informal rotating savings and credit associations (ROSCAs), which feature objectives such as "to help poor women to educate their children" and to make "buying books, uniforms and paying school fees for our school children" the first priority.[2] (Castilla, 2024, p.1,757) finds evidence that "women [in India] may be willing to incur costs to maintain control over money, fearing their partners would not allocate the money towards children's investments."[3] The inability to pool resources within the household to achieve human capital investments, such as expensive school materials or tuition fees, is particularly harmful in developing countries where both governments and private households are extremely financially constrained. If poor households invest

[1] For early and recent reviews of intra-household conflict and decision-making in the developing world, see Bruce (1989a) and Baland & Ziparo (2017), respectively. In high-income contexts, Mazzocco (2007a) and Browning *et al.* (1994a) reject the idea of the household as a unitary decision-maker using US and Canadian consumer data, but efficiency is not readily rejected.

[2] The literature on the economics of ROSCAs was the first to highlight the importance of within-household income pooling in developing countries: providing greater access to household durables and large, indivisible goods. Besley *et al.* (1993) view ROSCAs as a joint saving device formed by households that cannot finance these goods through autarkic saving. Anderson & Baland (2002) document that up to 84% of ROSCA participants in Kenya are women, who take part despite the Pareto-inefficient nature of these saving groups. They relate intra-household conflict and ROSCA membership through the inability of spouses to agree to save for the purchase of indivisible goods.

[3] Studying the extended family, Angelucci *et al.* (2018) document that well-connected and resource-pooling family networks can increase human capital investment when some of their members receive cash transfers. Jakiela & Ozier (2016) shows that households in Kenya invest inefficiently to keep earnings secret from their kin.

their financial resources in education sub-optimally, low human capital accumulation can perpetuate poverty and hinder growth.[4]

In this paper, we investigate whether parents fail to cooperate when making decisions on educational investments and test whether low female empowerment and disagreement with the spouse explain such behavior. We conduct a series of incentivized experiments with parental couples in Dar es Salaam, the commercial capital of Tanzania, representing 6th-grade children in randomly selected schools. We gathered parents and conducted a women empowerment expenditure that measures how much mothers are willing to sacrifice to have control over cash, money-earlier-later (MEL) experiment that captures impatience of mothers and fathers, and a novel three-stage decision-making experiment which involved both parents in decisions to invest in children's school materials. In the first stage of the decision-making experiment, the key focus of our paper, we separately asked mothers and fathers to indicate their preferred allocation of a budget of TZS 8,000 (US$3.60) between a *cash* and a *voucher* basket. To make the vouchers attractive, we doubled any money allocated to the *voucher* basket. We paid subjects the money they allocated to the *cash* basket at the end of the experiment. We informed parents that they can use the vouchers to purchase textbooks for the key grade 6 textbooks (Mathematics, Swahili, Science, Geography, and English) and other school materials, which our enumerators provided the next day. The focus on the purchase of textbooks is critical because textbooks are an important educational input. Still, none of the students in the sample schools owned them before our experiment.[5]

Results from stage 1 of the decision-making experiment suggest a large variation in preferences both across and within households. Almost half of the couples opted to use the entire budget for the educational voucher, while 6.49% of parents opted for a pure cash payoff, and 45.31% allocated to both the cash and the voucher baskets. The shares allocated to the voucher by fathers and mothers are on average 0.268 apart - mothers allocated a significantly higher share (80%) to human capital investment than fathers (67%). However, we don't find substantial differences in the share allocated to the voucher based on the gender of the child. In particular, neither fathers nor mothers seemed to treat children of the same sex preferentially

In the second stage of the decision-making experiment, we asked parents whether they wanted to remain with the allocations that they had chosen or to opt for joint budget allocation with their spouses. In a low-income context such as urban Tanzania, the gains from the joint management of financial resources are potentially

[4]Another important aspect of household educational decision, which we don't focus on in this paper, is the within-household variation in educational resource allocation. Giannola (2023) documents that parents in the Indian state of Odisha make educational investment decisions based on efficiency considerations - they invest more in high-achieving children, exacerbating inequality among children.

[5]In Tanzania, only 2.1% of children in the public primary school system own math and reading textbooks (SACMEQ, 2011). We surveyed a subsample of 291 students to confirm these statistics for the study sample. Only 4.5% and 5.8% of students reported possessing mathematics and Swahili textbooks, respectively.

large, as access to formal savings and credit products is scarce and individual incomes often do not suffice to finance expensive, indivisible educational inputs, such as textbooks. Choosing to remain with the individual allocation would mean that it would be realized with certainty. If a parent opted for a joint allocation, a new allocation would be elicited from the couple after they were reunited and allowed to discuss the choice privately. We varied the budget size for the joint decision by 12.5 percentage points in five levels. Moreover, to assess the scope of information asymmetry between the couples, we asked each parent to state what they believed to be their spouse's preferred allocation. If their belief was correct, we paid them additional TZS 1,000 (USD$ 0.45) in cash at the end of the session.

If a mother and father agree on the investment and pool their individual incomes, they may be able to afford these large educational expenditures without any need for individual saving. However, parents often disagree and decide not to jointly allocate money to education (Anderson & Baland, 2002; Castilla, 2024). Mothers may have a higher preference for their children's education than fathers but carry less weight in household decisions, and fathers may have other priorities than investment in children's education. If these inequalities are too strong, such that the father can enforce an allocation according to his preference in spousal bargaining, the mother would be worse off by contributing to a joint household budget. Her second best option is then to *ex ante* withdraw from bargaining and to individually invest in cheaper educational inputs or to use costly strategies to transfer income to the next period.[6]

We focus on two primary outcome variables of interest in the stage 2 of the experiment: a binary variable *joint decision* that denotes whether parents chose to allocate the budget jointly and, a continuous variable that represents the *endowment loss*, capturing the loss in budget from not choosing to allocate jointly for positive treatment levels (or from choosing to do so for the negative treatment level). We find that, overall, parents opted for joint decision-making in about half of the five decisions (51,5%), but mothers avoid joint decision-making significantly more often (+20% of decisions) and experience more frequent and higher endowment loss. Mothers tend to avoid joint decision-making when it is not profitable (17,7% at treatment 0), but react more strongly to increasing treatment levels than fathers. Parents who always choose to make individual decisions are more likely to be male, illiterate, and smokers. Regression results suggest that, compared to the baseline (treatment 0), a 37,5% increase in the joint budget increases the likelihood of allocating together with the spouse on average by 27,5% for fathers and 52,1% for mothers. At the maximum treatment, parents sacrifice on average TZS 767 (US$0.35) with mothers experiencing 42,5% higher endowment loss than fathers. The endowment loss from avoiding joint decisions relates directly to the educational investments as a share of the budget allocated to the voucher, in which case, the amount is doubled. When the benefits

[6]These strategies could range from participating in no-interest informal saving groups such as ROSCAs Anderson & Baland (2002) to hiding income from the husband (Ashraf, 2009) or engaging in in-kind credits (Goetz & Gupta, 1996).

of joint decision-making increase, so do the losses of those who avoid bargaining with their spouse. In the third (final) stage of the decision-making experiment, we paid out subjects by randomly drawing one of the five choices from the joint budget allocations.

We show that the key mechanisms that explain the difference in the decisions of mothers and fathers we document are differences in preference and decision-making weights, which represent a potential for intra-household conflict. More specifically, mothers, on average, believe that their spouse would allocate less to the voucher, while the opposite is true for fathers. As a result, the probability of joint decision-making declines with subjective disagreement. Following Almås *et al.* (2018), we experimentally elicit the willingness to pay of mothers to receive a cash transfer rather than having it go to their spouse and show that 65% of mothers are willing to sacrifice a positive amount of cash to gain control over the transfer. Mothers are on average willing to pay 16% of the maximum amount they could get. Using regressions, we show that a one standard deviation change in the belief of preference difference for the voucher implies a TZS 155 (0.19 sd) change in endowment loss. We find a similarly sized effect per standard deviation change in the empowerment measure for mothers (TZS 120, 0.15 sd), while there is no significant effect for fathers. The behavior of mothers mainly drives the results. Because of their weak position in household decision-making, women are more likely to think strategically and consider potential disagreements with their husbands. We also show that while fathers are reluctant to join bargaining if they believe that they disagree with the mother, this effect fades if the mother reveals low empowerment. We do not find that the effect of disagreement on mothers' willingness to allocate jointly is reinforced by low empowerment. It is possible that in a context of significant gender differences in decision-making power, disagreement by itself is often sufficient to drive non-cooperative behavior.

Because of the potential role of low-cost interventions that could improve communication between spouses, we also investigate the scope and implications of spouses' errors regarding each other's decisions and preferences. We find that only 38.7% of parents had a correct belief about the share their partner would allocate to the voucher. We note that having a correct belief makes parents, on average, 7.9% more likely to opt for joint decision-making. This translates to 31% less voucher losses. We also find a clear relationship between the magnitude of actual preference difference and the accuracy of beliefs. Strong disagreement intuitively makes it harder to assess the true magnitude of the preference difference correctly. One possible reason for such low levels of accuracy in beliefs is that couples in the study context operate in the separate spheres framework (Lundberg & Pollak, 1993), where traditional gender roles divide the responsibility for certain public goods between partners. However, at least half of the participating couples reported that they jointly decide on issues regarding their children's education and finances. It is therefore possible that unfamiliarity with the partner's preferences for large educational investment could be explained by the low frequency of such decisions rather than by separate spheres. The results imply that there is a significant scope to investigate and reduce the magnitude

of inaccurate beliefs by spouses, for example, by promoting spousal communication through parental training and mentoring.

Finally, to investigate whether the lack of cooperation in educational decision-making between parents affects children's outcomes negatively, we combine information on the redemption of vouchers from the experiment and administrative data on school grades and run regressions linking the value of the vouchers to school grades. We find that the educational voucher significantly increases children's grades. Specifically, a US$1 increase in the value of a voucher results in a 2.5 point increase in the grade point sum. At the average voucher payout of US$10.80, this effect represents a 5.5% improvement in mean baseline grades. One explanation for this large effect is that for high treatments, joint decision-making increases the budget enough for parents to afford textbooks. Both teachers and students reported these grade-specific books to be the most valuable educational inputs. In a follow-up survey, children whose parents redeemed the vouchers for textbooks reported high usage of 3.7 days per week, usefulness (73.2%), and small to large impact on grades (60.2% and 35.8%). In fact, even conditional on the voucher value, textbooks for mathematics, Swahili, English, science, and geography have a larger impact on grades in these specific subjects.

This paper contributes to the development economics literature on household decision-making that builds on the work by Anderson & Baland (2002); Ashraf (2009); Schaner (2015); Almås *et al.* (2018). In a recent overview of the literature on intra-household bargaining in developing countries, Baland & Ziparo (2017), p.10 states that "in developing countries, very little research is being done on the implications of strategic behavior during marriage for large irreversible decisions, such as child education." We provide evidence for noncooperative parental decisions that can help explain existing suboptimal levels of school inputs, delays in educational outcomes (Heyneman *et al.*, 1981; Lockheed & Hanushek, 1988; Glewwe *et al.*, 2011; Bold *et al.*, 2018) and persistent poverty in low-income contexts.[7] Importantly, uncovering whether and why women withdraw from joint management of financial resources sheds light on the emergence of second-best strategies of women to invest in their children's human capital in developing countries. This applies in particular to membership in informal saving groups (Anderson & Baland, 2002; Luengas-Sierra, 2018) and income hiding (Ashraf, 2009; Baland *et al.*, 2011; Castilla & Walker, 2013). The behavior of parents regarding the joint management of resources that we uncover in this paper may not be limited to the low-income context of the study, as preference heterogeneity and unequal distribution of the "power of the purse" are similarly prevalent for couples of some social classes in high-income settings (Kenney, 2006).

The paper also estimates the impact of unequal decision-making power and disagreement between spouses on the quality of household decisions and thereby speaks to the larger microeconomics literature that attempts to identify the key determi-

[7] In a related study, Ringdal & Sjursen (2021) attempt to experimentally increase educational investments by inducing a change in bargaining power in a similar context, but they don't not find any significant impact.

nants of household efficiency. Iversen *et al.* (2011) and Mani (2020) document that spouses do not realize efficiency gains in public good games in Uganda and India, respectively. They show that increased control over the allocation and assortative matching on observable characteristics has a positive impact on contribution levels. Ashraf (2009) explores the importance of information and communication in spousal resource allocation in the Philippines. In particular, the author observes that spouses who do not control the financial decisions in the household are more likely to use resources for their benefit when they are not obligated to communicate with their partner and when choices are private. Schaner (2015) documents that households sacrifice returns to savings. In her sample from Kenya, couples whose discount factors differ avoid joint saving accounts even if they provide higher interest. Almås *et al.* (2018) uses an experiment to show that women in Macedonia forgo substantial amounts of money to gain control over windfall income in the household. We extend this literature and show that these determinants can lead to a complete withdrawal of spouses from the bargaining process. The household fixed effect specification improves the identification of the impact of decision powers and spousal disagreement by removing confounders at the household level and quantifying the statistical bias that arises from the use of endogenous couple-level characteristics as explanatory variables.

The key drivers of noncooperative parental decision-making that we uncover have important policy implications. Besides highlighting the importance of empowering women within the household, there is a large scope for targeting women to improve the educational outcomes of children through alternative strategies. For instance, offering accessible formal saving opportunities to women gives them the chance to safeguard their income against their husbands' control. Prina (2015) shows that the provision of formal saving accounts to female household heads in Nepal resulted in a shift in expenditure toward educational goods. Ashraf *et al.* (2010) find that women with low decision-making power were able to increase household spending in their preferred durable goods when they received access to formal commitment saving devices. Aker *et al.* (2016) provides tentative evidence that the introduction of mobile payment accounts to women in Niger allowed them to alter the household's expenditure pattern by concealing income from the partner's reach. Furthermore, our findings suggest that some parents avoid bargaining because of high uncertainty about their spouses' preferences. Given the low frequency of these investment decisions, reducing asymmetric information between partners through communication interventions such as parent-teacher meetings at the school could foster cooperation.

The remainder of the paper proceeds as follows. Section 2 lays out the conceptual framework that guides the empirical analysis. Section 3 discusses the study context, data, and sample selection. Section 4 describes the experimental design. Section 5 reports the main results, the corresponding mechanisms, and key robustness checks. Section 6 discusses some caveats related to the design of the experiment and the external validity. Finally, section 7 concludes.

2. Conceptual Framework: Designing the Experiment

To motivate our experiment, we draw on the theoretical models of the household consisting of two decision-making members - a husband (father) and a wife (mother) who develop a contract of division of labor at the beginning of marriage. We consider informal contracting in Tanzania, where, like in many low-income societies, cultural norms dictate that women are responsible for household chores such as cooking, cleaning, and looking after children, while men are responsible for working outside the home and earning income to provide for the household. In these contexts, mothers are particularly accountable for following up on and ensuring children's schooling needs, such as school supplies and uniforms (Anderson & Baland, 2002; Castilla, 2019).[8] However, because husbands are the primary income earners in the household, they have a correspondingly higher decision-making power and likely impose their preferences in household decisions.

The most simplified household model, the "unitary" model assumes that individual preferences within the household are aggregated up to a single household utility function, which is optimized subject to a single household budget constraint (Deaton & Muellbauer, 1980; Barten & Bohm, 1993).[9] However, studies in different contexts (e.g., Chiappori, 1992; Browning *et al.*, 1994b; Mazzocco, 2007b; Laurens Cherchye & Vermeulen, 2009) rejected the unitary household model for multi-member households. Consequently, alternative theories of household decision-making emerged, the most notable of which is the collective model (Alderman *et al.*, 1995; Browning & Chiappori, 1998; Vermeulen, 2002). Under the collective household model, members in multi-person households may have different preferences, but reach Pareto-efficient allocation decisions through some cooperative bargaining.[10] While the key prediction on Pareto-efficiency has been supported empirically by some studies (Browning & Chiappori, 1998; Vermeulen, 2002; Bobonis, 2009), many other studies in different contexts (e.g., Udry, 1996b; Dercon & Krishnan, 2000b; Robinson, 2012b) rejected it. The recently emerged noncooperative household models (Anderson & Baland, 2002; Ashraf, 2009; Miller & Mobarak, 2013; Almås *et al.*, 2018; Schaner, 2015) consider members who end up making inefficient decisions due to differences in preference and intra-household bargaining power.

We design our experiment to test whether parents exhibit cooperative or noncooperative behaviour when they make financial decisions on educational investment for their children. Under the unitary and collective household models, one would

[8]The difference in time allocation between women and men is not unique to developing countries. Drawing on large-scale time use data from a range of 23 countries, Berniell & Sánchez-Páramo (2011) shows that there is a clear pattern of difference in time allocation between men and women even in industrialized countries.

