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8 February 2024

Online at <https://mpra.ub.uni-muenchen.de/120095/>
MPRA Paper No. 120095, posted 15 Feb 2024 14:44 UTC

Women's Empowerment and Intra-Household Bargaining Power*

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Abstract

We assess the effectiveness of the Abbreviated Women's Empowerment in Agriculture Index (A-WEAI) in predicting intra-household bargaining power. We conducted a lab-in-the-field experiment with 464 agricultural households, where spouses made decisions about money allocations. The experiment tested whether they would choose efficient overall household gains or favor individual monetary benefits. Our findings demonstrate that women's empowerment levels, as measured by the A-WEAI, are predictive of decisions in the allocation task. This supports the A-WEAI's utility in representing and predicting intra-household dynamics.

Keywords: A-WEAI, allocation task, dictator game, agricultural households

JEL codes: C72, C93, D13

*Ethics approval for this study was granted by the Board of Ethics and Deontology of the Dept. of Agricultural Economics & Rural Development (3/12.6.2018).

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1 Introduction

Empowerment of women and the reduction of gender disparities should be integral priorities in every development policy (Alkire et al. 2013). In the academic literature, multiple indicators have been employed to measure women’s empowerment: education (Berti et al. 2004; Smith and Haddad 2000), control over income (Andersen 2012; Berti et al. 2004; Leroy et al. 2009), the gender of the head of the household (Kennedy and Peters 1992), and asset control at the time of marriage (Quisumbing and Maluccio 2003) are a few among the previously utilized metrics (see Gupta et al. 2019, and citations therein).

Given that gender disparities and women disempowerment are particularly evident in agricultural and rural areas (Alkire et al. 2013), empowering women in agriculture has the potential to substantially enhance rural economies and promote rural development. However, prevailing policies frequently fall short in being gender-responsive, thereby overlooking the unique needs of rural women and the importance of quantifying empowerment for evidence-based policy-making. Efforts to bridge these gaps and implement inclusive policies are crucial for fostering sustainable development and equitable growth in rural communities.

The Women’s Empowerment in Agriculture Index (WEAI) (Alkire et al. 2013), emerged as a comprehensive tool for evaluating women’s access to resources and decision-making capacity in five agricultural domains: production, resources, income control, leadership, and time allocation. Each domain is assessed through a set of ten specific indicators. The WEAI marked a progression from earlier empowerment measures in several respects and particularly for its ability to be broken down and provide insights into the main factors contributing to both women’s and men’s disempowerment.

WEAI underwent significant refinement in response to field challenges, leading to the development of the Abbreviated WEAI (A-WEAI). A-WEAI emerged as a shorter and more efficient alternative, reducing the original ten indicators to six while maintaining the core domains of empowerment. This transformation ensures that the A-WEAI offers a more streamlined and accessible approach for assessing women’s empowerment in agriculture while requiring about 30% less time for administration.

Despite these advancements in measuring women’s empowerment, certain papers argue that empowerment is inadequately or less effectively measured with survey based methods (Adato et al. 2000; Almås et al. 2018). Additionally, other studies criticize the WEAI, asserting that its characterization of empowerment predominantly revolves around individual autonomy (see Addison et al. 2021, and citations therein). These critiques highlight a perceived limitation in WEAI, namely its omission of the substantial impact that intra-household relationships hold over outcomes (Farnworth et al. 2018; Doss and Quisumbing 2020). Researchers argue that such a singular focus on autonomy can lead to a distorted representation of intra-household dynamics, potentially overlooking crucial factors that contribute to the overall empowerment of women in agriculture. As the discourse contin-

ues, there is a growing call for a more comprehensive approach that duly considers the nuanced interplay between individual autonomy and intra-household relationships in the assessment of women’s empowerment (Addison et al. 2021; Quisumbing et al. 2023).

Our study contributes in this literature by assessing the validity of A-WEAI as a predictor of intra-household bargaining power using a lab-in-the-field experiment with 464 agricultural households in the Republic of North Macedonia. Besides measurement of A-WEAI with a structured questionnaire, we utilized a dictator/allocation game, that was played by spouses within the household, enabling the quantification of power dynamics between men and women within these households. This innovative approach not only enhances the comprehensiveness of our study but also serves to validate the A-WEAI through the lens of experimental economics, providing a robust and multifaceted evaluation of women’s empowerment in the agricultural context.

In our lab-in-the-field experiment, we ask spouses to make decisions regarding allocations of money between them and their spouse. The trade-off they face in each choice is between an efficient allocation for the household (more money overall) vs. allocations that involve more money for themselves. After making decisions alone and separately from each other, they were then asked to make joint decisions over similar allocations. By observing discrepancies in choices between the individual decisions of male and female spouses as compared to the joint decisions they make as a couple, we were able to quantify the intra-household bargaining dynamics. We find that the intra-household dynamic is explained by levels of women’s empowerment as measured with the A-WEAI. Our results thus provide evidence that A-WEAI can be a useful representation of intra-household dynamics, at least in the context of our study which involves a sample of agricultural households in a Balkan country in Southern Europe.

Our paper is structured as follows. In the next section, we review the existing literature related to women’s empowerment, the A-WEAI, and intra-household decision-making to set the context of our study. Section 3 describes the measurement of A-WEAI and allocation game, offering detailed insights into both data collection and experimental design. Subsequently, we present the outcomes of the A-WEAI assessment and the experimental results in Section 4. Our paper concludes with a discussion in the final section, summarizing key findings and exploring the implications of the A-WEAI validation through the experimental game.

2 Literature Review

Empowerment is a complex and multifaceted concept that can be evaluated through various methods, enabling the exploration of intra-household decision-making dynamics. On one hand, several studies have employed survey-based approaches to assess empowerment by constructing indices that provide a concise summary of gender dynamics within households. These indices aim to capture the overarching aspects of empowerment in a

quantitative manner.¹

On the other hand, research on intra-household decision-making has adopted experimental approaches, shedding light on power dynamics, information imbalances, and the influence of social norms. These factors play a crucial role in shaping decision outcomes and ultimately impact women's empowerment.

In the following subsections, we will delve into the findings and implications of these studies, offering valuable insights into the intricate gender dynamics within agricultural households. By examining the different dimensions of empowerment and the methods used to measure them, we gain a deeper understanding of the complexities involved in assessing and promoting women's empowerment.

2.1 The Women Empowerment in Agriculture Index

Women's empowerment in agriculture has garnered significant attention in recent years, with researchers employing various indices to measure and understand the complexities of gender dynamics in this sector. A-WEAI is one such indicator designed to gauge the empowerment levels of women and men across different domains within the agricultural context (Malapit et al. 2017; Malapit et al. 2020). The A-WEAI is a short version of the original Women's Empowerment in Agriculture Index (Alkire et al. 2013), which focuses on five key domains, namely, input in agricultural production decisions, access and decision-making power over productive resources, control over the use of income, leadership in the community, and time allocation.

Created as a concise version of the WEAI, the A-WEAI underwent cognitive testing and piloting in Bangladesh and Uganda, with subsequent modifications to incorporate feedback from the pilots. A-WEAI's aim is to provide a robust and practical tool for assessing women's empowerment in agriculture on a larger scale (Malapit et al. 2017).

As a testament to the popularity of the index, several studies have explored and applied the WEAI. Akter et al. (2017) studied gender inequity in agricultural households in Southeast Asia. The authors challenge conventional narratives by highlighting women's equal access to productive resources and greater control over household income. These findings emphasize the importance of tailoring gender intervention frameworks to each country to effectively address gender disparities in agriculture.

Gupta et al. (2019) explore the role household market integration and women's empowerment in agriculture can play in determining women's dietary diversity in rural India. The study emphasizes the importance of women's empowerment, particularly in input decisions and participation in self-help groups, in enhancing dietary diversity in India's agricultural price and procurement policies beyond staple grains. In a critical reflection

1. Richardson (2018) offers a critical review of current practices in measuring women's empowerment, recommending theory-based and comprehensive approaches. She argues that universal indices proposed by some studies (e.g., Alkire et al. 2013; Ibrahim and Alkire 2007; Malapit et al. 2017), may not be applicable to all contexts and may miss some nuances of empowerment in certain contexts.

on the A-WEAI’s adaptation to specific country contexts, Gupta et al. (2019) highlight challenges in questionnaire adaptation, index construction, and sensitivity analysis, underscoring the importance of tailoring empowerment indices to diverse agricultural contexts for meaningful policy impact.

Similarly, O’Hara and Clement (2018) critically examine measurement of empowerment through WEAI in Nepal and identify a discrepancy between local meanings of empowerment and standardized agency-based definitions. They suggest that incorporating critical consciousness into empowerment frameworks can enhance measurement accuracy.

The WEAI has been used in several other instances to quantify women’s disempowerment levels as in Pakistan (Aziz et al. 2023) and Guatemala (Muriel et al. 2019). Their findings underscore the need for tailored policies that address specific cultural and socioeconomic contexts to effectively empower women and promote gender equality in these regions.

2.2 Intra-household decision-making

Understanding the dynamics of intra-household decision-making and its implications for women’s empowerment is crucial in shaping policies and interventions. The empirical evidence so far suggests that women’s bargaining power affects a variety of outcomes (Doss 2013). Munro (2018, 2023) provides an authoritative survey of intra-household experiments and emphasizes the need for a behavioral approach to understand decision-making dynamics. Consistent findings in this literature are that intra-household decisions are rarely efficient (e.g., Kebede et al. (2014), Munro et al. (2014), and Lopez et al. (2015); see also Doss and Quisumbing (2020)), joint decisions are often different than decisions made individually and, in one part, this is because individual behaviour is affected by opportunities for hiding actions from spouses. Echoing this observation, Said et al. (2020) find that women are less generous when they can conceal their allocation decisions, illustrating the significant impact of hidden actions on intra-household dynamics and control over resources.

