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# Women's participation in decision-making and its implications for human capital investment

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## Abstract

We evaluate the implications of women's participation in domestic decision-making on diets and investments in human resources in Ethiopian rural households. We create a metric to capture intra-household decision-making, which we use to estimate a positive association between women's participation in decision-making and household-level dietary diversity. Moreover, we find that an increase in women's participation in intra-household decision-making is associated with higher financial investments in human resources.

**Keywords:** women, decision-making, dietary diversity, human capital, Ethiopia

**JEL classification**: Q18, Q01, Q12

## 1. Introduction

Interest in female empowerment is steadily growing as it was one of the Millennium Development Goals (MDGs) and is one of the goals mentioned in the new sustainable development agenda of the United Nations (2017), which states that women's empowerment supports societies and their economies as a whole. Additionally, the OECD (2012) refers to women's empowerment as an important tool for sustainable economic growth and poverty reduction. Following Kabeer (1999), this article defines empowerment as the expansion of abilities that enable people to make crucial choices that affect their lives.

Decision-making power is a commonly used proxy household-level bargaining power of women. Decisions are affected by certain factors within the household. Those factors determine the household-level decision-making

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processes where decisions are either made by the household head alone or made jointly with other household members. Several researchers put clear emphasis on decision-making participation as a suitable proxy bargaining power (see Malhotra and Mather, 1997; Sen, 1999; Becker, Fonseca-Becker and Schenck-Yglesias, 2006).

Researchers have used different methods and indicators to estimate empowerment. Malhotra, Shuler and Boender (2002) conclude that access to and control of household resources, household-level decision-making and freedom of movement are the most common proxy measures of empowerment. Women's asset ownership has also been used as a measure of her bargaining power (see Doss, 1996a). Acharya and Bennett (1983) and Schuler *et al.* (1996) see women's participation in decision-making (WPDM) processes as a valid dimension of empowerment. This was also relevant for the analysis of Allendorf (2007) who used decision-making power to analyse the effect of land rights on women's empowerment. Decision-making was also used as a women's empowerment indicator by Bhagowalia *et al.* (2012) who studied empowerment dimensions that are important for child nutrition. Narayanan *et al.* (2019) use the Women's Empowerment in Nutrition Index (WENI), defining nutritional empowerment as "the process by which individuals acquire the capacity to be well fed and healthy" (Narayanan *et al.*, 2019: 5). The latest method of assessing women's empowerment was developed by Alkire *et al.* (2013a): the Women's Empowerment in Agriculture Index (WEAI). This index assesses empowerment in five domains: resource, leadership, income, production and time allocation. The production and resource domains include decisions made within households. Moreover, the Women's Empowerment in Livestock Index (WELI) was developed based on WEAI methodology; concentrating mainly on livestock farming, it measures women's empowerment in the livestock sector. The use of WELI is relevant to communities where livestock is the main agricultural activity. Decision-making power is an important indicator of empowerment in WELI too (Galiè *et al.*, 2019).

Evidently, decision-making has been widely used as a measure of empowerment of the main female within households. All of the above cited studies have in common that they exclusively focus on the decision-making power of wives (or one adult female member) in comparison with the adult male household head, who actually is only one of many household members (e.g. Hashemi, Schuler and Riley, 1996; Allendorf, 2007; Bhagowalia *et al.*, 2012; Mishra and Sam, 2016). This approach ignores the fact that other female and male members may also be present and eligible to contribute to decision-making processes that affect the household or individual members. This critique also applies for the WEAI (and its versions), where respondents are usually either jointly wife and husband or separately one male and one female adult over 18 years of age. Moreover, as noted by Ragasa (2012), most studies concentrate on households headed by a single male or female person, ignoring other males or females in these households. If joint decision-making is considered, then only the household head and his/her spouse are included in the analysis. This approach under-evaluates the participation of

other household members (e.g. brothers, sisters and the elderly) in household decision-making.

Considering this conceptual gap in the analyses of women's participation in household decision-making, the main objective of this article is to create an index capturing women's participation in different domains of household decision-making. The rest of the paper aims to exemplify the use of the newly generated index and investigates the implications of female preferences on the household-level human capital investment. In this regard, we analyse the association of women's participation in domestic decision-making with household dietary diversity and investments in human resources like education, health and clothing. We hypothesise that in addition to husbands and wives, other household members can be extensively involved in decision-making. In fact, we suppose that the different processes may even occur within the same household, that is, depending on the decision domain or specific decision to be made, and households are very likely to show variation with regard to the number and gender of decision-makers. Moreover, higher female participation in decision-making is expected to be positively associated with better household dietary diversity and investments in human resources.