[9]The unitary household model was the key framework for early applied work on household behaviour, such as allocation of labor and consumption (Inderjit Singh & Strauss, 1986; Mark M. Pitt & Hassan, 1990; Alderman *et al.*, 1995).

[10]More recently, Lewbel & Pendakur (2022) proposed a collective household model that allows for some types of inefficiencies which depend on a "cooperation factor".

not expect a difference in investment decisions on children by parents. Both parents would consider the needs of the household and the child when making experimental decisions and, consequently, achieve efficient allocations. A preference difference between fathers and mothers is therefore unlikely to result in different decisions. Under a noncooperative household framework, however, mothers and fathers maximize their utility (likely including altruism-weighted spouse's utility), but their decisions may not be efficient. Thus, we formulate Hypothesis 1 as follows:

Hypothesis 1 *The higher the benefit of pooling incomes for educational investments, the lower the likelihood that parents avoid managing financial resources together with their spouses.*

In the context of many low-income countries, men, as the main breadwinners, are the default heads of the household and have the decision-making power on household resource allocation (Bruce, 1989b; Strauss & Beegle, 1996; Anderson & Baland, 2002; Duflo, 2012; Almås *et al.*, 2018). Women and girls, on the other hand, not only shoulder the responsibility of household chores such as caring for children, cooking, fetching water, and gathering fuel but also have lower levels of bargaining within the household. Observable household decisions are very often reflections of the preferences of men (Carlsson *et al.*, 2012, 2013; Alem *et al.*, 2023a). Women in low-income setups face lower political representation (Jayasuriya & Burke, 2013), and exert little influence over various household decisions, including inheritance and the purchase of durable goods (Deininger *et al.*, 2013; Miller & Mobarak, 2013; Roy, 2015; Kandpal & Baylis, 2019; Alem *et al.*, 2023a). Consequently, women are willing to forgo a significant portion of household income to have control over their accounts rather than joint ones with their spouses (Almås *et al.*, 2018; Schaner, 2015). This stylized fact is a key reason why most conditional cash transfer programs in developing countries target women as the primary recipients (Fiszbein *et al.*, 2009). This leads to hypothesis 2:

Hypothesis 2 *Subjective disagreement and differences in decision-making power between spouses negatively affect the likelihood of joint decision-making.*

We discussed that under a noncooperative household framework, each parent maximizes their own utility (including altruism-weighted spouse's utility). Investment in children's education is a household public good that primarily benefits children and, indirectly, the parents. Parents, therefore, contribute to this household public good consistent with their preference. When they make a joint decision, they engage in some negotiation on whether and how much to contribute to the school voucher. We don't observe and analyze these negotiations as it is beyond the scope of the paper. Nevertheless, in a low-income context, where a lion's share of children do not have essential school supplies, more importantly, textbooks, larger investments from pooled income by parents will likely improve the academic performance of the child. We formulate hypothesis 3 as follows:

Hypothesis 3 *If the joint management of resources allows for investments with higher returns, pooling incomes should have meaningful consequences for children's school outcomes.*

Finally, we argue that uncertainty about spouse preferences is one of the key drivers of uncooperative behaviour. Both the unitary and collective household models implicitly assume a perfect flow of information and communication between household members. Unlike other relationships (e.g., employer-employee relationships), asymmetric information is not an issue in spousal relationships because, by its very nature, marriage implies deep mutual knowledge and ability to monitor each other's behaviour (Browning *et al.*, 2011). Under a noncooperative household framework, however, uncertainty about the preferences of the spouse could lead to uncooperative and hence, inefficient behaviour. This would particularly be true for a spouse who has low decision-making power. Our final hypothesis is therefore:

Hypothesis 4 *Uncertainty about the spouse's preference reinforces noncooperative behavior.*

3. Sample and Data

We conducted our field experiments in public primary schools in Ilala District of Dar es Salaam, the commercial capital of Tanzania, at the beginning of the new school year in early 2018. We registered the design of the experiments and the empirical strategy as a preanalysis plan before the beginning of the fieldwork.[11] In collaboration with the District Educational Office, we randomly chose 8 out of 112 schools to participate in the experiments.[12] Public primary schools in Tanzania are tuition-free, but parents are required to cover the costs of school uniforms, books, stationery, tutoring, and transport.[13,14] Invitation letters to parents were sent home with the students of grade 6 classes, ages 12 to 13, informing them about the study, a minimum participation compensation of TZS 22,000 (US$9.90), and the chance to earn more money in economic experiments, depending on their choices. We chose this age group because of the high importance of the year before the final examination to enter secondary school, as well as due to its relevance for a separate project on the distributional preferences in adolescent peer networks (Alem *et al.*, 2023b) for which we simultaneously ran experimental sessions with the children. The only requirement to participate was that both biological parents or stepparents must

[11] Available online at www.socialscienceregistry.org/trials/2672.

[12] See Figure B.1 in Appendix B for the location and spatial distribution of sample schools.

[13] Tuition fees were abolished in 2002 to increase overall enrollment. The seven-year education (standard 1–7, ages 7–14) completes compulsory schooling on the Tanzanian mainland. Net enrollment (91.4% male, 92.5% female) and completion (82.3% male, 89.8%) rates are relatively high for Sub-Saharan Africa (Bank, 2015), but the abrupt introduction of free primary education has led to a decrease in quality due to high pupil-to-teacher ratios and scarce resources (Valente, 2019).

[14] In a small fact-finding survey we conducted before the experiments, parents reported average yearly schooling expenses of TZS 97,000 (US$44) per enrolled child.

attend. On average, a family earned TZS 41,000 (US$18.40) from participating in the experiment. This corresponds to almost three days' worth of income of an entire household based on self-reported income in the household survey.

Upon arriving at the primary school, we introduced parents to the study and briefed them about data security, privacy, and secured their informed consent. Then, we divided mothers and fathers into separate classrooms for the economic experiments. The sessions consisted of three parts. Mothers started with an experiment to measure women's empowerment, while fathers answered a household survey. After that, we conducted incentivized money-earlier-later (MEL) and distributional preferences experiments with both parents.[15] We randomly drew one out of the two (for fathers) or three (for mothers) experiments for payout at the end of the day. Finally, after a short break with refreshments, we let parents engage in a decision-making experiment regarding the allocation and joint management of monetary resources. We paid out any payoffs from this final task with certainty immediately after the experiments. To avoid income effects from the decision-making experiment, we kept the timeline of the sessions fixed during the entire data collection. We drew random payouts after all experiments had been conducted. To reduce the effect of enumerators, we randomly rotated enumerator teams of four persons per classroom between mothers' and fathers' sessions. The enumerators and field supervisors were PhD or master's students who were experienced in conducting fieldwork in the local Tanzanian context. They communicated all instructions in the local language (Swahili), and gave clarifications privately as needed. The entire experimental session, including a break, took approximately three hours.

The household survey included information on demographic family characteristics, income, and the use of saving technologies and decision-making in the household. Table 1 reports descriptive statistics of the key variables collected through the household survey. Most households in the sample have a low socioeconomic status and an elementary educational level. Modest literacy rates and familiarity with financial technologies such as bank accounts (23.3%), mobile payment accounts (97.1%), and saving groups (43.2%) suggest that participants could understand the financial choices they faced in the experiments. Wives are on average six years younger than their husbands and less likely to have access to savings devices or to consume tempting goods such as alcohol and cigarettes.

A total of 362 parental couples participated in the experiment. The sample schools combined had 1,892 students in grade 6. Thus, our sample of parental couples represents 19% of the students. An additional survey of all students in the first three participating schools shows that only 52% of students live with both biological parents.[16] If that percentage is applied to the entire sample, the eligible student

[15]We used standard incentivized choice list designs proposed by Sutter *et al.* (2013) for the MEL experiment and Kerschbamer (2015) for the distributional preferences experiment. The parameters elicited from the MEL experiment are used as control variables in the main analysis. Appendix C.4 presents a detailed description of the experiment and design.

[16]This percentage is particularly high in the urban context of our study because many children

body decreases to 984, and the parental couples represent 37% of the students in the sample schools. To avoid any contamination of experimental results through communication among parents after the experiments, we offered only one date per school class for the experimental sessions. Given these restrictions, the sample is a nontrivial fraction of the target population.

Table 1: Summary statistics

		By Parent		
	Households	Fathers	Mothers	
Age of parent	40.20	43.32	36.90	***
	(7.489)	(9.039)	(7.504)	***
Education (years of schooling)	7.160	7.272	7.034	
	(1.519)	(1.879)	(1.850)	
Literacy (0/1)	0.917	0.925	0.911	
	(0.232)	(0.263)	(0.285)	
Married (0/1)	0.923	|	|	
	(0.268)	|	|	
Years spent as a couple	15.57	|	|	
	(7.693)	|	|	
Household size	5.826	|	|	
	(1.893)	|	|	
Number of children in household	2.924	|	|	
	(1.373)	|	|	
Household income (monthly, US$)	209.80	|	|	
	(333.1)	|	|	
Muslim (0/1)	0.577	|	|	
	(0.478)	|	|	
Significant household debt (0/1)	0.380	|	|	
	(0.486)	|	|	
Formal savings account (0/1)	0.233	0.320	0.146	***
	(0.339)	(0.467)	(0.354)	***
Mobile payment account (0/1)	0.971	0.972	0.970	
	(0.148)	(0.164)	(0.172)	
Member of saving group (0/1)	0.428	0.457	0.399	
	(0.427)	(0.499)	(0.490)	
Alcohol (at least once a week) (0/1)	0.181	0.276	0.0856	***
	(0.311)	(0.448)	(0.280)	***
Smoke (at least once a week) (0/1)	0.0822	0.150	0.0139	***
	(0.204)	(0.358)	(0.117)	***
Observations	362	362	362	724

Notes: Standard deviations in parantheses; significance of within household difference in last column. Years of schooling is calculated as the minimum number of years to reach the highest reported completed school grade. Literacy is a dummy equal to one if a person can read and write. Results of t-tests are robust to the use of rank-sum testing. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

In contrast to most experimental studies in the field, we can address the issue

are sent from rural to urban areas to live with relatives and attend school. Other reasons include absent fathers and mothers due to work in other regions, sickness, or death.

of sample selection using administrative school grade data available for the entire student body of the sample schools. The sample mean and standard deviation of the normalized rank of students in the final sample are almost identical to the theoretical counterparts of sampling complete classes of that size. This suggests no selection on the school grade of the child. The distribution of within-class ranks of sample children is almost uniform, suggesting that there is no selection of participants on this characteristic. We present the distribution of school ranks of the sample students in Figure B.2 of the online appendix.

Additionally, we can use information on child characteristics of all grade 6 students for a subsample of schools (3 out of 8). Comparing the 164 participants with the 484 nonparticipants in this subsample, we find some evidence for selection on family size, in particular on the number of children, but not on religion or the children's gender (see Table A.4 of the Online Appendix). It is possible that both the economic incentive and the time and location of the experimental sessions particularly tended to attract families with more children. In fact, for the sample of participants, the number of children in the household is negatively correlated with income.

4. Decision-Making Experiment

4.1. Design

To investigate whether parents cooperate when making decisions on educational investments, we use a simple experiment that reflects the essential decision process that parents undergo, as motivated in the conceptual framework. For simplicity, it limits the strategic nature of the process to unilateral choices between individual and joint investment decisions. This means it creates the trade-off between withdrawing from and entering into a bargaining process with the spouse, while allowing the benefits from joint decision-making to be realized independently of whether the spouse also decides to make a joint decision. Our design allows us to randomly vary the benefit of income pooling with the spouse and overcome a significant empirical challenge: the degree to which households benefit from cooperative decision-making on educational investments is generally unobserved and varies between families or is even endogenous to unobserved family heterogeneity. Imposing the return to cooperation as an experimental treatment and observing parental decisions at different levels enables us to credibly answer the following questions: Do parents fail to opt for joint decision-making even if it is beneficial to do so? Are they thereby sacrificing additional returns on educational investment?

Experimenting in the field at public primary schools has several additional advantages. It provides the possibility of opening the black box of household decision-making by measuring the fundamental underlying factors, such as preferences, decision-making powers, and information structure. It also keeps the subject composition, choices, and payoffs as close to reality as possible. For the experiment, mothers and fathers were separated in different classrooms and randomly seated at single desks. The decision-making experiment consisted of three stages (described below), each of

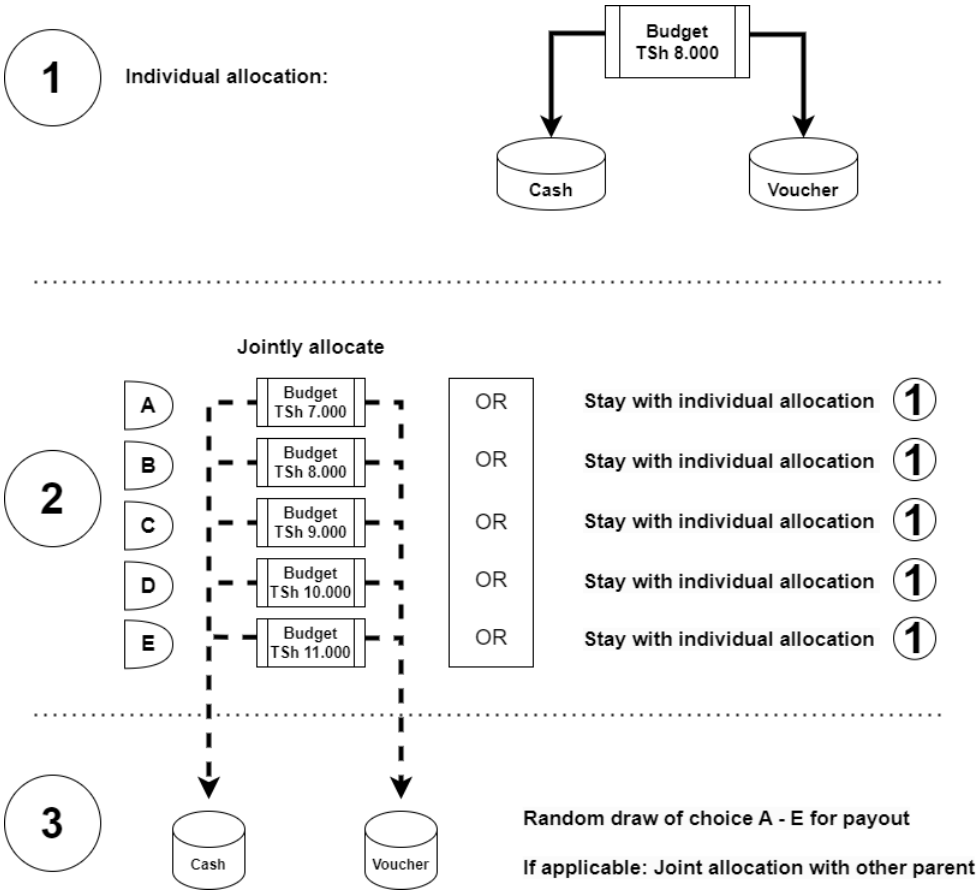

Figure 1: Experimental design

which was introduced in detail by the team of enumerators. Figure 1 summarizes these stages.

Stage 1: Individual Budget Allocation

We asked mothers and fathers separately to indicate their preferred allocation of a budget of TZS 8,000 (US$3.60). To do so, they had to divide eight play money bills of value TZS 1,000 between a *cash* and a *voucher* basket. To make the vouchers attractive, we doubled any money allocated to the *voucher* basket.[17] Alternatively, we would pay out any budget share allocated to the *cash* basket at the end of the session. Enumerators wrote down the chosen allocation on a decision sheet that

[17]Without an increase in the voucher value, parents would have an incentive to opt for the cash and spend it free from any limitations that voucher redemption may introduce. The voucher was also attractive because it eliminated any transaction or transport costs for the purchase of educational materials. By controlling voucher redemption and distributing grade-6-specific textbooks and school materials, we made an arbitrage on the voucher choice by selling it or reallocating it to other children who were unlikely to receive it.

remained with the participants. Next, parents were each asked to state what they believed to be their spouse's preferred allocation. If their belief was correct, they were paid additional TZS 1,000 (US$ 0.45) in cash at the end of the session.