Recent studies highlight the role of power dynamics, information asymmetry, and social norms in shaping decision outcomes. A lab-in-the-field experimental study in rural India (Tagat et al. 2023) explores how resolving information asymmetries on spousal preferences related to a bundle of private goods on intra-household allocations, may reduce gendered mis-perceptions, especially for men. However, Tagat et al. (2023) note that while provision of information affects beliefs, it may not significantly alter final allocation decisions, indicating the persistence of established gender norms.

In a European context, Campaña et al. (2023) use information from actual intra-household sharing of resources to construct an index to measure the bargaining power of wives in a household. They find that this index shows cross-country variations, with older, more educated, and higher-wage spouses generally having more power in intra-

household decision-making. The study underscores the correlation between individual characteristics, country-level conditions, and bargaining power within households, offering insights into the complexities of decision dynamics across countries.

Some studies try to quantify empowerment by either examining shifts from individual to joint decision making or by examining transfer of decision making from one spouse to another. For example, Yang and Carlsson (2021, 2016) examine spousal decision-making dynamics when it comes to intertemporal choices and find that males in Rural China have a stronger influence than wives and that a substantial share of choice shifts from individual to joint household decisions.² Abbink et al. (2020) conduct a lab-in-the-field experiment in rural Bangladesh regarding risky choices where either spouse can make the decision themselves or transfer it to the other spouse. They found that women were more likely to let their spouses make risky decisions and that this choice was significantly affected by whether the decision could be hidden from the spouse suggesting an imbalance of power.

Another stream of studies examine household's efficiency in decision making. For example, Verschoor et al. (2019) examine resource allocation decisions in a range of household types on the spectrum from unitary to separate-spheres household types in Nigeria, Ethiopia and India. They find that the more separate the decision-making in real life, the less efficient the resource allocation in the experiments. Moreover, in the presence of asymmetric information, spouses in married couples in India, strategically hide income, leading to efficiency losses (Castilla 2019). Lecoutere and Jassogne (2019) link choices from a lab-in-the-field experiment in Uganda with actual investment and resource allocation decisions. They find that intra-household decision-making that supports cooperation and equitable sharing is associated with more equitable access and control over income. Fiala and He (2016) show evidence from Uganda testing unitary, collective, and non-cooperative models of household decision-making based on money allocation experiments. Their results indicate the coexistence of unitary and non-cooperative models, challenging the notion of a one-size-fits-all approach to understanding household decision-making.

Contrary to the prevailing notion of conflicting interests between spouses, Bjorvatn et al. (2020) explore intra-household decision-making in Ethiopia, revealing striking similarities in social preferences and norms between men and women. The study challenges conventional wisdom, showing equal cooperation and altruism between spouses as well as risk and time preferences. Qualitative survey evidence suggests a norm of compensating wives for managing household expenses, providing a unique perspective on intra-household dynamics.

Lecoutere and Wuyts (2021) found that an intervention to increase participatory intra-household decision making in Ugandan agricultural households had a positive impact on women's agency and achievements. Additionally, it contributed to improved household

2. Munro (2018) finds that the fact that joint decisions are not a convex combination of individual decisions is a general theme in this literature.

welfare, thus providing a nuanced perspective on empowering women by involving them in strategic decisions.

Most relevant for our study, in a study focused on Ghana and Uganda, Ambler et al. (2020) assess the validity of experimental measures for intra-household resource control by examining how well willingness to pay to control resources correlates with individual and joint dictator games. Behavior in both tasks is correlated, indicating they measure similar latent variables. In Uganda, experimental data aligns well with survey measures of women’s empowerment, while in Ghana, it does not, highlighting the importance of context in the effectiveness of these measures. Hoel (2015) uses a series of dictator games played between spouses in Kenya to measure the fraction of spouses that respond to asymmetric information, identifying who reacts opportunistically and who does not under public and secret allocations. These decisions are then matched with cross-section survey data about spousal knowledge of income and expenditures at home. Hoel (2015) concludes that cross-section survey data about information between spouses should be interpreted carefully, as it often yields less nuanced insights compared to the more revealing and dynamic findings obtained from experimental data.

In the context of our study country, Almås et al. (2018) measured women’s empowerment in North Macedonia by eliciting women’s willingness to pay to receive a cash transfer instead of their spouse receiving it. Given that households in their sample had already been recipients of a conditional cash transfer (CCT) program, they find that having already been empowered by the CCT (i.e. residing in a municipality where women were offered the CCT) leads, on average, to a lower willingness to sacrifice household income to gain power. They thus, provide evidence that their experimental set-up measures bargaining power in a more effective way than traditional survey-based measures.

3 Methods

The data to construct the index for the A-WEAI and the allocation game were collected at the household and individual level by interviewing men and women within the same household. A field survey of 464 agricultural households was carried out in eight statistical regions of the Republic of North Macedonia (RNM), in accordance to the Nomenclature of Territorial Units for Statistics - NUTS 3 classification.³

Data collection for the A-WEAI and the allocation game was carried out in the pe-

3. NUTS is a geocode standard for referencing the administrative divisions of countries for statistical purposes, developed and regulated by the European Union. The main criterion for selecting the regions and municipalities for the survey was the national NUTS nomenclature that provides a single and uniform breakdown of territorial units at the regional and local level. This nomenclature is the basis for collecting, processing and publishing regional statistics used for planning and running the regional policy in the NM. The selection of the agricultural households in the survey was based on a sample defined in the Farm Accountancy Data Network (FADN) system selection plan for each region and the country. The aim was to get a representative sample in the following three dimensions: region, economic size of the farm and type of agricultural production.

riod from June 20 to July 31, 2018. Twenty enumerators from the National Extension Agency (NEA), were selected as interviewers based on the permanent cooperation with the agricultural producers. Each interview was attended by two enumerators and one supervisor.

A-WEAI was complemented with a dictator/allocation game that allows us to quantify the power balance of men/women within the household. For this purpose, a modification of an allocation game from the experimental economics literature was utilized (Cochard et al. 2016; Engel 2011; Forsythe et al. 1994), that elicits the level of women’s power in decision-making within the household. For reasons we explain momentarily, the allocation game was played first individually and then spouses had to make a joint decision.

3.1 The A-WEAI

We measured women empowerment in five domains in agriculture: 1) decisions about agricultural production, 2) access and decision-making power about productive resources 3) control over the use of income 4) leadership in the community, and 5) time allocation, using A-WEAI (Alkire et al. 2013; Malapit et al. 2020; Malapit et al. 2017). A-WEAI is a weighted average of a sub-index that measures the five domains of empowerment (5DE) and a sub-index of gender parity (GPI). The first sub-index assesses the degree to which women are empowered in the five domains of empowerment in agriculture. The second sub-index, the Gender Parity Index (GPI), measures gender parity within the household. GPI is a relative inequality measure that reflects the inequality in 5DE profiles between the primary adult male and female in each household. GPI measures intra-household inequality and facilitates the analysis of households that lack gender parity. For the A-WEAI data collection, men and women were interview with one household questionnaire and two individual questionnaires.

3.2 The allocation task

After eliciting the necessary information to construct the A-WEAI, subjects received instructions on the allocation task that was adapted from (Cochard et al. 2016). This task allows us to identify spouses that are strongly motivated by maximizing joint payoffs, by maximizing their own payoff, by maximizing their partner’s payoff, or by concerns for equality between partners.

In the allocation task, spouses had to decide between two monetary allocations in denars (€1=61.2 MKD; \$1 = 52.5 MKD at the time of the study) between themselves and their spouse. Each decision was framed as a choice between option A, comprising an equal split of 400 MKD, and option B, comprising the distribution of 600 MKD. The distribution for option B was varied across decisions (see Table 1). Option B is always efficient and a unitary household should always choose option B. However, if individual preferences

matter, there might be a trade-off between equity and efficiency, leading participants to prefer the equal but inefficient option.

In our experiment, we first asked subjects to make individual decisions separately and secretly to each other. Therefore, the male spouse would choose either A or B for each row of Table 1 and similarly for the female spouse. After both spouses made individual choices, they were brought together and were asked to reach to a joint decision for each row of the allocation task. Overall, each couple made 21 choices (7 for the female spouse, 7 for the male spouse and 7 jointly) with the understanding that only of the choices would be realized at the end. The binding choice for each household had been randomly drawn before hand and was printed inside a sealed envelope that was only revealed after the completion of the 21 choice tasks. We acknowledge that spouses could potentially infer behavior in the experiment from the earnings, despite not being given explicit information about the choices made. Hence, we consider our findings to represent a conservative estimate, thus possibly constituting a lower bound of the actual dynamics.

Table 1: Allocation task

Choice	Option A		Option B	
	Self	Other	Self	Other
1	200	200	50	550
2	200	200	100	500
3	200	200	200	400
4	200	200	300	300
5	200	200	400	200
6	200	200	500	100
7	200	200	550	50

Subjects were first given examples and were asked comprehension questions before they proceeded with their choices. Every person saw each row of Table 1 in a separate page in a graphical format as shown in Figure A1 in the Electronic Supplementary Material. All instructions given to subjects along with instructions for the enumerator are reproduced in the Electronic Supplementary Material.

4 Results

4.1 Sample descriptive statistics

Before we proceed with the analysis, some descriptive statistics of our sample for selected variables that are used as controls in the regression models that are estimated later might be worth discussing (see Table A1 in the Electronic Supplementary Material). As shown, the average age of the household couples is 49.54 years old. Males are on average relatively older than females (51.6 vs. 47.5 years old). Males younger than 40 years old compose 17.32% of our sample while the corresponding number for females is 28.5%. The vast

majority of subjects are educated up to hi-school and males are relatively better educated than females. The average number of members present in a household is 3.7 and household on average had more female members than males (female over male ratio is 1.16). Table A1 also shows that it is not uncommon for these households to have adult children living with them, in some cases even older than 40 years old, which is something very common for Southern European countries and Balkan countries in specific.