Intra-household decision-making is an example of a group behaviour that is associated with preferences of the members and factors that affect their preferences (Browning, Chiappori and Weiss, 2011). We refer to the collective model by Chiappori (1988), which assumes that households consist of members who make Pareto efficient decisions. Members have their own utility functions, and that is why final decisions of households result from an interaction between members. Pareto efficiency refers to the existence of 'sharing rule', which implies that the total resources of the household are divided based on sharing rule and, flowingly, members have their own utility function to be maximised, which is constrained by the assigned share of household resources (Chiappori, 1988; Chiappori and Bourguignon, 1992; Doss, 1996b).

The level of participation by different household members and the importance of their preferences are undervalued. Gender-specific preferences are likely to affect the outcomes of decision-making. There is no study known to the authors that offers a solution for cases in which decisions are reached through bargaining between all eligible household members where gender-specific preferences are observed to a greater extent than just husband and wife's bargaining. This could be due to the lack of data on other members' participation and resources (financial and temporal) for rural surveys. Household decision-making processes are very complex and generally involve more than just two household members, especially in areas such as time allocation, school education, sanitation and nutrition. We argue that in societies like Ethiopia, where families tend to be large, in many cases the number of decision-makers exceeds two. In these cases, the potential contribution or effect of a single female member can be limited if she must bargain with three male household members and vice versa. This situation is not acknowledged in the literature, which leads to a biased estimation of female decision-making power and its outcomes. This means that, from a gender perspective, intra-household

decision-making needs better quantification than simply noting if the spouse is participating in decision-making or not. The measuring of the decision-making power of women versus men would benefit from a wider context than just a process of husband and wife's bargaining over decisions, which is much more appropriate and yet, insufficiently analysed.

This paper starts with a short literature review on decision-making as an indicator of woman's empowerment. Next, the database, the main variables of interest and the methods are described. Analyses begin with a description of the observed decision-making behaviours in the sample households. This is followed by generation of the decision-making index and estimation of the association between WPDM and household dietary diversity measured as the Food Variety Score (FVS) and household-level investments in human resources. To conclude, further implications and critical remarks on the index are discussed.

## 2. Decision-making as a measure of woman's empowerment: a literature review

Empowerment is a difficult process to measure. To capture the real change in this process, using direct measures can be much more suitable than using proxy indicators (Malhotra and Schuler, 2005). Nevertheless, to this date, empirical literature fails to directly measure the bargaining power of individuals and mostly employs proxies (Bernard *et al*., 2020). Different dimensions of empowerment have been analysed in the literature. Malhotra and Schuler (2005) identify six basic dimensions of empowerment: political, socio-cultural, economic, legal, psychological and familiar. Moreover, they have different operationalisation at the household and community levels. This article is specifically interested in the household-level operationalisation of the familiar dimension, which is a household-level decision-making process.

Decision-making is used as a measure of empowerment in many cases. Analysis by Bhagowalia *et al*. (2012) of which dimensions of women's empowerment impact child nutrition identified decision-making as one of three most important dimensions. The other two were found to be mobility and attitudes towards violence. Garikipati (2008) also uses decision-making as well as asset ownership and time allocation as measures of empowerment in the analysis of effects of lending to women on their empowerment. Hashemi, Schuler and Riley (1996) used six indicators to measure empowerment, including participation in decision-making (others were mobility, off-farm employment, political awareness and the ability to make small and large purchases). Another example is from the analysis of effects of land rights on female empowerment by Allendorf (2007). She concentrates on the female participation in household decision-making as a measure of their empowerment. Similar work was done by Mishra and Sam (2016) where they concentrated on decisions about healthcare, purchases and family visits as measure of women's empowerment. The consideration of decision-making as a measure of empowerment is present

in many other studies (Malhotra and Mather, 1997; Sen, 1999; Kishor, 2000; Becker, Fonseca-Becker and Schenck-Yglesias, 2006).