We informed parents that they could use the vouchers to purchase textbooks and other school materials. We particularly emphasized the possibility of redeeming the vouchers for expensive textbooks, which cost USD$4.50 each. The textbooks offered for voucher redemption included all necessary grade 6 textbooks for Mathematics, Swahili, Science, Geography, and English that were compatible with the study curriculum of the school. Before the experiment, we confirmed with teachers that almost no students owned a textbook for any given subject and that none of them possessed the complete set for all subjects, and these textbooks are not readily available at shops outside the city center. Enumerators would take orders for school materials for the voucher value at the end of the session and deliver them to the school the following day. We ensured trust between parents and the survey team through collaboration with the school administration and the University of Dar es Salaam, which facilitated our fieldwork. The fast delivery to the school eliminated substantial transport and transaction costs for parents. Thus, parents had all the incentives to carefully evaluate their decision to allocate money between the *cash* basket vs the *voucher* basket. Another intention of the voucher was that parents would not simply replace any existing and planned expenses that would have occurred regardless of the study. We therefore encouraged the purchase of textbooks until the remaining value was lower than the textbook price. Parents should then spend the remaining amount on exercise books, rulers, pencils, or pens. The experiment took place approximately two weeks into the new school year, by which time most planned purchases of school materials had already taken place.

Stage 2: Individual versus Joint Decision

Subsequently, we asked parents to indicate whether they wanted to remain with the allocations that they had just chosen or to opt for joint budget allocation with their spouses. Choosing to remain with the individual allocation would simply mean that it would be realized with certainty. If a parent opted for a joint allocation, a new allocation would be elicited from the couple after they were reunited and allowed to discuss the choice privately. Note that this possible joint allocation was independent of the spouse's decision in his or her parallel session. This implies that couples could face zero, one, or even two joint allocations at the end of the experiment.

Individual and joint allocations were identical with the exception that the budget size for the latter varied with treatment levels T = {-12.5, 0, 12.5, 25, 37.5}, which marks the percentage point decrease and increase. We used a within-subject design, meaning that we asked parents to make a choice for each of these five treatment levels (Choices A-E in Fig. 1). Given the initial budget of TZS 8,000 (US$3.60), we introduced a variation between TZS 7,000 and TZS 11,000 (US$3.14 and US$4.93) in the joint budgets. This variation of the joint budget in line with the benefit

from pooling incomes we hypothesized in the conceptual framework. The design implies that it was not beneficial to opt for joint decision-making at all levels. We clearly stated the new budget size in the decision sheet if parents opted for the joint decision.[18] We marked the individual allocation on the decision sheet to help parents recall the initial choice in stage 1.

Stage 3: Joint Decision and Payout

The final payout was determined by randomly drawing one of the five choices of the joint budget. If a parent chose the individual option for the randomly drawn choice, the final payout would be determined from the initial individual allocation. If a parent opted for joint allocation for the drawn choice, a new allocation with the applicable budget size would be elicited from the couple. Thus, all stages of the experiment were relevant for payout and, as a result, incentivized participants to reveal their true preferences. The within-subject design allowed us to collect a large number of responses, and the random element alleviated the concern that the benefit of joint decision-making in a given family might be endogenous. The cash payouts were given to parents immediately in equal shares. The amount allocated to the voucher was doubled and used to order school materials.

Note that both parents simultaneously and independently participated in the first two stages of the experiment. Due to the random draw for payout (not observable for the other parent), parents knew that their individual choices in stage 2 remained private information. If they met to allocate a budget jointly, they did so because either one or both spouses made a payout choice, opting for joint decision-making. This means they could be jointly allocating a maximum of two budgets, one from each parent. Decision-making was therefore subject to asymmetric income effects in this third stage. Given this, in the results section, we mainly focus on the choices in stages 1 and 2 of the experiment. Moreover, the overall payout of the experimental session included several payouts, including from MEL choices, distributional preference choices, and decision-making experiments. Thus, a parent could not deduce the spouse's individual allocations from Stage 1.

4.2. Background Results from Stage 1

The first stage of the experiment provides data on the individual budget allocations of mothers and fathers. We can interpret the budget share that a parent allocated to the voucher as the revealed preference for educational investments relative to consumption. We present the budget shares allocated to the voucher separately by the gender of parents in Figure 2, which suggests a large variation in preferences both across and within households.[19] Almost half of the couples opted to use the

[18] The choice lists for stages 1 and 2 are provided in section C.1 of the Online Appendix.

[19] We present information on the allocations from the joint decision-making in Figure B.3 of the Online Appendix for those participants who opted for the joint budget allocation for the randomly drawn payout. Though they are likely distorted by income effects stemming from the sometimes

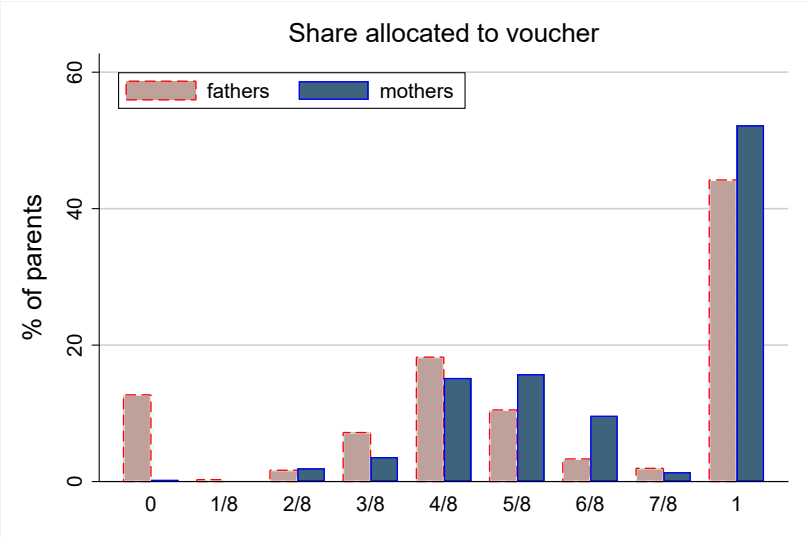

Figure 2: Parents' preferences for educational voucher

Notes: This figure presents descriptive statistics on the allocation of TZS 8,000 (US$3.60) budget between cash and educational voucher by the sample of parents.

entire budget for the educational voucher. In contrast, 6.49% of parents opted for a pure cash payoff, and 45.31% allocated to both the cash and the voucher baskets.[20]

The shares allocated to the voucher by fathers and mothers are on average 0.268 apart. Mothers allocated a significantly (p-value$<$ 0.001) higher share (80%) to human capital investment than fathers (67%). The preference for the voucher correlates considerably with children's school grades (+), muslim families (-), consumption of temptation goods like alcohol and cigarettes (-), debt (-), patience as measured by an incentivized money earlier or later [MEL] experiment (+), and school fixed effects. Table A.6 of the Online Appendix presents the details on the correlates of the share allocated to the educational voucher. We also don't find substantial differences in the share allocated to the voucher based on the gender of the child. Neither fathers nor mothers seemed to treat children of the same sex preferentially (see Figure B.6 in the Online Appendix).

already realized individual allocation of the spouse, the distribution of allocations largely resembles the individual counterpart.

[20]Multiplying the amounts in the voucher basket by a factor of two clearly made it very attractive to invest in school materials. We refrained from introducing any lower, non-integer factor because it would have likely made the budget allocation overly complex for parents.

5. Main Results

5.1. Joint Decision-Making and Endowment Losses

In the second stage of the experiment, parents could choose to secure their individual allocations or opt for a joint allocation decision in consultation with their spouse. They indicate their decision for all five possible treatments. At the highest treatment level, joint decision-making resulted in a budget that was up to TZS 3,000 (US$1.35) higher than with the individual allocations. If allocated entirely to the voucher basket, this additional income was worth TZS 6,000 (US$2.69). Conversely, the lowest treatment level was negative and reduced the joint budget by TZS 1,000 (US$0.45). We focus on two primary outcome variables of interest from this stage:

- A binary variable *joint decision* that denotes whether parents chose to allocate the budget jointly
- A continuous variable that denotes the *endowment loss*, capturing the loss in budget from not choosing to allocate jointly for positive treatment levels (or from choosing to do so for the negative treatment level)

Table 2 presents the distribution of joint decision and endowment loss by the gender of parents. Overall, parents opted for joint decision-making in about half of the five decisions (51,5%). Since avoiding a joint allocation of the budget does not result in an endowment loss unless the treatment is positive, an endowment loss is only registered for 22,5% of the five decisions. Endowment losses, which can range from TZS 0 to TZS 3,000 (US$1.35) are on average TZS 409 (US$0.18). It is important to note that any lost endowment could have been allocated to the voucher and thus potentially doubled in value. Higher treatment levels incentivized parents to a higher rate of joint decision-making, indicating that economic and strategic motivations play an essential role in the cooperative behavior of mothers and fathers. Consequently, the endowment losses do not increase proportionally with the higher potential endowments at higher treatment levels. Taken together, the results provide strong support for hypothesis 1.

Looking at the distribution of joint decisions and endowment loss separately for mothers and fathers, we observe that mothers avoid joint decision-making significantly more often (+20% of decisions, $p < 0.001$) and experience more frequent and higher endowment loss ($p < 0.001$). Mothers tend to avoid joint decision-making when it is not profitable (17,7% at treatment 0), but react more strongly to increasing treatment levels than fathers. Interestingly, there is a significantly larger fraction of fathers than mothers (+23,8%, $p < 0.001$) that opt for joint budget allocation, even if it generates an endowment loss of TZS 1000 (US$0.45) at treatment -12,5%. For men, this pattern correlates with reporting that financial decisions in the family are made by both parents. However, there are no observable characteristics that correlate with this behavior of mothers. This pattern may reflect a tendency of fathers to always involve the mother in decisions regarding the child and their education. On

Table 2: The distribution of joint decision and endowment loss

	All Decisions	By Treatment				
		-12.5%	0.0%	12.5%	25%	37,5%
Joint decision	0.515	0.221	0.345	0.586	0.680	0.744
	(0.500)	(0.415)	(0.476)	(0.493)	(0.467)	(0.436)
Endowment Loss (0/1)	0.225	0.200	0	0.390	0.298	0.236
	(0.237)	(0.401)	(0)	(0.488)	(0.458)	(0.425)
Endowment loss	408.6	221.0	0	414.4	640.9	766.6
	(822.6)	(415.2)	(0)	(493.0)	(933.9)	(1309.4)
Observations	724	724	724	724	724	724
Fathers:						
Joint decision	0.615	0.340	0.514	0.680	0.757	0.787
	(0.487)	(0.474)	(0.501)	(0.467)	(0.430)	(0.410)
Endowment Loss (0/1)	0.188	0.298	0	0.271	0.199	0.174
	(0.215)	(0.458)	0	(0.445)	(0.400)	(0.380)
Endowment loss	356.9	339.8	0	320.4	486.2	638.1
	(763.1)	(474.3)	(0)	(467.3)	(859.1)	(1229.4)
Observations	362	362	362	362	362	362
Mothers:						
Joint decision	0.415	0.102	0.177	0.492	0.602	0.702
	(0.493)	(0.382)	(0.501)	0.602	(0.490)	(0.458)
Endowment Loss (0/1)	0.261	0.102	0	0.508	0.398	0.298
	(0.252)	(0.303)	0	(0.501)	(0.490)	(0.458)
Endowment loss	460.2	102.2	0	508.3	795.6	895.0
	(875.2)	(303.3)	(0)	(500.6)	(980.2)	(1374.5)
Observations	362	362	362	362	362	362
Differences between parents:						
Joint decision: *T-test*	***	***	***	***	***	**
Endowment loss (0/1): *T-test*	***	***		***	***	***
Endowment loss: *T-test*	***	***		***	***	**

Notes: This table shows the percentages of joint decisions and endowment losses per treatment level from stage 2 by the gender of the parent.

the other hand, "never compliers", i.e., parents who always choose to make individual decisions, are more likely to be male, illiterate, and smokers (see Table A.7 of the Online Appendix for the regression results).

Next, we run an OLS regression of joint decision-making and endowment loss on the treatment levels (baseline 0%) for decision l (for each of the five treatments) of parent $i \in \{a, b\}$ specified in equation 1 as follows:

$$y_{il} = \alpha_0 + \alpha_1 T_{il} + X_i' \alpha_2 + u_{il} \tag{1}$$

where y_{il} is the outcome variable (joint decision making and endowment loss), X is a matrix of demographic, financial knowledge, and individual controls, as well as school fixed effects. T is the treatment indicator of a given decision, and α_1 is vector of coefficients of the treatments.

We report the coefficients from the regression in figure 3, and the full regressions in Table A.1 of the Online Appendix. Standard errors are clustered at the household

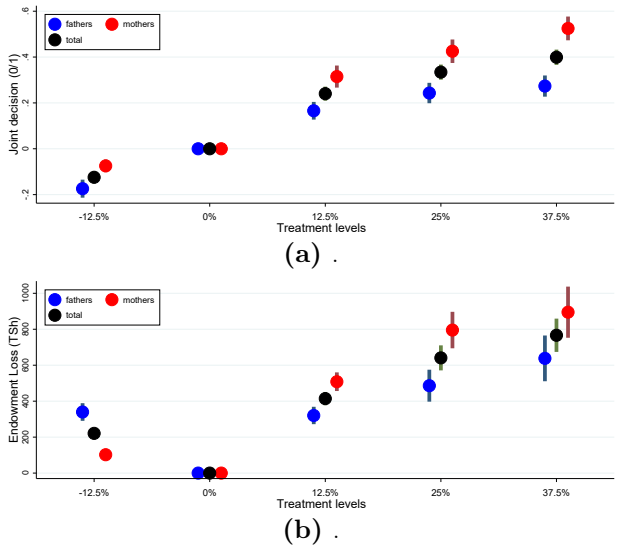

Figure 3: Joint decision-making and endowment loss

level. The results in panel (a) confirm that the relationship between the treatments and joint decision-making we reported above holds in a regression framework that controls for household and individual characteristics as well. Compared to the baseline (treatment 0), a 37,5% increase in the joint budget increases the likelihood of allocating together with the spouse on average by 27,5% for fathers and 52,1% for mothers. Panel (b) indicates that at the maximum treatment, parents sacrifice on average TZS 767 (US$0.35) with mothers experiencing 42,5% higher endowment loss than fathers. The endowment loss from avoiding joint decisions relates directly to the educational investments as a share of the budget allocated to the voucher, in which case, the amount is doubled. When the benefits of joint decision-making increase, so do the losses of those who avoid bargaining with their spouse.

5.2. Mechanisms

The conceptual framework points out two main dimensions of household heterogeneity that can affect parents' likelihood of managing their finances jointly: preference differences and decision weights. We measure these variables through parents' decisions in the experimental session and test hypothesis 2 individually and jointly.

1 Parents who believe their spouse has different preferences are less likely to make joint decisions on educational investments.

2 Low female empowerment implies unequal decision-making powers and therefore a lower probability of joint decision-making for women. To the extent that high female empowerment reduces men's decision-making power, we expect the opposite effect for men.

3 The interaction between both dimensions is crucial. If there is no disagreement, decision-making powers are less decisive. If decision-making powers are equal, disagreement may not matter as much.

Measuring Disagreement and Decision Weights

Spouses may have different preferences for the educational voucher. When a parent decides whether to bring income into the joint household budget, they do so based on a subjective belief about the extent of the disagreement with the spouse.

In the first stage of the main experiment, participants revealed their individual preferences for the voucher, as well as their beliefs about the allocation that their spouse would choose. We can use these two measures to assess both the actual and subjective preference differences between spouses. For example, from the perspective of a mother b in household h, the belief about the preference difference with her spouse a takes the following form:

$$\mathbf{disagree}_b = |\mathbf{voucher}_b - E_b\left(\mathbf{voucher}_a\right)| \tag{2}$$

We present the results in the left panel of Figure 4, which captures the absolute value of the difference between the share allocated to the voucher by a parent and the belief about the share that the spouse would choose. The results suggest that, on average, parents believed that their share allocated to the voucher differed by 0.18 (sd 0.27) from that of the spouse. While a large fraction of both fathers and mothers expect little disagreement with their partner, there is substantial variation across households, which represents a clear potential for intra-household conflict. The left panel also shows that mothers, on average, believe that their spouse would allocate less to the voucher, while the opposite is true for fathers.