4.2 Women empowerment

Table 2 shows descriptive statistics for the calculated indexes. The indexes that have been calculated are the five domains of empowerment index (5DE), the disempowerment index (1-5DE), the Gender Parity Index (GPI), the empowerment gap defined as the percentage difference in empowerment scores between males and females, and the Abbreviated-Womans Empowerment in Agriculture Index (A-WEAI) defined as $A-WEAI = 90\% \times 5DE + 10\% \times GPI$.

The average value of the 5DE index is 0.643 for females which is equivalent to say that women are on average empowered in 64.3% of the indicators while males are empowered in 83.4% of the indicators. On the flip-side, the disempowerment score can be interpreted as the opposite of the 5DE index i.e., females are disempowered in 35.7% of the indicators. The average GPI score is 0.838 which is to say that females exhibit empowerment scores that are 83.8% of those of males. This difference with men is reflected to the average empowerment gap which amounts to 16.2% ($= 1-GPI$). Finally, the A-WEAI is a weighted average between 5DE and GPI. The A-WEAI amounts to an overall value of 0.662 and exhibits significant potential for improvement either through improving 5DE or by reducing the empowerment gap between males/females.

Table 2: Descriptive statistics for 5DE, GPI, A-WEAI scores and empowerment gap

	Females		Males	
5DE	0.643	(0.322)	0.834	(0.239)
Disempowerment score (1-5DE)	0.357	(0.322)	0.166	(0.239)
GPI score	0.822	(0.237)	-	-
Empowerment gap	0.178	(0.237)	-	-
AWEAI score	0.661	(0.310)	-	-

Notes: 5DE is the five domains of empowerment score (0 = completely disempowered; 1 = completely empowered). A-WEAI is the Women’s Empowerment in Agriculture Index. GPI is the Gender Parity index score (0 = complete disparity; 1 = complete parity). Mean values and percentages are reported; standard deviations in parentheses.

Figure 1 shows contribution to the disempowerment index of each one of the six indicators that compose the disempowerment index by gender. The red line in the graph is the national average of the disempowerment index. It is obvious that when it comes to group membership, workload and access/decisions to credit, contribution to DAI is about the same between males and females. What seems to contribute more to DAI for females

than men is ownership of assets, control over income use and input in decision making. These three indicators contribute around 34.5% to the value of the DAI for females but only 10.1% to the value of the DAI for males.

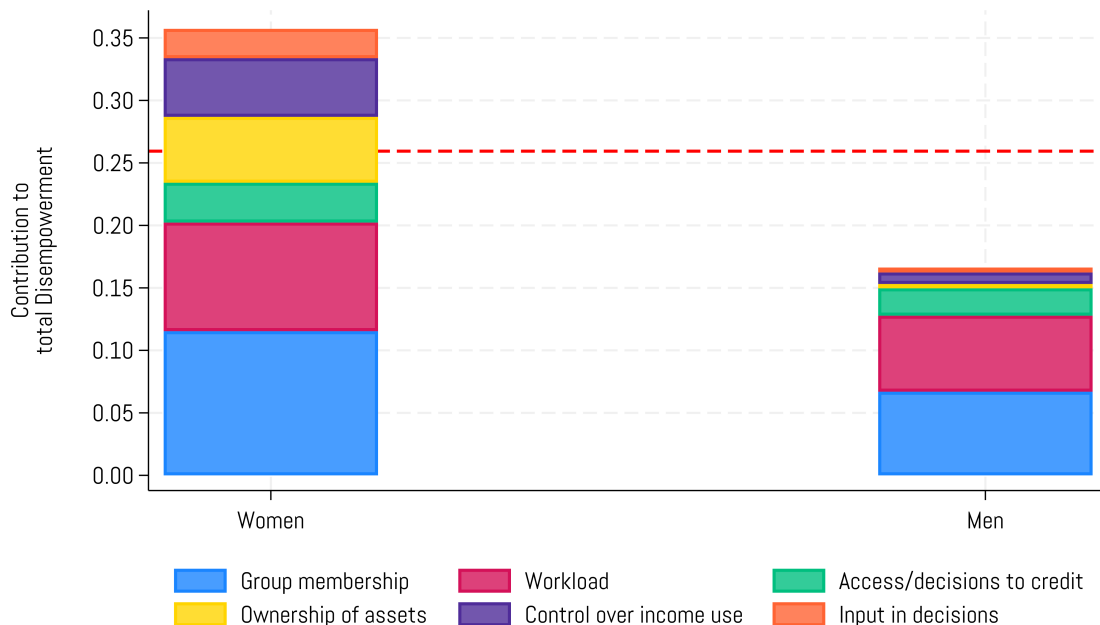


Figure 1: Contribution to disempowerment index (1-5DE) by gender

Note: Red line is the national average of the index.

4.3 The allocation task

The allocation task (see Table 1) allows us to identify participants who prefer their own payoff maximization (i.e., selfish), joint payoff maximization or have preferences such as inequality aversion or altruism.⁴ Table 1 shows that about half of all households chose efficient allocations when they decided individually (49.67% of females and 50.54% of males). When couples had to make joint decisions, more couples were able to agree in efficient allocations (percentage rises to 59.44%). The shifts to a higher proportion of efficient allocations are statistically significant at the 5% level based on Wilcoxon signed-rank tests and proportion tests.

4. Observations from the allocation task can be aggregated to identify participants who are maximizing the couples' payoff (always choosing option B), those who are maximizing own payoff (choosing based on the pattern AAABBBB or AABBBBBB across the 7 choices) or those who maximize their partner's payoff (choosing the opposite pattern i.e., BBBBAAA or BBBBBAAA across the 7 choices). Participants that choose option A in choice task 4 are characterized as irrational. Additionally, we can further identify participants who choose option A (the equal option) at least once, but are not classified to any of the categories mentioned above, as suggesting that they are sensitive to the efficiency-equality trade-off. For these participants we calculate a ratio of 'own payoff' to 'couples' payoff' aggregated over all choices. This corresponds to the share of the total payoff retained for the individual. If this share equals 0.5, subjects are classified as symmetric; if this share is greater (lower) than 0.5, participants are classified as asymmetric-selfish (asymmetric-altruistic).

For individual decisions, 11.06% of females and 12.36% of males seek to maximize their own payoff. The number of males seeking to maximize their own payoff drops when a joint decision has to be made but it is exactly zero for females suggesting that no woman seeks to maximize her payoff when in a joint decision environment. This asymmetric effect between males and females possibly reveals that males have a higher bargaining power for intra-household allocations. In addition, a small proportion of subjects chose to maximize the other spouse’s payoffs when they made individual decisions, which was significantly reduced under the joint decision making mode.

According to Wilcoxon signed-rank tests the distribution between males and females does not differ for any of the classifications of Table 3 as far as the individual decision making is concerned. Similar conclusions are in place if we use proportions tests. This is to say that male and females are classified in the various groups of Table 3 in similar proportions. However, we do find differences when we compare individuals with joint decisions. For example, the number of selfish members reduces under joint decision making for both genders, but the drop for females is down to zero. For males, a small percentage of them still choose maximizing their own payoff even when jointly deciding between options, which highlights the fact that males have a higher intra-household allocation power than females.

Another result coming out from Table 3 is that under joint decision making, males and females choose more often to maximize their joint payoff than when choosing individually.

Table 3: Classification of individual and joint decision making by gender

	Individual decisions				Joint decisions			
	Females		Males		Females		Males	
Max own payoff	51	11.06%	57	12.36%	0 [†]	0.00%	29 [‡]	6.29%
Max other’s payoff	23	4.99%	28	6.07%	0 [†]	0%	13 [‡]	2.82%
Max couple’s payoff	229	49.67%	233	50.54%	274 [†]	59.44%	274 [‡]	59.44%
Irrational	15	3.25%	16	3.47%	17	3.69%	17	3.69%
<i>Sensitive to efficiency-equality trade-off:</i>								
Symmetric	36	7.81%	33	7.16%	37	8.03%	37	8.03%
Asymmetric-selfish	70	15.18%	62	13.45%	47 [†]	10.20%	57	12.36%
Asymmetric-altruistic	37	8.02%	32	6.94%	86 [†]	18.66%	34	7.38%
Total households	461							

Notes: The † symbol indicates a statistically significant difference with female decision making at the individual stage according to a Wilcoxon signed-rank test and a proportion test at the 5% significance level. A ‡ symbol indicates a statistically significant difference with male decision making at the individual stage according to a Wilcoxon signed-rank test and a proportion test at the 5% significance level.

4.4 The allocation game and women empowerment

In order to correlate behavior in the experimental part of the study with values of the empowerment indexes, we run random effects logit regressions where the dependent variable is whether a subject makes an inefficient allocation decision (chooses option A in a row of Table 1) or an efficient one (chooses option B). The basic specification uses dummies for the mode of the decision environment (female decides alone, male decides alone, couple makes joint decisions), the money that the more efficient option (option B) allocates to the female (in units of 100 denars), and the value of the 5DE index for females and males as elicited through the survey questions. Because it is likely that these three basic sets of variables affect the probability of choice non-linearly, our basic setup contains all two-way and three-way interaction terms of these basic variables. Information criteria values like Akaike's information criteria are always in favor of the model with the interaction terms, so we base our findings on this model.

Because of the interaction terms and the non-linearity of the logit model, we rely on graphical display of marginal effects to interpret our findings. Raw coefficient estimates are available in the Electronic Supplementary Material.