The most recent tool for measuring women's empowerment in agriculture, referred to as the WEAI, was developed within the Feed the Future project (IFPRI, 2012). The index defines five major dimensions (5DE) of women's empowerment in the agricultural sector. These are production, productive resources, income, time allocation and leadership. In total, these dimensions consist of 10 indicators that have different weights. Decision-making is present in the indicators of three out of the five dimensions. One of the indicators of the production dimension weighs a person's input to production-related decisions. Two of the indicators of the resources dimension are about a person's participation in decision-making processes related to productive resources (purchase, sale, transfer, etc.) and decisions about credit (obtaining and using). The income dimension's only indicator is about income use decisions (Alkire *et al*., 2013a). Thus, the WEAI considers decision-making to be a key dimension of empowerment. The newest version of WEAI that is project-level WEAI (pro-WEAI) is also mainly comprised of decision-making questions (Malapit *et al*., 2019). The WELI is another similar measure based on the WEAI methodology, and decision-making is present in five out of six of its dimensions (Galiè *et al*., 2019). Another similar measure is the WENI that contains food, health and institutions domains. Each domain considers agency domain from Kabeer (1999), which is operationalised as decision-making ability or one's autonomy in making decisions.

Like earlier approaches that captured empowerment, the WEAI and its versions only consider the main decision-makers. The respondents are asked to report whether the decision-maker is male, female or husband and wife jointly, ignoring the potential participation of other household members in decision-making processes. Therefore, the index does not sufficiently allow the analysis of decision-making in rural settings where household size may range from 2 to 13 members, as it does in the survey data for Ethiopia. Moreover, including a WEAI module in the survey instrument increases survey costs and enumeration time substantially (see Alkire *et al*., 2013b). In this regard, although the approach we explore in this article concentrates only on one aspect of women's empowerment within households, it is less costly and more time efficient and can be easily adapted into any kind of agricultural survey (e.g. technology adoption studies). Members may have different preferences that they would bring to the household decision-making processes. These preferences are likely to have a high level of gender specificity. Our approach aims to capture the share of female voices heard and thus, female preferences declared in different fields of domestic decision-making and further evaluating its outcomes with regard to household food security.

## 3. Data

This article draws upon data collected in Ethiopia in 2014, where a randomly selected household survey was conducted covering 404 farmers living within

a radius of 200 km around Hawassa town. The area covers large parts of Southern Nations, Nationalities, and Peoples' (SNNP) Region and Oromia Region. Due to financial, administrative and logistical constraints, our sample reflects a sub-sample of a nationally representative baseline survey conducted in 2012 by the Agricultural Transformation Agency (ATA) of Ethiopia together with the International Food Policy Research Institute (IFPRI). Considering that the sub-sample covers an area that is diverse in production systems, market accessibility, infrastructural endowments and agro-ecological zones, some wider inferences can still be made. The full sample includes cases in which only one gender (eligible male or female) forms the household. In such cases, there is no gender-related bargaining regarding household decisions. Therefore, 26 cases were dropped from the analyses, leaving 378 households with a mixed household member composition. A team of trained enumerators used computer-assisted personal interviews (CAPI) to collect information on various socio-economic household characteristics and included detailed questions on various household decisions from the most informed household member, who is usually the household head and for the consumption data, is the main female. The information reported may not fully reflect reality (see Annan *et al.*, 2019 for the more in Sub Saharan context), leading to under- or overestimation of the participation of women or men. An option could be to have respondents of both genders answering the questions related to decision-making, but this was not possible due temporal and financial constraints.

## 4. Variable descriptions and definitions

### 4.1. Deriving the WPDM index

In order to reflect decision-making processes in different decision-making domains, the data contains information about decisions pertaining to many household-level activities related to crop production, livestock, use of income from various sources, technology adoption, health, food and clothing expenditures, harvest use, crop input use, non-labour income use, gift giving, loaning and borrowing. Naturally, not all households are engaged in the same activities. This results in decisions that are only relevant for some households. For example, decisions about the use of transfer income are only relevant for those households that received remittances and/or food aid, and decisions about loan repayment are only relevant for those households that received a loan. To have a better coverage of the population, primary concentration is given to decisions that are relevant for most of the sample households. In this regard, decisions are considered most relevant where decisions were made by more than 88 per cent (overall results are robust to 80, 85 and 90 per cent cutoffs) of the population and therefore reflect the most important decision-making domains for the households in the research area. The seven decisions relate to (i) animal purchases, (ii) use of income from animal sales, (iii) agricultural technology

adoption, (iv) crops grown, (v) input use, (vi) harvest use and (vii) household purchases (e.g. food, clothing, household and agricultural assets).

The WPDM index (WPDMI) is created by employing principal component analysis (PCA). PCA is used for linear transformation of a large set of correlated variables into an uncorrelated set of components without losing the information from the original set of variables. This allows the number of variables to be decreased while retaining the information of interest in the dataset. It is widely used in social, behavioural, geological, biological, medical and economic studies (Dunteman, 1989).