Identifying a parent's decision weight in the household is empirically challenging. Instead, we proxy the mother's decision-making power by an experimental measure of female empowerment and allow its impact on the mother's and father's decisions to vary in sign. The conceptual framework implies that the more a mother is empowered in household decision-making, the more weight her preferences will carry in the joint allocation of income. We follow Almås *et al.* (2018) and experimentally elicit the willingness to pay of mothers to receive a cash transfer rather than having it go to their spouse. This measure of empowerment is mainly motivated by the collective model and predicts that less-empowered women are willing to sacrifice more money to control resources. However, the intuition behind the interpretation of the measure is applicable to a wide range of household models, including the non-cooperative framework which our conceptual framework draws on. The experiment highlights the "trade-off between the total amount of resources available to the household and those controlled by the participant" and shows that some mothers are "willing to pay [...] to change the [decision] weights" (Almås *et al.*, 2018, p.617).[21]

[21] Conversely, in the unitary model, mothers have no incentive to sacrifice resources to receive a transfer. For a detailed discussion of the measure in the context of different household decision-

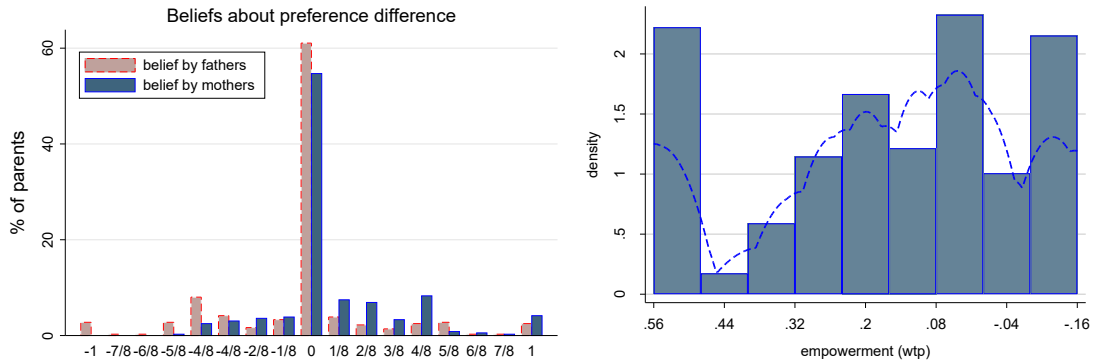

Figure 4: Parents' belief about disagreement with spouse and distribution of experimental female empowerment measure

Notes: **Left Panel:** Difference between the share allocated to the voucher by a parent and the belief about the share that the spouse would choose. **Right Panel:** Histogram and kernel density of the normalized willingness to pay (WTP) measure from the empowerment experiment. Low WTP corresponds to high empowerment. For a comparison of the experimental and the alternative survey-based measure for female empowerment, see Appendix C.3.

We asked the mother to choose from a 10-item choice list design that determines the amount of cash to be paid either to the father or to herself. The amount for the father remains constant at TZS 7,500 (US$3.36), while the mother's amount decreases monotonically from TZS 8,700 (US$3.90) to TZS 3,300 (US$1.48). During the experiment, we separated mothers from their husbands and assured that their decisions would remain confidential and would not be revealed to their spouses at any point.[22] To obtain a comparable measure for empowerment from the choice list design, we use the halfway value of the transfer to the mother around the switching point and normalize it by the amount paid to the father.

The right panel of Figure 4 shows that around 65% of mothers are willing to sacrifice a positive amount of cash to gain control over the transfer. Mothers are on average willing to pay 16% of the maximum amount they could get. In comparison with the results from Macedonia by Almås *et al.* (2018), the distribution is overall similar but shows a higher frequency of large WTP and fewer individuals with

making models, see Almås *et al.* (2018).

[22]We did not disclose the nature of the experiment to the husbands, indicating that the payout to the mother was merely compensation for the time spent at the study. To avoid the possibility of cash appropriation by the father, we made the transfers to the mother's private mobile payment account. Mobile payment services such as M-Pesa transfer money directly between cellphones, ensuring that the mother would have complete control over the transfer. To foster trust, there was at least one female enumerator in the room at all times during this experiment. Full information on payouts, but not on experimental decisions, was provided to both the woman and her spouse, thereby excluding the possibility of hiding motives. In case the mother drew this experiment for payout, one of the 10 rows of the choice list was chosen randomly and paid out according to the marked decision. The choice list and instructions are available in Appendix C.2.

negative values. This could be attributed to particularly high gender inequality in Tanzania.

To validate whether the empowerment measure indeed correlates with actual bargaining outcomes, we provide tentative evidence showing that it indeed matters for the outcome of joint bargaining at the end of the main decision-making experiment (Stage 3). However, these results have to be interpreted with caution, because only a selected sample of parents reach this stage, and income effects could be in play if one of the parents chose to allocate individually. Nevertheless, using the available data, Table A.8 of the Online Appendix suggests that mothers' influence on the share allocated to the voucher in a joint bargaining (i.e., how similar it is to their individual preference) is increasing in their empowerment using both the WTP and an alternative decision-making index. See Section C.3 of the Online Appendix for a description and comparison of these measures.

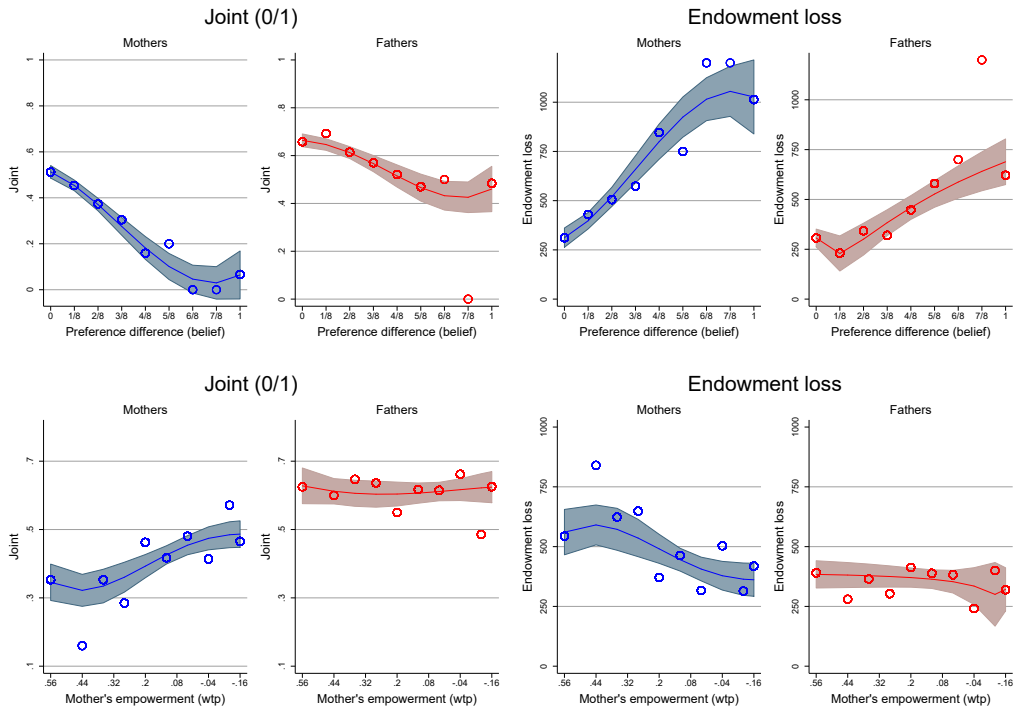

Figure 5: Determinants of joint decision-making and endowment loss: Subjective disagreement and mother's empowerment

Notes: Y-axes depict the share of joint budget allocations (left panels) and endowment loss [2180 TZS = 1 USD] (right panels). X-axes denote the level of perceived disagreement (upper panels) and female empowerment (bottom panels). Graphs show fractional polynomial fit with confidence intervals and means for levels of preference difference and empowerment.

Heterogeneity Analysis: Disagreement and Decision Weights

We report results from the raw data confirming hypothesis 2 on the impact of subjective disagreement and mothers' empowerment on joint decision-making and endowment loss in Figure 5. We note that joint decision-making decreases with the continuous measure of subjective disagreement. The relationship is particularly pronounced for mothers, while fathers follow a similar, but less striking, pattern. Higher female empowerment is associated with more cooperative behavior for mothers, but there does not appear to be a comparable effect on fathers. As the lack of joint decision-making potentially implies smaller budgets in the experiment, these relationships also hold for the previously defined measure of endowment loss.[23]

Next, we empirically test whether household heterogeneity along these two dimensions (i.e., subjective disagreement and mothers' empowerment) represents the underlying mechanism through which noncooperative decision-making may negatively affect educational investments. We begin by estimating the following specification for decision l (for each of the five treatments) of parent $i \in \{a, b\}$ in household h using OLS:

$$endowment\ loss_{ihl} = \gamma_0 + \gamma_1 disagree_{ih} + \gamma_2 emp_h \cdot D_i + \pi T_{il} + X'_{ih}\eta + \epsilon_{ihl} \quad (3)$$

The dependent variable denotes the endowment loss. The main explanatory variables of interest *disagree* and *emp* denote the expected preference difference and the experimental female empowerment measure. To allow the proxy for gender decision weights *emp* to affect mothers and fathers differentially, we interacted it with a gender dummy D. X is a matrix of demographic, financial knowledge, and individual controls, as well as school fixed effects. T is the treatment fixed effect of a given decision. Standard errors are clustered at the household level.

We report the regression results from an OLS estimator in Table 3, columns 1–5. The results in columns 1-4 suggest a strong and statistically significant relationship between perceived disagreement and endowment loss. A one standard deviation change in the belief of preference difference for the voucher (γ_1) implies a TZS 155 (0.19 sd) change in endowment loss. We find a similarly sized effect per standard deviation change in the empowerment measure (γ_2) for mothers (TZS 120, 0.15 sd), while there is no significant effect for fathers. The results are robust to the inclusion of controls such as demographic characteristics, time preferences, and measures of financial knowledge in columns 3 and 4. As shown graphically, the results are mainly driven by the behavior of mothers. Because of their weak position in household decision-making, women are more likely to think strategically and consider potential disagreements with their husbands.

In column (5), we fully interact with disagreement and mother's empowerment, as it is intuitive that the combination of both factors may matter. The results show

[23] Interestingly, Figure B.5 of the Online Appendix shows that the correlation between endowment loss and disagreement/female empowerment becomes stronger at higher levels of treatment T. This likely suggests that household heterogeneity is tightly connected to the strategic choices of parents.

that while fathers are reluctant to join bargaining if they believe that they disagree with the mother, this effect fades if the mother reveals low empowerment. We do not find that the effect of disagreement on mothers' willingness to allocate jointly is reinforced by low empowerment. It is possible that in a context of stark gender differences in decision-making power, disagreement by itself is often sufficient to drive noncooperative behavior.

Although the OLS estimates in Table 3 are intuitive and in line with the predictions of the conceptual framework, one cannot readily exclude alternative explanations. For instance, one can expect that couples with different preferences for educational investments are also heterogeneous on a range of other observable and unobservable characteristics. If reluctance to make decisions together with the spouse reflects a preference for individual decision-making, such confounding factors could make the variables of interest endogenous. For instance, one could argue that the results on mothers' empowerment reported at the bottom left panel of Figure 5 are driven by an omitted variable (cooperativeness of fathers), which affects both women's empowerment and fathers' behavior in the experiment. The OLS estimator does not control for all such observable and unobservable characteristics. Because parents might have married assortatively with these confounding factors, we refer to the issue as marital matching endogeneity. The error term ϵ of equation (3) is the sum of unobserved family heterogeneity f_h and an idiosyncratic error term. The coefficients γ_1 and γ_2 will be biased if unobservables are correlated with the explanatory variables:

$$\begin{aligned} Cov(disagree_{ih}, f_h) &\neq 0 \\ Cov(emp_h D_i, f_h) &\neq 0 \end{aligned} \tag{4}$$

Table 3: Exploring the mechanism: determinants of endowment loss

Endowment loss	Ordinary Least Squares					Household Fixed Effects				
Mean=408.6	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Perceived preference difference	569.0***		571.0***	568.4***	669.0***	388.7***		398.2***	398.9***	426.4***
	(61.43)		(65.37)	(65.09)	(78.65)	(101.2)		(101.4)	(101.2)	(125.0)
Mother's empowerment (WTP)		506.1*	398.3*	396.6*	385.2+		228.0	252.3	237.1	83.97
× Mother (0/1)		(212.1)	(195.2)	(194.1)	(206.9)		(156.7)	(154.0)	(153.3)	(188.7)
Mother's empowerment (WTP)		307.5	166.1	171.0	338.8+					
× Father (0/1)		(205.7)	(200.1)	(198.1)	(204.1)					
Mother's empowerment (WTP)					-28.61					348.3
× Perceived preference difference					(354.8)					(527.8)
× Mother (0/1)										
Mother's empowerment (WTP)					-941.2**					-445.0
× Perceived preference difference					(334.5)					(534.0)
× Father (0/1)										
Mother (0/1)	107.2**	73.52+	67.52	59.08	59.83	69.37+	28.20	25.53	19.11	21.22
	(36.03)	(43.34)	(42.54)	(43.71)	(43.84)	(36.88)	(43.17)	(42.38)	(46.16)	(46.01)
Preference for voucher	39.38	-26.55	60.72	61.23	46.76	303.0**	296.5**	313.9**	321.5**	303.0**
	(62.59)	(63.12)	(66.16)	(65.89)	(65.13)	(101.7)	(106.3)	(103.6)	(103.8)	(104.8)
School FE			Yes	Yes	Yes			Yes	Yes	Yes
Controls			Yes	Yes	Yes			Yes	Yes	Yes
Observations	3615	3600	3570	3570	3570	3615	3600	3590	3590	3590

Notes: This table shows coefficients of OLS (columns 1–5) and household fixed effects (6–10) regressions of voucher loss on parent characteristics. Standard errors are clustered at the family level (columns 1–5) and robust (6–10). Preference difference (belief) is measured by the difference between a parent's own share allocated to the voucher and the belief about the spouse's share allocated to the voucher. Empowerment is measured by the experimental WTP measure. The variable preference for voucher is the share of the budget allocated to the educational voucher in stage 1 of the experiment (individual allocation). Standard controls includes treatment fixed effects, dummies for censored empowerment values and gender. In columns (3–5) and (8–10) controls include sets of demographic characteristics (income, Muslim (0/1), household size, child's school grade, and parent's education) and time preferences. Columns (4),(5),(9) and (10) include additional controls for financial knowledge (being member of a saving group, having a savings account/mobile payment account, having debt). $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

To fully control for time-invariant unobserved heterogeneity at the family level, we implement a household fixed effects approach. The sampling of couples and observations of parental decisions for various treatment levels per parent allow for this strategy by generating a panel data with 2 × 5 decisions per family. As the experiments took place in a single session, unobserved family heterogeneity is unlikely to vary across treatment levels and is therefore *de facto* time-invariant. We re-specify equation (3) with a family fixed effect ψ, which controls for marital matching:

$$endowment\ loss_{ihl} = \delta_0 + \delta_1 disagree_{ih} + \delta_2 emp_h \cdot D_i + \pi T_{il} + X_i'\eta + \psi_h + v_{ihl} \quad (5)$$

Because of mechanical collinearity, in this specification, we omitted the effect of mother's empowerment interacted with the gender dummy for fathers. The control variable X captures individual parent characteristics, as well as school fixed effects.

We report the fixed effects regression results in columns (6–9) of Table 3. We clustered the standard errors at the household level. Though not definitively causal, because of potential confounds at the individual level, the significant impacts of the belief of preference difference and mother's empowerment strongly suggest that the mechanism is important. The fixed effects estimates also highlight the importance of accounting for endogeneity due to marital matching. When we compare the fixed effects results with the OLS results (more importantly, column 4), we note that the point estimates in the OLS specification are upward biased by 42.5% for disagreement and 40.2% for mother's empowerment. The fixed effects results are robust to the inclusion of individual controls, such as education, financial knowledge, and patience (as measured by the incentivized MEL experiment). The fully interacted model (column 10) shows qualitatively similar point estimates to the OLS model, but lacks the power to detect significant effects.

5.3. Possible Impact on Children's School Outcomes

What are the consequences for the child if parents do not cooperate in educational decision-making? In other words, can parents' noncooperative behavior create intergenerational effects through a negative impact on children's outcomes? We combine information on the redemption of vouchers from the experiment and administrative data on school grades to shed light on this issue. We estimate the following regression, which runs school grades (overall and subject-specific) on educational inputs (captured by vouchers) by household h at time $t = 1$ (post-experiment):

$$school\ grade_{h,1} = \alpha_0 + \alpha_1 voucher_{h,1} + \theta_s + f_h + u_{h,1} \quad (6)$$

The dependent variable measures the school grade five months after the experiment.[24] θ_s controls for school fixed effects.

[24]School grades are the results of a national exam and represent the grade point sum for all 10 subjects: Swahili, English, mathematics, science, geography, civic education, history, art/handicraft, communication/informatics/ICT, and physical education.