Figure 2 shows the marginal effects (ME) and associated Confidence Intervals (CI) for an increase of 100 denars in the amount of money allocated to the female in option B. Note that more money allocated to the female should be interpreted as less money allocated to the male partner. In addition, given that option B varies the money allocated to the female partner from 50 to 550 denars, going down from the first row of Table 1 to the last row should be interpreted as 5 times the magnitude of the marginal effect shown in Figure 2. Figure 2 also depicts a vertical red line on zero and consequently any CI crossing over the red line should be interpreted as a null effect. Given that most CI lines do not cross the red line, we can safely conclude that subjects are responsive to how money are allocated between partners. Furthermore, the CI intervals get closer to the red line for higher values of the female 5DE (higher values of the 5DE should be interpreted as more empowered females; e.g. a 100% value of the 5DE means complete empowerment). This suggests that for more empowered females, increasing the money allocated to the female partner does not significantly affect the probability of inefficient allocations.

Let's, for example, first interpret the CI lines for the 0% 5DE (totally disempowered females). The CI intervals show that when males make decisions alone but also when spouses make joint decisions, more money allocated to the female partner results in a higher probability of choosing an inefficient allocation for the household. However, these effects are diminished for higher values of empowerment so that for a totally empowered female (100% 5DE), males are not more likely to make inefficient allocation (alone or jointly) when money allocated to the female increase. In fact, for a totally empowered female, increasing the money allocated to the female results in a lower probability of choosing an inefficient allocation (upper part of the graph; the CI line spans at the left of

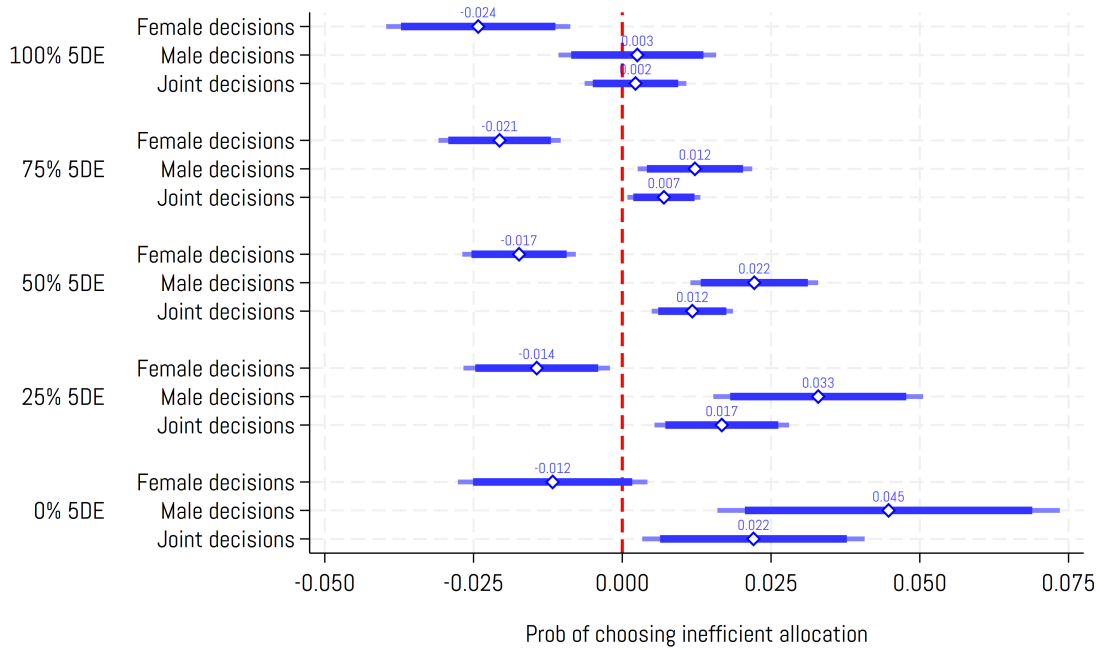


Figure 2: Marginal effect (and 95% CI) of an increase of 100 Denars on the money allocated to the Female household member on the probability of choosing an inefficient allocation

Note: A 100% for 5DE can be interpreted as a woman that achieves empowerment in 100% of the five domains of empowerment.

the red line).

We also run additional models and specifications as follows: i) a model where sample is constrained to rational households i.e., it excludes households that chose the fourth choice of Table 1 where the ‘irrational’ option A was chosen (because this is the dominated choice), ii) same as i) but also drops the fourth choice that exhibits very low variability, iii) same as the baseline model but with additional demographic controls (at the cost of a lower sample size due to missing observations), iv) same as the baseline model but where 5DE index is replaced with A-WEAI.⁵

Marginal effects are displayed in the Electronic Supplementary Material and are virtually identical to Figure 2, providing comfort to the robustness of our findings.

5 Discussion and Conclusions

Quantifying women’s empowerment and evaluating gender disparities play a pivotal role in shaping policies that address the challenges women face, particularly in rural areas. These metrics are more than numbers since they help form strategies aimed at creating gender-responsive policies. By accurately measuring where women stand in terms of em-

5. Recall that for the 5DE we can calculate a separate value for males and for females while A-WEAI is calculated only for females.

powerment and access to resources, policymakers can tailor interventions that specifically target the barriers hindering women’s progress. This approach is essential for fostering women’s empowerment and gender parity, which in turn, can significantly contribute to enhancing rural economies and promoting broader economic development.

A-WEAI has been at the forefront of these efforts, offering a framework for assessing women’s empowerment and gender equality within the agricultural households. The A-WEAI examines various dimensions of empowerment, including women’s access to and control over critical resources, their participation in decision-making processes, and their ability to assert their rights within both the household and the broader community. By covering these key domains, the A-WEAI provides invaluable insights into the status of women’s empowerment.

Despite its contributions, the A-WEAI’s methodology and focus have sparked discussions and criticisms. One of the main concerns is the reliance on survey-based methods, which may not fully capture the nuances of empowerment or accurately reflect the conditions of women in different cultural contexts. Survey-based methods could introduce bias by overlooking the complex dynamics of intra-household relationships and decision-making processes, potentially misrepresenting the intra-household bargaining dynamics. For example, Addison et al. (2021) highlight the need to consider the broader socio-economic and cultural factors that influence empowerment, suggesting that a more nuanced approach may be necessary to understand and effectively address gender disparities.

In this study, we sought to contribute to the ongoing debate surrounding the effectiveness of the A-WEAI by integrating it with an innovative approach. Specifically, we supplemented the A-WEAI measurement obtained from 464 agricultural households in the Republic of North Macedonia with an allocation task designed to quantitatively assess intra-household bargaining dynamics. This methodological innovation allowed us to explore the predictive value of A-WEAI scores concerning these dynamics.

Despite the acknowledged limitations found in the existing literature concerning the A-WEAI (Addison et al. 2021; Farnworth et al. 2018; Gupta et al. 2019), our study reveals a significant correlation between A-WEAI and intra-household bargaining power, suggesting that both may tap into similar underlying constructs of empowerment and that the A-WEAI can serve as a reliable predictor of bargaining power within households. As in many studies, we acknowledge however the possibility that our findings are dependent upon the context of our study; i.e., specific to a particular sample in a specific country at a single point in time. Additionally, the higher level of education among farmers in North Macedonia, compared to those in less developed countries, may have impacted their understanding and engagement with the allocation task, potentially skewing the findings. This aspect underscores the importance of considering socio-demographic factors when interpreting the results of empowerment measurements.

Therefore, while our study provides valuable evidence supporting the utility of the A-WEAI as an indicator of intra-household dynamics, it also highlights the need for further

research. Future studies should aim to validate our findings across different contexts, samples, countries, and time periods to ascertain the robustness of the A-WEAI as a tool for measuring women's empowerment and intra-household bargaining power. Despite these considerations, our research marks a significant step forward in understanding the complexities of empowerment and decision-making within households, affirming the potential of tools like the A-WEAI to yield meaningful insights into the dynamics of gender and power in agricultural communities.

Acknowledgements

This study was supported in the framework of the UN Women project “Promoting Gender Responsive Policies and Budgets: Towards Transparent, Inclusive and Accountable Governance in the Republic of North Macedonia”, funded by the Swiss Agency for Development and Cooperation and the Swedish International Development Cooperation Agency – Sida.

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Electronic Supplementary Material of Women's Empowerment and Intra-Household Bargaining Power

Marina Nacka^{*}, Andreas C. Drichoutis[†] and Rodolfo M. Nayga[‡]

Experimental instructions

FEMALE QUESTIONNAIRE

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Date: _____

Start time (HH:MM): ____ : ____

Area: _____

Interviewer name: _____

Welcome!

[Interviewer will read aloud instructions. Text in brackets are for the interviewer only and subjects should not be able to read these parts.]

[Ask the male/husband/partner to leave the room and to leave you alone with the wife in order to administer the questionnaire in private.]

In this part of the survey you will be asked to make a series of very simple money allocation decisions. In order to better understand what you will be doing, we will provide some instructions and examples. If you follow the instructions carefully, you will be able to earn money. Money will be given to you at the end of the questionnaire in *a sealed envelope in cash*.

Your earnings will also depend on the decision by your partner and on luck. You will be asked to make multiple decisions. One of these decisions is randomly chosen to actually count toward your earnings. So each decision that you make is very important because it could finally count toward your earnings.

Note: All of your decisions are anonymous: they are neither revealed to your partner nor to any other participant, even at the completion of the experiment.

In total you will make 14 decisions. Each decision consists of choosing between two allocations of MKD between yourself and your partner. You will make the first 7 decisions in private by yourself. Your husband will not be able to read, listen or know your decision. I, the interviewer, will take any step necessary to keep this information private. Your husband will complete or has completed a similar questionnaire/task.