If unobservable household characteristics such as the parenting style or the quality of parents' relationships captured by f, affect both school grades and decision-making during the experiment, the estimates suffer from endogeneity bias. However, under the assumption that these heterogeneities are time-invariant and that all remaining changes in grades are due to voucher impact, we argue that controlling for the lagged dependent variable (the school grade one month before the experiment) would account for a large part of this bias:[25]

$$school\ grade_{h,1} = \beta_0 + \beta_1 voucher_{h,1} + \beta_2 school\ grade_{h,0} + \theta_s + u_{h,1} \tag{7}$$

Essentially, the specification boils down to a first difference estimator for two reasons: (i) the voucher in the experiment represented additional school materials unrelated to prior inputs, and therefore $voucher_1 - voucher_0 = voucher_1$ and (ii) the estimated coefficient for the baseline grade is 1.03, with confidence interval $[0.97, 1.09]$. Formally, the first-difference estimator requires changes over time in the error term conditional on the voucher value and controls to equal zero to be unbiased and consistent: $E\left(u_{h,1} - u_{h,0} | voucher, ...\right) = 0$. We keep the specification in levels rather than differences to address the validity of this assumption using Oster (2019) bounds for the identified set and proportional selection values. This approach assumes that selection on observables and unobservables is proportional and provides coefficient bounds for the extreme cases that unobservables are related to the key explanatory variable either not at all or fully proportional to observable controls.

Another empirical challenge is that it is likely not sufficient to control for baseline grades at the levels without capturing the fact that children of noncooperative parents might be on lower trajectories in a dynamic human capital accumulation process. Therefore, our results should only be considered as suggestive evidence.

Figure 6 presents the results for the regression specified in equation (7). The results suggest that the educational voucher significantly increases children's grades. A US$1 increase in the value of a voucher results in a 2.5 point increase in the grade point sum. At the average voucher payout of US$10.80, this effect represents a 5.5% improvement in mean baseline grades.

Since most of the variation in voucher payout is driven by parents' baseline preference for educational investments, we decompose the voucher value between preference and gains from cooperative decision-making. In essence, this means that we assume that the share allocated to the voucher is constant, and apply it to the additional part of the voucher, which parents achieved through cooperative joint decision-making (potentially TZS 1000, 2000, or 3000 per parent in stage 3). We then get:

- The "cooperation" part of the voucher

[25] In Figure B.4 of the Online Appendix, we provide results for an alternative specification using changes in students' ranks within their school as the outcome variable to provide a robustness check to any changes in the distribution of grades that are not controlled for by school fixed effects. The results we document here remain robust.

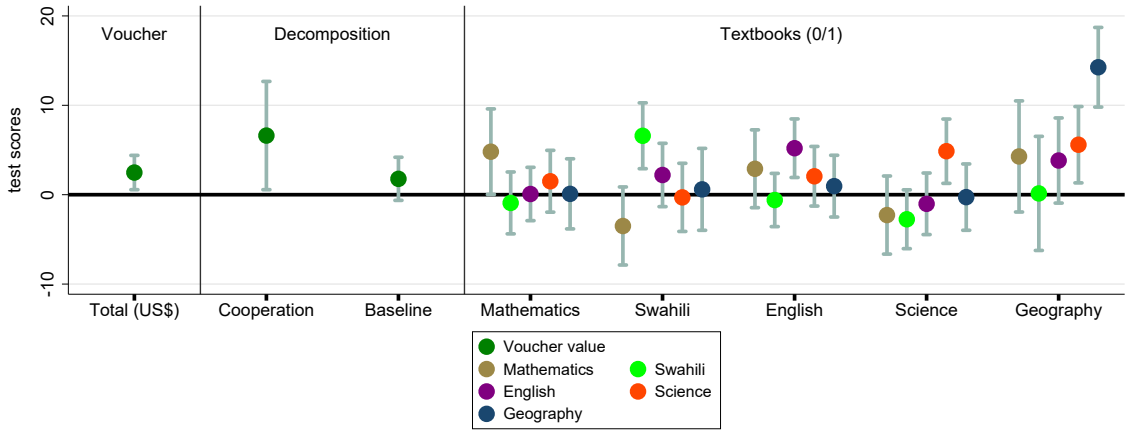

Figure 6: Voucher value and school grades

Notes: Coefficients of OLS regressions with robust standard errors. The dependent variable is the change in grade point sum and subject-specific grades between one month before and five months after the experiment. Controls include baseline grade, total voucher value, and school fixed effects.

- The remaining part of the voucher

The former proves to be highly relevant in explaining improvements in school performance. One additional US dollar from this source corresponds to a 6.6 point higher grade.

One explanation for this large effect is that for high treatments, joint decision-making increases the budget enough for parents to afford textbooks. Both teachers and students reported these grade-specific books to be the most valuable educational inputs. In a follow-up survey, children whose parents redeemed the vouchers for textbooks reported high usage of 3.7 days per week, usefulness (73.2%), and small to large impact on grades (60.2% and 35.8%). In fact, even conditional on the voucher value, textbooks for mathematics, Swahili, English, science, and geography have a significant impact on grades in these specific subjects.

The corresponding coefficient bounds are reported in Table A.9 in the Online Appendix. The results provide evidence that even under equal importance of observable and unobservable factors, the coefficient for the voucher value would not go toward zero when controlling for more and more explanatory variables. In particular, the lower bounds for the impact of total voucher value and its decomposition lie within the standard confidence intervals. Using a related approach based on Altonji *et al.* (2005) the selection on unobservables in our main specification (column 1) would have to be 3.39 times as important as selection on observables to reject a nonzero impact of the voucher, an unlikely possibility at the high R^2 of 0.782.

Interestingly, the average impact of the total voucher payout (+0.24 sd) and textbooks (+0.19 sd) correspond closely to the causal impact of textbooks on school performance for the top quintile of students (+0.22 sd) estimated by Glewwe *et al.*

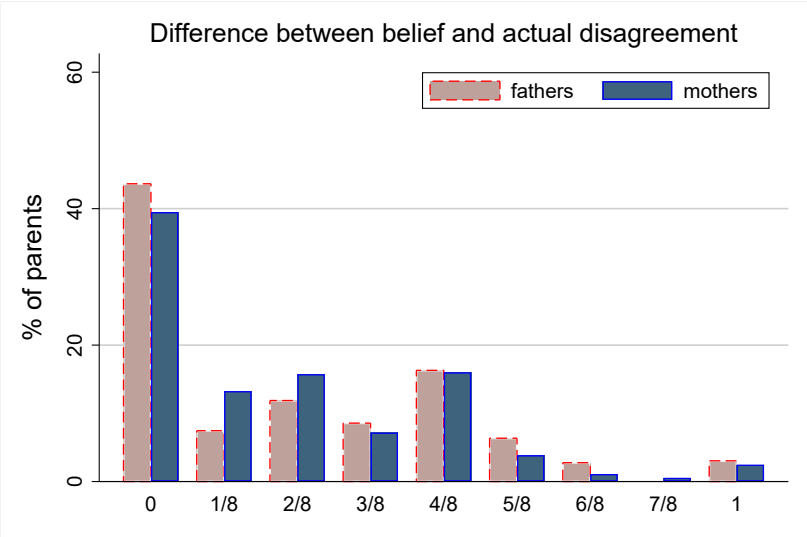

Figure 7: Accuracy of beliefs about spouse's preference for educational voucher

Notes: Allocation of TZS 8,000 (US$3.60) budget between cash and educational voucher. Percentages of parents by belief about the share of budget allocated to educational voucher by spouse.

(2009) in a randomized control trial in Kenyan primary schools.[26]

5.4. Additional Results

Uncertainty and Accuracy of Beliefs (Hypothesis 4)

In the preceding sections, we showed that the belief about a spouse's preference difference is a strong predictor of joint decision-making. Theoretically, because of risk aversion, uncertainty about the partner's preferences decreases the expected utility from collective decisions. Furthermore, asymmetric information between spouses can require additional incentive compatibility constraints in the household model to sustain cooperation. This is the case because parents could potentially mask and misreport their own preferences in the collective decision-making to manipulate the choice in their favor.

While we cannot measure uncertainty directly, we can use the accuracy of beliefs as a proxy for it. To explore the role of beliefs, we present descriptive statistics on preference differences and experimental outcomes by subgroups of parents with correct and incorrect beliefs in Table 4. We coded a belief "correct" if it was within 0.5 sd of the variable "share allocated to voucher". Surprisingly, we find that only 38.7% of parents had a correct belief about the share their partner would allocate to

[26] Glewwe *et al.* (2009) report that effect sizes from providing textbooks in English to primary school students were small because of misalignment of school materials and curricula with children's needs. Unlike the program in Kenya, we provided textbooks in Swahili as recommended by the teachers of the schools.

Table 4: The role of accurate beliefs about a spouse's preference

	Inaccurate (61.3%)		Correct (38.7%)		
Joint decision (0/1)	0.485	(0.392)	0.564	(0.338)	**
Voucher loss (0/1)	0.254	(0.241)	0.179	(0.224)	***
Voucher loss (%)	0.0540	(0.0620)	0.0369	(0.0553)	***
Actual preference difference	0.361	(0.263)	0.122	(0.244)	***
Share of parents	0.61		0.39		***
Observations	444		280		

Notes: This table shows summary statistics of joint decision-making and voucher loss by accuracy of the perceived preference difference. T-test statistics are robust to the use of rank-sum testing. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

the voucher. We note that having a correct belief makes parents, on average, 7.9% more likely to opt for joint decision-making (row 1). This translates to 31% less voucher losses (row 2). We also find a clear relationship between the magnitude of actual preference difference and the accuracy of beliefs (row 4). Strong disagreement intuitively makes it harder to assess the true magnitude of the preference difference. Taken together, the results suggest that there is a significant scope to investigate and reduce the magnitude of inaccurate beliefs by spouses, for example, by promoting spousal communication through parental training and mentoring.

Another possible reason for such low levels of accuracy in beliefs is that couples in the study context operate in the separate spheres framework (Lundberg & Pollak, 1993), where traditional gender roles divide the responsibility for certain public goods between partners. However, at least half of the participating couples reported that they jointly decide on issues regarding their children's education and finances. It is therefore possible that unfamiliarity with the partner's preferences for large educational investment could be explained by the low frequency of such decisions rather than by separate spheres. For instance, the necessity of pooling incomes for textbooks is limited to one or two occasions per school year. Currently, the sample of schools we studied are not actively promoting the purchase of textbooks to both parents at the start of the school year. If that is the case, informational parent meetings could serve as communication venues for parents.

Alternatives to Income Pooling

The lack of spousal income pooling for the purchase of a large investment or durables has been linked to the emergence of alternative saving strategies by women (Anderson & Baland, 2002; Luengas-Sierra, 2018). Using survey data, we can tentatively confirm the hypothesized relationship between joint decision-making in the household and the prevalence of such strategies. Figure 8 shows that parents who experience endowment losses in the experiment are, on average, less likely to be members of informal saving groups, but this masks a stark heterogeneity between fathers and mothers. The share of mothers in these groups increases substantially for those experiencing endowment

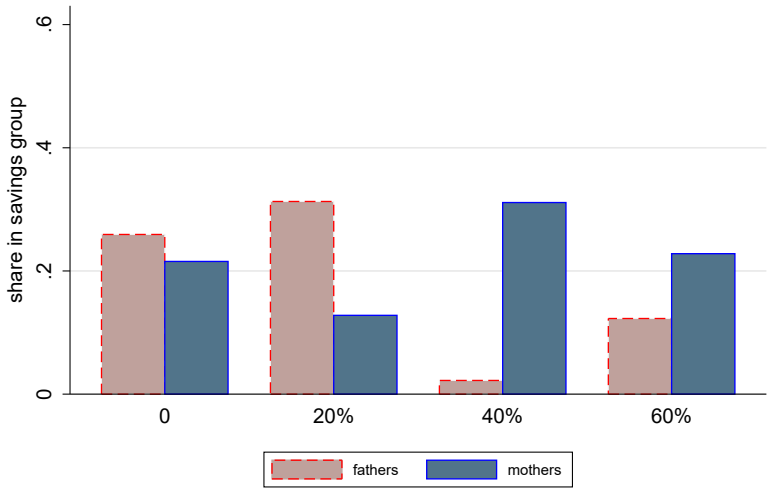

Figure 8: Saving group membership by percentage of noncooperative choices

losses in the experiment. The use of formal savings accounts by mothers is not correlated with income pooling, most likely due to a lack of accessibility.

5.5. Robustness Checks

The identification of the key relationships we established in this study draws heavily on experimental data. Consequently, conducting robustness checks to confirm that the data collection process and measurement errors do not drive our results is warranted. In this section, we conduct two critical robustness checks related to the measurement of mothers' empowerment and the revealed preferences measure for human capital investment by both spouses.

First, the choice list design we used to measure the empowerment of mothers is likely to have two limitations. i) WTP for complete control of income is both left and right censored. Thus, we do not observe potential extremely low and high values. ii) The interpretation of negative WTP is difficult. On the one hand, such values could be chosen by highly empowered women, who take a large role in decision-making in the household. On the other hand, strong traditional gender roles and social norms could lead to mothers giving up control to their husbands. To address these issues, we control for binary variables capturing whether an observation falls within the censored range and run robustness checks excluding couples with negative WTP. The results presented in Table A.11 of the Online Appendix suggest that the key results are robust to the exclusion of negative empowerment values, with slightly larger point estimates for the non-negative subsample. This indicates that negative and left-censored values capture, on average, higher empowerment. The other issue is related to the extent to which the experimental WTP measure captures true empowerment. We cannot directly address this question but rely on Almås *et al.*

(2018)'s argument that commonly used survey empowerment measures are too noisy and lack variation. Nevertheless, Table A.11 shows that a simple survey index can qualitatively reproduce the results obtained with the experimental measure. Appendix C.3 discusses the construction of the survey index and its relationship to the WTP measure in detail.

Second, the revealed preference measure for human capital investment could introduce bias to the analysis if fathers and mothers reacted differently to the specific goods that we provided for the voucher. We check for this by using differences in the raw experimental measure of patience from the MEL experiment instead of preferences for the educational voucher. Reassuringly, the results remained robust (see Table A.12 of the Online Appendix). Intuitively, this makes sense because patience derived from the MEL experiment is a significant predictor of the share that a parent allocated to the voucher. Furthermore, this evidence suggests that the mechanism uncovered in this study can extend to a larger range of indivisible or durable goods that require income pooling. For instance, previous research shows that the willingness to pay for improved cookstoves in rural Ethiopia (Alem *et al.*, 2023a) and Bangladesh (Miller & Mobarak, 2013) depends on time preferences and bargaining powers and significantly differs between the two genders.

6. Caveats: Modelling Decisions, Design, and External Validity

Using a novel decision-making experiment with parents in urban Tanzania, we document a clear gender difference in preference for a voucher that offers significantly larger values - mothers allocating a substantially larger fraction of their budget for the voucher. We also show that parents opted for joint decision-making in about half of the decisions, with another clear gender difference in preference - mothers avoiding joint decision-making with their spouse more often and significantly experiencing considerable endowment loss, believing that their spouse would allocate little to the voucher. Using an empowerment experiment that offers a choice to women between a fixed amount of transfer to their spouse vs a declining amount to their private account, we document that women in urban Tanzania are willing to sacrifice a substantial amount of household resources to have control over it. We also find that over 60 percent of the participants have incorrect beliefs about their spouses' preferences. While all these results are insightful, there are some caveats that we would like to point out and acknowledge. Some of these caveats apply to most similar types of lab-in-the-field experiments, and some of them are related to our particular experimental design and modelling framework.

First, to simplify our experimental design, we assumed a one-shot decision in case of income pooling, thereby excluding strategic behaviours of parents that could arise from repeated interactions. Although educational investment decisions in the context of this study are repeated only at yearly or half-yearly frequency, the threat of retreating to an outside option in future periods is theoretically possible and can affect income pooling, as shown by Lundberg & Pollak (1993) and Browning

et al. (2010). However, Baland & Ziparo (2017) argues, several factors limit the ability of women in developing countries to punish their husbands. Most importantly, traditional social norms restrict or exclude the right to use outside options, such as divorce or separation. Low discount rates and short time horizons due to health hazards further decrease the possibility of using punishment in repeated interactions. Domestic violence is more common in many low-income countries, making a credible threat potentially very costly for women (Hidrobo *et al.*, 2016; La Mattina, 2017). It is also theoretically possible that a woman fears punishment from her husband once her allocation is revealed in the household. However, we believe that this is unlikely for two reasons: i) in the real-life context of a developing country, per-period incomes are likely to vary substantially over time and thus cannot be easily predicted by the spouse. ii) Although the educational investment is eventually revealed to the spouse through the human capital of the child later on, it is not necessarily directly observable to the husband and therefore not indicative of the mother's income.

Second, the experiment restricts income pooling to a binary choice, which excludes the possibility that a parent brings part of the income to the joint household budget. The public nature of consumption goods is restricting parents' trade-off between consumption and educational investment. This means that in our framework, they only decide how much, but not what to consume. The public cash payout to parents in equal shares in the experimental design reflects this choice, which intentionally narrows down parents' decision space to study the research question at hand. Moreover, excluding inter-temporal choices, such as individual saving or hiding of income to transfer it to the next period, reflects to a large degree the realities in a developing country context. There is low access to formal, efficient saving technologies, in particular for mothers. On the other hand, to the extent that Anderson & Baland (2002) and Ashraf (2009) have documented the use of informal saving devices and hiding of income, these strategies are costly, hard to time, and require, in the case of school inputs, a relatively high planning effort.

Third, we acknowledge the possibility of experimental demand effects (EDEs). EDEs occur when subjects pick up on cues from the field staff about what behaviour or outcomes are expected and consciously or unconsciously align their choices to match the perceived expectations (Zizzo, 2010; de Quidt *et al.*, 2018). EDEs are particularly highly likely in a lab-in-the-field experiment, such as ours, and thereby affect the internal and external validity of the experiment. In our experiment, EDEs can be a concern on two aspects: i) parents could have revealed individual preferences for cash and educational investments in the experiment, different from their everyday life. To reduce the likelihood of this effect, we made sure to communicate the benefits of the educational investments transparently to all parents. The allocation between cash and voucher is not our main variable of interest. ii) One could be concerned that the experimental set-up may have distorted the choices in stage 2 (individual vs. joint decision-making). However, there is no reason to believe that parents interpreted one of the options as morally or socially superior from the experimenter's perspective. Neither individual empowerment nor self-assertion and

cooperation were communicated or signalled as a preferable outcome. Furthermore, the authors are experienced in conducting both lab-in-the-field and randomized controlled trials in Tanzania, and many other developing countries, and used a team of graduate students who spoke Swahili in the local dialect as enumerators and field supervisors. We used standardized scripts and instructions that were translated into the local language, limited (and monitored) field staff and subject interactions, unless subjects had questions, and conducted repeated training and pilot sessions to reduce EDEs and elicit the authentic behaviour of subjects.

Finally, we note that our experimental results may not be directly generalisable to all Sub-Saharan African contexts. The results from the empowerment experiment are particularly important to be cautious about in making generalisations. Lowes (2022) recently shows that matrilineal kinship, where lineage and inheritance are traced through women, benefits women than patrilineal kinship. Building on the anthropological literature and a geographic regression discontinuity design on data from the matrilineal belt, the author shows that matrilineal women have a lower probability of believing domestic violence is justified, experience less domestic violence, and have greater autonomy in decision making. The author also finds that individuals from a matrilineal society cooperate less with their spouses in a household public goods game. Thus, our findings may not necessarily carry over to matrilineal societies.

7. Conclusions

Spouses often make household decisions that have significant implications for the welfare of all members of the household. When spouses have different preferences, decision-making autonomy, or erroneous beliefs about each other's preferences, household decisions may lead to sub-optimal resource allocations. In this paper, we study the decision-making behaviour of parents on educational investment of children, a key decision domain affected by parental conflict and has a long-term effect on children's outcomes. We conduct a series of incentivized lab-in-the-field experiments - women empowerment, money-earlier-later, and a three-stage decision-making experiment - with parents of sixth-graders in Dar es Salaam, Tanzania. The decision-making experiment is particularly novel because it offers parents the opportunity to choose their preferred allocation of a budget between a *cash* and a *voucher* basket, worth twice the amount of the cash basket used to purchase key sixth-grade textbooks and school materials. We also asked parents to choose whether to remain with the allocations that they chose or to opt for joint budget allocation with their spouses, which involves five choices that increase substantially at every level. The design, therefore, allows us to shed light on the magnitude of inefficiency in household resource allocation due to differences in preference, information asymmetry, and decision-making weights, which are the key contributions of the paper.

We find a large difference between mothers and fathers in resource allocation for schooling vouchers. Mothers allocated a significantly higher share (80%) to the

vouchers than fathers (67%), suggesting a clear preference difference between parents in preference for human capital investment. We also find that mothers avoid joint decision-making significantly more often and experience more frequent and higher endowment loss. In a women's empowerment experiment, we find that mothers are on average willing to pay 16% of the maximum amount they could get to gain control over a cash transfer. We also find that spouses have significantly incorrect beliefs about each other's preferences, with only 38.7% of parents having a correct belief. Having a correct belief makes parents, on average, 7.9% more likely to opt for joint decision-making. This translates to 31% less voucher losses. Thus, differences in preference and decision-making autonomy, and erroneous beliefs about the preferences of fathers are the key mechanisms that explain mothers' behaviour.

Using administrative school grade data, we show that the educational voucher significantly increased children's grades. Specifically, a US$1 increase in the value of a voucher results in a 2.5 point increase in the grade point sum. At the average voucher payout of US$10.80, this effect represents a 5.5% improvement in mean baseline grades. The key mechanism that explains this large effect is that for high treatments, joint decision-making increases the budget enough for parents to afford textbooks. Our results suggest that noncooperative parental decision-making can have adverse intergenerational effects through educational investments. Parents in low-income households who do not make use of the benefits of joint management of financial resources invest inefficiently in their children's education. This behavior is directly related to lower educational outcomes for the children.

The experimental results should probably be interpreted within the study context. Outside of the lab-in-the-field setting, the inability of spouses to pool resources and jointly manage them may not translate into the same magnitude of loss. Some parents, mothers in particular, have second-best strategies to make large educational investments. These strategies include the use of informal and potentially inefficient saving devices, such as ROSCA-type saving groups (Anderson & Baland, 2002) or the hiding of resources (Ashraf, 2009), which are risky and costly. In fact, by setting our results in relation to the literature on efficiency losses from intra-household conflict, we find that these alternative strategies often lead to slightly smaller losses. The average loss in human capital investment in our sample is TZS 599.9 (US$ 0.27), which is driven by 59% of parents who experience a loss for at least one treatment level. On average, parents lose 4.7% of potential educational investment. Schaner (2015) documents that because of mismatch in discount rates, couples in Kenya lose on average 4.4% in interest rates when they have access to either individual or joint savings accounts, which translates to US$ 0.232.[27] Anderson & Baland (2002) reports that women who participated in a ROSCA gave up any interest in standard savings products. Jakiela & Ozier (2016) find that subjects in Kenya were willing to pay 4.6% of their investment earnings to keep them a secret from their kin. Similarly, Ashraf (2009) documents that participants in the Philippines were willing to pay

[27]Calculations are based on 10.4% average losses of couples who save and 42.3% of all couples saving with US$ 12.50 average daily account balances.

5.15% to secure income from their spouses in the comparable treatment, in which payouts were public information. If the frequency of intra-household income pooling improves, at least a non-negligible fraction of these losses could be prevented.

Our findings have implications for three economic and social interventions. First, policies could alter the fundamentals of the household (more importantly, spousal) decision-making process. We analyze the role of two such fundamentals: empowerment and beliefs about the spouse's preferences. There are potential gains from fostering female empowerment and efficient marital matching. A more tangible and immediate intervention is to increase the awareness and communication about spousal needs and preferences through parental training and school meetings. In particular, the inclusion of fathers in educational matters could yield significant improvements in how parents make decisions on children's education.

Second, the government and other stakeholders (e.g., NGOs) could implement policies that provide low-risk and low-cost second-best options for mothers. For example, Aker *et al.* (2016) suggests that the introduction of mobile payment systems in Niger benefits women and children through an increase in bargaining power and lower costs of concealing income from the husband. Similarly, Prina (2015) observes higher educational expenditure by women in Nepal with low empowerment after providing them with access to formal saving devices.

Finally, targeting women with cash transfers may reduce their reliance on joint decisions with their husbands to finance larger investments by making them more financially independent. This channel could partly help explain the overall finding that cash transfer programs for women in developing countries benefit children's health and education (Yoong & Diepeveen, 2012).

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Parental Decision-Making and Educational Investments: The Intergenerational Cost of Noncooperation (Online Appendix)

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Contents

1. Appendix A. Additional Tables

Table A.1. Budget allocations and preference difference

	Joint decision (0/1)			*Endowment loss*		
		By Parent			*By Parent*	
		Husband	Wife		Husband	Wife
Treatment -12,5%	-0.125***	-0.175***	-0.0752***	221.1***	338.9***	103.1***
	(0.0132)	(0.0202)	(0.0140)	(15.35)	(25.16)	(16.19)
Baseline treatment 0%	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
Treatment 12,5%	0.239***	0.167***	0.312***	414.5***	319.4***	509.7***
	(0.0157)	(0.0198)	(0.0247)	(18.90)	(24.79)	(26.61)
Treatment 25%	0.332***	0.244***	0.421***	642.6***	483.3***	802.2***
	(0.0169)	(0.0228)	(0.0263)	(35.64)	(45.52)	(52.19)
Treatment 37,5%	0.398***	0.275***	0.521***	767.7***	633.3***	902.5***
	(0.0171)	(0.0237)	(0.0266)	(47.41)	(65.09)	(73.25)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3595	1800	1795	3595	1800	1795

Notes: This table coefficients from an OLS regression of joint decision making and endowment loss on treatment levels.Standard errors are clustered at the family level. Treatment refers to the percentage decrease or increase applied to the baseline (TZS 8.000) for joint decision-making. Controls include demographic characteristics (income, Muslim (0/1), household size, child's school grade, parents' education) and financial knowledge (being a member of a saving group, having a savings account/mobile payment account, having debt). $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.2. Summary statistics: parental decision-making

Who Decides?	Mean	SD
Consumption choices		
Father	0.268	(0.444)
Mother	0.199	(0.400)
Both	0.533	(0.500)
Financial choices		
Father	0.356	(0.480)
Mother	0.0552	(0.229)
Both	0.588	(0.493)
Child-rearing choices		
Father	0.152	(0.359)
Mother	0.108	(0.310)
Both	0.740	(0.439)
Educational choices		
Father	0.215	(0.412)
Mother	0.0746	(0.263)
Both	0.710	(0.454)
Observations	362	

Note: Variables constructed from survey questions on 'who typically decides on various household issues'.

Table A.3. Textbook use

	Endline Subsample	
	Mean	SD
# of textbooks received	1.406	(0.985)
# of days/week textbook use	3.691	(1.718)
Share with friends (0/1)	0.878	(0.329)
How often was textbook shared?		
Once a week	0.620	(0.488)
Once every other week	0.148	(0.357)
Once every month	0.231	(0.424)
Was textbook useful for studies?		
Not useful	0.268	(0.445)
Useful	0.732	(0.449)
Impact on grades		
No impact	0.0407	(0.198)
Little impact	0.602	(0.492)
Large impact	0.358	(0.481)
Observations	185	

Note: Variables constructed from questions in the endline survey, conducted with a subsample of children eight months after the experiment.

Table A.4. Sample selection of parents (based on children's characteristics)

I. Full sample	*Participant Sample (364)*		*Potential Sample (1892)*		
	Mean	SD	Mean	SD	T-test
Normalized rank in class	0.529	0.288	0.5	0.289	
II. Subsample	*Participant Sample (162)*		*Non-part. Sample (484)*		
Child characteristics	Mean	Sd	Mean	Sd	T-test
Female	0.512	0.500	0.537	0.503	
Muslim	0.564	0.480	0.614	0.487	
Household size	5.707	1.729	5.265	2.084	*
Children in household	2.911	1.411	2.551	1.279	**

Notes: Normalized rank is the ranking of a student of grade 6 at a given school divided by the number of grade 6 students at that school. T-test results are robust to the use of rank-sum testing. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.5. Budget allocations and preference difference

			By Parent				
	Parents		Husband		Wife		T-test
Share allocated to voucher	0.736	(0.303)	0.672	(0.349)	0.799	(0.232)	***
Spouse's voucher share (belief)	0.708	(0.344)	0.711	(0.378)	0.705	(0.307)	
Preference difference (actual)	0.268	(0.281)	|	|	|	|	
Preference difference (belief)	0.181	(0.273)	0.188	(0.290)	0.173	(0.256)	
Observations	724		362		362		724

Notes: This table shows summary statistics on the allocation of TSh 8,000 budget between cash and educational voucher. Average share allocated to voucher. Belief about spouses share allocated to voucher (incentivized elicitation). T-test statistics are robust to the use of rank-sum testing. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.6. Correlates of parents' preference for the educational voucher

			By Gender	
Mean=73.57	Full Sample	Full Sample	Father	Mother
Education	0.288	0.294	-0.552	0.975
	(0.601)	(0.624)	(0.940)	(0.750)
ln(monthly income)	-1.361	-1.164	-1.646	-0.447
	(1.481)	(1.556)	(2.296)	(1.598)
Muslim (0/1)	-8.305***	-8.515***	-11.82**	-5.146*
	(2.428)	(2.466)	(3.925)	(2.519)
Household size	0.853	0.870	1.229	0.461
	(0.647)	(0.648)	(1.024)	(0.597)
Impatience (MEL)	-11.45***	-11.19***	-8.814^{+}	-11.91***
	(2.763)	(2.755)	(4.858)	(2.940)
Child's GPS	0.0282**	0.0264**	0.0386**	0.0143
	(0.00894)	(0.00902)	(0.0143)	(0.00916)
Mother (0/1)	10.31***	10.95***		
	(1.998)	(2.107)		
Alcohol (0/1)	-3.945	-4.588	-7.995	2.195
	(3.731)	(3.803)	(4.906)	(4.368)
Smoke (0/1)	-11.18*	-11.25*	-12.45*	-7.326
	(5.001)	(5.046)	(5.675)	(9.604)
Savings acc. (0/1)		3.047	3.530	1.720
		(3.190)	(4.497)	(3.637)
Mobile acc. (0/1)		-4.375	-5.982	-3.172
		(6.091)	(10.62)	(6.947)
Savings group (0/1)		-1.389	-0.880	-2.694
		(2.667)	(4.061)	(2.879)
Debt (0/1)		-4.307^{+}	-7.602^{+}	-0.783
		(2.551)	(3.967)	(2.598)
Observations	689	681	342	339

Notes: This table shows the relationship between the share allocated to the educational voucher and individual and household characteristics. Standard errors are clustered at the family level (columns 1–2) and robust (3–4). All columns include school fixed effects. The independent variable is the budget share allocated to the voucher in percentage. Education is calculated as the minimum number of years to reach the highest completed school grade. Debt is a dummy equal to one if the household has a significant amount of debt. Alcohol and smoke are dummies equal to one if the parent drinks or smokes at least once a week. Child's grade point sum (GPS) is the sum over test scores in all 10 subjects (max 1000). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.7 Joint decision-making and parents' characteristics

	joint decision-making			*at treatment level 0*		
		Husband	Wife		Husband	Wife
Years of Schooling	0.000671	0.00367	-0.00356	0.0109	0.000915	0.0171^{+}
	(0.00928)	(0.0136)	(0.0116)	(0.00924)	(0.0174)	(0.00926)
log(Monthly Household Income)	-0.00721	-0.0332	0.0277	-0.00339	-0.0273	0.0303
	(0.0176)	(0.0250)	(0.0228)	(0.0234)	(0.0371)	(0.0238)
Muslim (0/1)	-0.0470	-0.0943*	-0.00914	-0.0252	-0.0756	0.0146
	(0.0300)	(0.0446)	(0.0396)	(0.0345)	(0.0589)	(0.0400)
Household Size	0.00552	0.0208*	-0.00516	0.00439	0.0189	-0.00606
	(0.00711)	(0.0102)	(0.00951)	(0.00832)	(0.0146)	(0.00828)
Married (0/1)	0.0174	-0.0816	0.112	-0.00266	-0.0204	0.0201
	(0.0526)	(0.0896)	(0.0765)	(0.0713)	(0.131)	(0.0852)
Years as Couple	-0.00355^{+}	-0.00401	0.00310	-0.00356	0.000825	0.000186
	(0.00214)	(0.00322)	(0.00277)	(0.00257)	(0.00430)	(0.00247)
Smoke (0/1)	-0.0271	-0.0641	-0.254	0.0506	-0.0303	0.129
	(0.0609)	(0.0609)	(0.205)	(0.0706)	(0.0786)	(0.197)
Alcohol (0/1)	0.0179	-0.0384	0.0433	0.00861	-0.0461	-0.0231
	(0.0379)	(0.0508)	(0.0592)	(0.0469)	(0.0623)	(0.0613)
Literacy (0/1)	0.0877	0.0668	0.0952	-0.0647	-0.0969	-0.0805
	(0.0674)	(0.104)	(0.0782)	(0.0620)	(0.114)	(0.0739)
Impatience (MEL)	-0.0290	-0.0673	-0.00604	-0.0527	-0.100	-0.00999
	(0.0371)	(0.0558)	(0.0480)	(0.0409)	(0.0684)	(0.0444)
Age	0.00514**	-0.0000431	0.00122	0.00574**	-0.00392	0.00377
	(0.00198)	(0.00282)	(0.00291)	(0.00215)	(0.00337)	(0.00250)
Savings acc. (0/1)	0.0628	-0.00423	0.0586	-0.00346	-0.0720	-0.0387
	(0.0384)	(0.0504)	(0.0568)	(0.0455)	(0.0677)	(0.0484)
Mobile acc. (0/1)	-0.0712	-0.134	-0.00864	-0.0284	0.0138	-0.0271
	(0.0846)	(0.115)	(0.111)	(0.100)	(0.159)	(0.116)
Savings group (0/1)	0.00603	0.0642	-0.0462	-0.00860	0.0875	-0.0905*
	(0.0330)	(0.0465)	(0.0425)	(0.0364)	(0.0599)	(0.0399)
Debt (0/1)	0.00942	0.0324	-0.0194	0.0204	0.0100	0.0422
	(0.0309)	(0.0427)	(0.0397)	(0.0359)	(0.0548)	(0.0374)
Mother financial decisionm. (0/1)				0.0395	0.0836	-0.00783
				(0.0899)	(0.135)	(0.0842)
Both parents financial decisionm. (0/1)				0.0856*	0.141*	0.0623
				(0.0393)	(0.0649)	(0.0424)
Mother child decisionm. (0/1)				-0.00755	-0.0641	0.0305
				(0.0710)	(0.120)	(0.0546)
Both parents child decisionm. (0/1)				0.0530	-0.0208	0.0839
				(0.0570)	(0.0944)	(0.0534)
Mother education decisionm. (0/1)				-0.0659	-0.0410	-0.0833
				(0.0739)	(0.120)	(0.0664)
Both parents education decisionm. (0/1)				-0.0679	-0.116	-0.0105
				(0.0531)	(0.0818)	(0.0573)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3325	1690	1635	665	338	327