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After you are both done, you will be asked to consider 7 allocation tasks together and jointly reach an agreed outcome. Thus, in total, you household will make 21 allocation decisions as follows: a) 7 decisions by you in private: labelled as F1 to F7, b) 7 decisions by your husband in private: labelled as M1 to M7 c) 7 joint decisions: labelled as J1 to J7.

At the end, one decision will be randomly chosen for payment in the following manner: I have with me a sealed envelope. A computer was used by the researchers of this study to randomly select one of the 21 decisions. Then, this decision was printed in a piece of paper using one of the labels below and the paper was put in an envelope:

F1	F2	F3	F4	F5	F6	F7	M1	M2	M3	M4	M5	M6	M7	J1	J2	J3	J4	J5	J6	J7
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----





I, the interviewer, have no knowledge of which decision has been selected by the researchers of this study. The envelope was given to me sealed along with the rest of material. After you are done with making decisions, I will open this envelope in front of you. I will then check your response in the randomly selected decision and put the money for you and your partner/husband in separate envelopes. The envelopes with the money in cash will be sealed and will be given to you in private. I will not share your response or how much money you made with anyone. This is private information and I guarantee to keep all information confidential.

The reason we follow this procedure for payment is because funding for this research is provided by the United Nations and researchers will be audited for all the money they spent. Thus, it was required to have an independent mechanism on how to randomly decide payments for individuals that can be later audited.

--- Page break ---

Let's start with an example to make sure you'll understand well the tasks to follow. Assume you are given this choice for allocating money between you and your husband:

Training: Choice 1





Option A		Option B	
			
My partner 100 MKD	Me 100 MKD	My partner 150 MKD	Me 80 MKD
<input checked="" type="checkbox"/> I choose Option A		<input type="checkbox"/> I choose Option B	

Assume that in this choice, you chose "Option A" as indicated above. Please write down:

- a) How much are your earnings:
[Interviewer: Write down the amount of money the respondent will freely say. Don't guide her response. Explain, if necessary, the correct response.]
- b) The earnings of your partner/husband are:
[Interviewer: Write down the amount of money the respondent will freely say. Don't guide her response. Explain, if necessary, the correct response.]

Now, assume you are given this choice for allocating money between you and your husband:

Training: Choice 2

Option A		Option B	
			
My partner	Me	My partner	Me
100 MKD	100 MKD	160 MKD	70 MKD
<input type="checkbox"/> I choose Option A		<input checked="" type="checkbox"/> I choose Option B	

Assume that in this choice, you chose “**Option B**” as indicated above. Please write down:

- a) How much are your earnings: MKD
[Interviewer: Write down the amount of money the respondent will freely say. Don't guide her response. Explain, if necessary, the correct response.]
- b) The earnings of your partner/husband are: MKD
[Interviewer: Write down the amount of money the respondent will freely say. Don't guide her response. Explain, if necessary, the correct response.]

For each of the next 7 choices, please select whether you prefer the allocation between you and your partner indicated in Option A or Option B.

--- Page break ---



Choice No F1

Option A		Option B	
			
My partner	Me	My partner	Me
200 MKD	200 MKD	550 MKD	50 MKD
<input type="checkbox"/> I choose Option A		<input type="checkbox"/> I choose Option B	

--- Page break ---

Choice No F2

Option A





My partner
200 MKD

Me
200 MKD

I choose Option A

Option B



My partner
500 MKD



Me
100 MKD

I choose Option B

--- Page break ---

Choice No F3

Option A





My partner
200 MKD

Me
200 MKD

I choose Option A

Option B



My partner
400 MKD



Me
200 MKD

I choose Option B

--- Page break ---

Choice No F4

Option A





My partner
200 MKD

Me
200 MKD

I choose Option A

Option B



My partner
300 MKD



Me
300 MKD

I choose Option B

--- Page break ---

Choice No F5

Option A





My partner
200 MKD

Me
200 MKD

I choose Option A

Option B



My partner
200 MKD



Me
400 MKD

I choose Option B

--- Page break ---

Choice No F6

Option A





My partner
200 MKD

Me
200 MKD

I choose Option A

Option B



My partner
100 MKD



Me
500 MKD

I choose Option B

--- Page break ---

Choice No F7

Option A





My partner
200 MKD

Me
200 MKD

I choose Option A

Option B



My partner
50 MKD

Me
550 MKD

I choose Option B

MALE QUESTIONNAIRE

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Date: _____

Start time (HH:MM): ____ : ____

Area: _____

Interviewer name: _____

Welcome!

[Interviewer will read aloud instructions. Text in brackets are for the interviewer only and subjects should not be able to read these parts.]

[Ask the female/wife/partner to leave the room and to leave you alone with the husband in order to administer the questionnaire in private.]

In this part of the survey you will be asked to make a series of very simple money allocation decisions. In order to better understand what you will be doing, we will provide some instructions and examples. If you follow the instructions carefully, you will be able to earn money. Money will be given to you at the end of the questionnaire in *a sealed envelope in cash*.

Your earnings will also depend on the decision by your partner and on luck. You will be asked to make multiple decisions. One of these decisions is randomly chosen to actually count toward your earnings. So each decision that you make is very important because it could finally count toward your earnings.

Note: All of your decisions are anonymous: they are neither revealed to your partner nor to any other participant, even at the completion of the experiment.

In total you will make 14 decisions. Each decision consists of choosing between two allocations of MKD between yourself and your partner. You will make the first 7 decisions in private by yourself. Your wife will not be able to read, listen or know your decision. I, the interviewer, will take any step necessary to keep this information private. Your wife will complete or has completed a similar questionnaire/task.

After you are both done, you will be asked to consider 7 allocation tasks together and jointly reach an agreed outcome. Thus, in total, you household will make 21 allocation decisions as follows: a) 7 decisions by you in private: labelled as M1 to M7, b) 7 decisions by your wife in private: labelled as F1 to F7 c) 7 joint decisions: labelled as J1 to J7.

At the end, one decision will be randomly chosen for payment in the following manner: I have with me a sealed envelope. A computer was used by the researchers of this study to randomly select one of the 21 decisions. Then, this decision was printed in a piece of paper using one of the labels below and the paper was put in an envelope:

M1	M2	M3	M4	M5	M6	M7	F1	F2	F3	F4	F5	F6	F7	J1	J2	J3	J4	J5	J6	J7
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----



I, the interviewer, have no knowledge of which decision has been selected by the researchers of this study. The envelope was given to me sealed along with the rest of material. After you are done with making decisions, I will open this envelope in front of you. I will then check your response in the randomly selected decision and put the money for you and your partner/husband in separate envelopes. The envelopes with the money in cash will be sealed and will be given to you in private. I will not share your response or how much money you made with anyone. This is private information and I guarantee to keep all information confidential.

The reason we follow this procedure for payment is because funding for this research is provided by the United Nations and researchers will be audited for all the money they spent. Thus, it was required to have an independent mechanism on how to randomly decide payments for individuals that can be later audited.

--- Page break ---

Let's start with an example to make sure you'll understand well the tasks to follow. Assume you are given this choice for allocating money between you and your husband:

Training: Choice 1




Option A		Option B	
			
My partner 100 MKD	Me 100 MKD	My partner 150 MKD	Me 80 MKD
<input checked="" type="checkbox"/> I choose Option A		<input type="checkbox"/> I choose Option B	

Assume that in this choice, you chose "Option A" as indicated above. Please write down:

- a) How much are your earnings:
[Interviewer: Write down the amount of money the responded will freely say. Don't guide her response. Explain, if necessary, the correct response.]
- b) The earnings of your partner/husband are:
[Interviewer: Write down the amount of money the responded will freely say. Don't guide her response. Explain, if necessary, the correct response.]

Now, assume you are given this choice for allocating money between you and your husband:

Training: Choice 2

Option A		Option B	
			
My partner	Me	My partner	Me
100 MKD	100 MKD	160 MKD	70 MKD
<input type="checkbox"/> I choose Option A		<input checked="" type="checkbox"/> I choose Option B	

Assume that in this choice, you chose “**Option B**” as indicated above. Please write down:

- a) How much are your earnings: MKD
[Interviewer: Write down the amount of money the responded will freely say. Don't guide her response. Explain, if necessary, the correct response.]
- b) The earnings of your partner/husband are: MKD
[Interviewer: Write down the amount of money the responded will freely say. Don't guide her response. Explain, if necessary, the correct response.]

For the next 7 choices, please select whether you prefer the allocation between you and your partner indicated in Option A or Option B.

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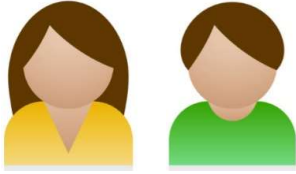
Choice No M1

Option A		Option B	
			
My partner	Me	My partner	Me
200 MKD	200 MKD	550 MKD	50 MKD
<input type="checkbox"/> I choose Option A		<input type="checkbox"/> I choose Option B	

--- Page break ---

Choice No M2

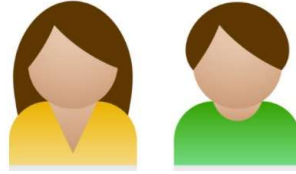
Option A



My partner Me
200 MKD 200 MKD

I choose Option A

Option B



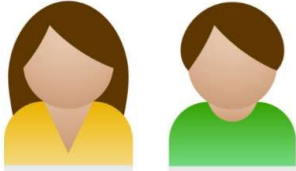
My partner Me
500 MKD 100 MKD

I choose Option B

--- Page break ---

Choice No M3

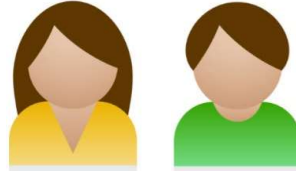
Option A



My partner Me
200 MKD 200 MKD

I choose Option A

Option B



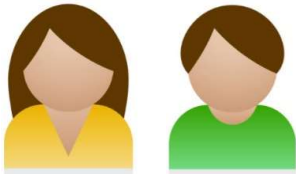
My partner Me
400 MKD 200 MKD

I choose Option B

--- Page break ---

Choice No M4

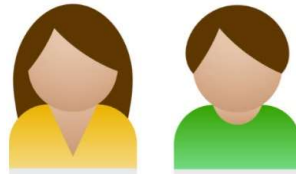
Option A



My partner Me
200 MKD 200 MKD

I choose Option A

Option B

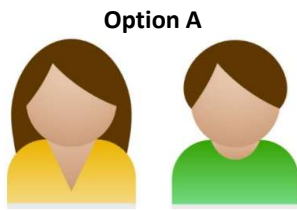


My partner Me
300 MKD 300 MKD

I choose Option B

--- Page break ---

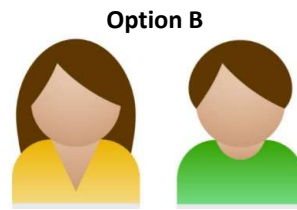
Choice No M5



My partner
200 MKD

Me
200 MKD

I choose Option A



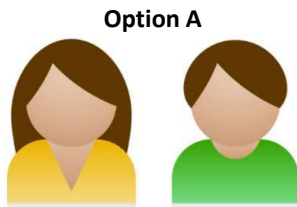
My partner
200 MKD

Me
400 MKD

I choose Option B

--- Page break ---

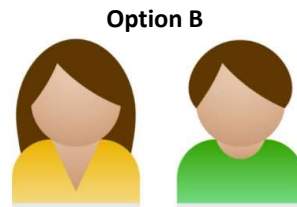
Choice No M6



My partner
200 MKD

Me
200 MKD

I choose Option A



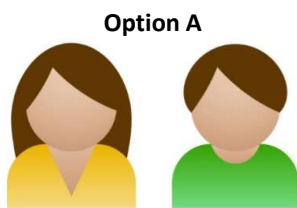
My partner
100 MKD

Me
500 MKD

I choose Option B

--- Page break ---

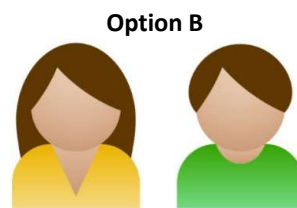
Choice No M7



My partner
200 MKD

Me
200 MKD

I choose Option A



My partner
50 MKD

Me
550 MKD

I choose Option B

JOINT QUESTIONNAIRE

[PRINT EVERYTHING BUT THIS PAGE]

--- Page break ---

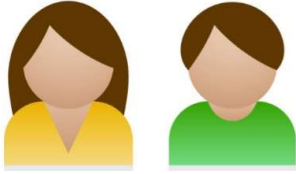
[Ask the husband and wife partner to join each other in the room. Then administer the choice tasks J1 to J7. You need to make sure that the couple negotiates their choice. A choice (either option A or option B) is considered valid only if both partners have agreed. You should not accept a choice that is forced by one of the partners while the other one remains silent. If this happens, you should say: 'I remind you that you should reach a joint decision' and ask the other partner if he/she agrees with the decision made by her partner. If not, you should instruct them to negotiate again and reach a joint decision. This process should be repeated for as long as needed, until both partners agree to a joint decision.]

Now you need to reach a decision jointly. Please talk to each other and for each choice task labelled as J1 to J7, indicate if you prefer option A or option B. Note, that I am instructed to accept a decision as valid, only if you both consent on the chosen option.

--- Page break ---

Choice No J1

Option A

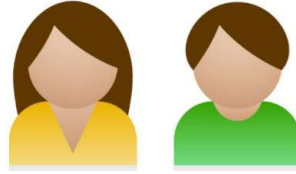


Wife
200 MKD

Husband
200 MKD

We choose Option A

Option B



Wife
550 MKD

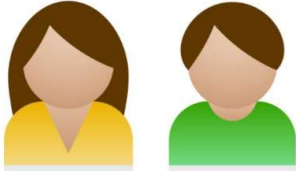
Husband
50 MKD

We choose Option B

--- Page break ---

Choice No J2

Option A

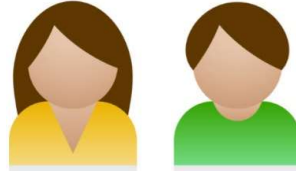


Wife
200 MKD

Husband
200 MKD

We choose Option A

Option B



Wife
500 MKD

Husband
100 MKD

We choose Option B

--- Page break ---

Choice No J3

Option A

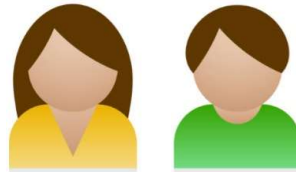


Wife
200 MKD

Husband
200 MKD

We choose Option A

Option B



Wife
400 MKD

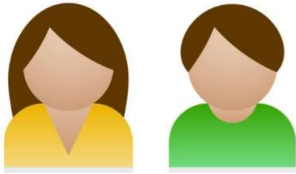
Husband
200 MKD

We choose Option B

--- Page break ---

Choice No J4

Option A

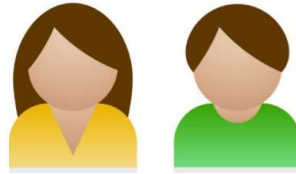


Wife
200 MKD

Husband
200 MKD

We choose Option A

Option B



Wife
300 MKD

Husband
300 MKD

We choose Option B

--- Page break ---

Choice No J5

Option A

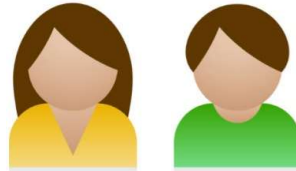


Wife
200 MKD

Husband
200 MKD

We choose Option A

Option B



Wife
200 MKD

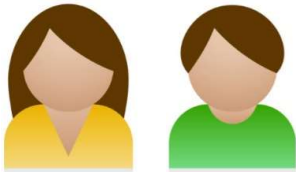
Husband
400 MKD

We choose Option B

--- Page break ---

Choice No J6

Option A

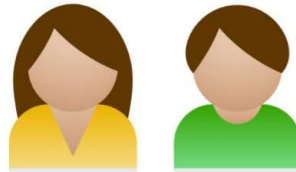


Wife
200 MKD

Husband
200 MKD

We choose Option A

Option B



Wife
100 MKD

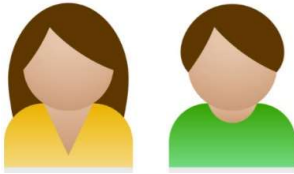
Husband
500 MKD

We choose Option B

--- Page break ---

Choice No J7

Option A

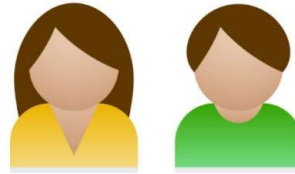


Wife
200 MKD

Husband
200 MKD

We choose Option A

Option B



Wife
50 MKD

Husband
550 MKD

We choose Option B

End time (HH:MM): ____ : ____

--- Page break ---

[Interviewer Instructions – AFTER ALL TASKS HAVE BEEN COMPLETED]

[After tasks F1-F5, M1-M7 and J1-J7 are completed, the interviewer will have to unseal the sealed envelope in front of the couple and put the money in the envelopes. Read the text below:]

- Now that you have completed all 21 decisions, it is time to randomly select one of these decisions for payment. As I explained before, one decision has already been selected randomly, was printed in a piece of paper and was put in this envelope.

[Show envelope and CHECK that the number outside the envelope is the SAME as the questionnaire ID number.]

[Open the envelope, take out the piece of paper and read out loud the label of the decision. Then say:]

- Now I need to prepare the envelopes with the money, can I please do it in private?

[The interviewer needs to find a way to do this in private, without the household members looking at him/her when s/he puts the money inside the envelope. Some options: a) get outside of the house in order to be alone b) ask them to leave you alone for 5 min in the room c) ask them if you can go to another room to prepare the envelopes.]

[closely observe the labelled chosen decision on the piece of paper. Go back to the questionnaire and find the page where the respective choice was shown to the subjects. For example, if the label in the envelope is F5, then you should review the "Choice No F5". If the written label in the envelope is J4, then you should review the "Choice No J4".

When you find the respective choice, you need to check if the husband/wife have selected 'Option A' or 'Option B'.

If 'Option A' was selected then you should put 200 MKD in the envelope labeled "To MRs....." (for the wife) and 200 MKD to the envelope labeled "To Mr...." (for the husband) (for a total of 400 MKD).

If 'Option B' was selected then you should put the corresponding MKD of the wife to the envelope labeled "To MRs....." and the corresponding MKD of the husband to the envelope labeled "To Mr...." (for a total of 600 MKD).

You should be very careful on how you split the money in order to put the correct amount of money in the envelopes. In addition, the husband and wife should not know how much money you are putting in the envelopes and should not observe you how you split the money.

After, you put the money to the envelopes, write the names of the husband/wife on the outside of the corresponding envelope and give the envelopes with the money to the wife/husband.]

[Then ask the husband to leave the room to ask some final questions to the wife.]

--- Page break ---

Additional questions

Q22f. What do you plan to do with the money you just earned? [open ended question; write down one or two responses]:

a. _____

b. _____

Q23f. Did you at any level doubt that the decision that was printed inside the envelope was truly randomly selected?

No, I trust that the researchers did their best in randomly selecting the choice

Yes, I don't believe that the decision was selected in a random way.

Q24f. [If 'Yes' was selected in Q23] Why do you think the researchers did not randomly select one of the decisions?