Notes: This table coefficients from an OLS regression of joint decision making on treatment individual and household characteristics. Standard errors are clustered at the family level. Treatment levels are controlled for in the first three specifications. Treatment refers to the percentage decrease or increase applied to the baseline (TZS 8.000) for joint decision-making. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

A.8. Joint decision-making outcomes, parents' preferences and empowerment

		Interaction with empowerment	
		WTP	*Index*
Mother's preference for educ. voucher	0.364**	0.384***	0.662***
	(0.114)	(0.115)	(0.142)
Father's preference for educ. voucher	0.417***	0.433***	0.415***
	(0.0826)	(0.0827)	(0.0827)
Mother's preference for educ. voucher		-0.237	
× Mother's empowerment (WTP)		(0.161)	
Mother's preference for educ. voucher			-0.146**
× Empowerment index			(0.0503)
Joint budget by mother (0/1)	0.0987	0.125	0.106
	(0.105)	(0.105)	(0.107)
Observations	385	173	212

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: This table coefficients from an OLS regression of the joint decision outcome "share of joint budget allocated to voucher" on mothers' and fathers' individual preferences for the voucher and household characteristics. Standard errors are clustered at the family level. Columns (2) and (3) interact the mother's individual preference for the voucher with measures for female empowerment (WTP and Decision-making Index). Controls include income, Muslim (0/1), household size, married (0/1), school fixed effects and a dummy whether the joint budget was provided by the mother. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.9. Voucher value and improvements in school performance

	Test Score		By Subjects				
			Math	Swahili	English	Science	Geog.
Mean Grade (baseline) = 484.48	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Voucher value (US$)	2.478*						
	(0.812)						
Identified set (Oster, 2019)	[1.81; 4.55]						
Cooperation part of voucher (US$)		6.614*					
		(2.561)					
Identified set (Oster, 2019)		[3.64; 15.46]					
Preference part of voucher (US$)		1.776					
		(1.020)					
Identified set (Oster, 2019)		[0.77; 4.47]					
Textbook (0/1)			5.639*	7.273***	5.094**	3.744*	14.32***
			(2.219)	(1.736)	(1.545)	(1.652)	(2.079)
Remaining voucher value (US$)			0.594*	-0.123	0.166	-0.0789	-0.0188
			(0.246)	(0.155)	(0.181)	(0.178)	(0.168)
Baseline grade	1.033***	1.033***	0.677***	0.743***	0.539***	0.611***	0.599***
	(0.0396)	(0.0396)	(0.0755)	(0.0572)	(0.0504)	(0.0613)	(0.0589)
Observations	345	345	226	227	227	227	227
R^2	0.782	0.784	0.526	0.514	0.365	0.525	0.399

Notes: This table shows the coefficients of an OLS regression of school grades on voucher value. Standard errors are robust. All columns include school fixed effects. The dependent variable in columns (1–7) is the change in grade point sum and subject specific grade from one month prior to five months after the study. The dependent variable is the voucher loss as % of potential educational investment. Voucher value is the value for educational investments that the household earned as payout in the experiment. Textbook (0/1) is a dummy variable if a child got a textbook in a specific subject paid by the voucher. Identified sets under the assumption of proportional selection on observables and unobservables ([uncontrolled β; biased-adjusted β]). First stage F-statistic for excluded instruments in IV estimation: 239.81. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A. 10. Exploring the mechanism: Determinants of non-cooperative decision-making (extensive margin)

Voucher Loss (0/1)	Ordinary Least Squares				Household Fixed Effects			
Mean=0.225	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Preference difference (belief)	0.259***		0.261***	0.261***	0.164***		0.168***	0.168***
	(0.0284)		(0.0295)	(0.0294)	(0.0443)		(0.0441)	(0.0435)
Mother's empowerment (WTP)		-0.239*	-0.187^{+}	-0.187^{+}		-0.169*	-0.177*	-0.168*
× Mother (0/1)		(0.105)	(0.0984)	(0.0975)		(0.0716)	(0.0711)	(0.0708)
Mother's empowerment (WTP)		-0.0874	-0.0239	-0.0274				
× Father (0/1)		(0.102)	(0.0994)	(0.0978)				
Mother (0/1)	0.0591***	0.0337^{+}	0.0301	0.0259	0.0351*	0.00707	0.00525	0.000945
	(0.0172)	(0.0203)	(0.0201)	(0.0207)	(0.0177)	(0.0204)	(0.0202)	(0.0221)
In saving group				-0.0277				-0.0750^{+}
				(0.0186)				(0.0384)
Preference for voucher	0.139***	0.108***	0.158***	0.159***	0.303***	0.298***	0.309***	0.315***
	(0.0267)	(0.0274)	(0.0274)	(0.0275)	(0.0433)	(0.0449)	(0.0441)	(0.0444)
Observations	3615	3600	3570	3570	3615	3600	3570	3570

Notes: Standard errors are clustered at the family level (columns 1–4) and robust (5–8). The dependent variable is a dummy equal to one if a parent experienced any voucher loss at a given decision. Preference difference (belief) is measured by the difference between a parent's own share allocated to the voucher and the belief about the spouse's share allocate to the voucher. Empowerment is measured by the experimental WTP measure. Standard controls include treatment fixed effects, dummies for censored empowerment values and gender. In columns 3–4 and 7–8 controls include sets of demographic characteristics (income, Muslim (0/1), household size, child's school grade and parent's education) and time preferences. Columns 4 and 8 include additional controls for financial knowledge (being a member of a saving group, having a savings account/mobile payment account, having debt). $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.11. Robustness check: Alternative and non-negative empowerment measure

Endowment loss	Empowerment Index		Empowerment (WTP)>0	
Mean=408.6	(1)	(2)	(3)	(4)
Empowerment index × Mother (0/1)	-87.95	-114.9^{+}		
	(66.77)	(66.47)		
Empowerment index × Father (0/1)	-5.548	-2.465		
	(52.93)	(52.73)		
Empowerment (WTP>0) × Mother (0/1)			-459.3**	-478.7**
			(161.2)	(160.5)
Empowerment (WTP>0) × Father (0/1)			15.94	-26.44
			(144.6)	(143.6)
Mother (0/1)	181.1*	198.2*	-30.38	-41.53
	(89.46)	(88.48)	(66.51)	(66.29)
School FE		Yes		Yes
Controls		Yes		Yes
Observations	3620	3595	2690	2685

Notes: Standard errors are clustered at the family level. The empowerment index is constructed from survey questions using factor analysis with polychoric correlation matrix. Empowerment (WTP) is measured by the experimental empowerment measure for observations with WTP>0. Standard controls include treatment fixed effects and gender. In columns 2 and 4 controls include sets of demographic characteristics (income, Muslim (0/1), household size, child's school grade and parent's education), time preferences and financial knowledge (being a member of a saving group, having a savings account/mobile payment account, having debt).$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.12. Robustness check: difference in time preference

Endowment (Mean=408.6)	Loss	(1)	(2)	(3)
Diff. in impatience		133.7*	104.4*	95.78^{+}
		(53.05)	(51.53)	(50.49)
Mother (0/1)		103.0**	106.5**	93.74*
		(36.15)	(36.11)	(37.27)
Impatience			8.802	6.111
			(47.01)	(47.87)
In Savings Group				-68.44^{+}
				(40.69)
School FE			Yes	Yes
Controls			Yes	Yes
Observations		3610	3590	3590

Notes: Standard errors are clustered on family level. Impatience of spouses is elicited from a choice list experiment. Standard controls includes treatment fixed effects and gender. In columns (2) and (3) controls include sets of demographic characteristics (income, Muslim (0/1), household size, child's school grade and parent's education) and time preferences. Columns (3) include additional controls for financial knowledge (being member of a savings group, having a savings account/mobile payment account, debt).

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

2. Appendix B. Additional Figures

Figure B.1 Location of sample schools within Ilala district, Dar es Salaam

Note: The 8 sample schools were randomly selected from 112 schools in Ilala district, one of five district of Dar es Salaam.

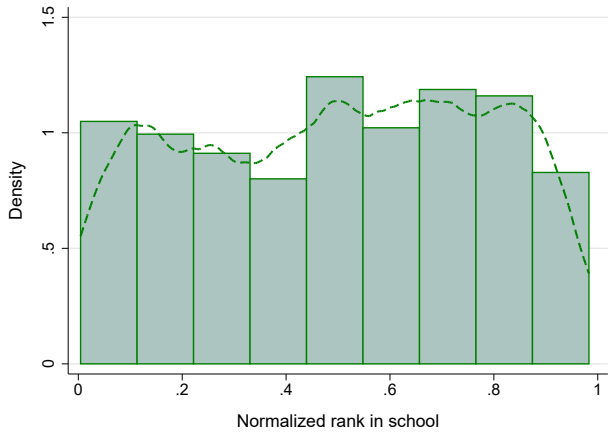

Figure B.2. Distribution of school ranks of sampled students

Notes: Rank of students according to grade point sum over all 10 subjects and normalized by number of students. Uniform distribution would correspond to no selection or full sample.

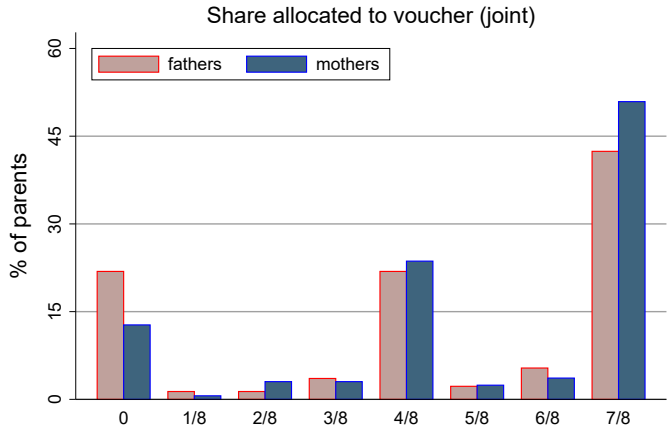

Figure B.3. Joint decision-making: share allocated to voucher

Notes: Allocation of applicable joint budget (TZS 7,000– 11,000) between cash and educational voucher if a parent chose joint for the randomly drawn payout choice. Allocations are potentially distorted by income effects. Percentages of parents by share of budget allocated to educational voucher.

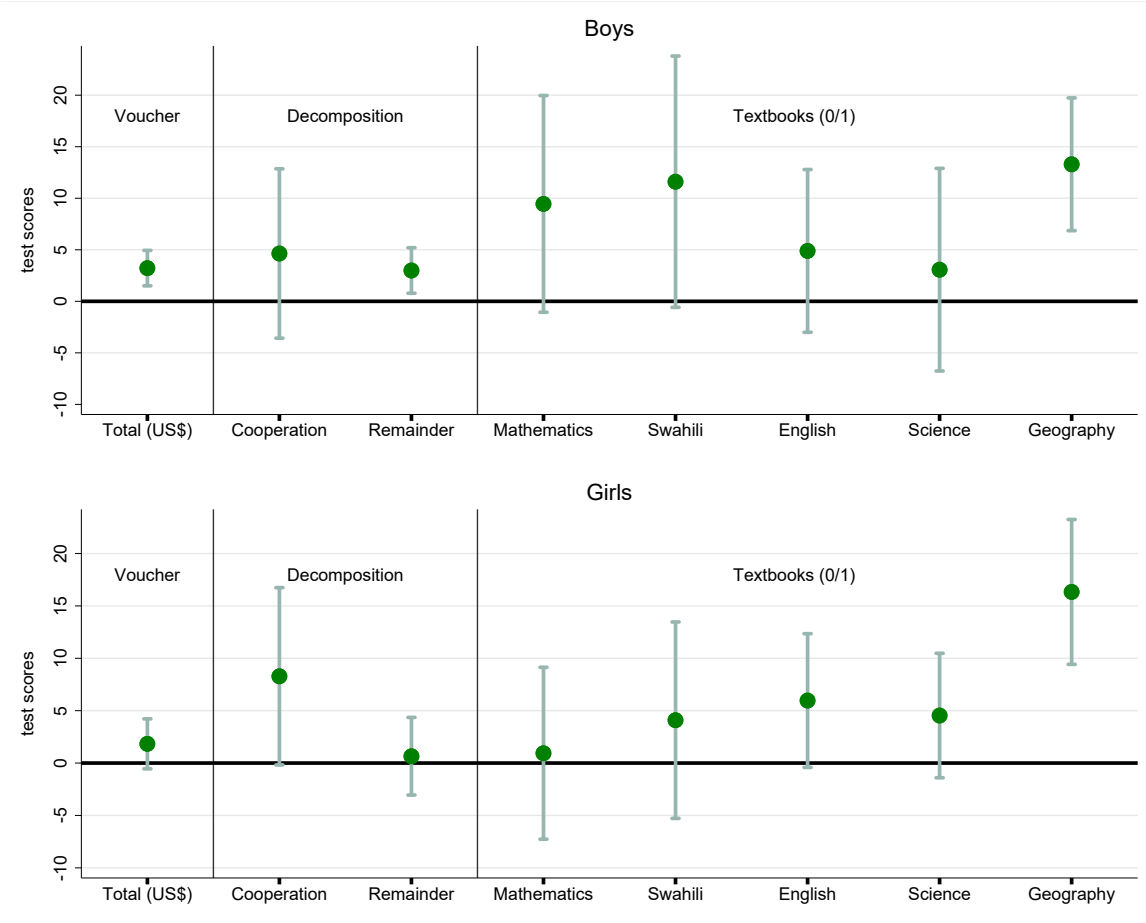

Figure B.4. Voucher value and school grades by gender

Notes: Coefficients of OLS regressions with robust standard errors. Controls include baseline grade, total voucher value, and school fixed effects.