[Then ask the wife to leave the room to ask some final questions to the husband.]

Q22m. What do you plan to do with the money you just earned? [open ended question; write down one or two responses]:

a. _____

b. _____

Q23m. Did you at any level doubt that the decision that was printed inside the envelope was truly randomly selected?

No, I trust that the researchers did their best in randomly selecting the choice

Yes, I don't believe that the decision was selected in a random way.

Q24m. [If 'Yes' was selected in Q23m] Why do you think the researchers did not randomly select one of the decisions?

Additional Tables and Regressions

Table A1: Descriptive statistics

	Females	Males
Age	47.46	51.63
	49.54	
Age < 40 yo	28.57%	17.32%
<i>Education</i>		
Up to primary school	28.10%	16.96%
Up to hi-school	58.17%	66.74%
University or higher	13.73%	16.30%
<i>Household characteristics</i>		
Received paid maternity leave	28.76%	
Farm accountancy	88.91%	
<i>Responsible person for farm accountancy is ...</i>		
Male	35.14%	
Female	9.09%	
Both male & female	52.83%	
Other	2.95%	
<i>Household composition</i>		
Household size	3.73	
N of females	1.87	
N of males	1.85	
Female over male ratio	1.16	
Male children < 18 yo	13.85%	
Male children between 18-40 yo	27.49%	
Male children > 40 yo	2.81%	
Female children < 18 yo	14.50%	
Female children between 18-40 yo	17.75%	
Female children > 40 yo	0.43%	

1. Model (1): Baseline

```

Random-effects logistic regression      Number of obs   = 9,051
Group variable: decisionset           Number of groups = 1,293

Random effects u_i ~ Gaussian          Obs per group:
                                         min = 7
                                         avg = 7.0
                                         max = 7

Integration method: mvaghermite        Integration pts. = 12

Log pseudolikelihood = -3648.5489      Wald chi2(17)   = 85.14
                                         Prob > chi2     = 0.0000

```

(Std. err. adjusted for 431 clusters in hhid)

		Robust				
choice		Coefficient	std. err.	z	P> z	[95% conf. interval]
mode						
Female alone		3.470012	.8696936	3.99	0.000	1.765444 5.17458
Male alone		-.0179451	.9838605	-0.02	0.985	-1.946276 1.910386

moneyF	.3188256	.1870092	1.70	0.088	-.0477057	.6853569
mode#c.moneyF						
Female alone	-.8619165	.2363258	-3.65	0.000	-1.325106	-.3987265
Male alone	.0558765	.2417568	0.23	0.817	-.4179582	.5297112
fiveDEF	1.169141	.6960149	1.68	0.093	-.1950236	2.533305
mode#c.fiveDEF						
Female alone	-.5782552	.7456066	-0.78	0.438	-2.039617	.8831068
Male alone	.3462605	.7071024	0.49	0.624	-1.039635	1.732156
c.moneyF#c.fiveDEF	-.3391781	.1543659	-2.20	0.028	-.6417298	-.0366265
mode#c.moneyF#c.fiveDEF						
Female alone	.2384947	.2107072	1.13	0.258	-.1744837	.6514732
Male alone	-.1279228	.1778687	-0.72	0.472	-.476539	.2206933
moneyF	0 (omitted)					
fiveDEM	.1663065	.9592305	0.17	0.862	-1.713751	2.046364
mode#c.fiveDEM						
Female alone	-1.848737	.9913064	-1.86	0.062	-3.791662	.0941882
Male alone	.1608412	1.054266	0.15	0.879	-1.905482	2.227165
c.moneyF#c.fiveDEM	.0688156	.2040606	0.34	0.736	-.3311359	.4687671
mode#c.moneyF#c.fiveDEM						
Female alone	.3924279	.274954	1.43	0.154	-.1464721	.931328
Male alone	.0723292	.2534697	0.29	0.775	-.4244622	.5691207
_cons	-4.146322	.8812154	-4.71	0.000	-5.873472	-2.419171
/lnsig2u	1.8112	.1021361			1.611017	2.011383
sigma_u	2.473415	.1263125			2.237834	2.733797
rho	.6502987	.0232268			.6035238	.69435

2. Model (2): Like model (1) but excludes irrational households

Random-effects logistic regression
Group variable: decisionset

Number of obs = 8,463
Number of groups = 1,209

Random effects u_i ~ Gaussian

Obs per group:
min = 7
avg = 7.0
max = 7

Integration method: mvaghermite

Integration pts. = 12

Log pseudolikelihood = -3321.1411

Wald chi2(17) = 82.18
Prob > chi2 = 0.0000

(Std. err. adjusted for 403 clusters in hhid)

choice	Coefficient	Robust std. err.	z	P> z	[95% conf. interval]	
mode						
Female alone	3.217175	.8839127	3.64	0.000	1.484738	4.949612
Male alone	-.6795569	.9940349	-0.68	0.494	-2.62783	1.268716
moneyF	.2679608	.1900934	1.41	0.159	-.1046154	.640537
mode#c.moneyF						
Female alone	-.8497346	.2444897	-3.48	0.001	-1.328926	-.3705436
Male alone	.1714335	.2470651	0.69	0.488	-.3128052	.6556722
fiveDEF	1.386143	.6945003	2.00	0.046	.0249476	2.747339
mode#c.fiveDEF						
Female alone	-.5048671	.778461	-0.65	0.517	-2.030623	1.020888

Male alone		.4549491	.7422357	0.61	0.540	-.9998062	1.909704
c.moneyF#c.fiveDEF		-.3069323	.1565717	-1.96	0.050	-.6138072	-.0000573
mode#c.moneyF#c.fiveDEF							
Female alone		.2282713	.2215185	1.03	0.303	-.2058969	.6624395
Male alone		-.1990562	.1871867	-1.06	0.288	-.5659354	.167823
moneyF		0	(omitted)				
fiveDEM		-.4569542	.9655304	-0.47	0.636	-2.349359	1.435451
mode#c.fiveDEM							
Female alone		-1.648693	1.023404	-1.61	0.107	-3.654528	.3571415
Male alone		.7454421	1.053605	0.71	0.479	-1.319585	2.810469
c.moneyF#c.fiveDEM		.1227739	.2083122	0.59	0.556	-.2855105	.5310583
mode#c.moneyF#c.fiveDEM							
Female alone		.3682613	.2886019	1.28	0.202	-.197388	.9339106
Male alone		.0032146	.262996	0.01	0.990	-.5122481	.5186772
_cons		-3.855404	.8705188	-4.43	0.000	-5.561589	-2.149218
/lnsig2u		1.588175	.0998605			1.392452	1.783898
sigma_u		2.212421	.1104667			2.006167	2.43988
rho		.5980453	.0240052			.5502311	.6440647

3. Model (3): Like model (2) but excludes fourth choice in allocation task

Random-effects logistic regression
Group variable: decisionset
Random effects u_i ~ Gaussian
Integration method: mvaghermite
Log pseudolikelihood = -2923.8322

Number of obs = 7,254
Number of groups = 1,209
Obs per group:
min = 6
avg = 6.0
max = 6
Integration pts. = 12
Wald chi2(17) = 85.05
Prob > chi2 = 0.0000

(Std. err. adjusted for 403 clusters in hhid)

choice	Coefficient	Robust std. err.	z	P> z	[95% conf. interval]	
mode						
Female alone	3.458866	.9420446	3.67	0.000	1.612492	5.305239
Male alone	-.6913447	1.057212	-0.65	0.513	-2.763441	1.380752
moneyF	.2767801	.1987899	1.39	0.164	-.112841	.6664012
mode#c.moneyF						
Female alone	-.8862829	.2504756	-3.54	0.000	-1.377206	-.3953597
Male alone	.1795242	.255708	0.70	0.483	-.3216543	.6807026
fiveDEF	1.455505	.7623014	1.91	0.056	-.0385782	2.949588
mode#c.fiveDEF						
Female alone	-.4724076	.8425203	-0.56	0.575	-2.123717	1.178902
Male alone	.4626059	.8022023	0.58	0.564	-1.109682	2.034894
c.moneyF#c.fiveDEF	-.3221517	.1641719	-1.96	0.050	-.6439228	-.0003806
mode#c.moneyF#c.fiveDEF						
Female alone	.2508064	.231567	1.08	0.279	-.2030566	.7046695
Male alone	-.209308	.196043	-1.07	0.286	-.5935452	.1749292

moneyF	0 (omitted)						
fiveDEM	-.5054524	1.05673	-0.48	0.632	-2.576605	1.5657	
mode#c.fiveDEM							
Female alone	-1.786598	1.095876	-1.63	0.103	-3.934475	.3612801	
Male alone	.8834134	1.125902	0.78	0.433	-1.323313	3.09014	
c.moneyF#c.fiveDEM	.1364726	.2184736	0.62	0.532	-.2917277	.5646729	
mode#c.moneyF#c.fiveDEM							
Female alone	.3749085	.2982118	1.26	0.209	-.2095759	.9593928	
Male alone	.0013893	.273851	0.01	0.996	-.5353487	.5381274	
_cons	-3.963925	.9519395	-4.16	0.000	-5.829692	-2.098158	
/lnsig2u	2.000742	.1273452			1.75115	2.250334	
sigma_u	2.71929	.1731443			2.400255	3.080731	
rho	.692087	.0271376			.6365225	.7425924	