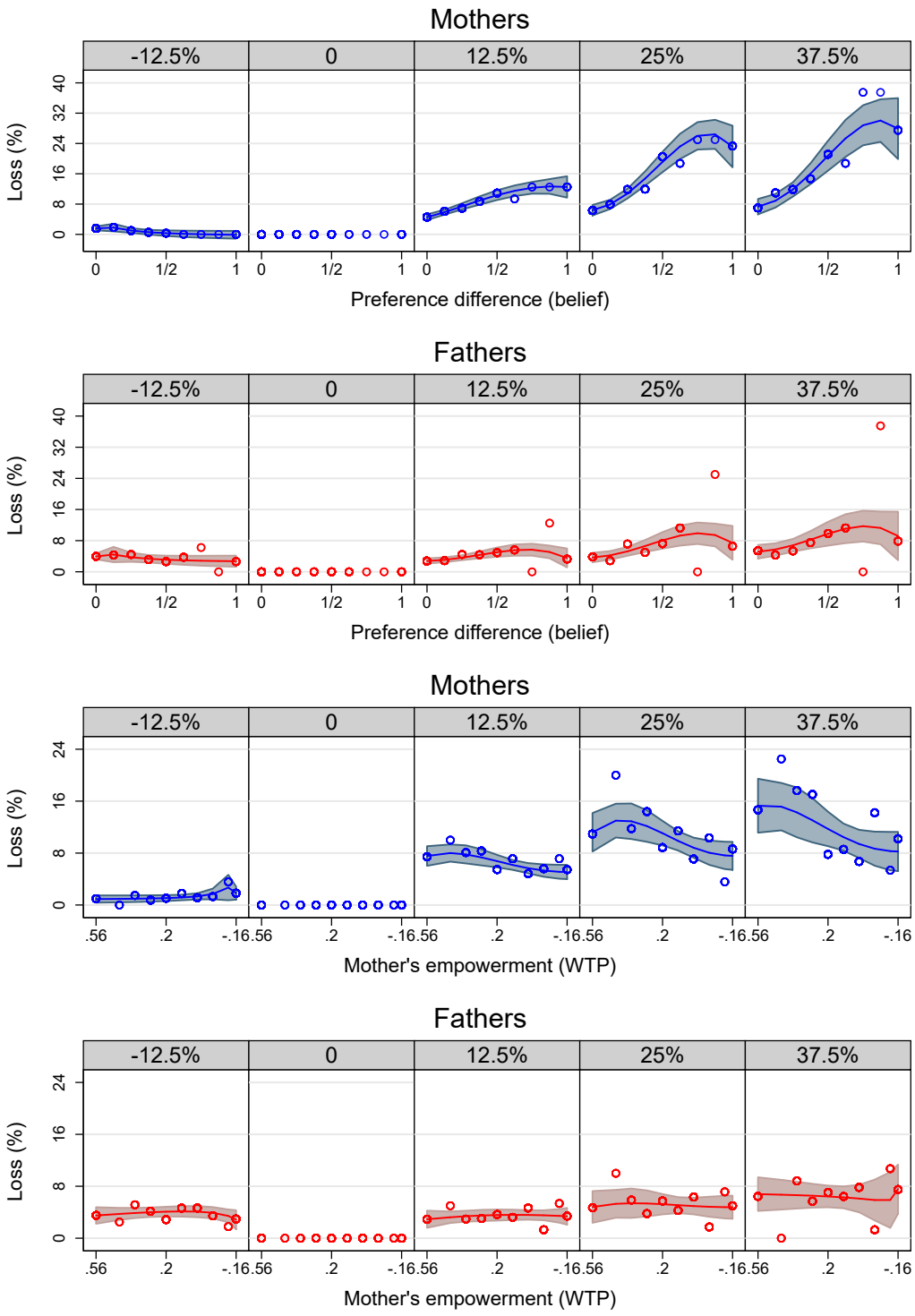

Figure B.5. Determinants of endowment loss by treatment

Notes: Y-axes depict endowment loss. X-axes denote the level of perceived disagreement (upper panels) and female empowerment (bottom panels). Fractional polynomial fit with CIs and means for levels of preference difference and empowerment.

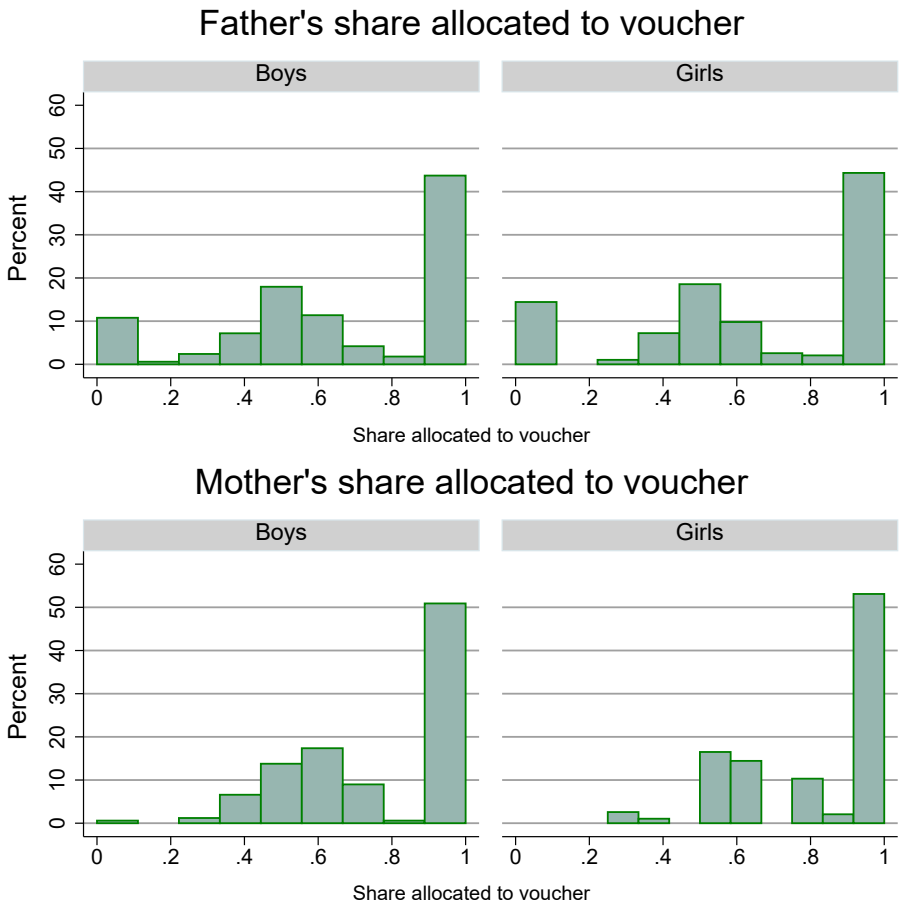

Figure B.6. Voucher preference by child's sex

Notes: Allocation of TZS 8,000 (US$3.60) budget between cash and educational voucher. Percentages of parents by share of budget allocated to educational voucher separated by gender of child.

3. Appendix C. Experimental Materials (Choice Lists and Instructions)

3.1. Appendix C.1 Decision-Making Experiment

Family ID: Individual ID:

Individual decision

Cash (TZS) 	*School material voucher (TZS)* 
Budget: 10.000	
……	……

Belief about spouse: …… ……

Figure C.1. Individual allocation

Family ID: Individual ID:

	Stay			*Joint decision with spouse*		
	Individual Budget 10.000 Your choice:		***or***	*Cash (TZS)* *School material voucher (TZS)*		
1.	Stay with individual decision	**O**		**O**	Joint Budget	*7.000*
2.	Stay with individual decision	**O**		**O**	Joint Budget	*8.000*
3.	Stay with individual decision	**O**		**O**	Joint Budget	*9.000*
4.	Stay with individual decision	**O**		**O**	Joint Budget	*10.000*
5.	Stay with individual decision	**O**		**O**	Joint Budget	*11.000*

Figure C.2. Stay with individual decision vs. make joint decision with spouse

Enumerators (start by reading the following instructions to the participants: *We will now proceed with the final part of today's session. Before we start, we will explain the rules of this decision-making experiment. If you have any questions during the explanation, please stop me and ask. Depending on your decisions you will earn some money. That's why it is important that you understand the rules of the experiment. Part 1: This experiment has two parts. Let's start with rule for the first part: You will now make one individual choices. The decision is to divide a budget of 10.000 TZS between the two cups in front of you. The first cup is the cash cup. Any money that is put into this cup, will be paid out to you in cash by transferring it to your mobile account at the end of the day. The second cup is the educational voucher cup. Any money that is put into this cup, will be doubled and given to your family in the form of a voucher. With the value of the voucher you will be able to purchase educational materials for your child. It can exclusively be used for your child's education which may increase your child's grades and opportunities in the future! It can for instance be exchanged for mathematics or reading textbooks. Your choices will be relevant for the second part of this experiment and for determining your final payout for this experiment, depending on your choices in the second part. Let's look at an example (Budget of TZS 10.000, TZS 4.000 allocated to cash option, TZS 6.000 allocated to voucher). If you divide the budget of TZS 10.000, such that TZS 4.000 go into the cash cup and TZS 6.000 go into the educational voucher cup, you will get the following payout: 4.000 TZS will be paid out to your family (split among spouses). The TZS 6.000 in the voucher cup are doubled to TZS 12.000 and given to you in the form of a voucher which you can exchange for educational material at the end of the day.Your first stage choice is relevant for the second part of the game. We will explain this carefully in the second part. We will also ask you to state the belief about what your spouse would choose. If you guess the budget split of your spouse correctly you can earn additional TZS 1.000. If there*

are no further questions, we will now individually collect the first stage choices from you (go from desk to desk and collect choices, write down into list).

Part 2: Now, in the second part, for your choice from the first part you are asked 4 times to either stay with that individual decision that you made in the first part, or to choose to make a joint decision with your spouse. This part will define your payout. If you decide to stay with the individual decision, you will get the pay-off that you chose in the first stage. The payoff will be paid out to your family without revealing any of your choices. If you decided to make the decision jointly with your partner, you will discuss the choice with your spouse and report your decision after this game. The prize of your choice will then be paid out to your family accordingly. We brought along here an example decision sheet. Imagine that in the first part you chose to divided the budget of 10.000 putting TZS 4.000 to the cash cup and TZS 6.000 (which gives a voucher of TZS 12.000) to the voucher cup. Here are 5 decisions to make in the second part. On the right you see the details of the joint decision. Notice that the joint decision differs from the individual decision only by the size of the budget. This means it is the same type of decisions, just with different budgets to divide between the cups. You are asked to choose whether to stay with the individual split, or to make the decision again with your spouse. You have to make that decision for different budget sizes in the joint decision. Everybody following so far?

3.2. Appendix C.2 Empowerment Experiment

Namba ya familia: Namba ya mtu binafsi:

	A			B
I	TSh to me			TSh to my spouse
1.	*8.700 TSh*	O	O	*7.500 TSh*
2.	*8.100 TSh*	O	O	*7.500 TSh*
3.	*7.500 TSh*	O	O	*7.500 TSh*
4.	*6.900 TSh*	O	O	*7.500 TSh*
5.	*6.300 TSh*	O	O	*7.500 TSh*
6.	*5.700 TSh*	O	O	*7.500 TSh*
7.	*5.100 TSh*	O	O	*7.500 TSh*
8.	*4.500 TSh*	O	O	*7.500 TSh*
9.	*3.900 TSh*	O	O	*7.500 TSh*
10.	*3.300 TSh*	O	O	*7.500 TSh*

Figure C.3. Empowerment experiment choice list

Enumerators (start by reading the following instructions to the participants): *We will now start with the first part of today's session. Today you will respond to a survey to study the needs of women and economic decision-making. Your session consists of 4 parts of decision-making tasks. The last part and one additional part, which will be randomly drawn at the end of the day, will determine your payout. Please give sincere answers. Your answers will be kept completely anonymous and no replies will be revealed to anyone except the researchers. If you have any question during the explanation, please stop me to ask. In the following questions you will be facing different choices for which you will have to choose between two alternatives, A or B. You cannot choose both. You will have to state your preferred choice (A or B) in each situation. If you choose A it means you prefer alternative A to alternative B. We will be rewarding you for your choices and your decisions affect your actual reward. The amount of your reward will be communicated at the end of the survey. We will start by providing you with an example, so that you can understand better (A: TZS 4.500 to me, B: TZS 5.000 to my spouse). You will have to state your preferred choice (A or B) in this situation. This means that you will be paid the amount TZS 4.500, stated in A, if you choose alternative A. If you choose alternative B, your spouse will be paid the amount TZS 5.000, stated in B. In total you will be asked to make 10 decisions between A and B by crossing the circle next to that alternative. Once you switch from A to B, you should think carefully if it makes sense to switch back at a later choice as alternative A is decreasing in each row and alternative B stays the same. We will tell you at the end of the today's session which one determines the actual payment for you and your partner. If this part of the survey is randomly chosen, then you will be paid according to one of your decisions. You will draw a numbered cards from 1 to 10 which will define the choice that is relevant for payout. The amount will be paid to you or your spouse without revealing any of your decisions. In the example choice this means that if you chose*

A, TZS 4.500 will be transferred to your mobile account. If you chose B, TZS 5.000 will be paid to your husband's mobile account. Any questions?

3.3. Appendix C.3. Empowerment Measures in Comparison

Decision-making index: This approach uses a questionnaire design to elicit a measure of female empowerment. The respondent was asked to indicate the decision-maker in the household for several categories. If the mother (father) is the decision-maker for a category, it is coded with 0 (2). If the couple decides together, the variable takes value 1. The subcategories are basic consumption (e.g. food, clothing), financial decisions, child raising and educational decisions. To condense these categorical variables to an empowerment index I use a factor analysis with polychoric correlation matrix. Figure ?? and Table ?? show the distribution and the factor loading of the decision-making (DM) index. As expected the index is skewed to the left, indicating low decision power of mothers. Factor loading is relatively evenly distributed across the decision-making categories, suggesting that none of them should be excluded. The DM index has been argued to contain very noisy and limited information because of its survey nature and potential simultaneous roles as source and consequences of empowerment.

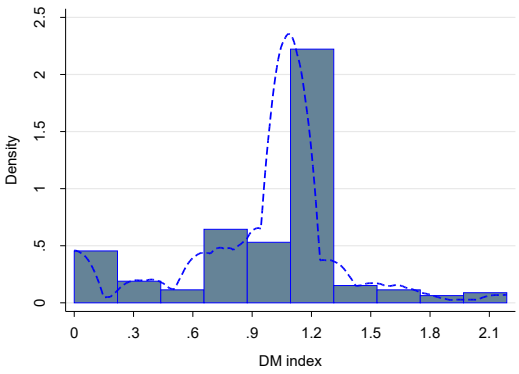

Figure C.4 Distribution of DM index

Notes: Histogram and kernel density of the decision-making index measure from survey questions. High values correspond to low empowerment

Table C.1. Factor loadings

	Factor Loadings
Consumption	0.4896
Financial	0.6056
Child raising	0.6754
Education	0.6811

Note: Variables for decision-making categories take value 0 (2) if mother (father) decides and 1 if both parents decide jointly.

Comparing empowerment measures: For a better understanding of the different empowerment measures and the information they carry about the true decision-making power in the household, Table ?? reports their correlation for the full sample and excluding negative WTP couples. The negative correlation between the DM index and WTP is surprising, as one would expect a mother with higher responsibility for decision-making to exhibit lower WTP. However, the correlation is in line with the findings of Almås et al.(2018), who argue that it can be explained by confounding factors. The DM index and WTP carry different information. Both capture the true decision-making power to a certain extent, but they load on different observables or unobservables. While the DM index and WTP can both be correlated with true power, if they load on other variables with different signs, negative correlation between them can arise. Following Almås et al.(2018), one can think about i different empowerment measures that depend on true, unobservable power (P), confounding factors (X), and pure noise (ϵ_i): $m_i = \alpha_i + \lambda_i P + \beta_i X + \epsilon_i$. Using $i = 3$ empowerment measures, they are able to estimate this model using several observable confounds and find that the measures indeed load with opposite signs on variables such as ethnicity, gender of household head, and settlement condition.

By including observable characteristics as controls and family fixed effects in the empirical specifications, I can capture confounding factors at the family level while exploiting the information about true power in the empowerment measures.

Table C.2. Correlation matrix of empowerment measures

	Full Sample	Excluding Neg. WTP
	WTP measure	WTP measure
DM_index	-0.00114	-0.0358
Observations	360	269

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

3.4. Appendix C.4. Patience (Money Earlier or Later)

Time preferences are elicited with choice lists with early and delayed payoffs or time-investment exercises. The choice list design is motivated by (i) its simplicity, making it suitable for a sample of low educated and adolescent subjects and (ii) the use of raw measures without any assumption on the functional form for the utility function (as in Sutter et al. 2013). Subjects will select their preferred choice in a list of 10 decisions per decision sheet. Choices are made between upfront payoff of TZS 4,000 (US$1.80) and delayed payoffs between TZS 4,000 (US$1.80) and TZS 8,000 (US$3.60). Starting with equal payoffs, the delayed option increases monotonically. Two decision sheets are presented to the subjects in random order. After all choices are made, one list and one decision are randomly selected for payout. Since transaction costs and uncertainty about the payment could bias the results, particular focus is placed on trust issues related to the delayed payment option. Using mobile phone banking, which is widespread and common in Tanzania, we alleviated concerns about additional transaction costs for the delayed payments. Using the observed switching point from early to delayed payoff, we calculated the *future equivalent* (FE) at the midpoint of the two delayed payoffs around the switching point. Normalizing it by the early payoff results in a comparable indicator for patience: $t = \frac{FE}{A}$. The higher the *normalized future equivalent* (t), the more impatient the individual is.