4. Model (4): Like model (1) with additional demographics

Random-effects logistic regression
Group variable: decisionset

Number of obs = 8,883
Number of groups = 1,269

Random effects u_i ~ Gaussian

Obs per group:
min = 7
avg = 7.0
max = 7

Integration method: mvaghermite

Integration pts. = 12

Log pseudolikelihood = -3552.4862

Wald chi2(33) = 126.34
Prob > chi2 = 0.0000

(Std. err. adjusted for 423 clusters in hhid)

choice	Coefficient	Robust std. err.	z	P> z	[95% conf. interval]	
mode						
Female alone	3.337892	.8997343	3.71	0.000	1.574445	5.101339
Male alone	.1313464	.9982331	0.13	0.895	-1.825155	2.087847
moneyF	.3395483	.1929402	1.76	0.078	-.0386076	.7177042
mode#c.moneyF						
Female alone	-.818462	.2393966	-3.42	0.001	-1.287671	-.3492533
Male alone	.0088257	.2445622	0.04	0.971	-.4705074	.4881588
fiveDEF	1.197641	.6953506	1.72	0.085	-.165221	2.560503
mode#c.fiveDEF						
Female alone	-.5079186	.756094	-0.67	0.502	-1.989836	.9739985
Male alone	.2752485	.7081378	0.39	0.698	-1.112676	1.663173
c.moneyF#c.fiveDEF	-.3505742	.156111	-2.25	0.025	-.6565462	-.0446023
mode#c.moneyF#c.fiveDEF						
Female alone	.2223822	.2109748	1.05	0.292	-.1911209	.6358852
Male alone	-.1114438	.1787946	-0.62	0.533	-.4618748	.2389872
moneyF	0 (omitted)					
fiveDEM	-.1310374	.9656564	-0.14	0.892	-2.023689	1.761614
mode#c.fiveDEM						
Female alone	-1.736521	1.012408	-1.72	0.086	-3.720804	.2477609
Male alone	.0844039	1.061942	0.08	0.937	-1.996963	2.165771
c.moneyF#c.fiveDEM	.0536589	.2077914	0.26	0.796	-.3536047	.4609226
mode#c.moneyF#c.fiveDEM						

Female alone	.355973	.2760456	1.29	0.197	-.1850664	.8970124
Male alone	.1080756	.2558162	0.42	0.673	-.3933149	.6094662
ageF	-.0123365	.0215501	-0.57	0.567	-.0545739	.029901
ageM	.008234	.0237751	0.35	0.729	-.0383644	.0548325
region						
Eastern	.7938466	.5875472	1.35	0.177	-.3577248	1.945418
Northeast	.8649808	.8128962	1.06	0.287	-.7282665	2.458228
Pelagonia	1.041352	.5575714	1.87	0.062	-.0514682	2.134172
Polog	1.596836	.5135084	3.11	0.002	.5903776	2.603294
Southeast	.846453	.4898117	1.73	0.084	-.1135602	1.806466
Southwest	.9980483	.7692519	1.30	0.194	-.5096576	2.505754
Vardar	-.9136317	.67611	-1.35	0.177	-2.238783	.4115196
educationF						
Up to hi-school	-.1910339	.3259132	-0.59	0.558	-.829812	.4477443
University or higher	-.2155203	.5276913	-0.41	0.683	-1.249776	.8187357
educationM						
Up to hi-school	.6224021	.3845184	1.62	0.106	-.1312402	1.376044
University or higher	.2979114	.5801464	0.51	0.608	-.8391546	1.434977
religion						
Muslim	-.2609199	.5814542	-0.45	0.654	-1.400549	.8787095
hsize	.0365998	.0860457	0.43	0.671	-.1320466	.2052463
femovermale	.1463204	.1560007	0.94	0.348	-.1594353	.4520761
_cons	-5.068656	1.377832	-3.68	0.000	-7.769157	-2.368155
/lnsig2u	1.751173	.110809			1.533991	1.968354
sigma_u	2.400282	.1329865			2.153287	2.675609
rho	.6365278	.0256368			.5849539	.6851425

5. Model (5): Like model (1) but replaces 5DE with A-WEAI

Random-effects logistic regression
Group variable: decisionset
Random effects u_i ~ Gaussian
Integration method: mvaghermite
Log pseudolikelihood = -3655.7885

Number of obs = 9,051
Number of groups = 1,293
Obs per group:
min = 7
avg = 7.0
max = 7
Integration pts. = 12
Wald chi2(11) = 74.20
Prob > chi2 = 0.0000

(Std. err. adjusted for 431 clusters in hhid)

choice	Coefficient	Robust std. err.	z	P> z	[95% conf. interval]	
mode						
Female alone	2.092347	.5634403	3.71	0.000	.9880245	3.19667
Male alone	.0903614	.5879007	0.15	0.878	-1.061903	1.242626
moneyF	.3862996	.1122022	3.44	0.001	.1663873	.6062118
mode#c.moneyF						
Female alone	-.5732345	.1554897	-3.69	0.000	-.8779888	-.2684802
Male alone	.1196744	.1396507	0.86	0.391	-.154036	.3933848
aweaiF	1.227609	.715666	1.72	0.086	-.1750705	2.630289
mode#c.aweaiF						
Female alone	-.7933066	.7585451	-1.05	0.296	-2.280028	.6934145
Male alone	.3729379	.72805	0.51	0.608	-1.054014	1.79989
c.moneyF#c.aweaiF	-.3457133	.1596789	-2.17	0.030	-.6586781	-.0327484
mode#c.moneyF#c.aweaiF						

Female alone		.2871162	.2142652	1.34	0.180	-.1328358	.7070682
Male alone		-.1273406	.1847895	-0.69	0.491	-.4895213	.2348402
_cons		-4.064022	.5399111	-7.53	0.000	-5.122229	-3.005816

/lnsig2u		1.809754	.1025153			1.608828	2.01068

sigma_u		2.471628	.1266899			2.235386	2.732837
rho		.6499698	.0233232			.6029998	.6942008

Additional Figures

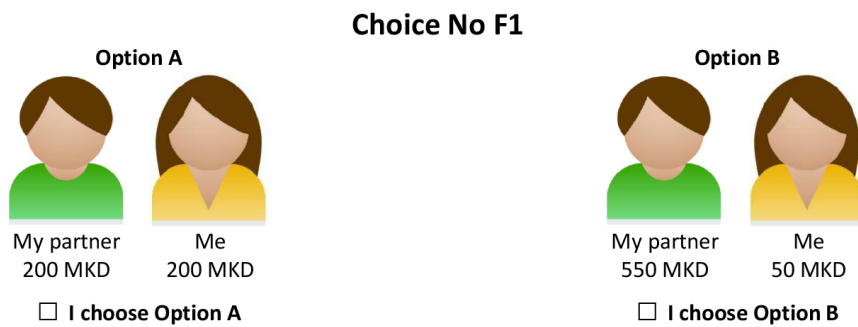
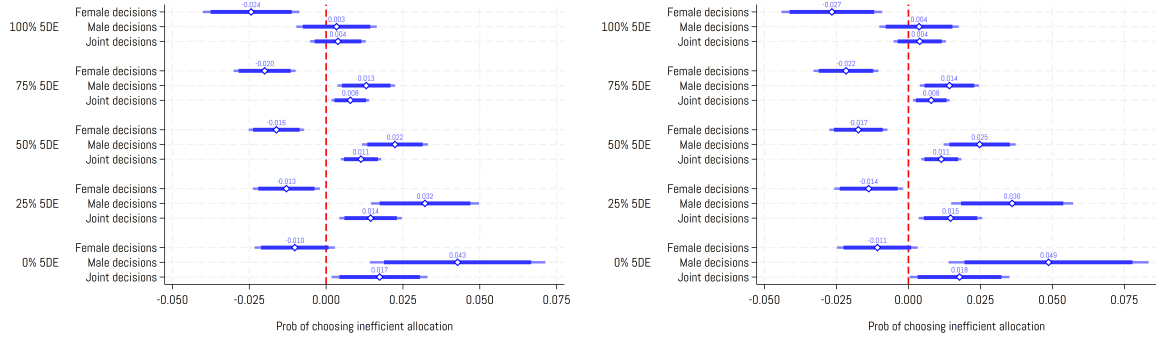
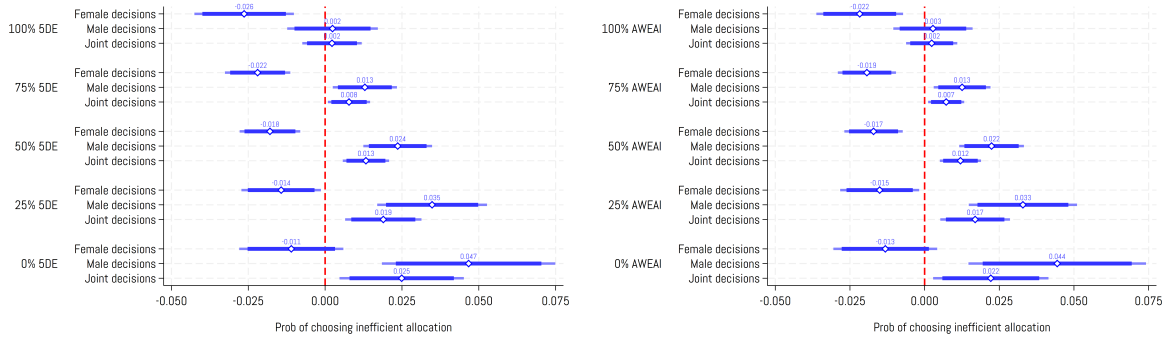


Figure A1: Example of a choice task for a female spouse in the allocation game



(a) Model (2): Model (1) but excludes irrational households (b) Model (3): Model (2) but excludes fourth choice in allocation task



(c) Model (4): Model (1) with additional demographics (d) Model (5): Model (1) but replaces 5DE with AWEAI

Figure A2: Marginal effect (and 95% CI) of an increase of 100 Denars on the money allocated to the Female household member on the probability of choosing an inefficient allocation (alternative specifications)

Note: A 100% for 5DE (AWEAI) can be interpreted as a woman that achieves 100% empowerment.