For the results of PCA to be valid, Kaiser (1960) (cited in Field, 2009: 640) suggests retaining only principal components with an eigenvalue greater than 1. After determining the components, the next step is to identify the variables that are important for the particular factors. For this purpose, Stevens (2002) (cited in Field, 2009: 645) suggests the interpretation of only those variables that have an absolute factor loading greater than 0.4. The final step for checking the validity of PCA results is applying the Kaiser-Meyer-Olkin (KMO) measure of adequacy. To calculate the KMO, the squared total correlation between variables is divided by the sum of squared total correlation and squared partial correlation between them (Pett, Lackey and Sullivan, 2003). The results range between 0 and 1. A value close to 1 is always preferable as it indicates a more reliable factor. In the ranges of 0.5–0.7, 0.7–0.8, 0.8–0.9 and 0.9–1.0, results are mediocre, good, great and superb, respectively (Kaiser, 1974 cited in Field, 2009: 647).

## 4.2. Participation in decision-making

Of the 378 households with a mixed gender composition, 49 (13 per cent) are female headed. Of the 2,564 household members, 1,156 (47 per cent) are female. The age eligibility criterion to participate in the decision-making process, and therefore this study, is set as the potential marriage age in Ethiopia, that is, the age at which a person may form his or her own household and be considered the head. The Central Statistical Agency [Ethiopia] (2014) in its Ethiopian Demographics and Health Survey analyses the marital status of the population aged 15 and above. Considering marriage as an important decision for an individual and the starting point for many more decisions to be made throughout the life, age 15 is our cutoff age for the analysis. Therefore, women and men aged 15 years and above are regarded as eligible to participate in decision-making processes. This restriction results in 1,254 decision-makers (DMs), of whom 580 (47 per cent) are female. This is especially important because the suggested index must allow for all eligible members to participate in household decisions, that is, decisions that are made jointly by the whole family.

In order to collect the required information, respondents (i.e. the household head and for the consumption data, the main female) were asked who made the decisions. The survey question was designed so that it was first asked whether the decision was made by one, two, all household members or an external person. This was followed up by explicitly naming the household member

**Table 1.** Possible derivation of assigned and/or calculated weights

| WPDM | Decisions made | Occurs if |
|---|---|---|
| 1 | By women only | (i) A female member makes decision alone<br>(ii) Joint decision-makers are all female |
| $0 < x < 1$ | Jointly | (i) Joint decision-making (share of female decision-makers), e.g. 0.5 indicates that decision-makers are equally numbered male and female |
| 0 | By men only | (i) A male member makes decision alone<br>(ii) Joint decision-makers are all male |

(cross-validated with the household roster). Gathering this information allows for the identification of who made the decision and thus, how many female decision-makers participated in the process. Putting this in relation to the total number of potential decision-makers, in each $z$ decision domain, $WPDM_z$ is calculated using Formula 1:

$$WPDM_z = \frac{\sum FPDM_z}{\sum PDM_z} \tag{1}$$

where:

- $FPDM_z$ = number of female participants in decision-making in the $z$th decision domain
- $PDM_z$ = total number of participants in decision-making in the $z$th decision domain

This leads to $WPDM_z$ ranging between 0 and 1, with 0 indicating no female participation and 1 indicating only female participation. WPDM variables are then employed in PCA to develop the index (i.e. WPDMI). Table 1 summarises how different weights may occur based on the design of the research instrument.

### 4.3. Dietary diversity and investments in human resources

To exemplify the association of WPDM with livelihood outcomes, FVS was chosen as an indicator of the food and nutrition diversity of a household. A household's FVS is the number of different food items consumed by the household within the 7 days prior to the interview and is often used as an indicator for dietary adequacy (see Hatloy, Torheim and Oshaug, 1998; Steyn *et al*., 2006). Investment in nutrition links to human capital development, and a very limited dietary diversity may result in negative health and well-being outcomes of household members (Underwood, 1988 cited in Savy *et al*., 2005). Since FVS is a count variable, a Poisson model is a natural choice of estimation.

WPDMI is the main independent variable in the analysis. Other independent variables are added based on a review of the existing literature on determinants of dietary diversity (Pellegrini and Tasciotti, 2014; Sibhatu, Krishna and Qaim, 2015; Koppmair, Kassie and Qaim, 2016; Hirvonen and Hoddinott, 2017). We control for human capital formation of the households by including the gender of the head, education, age, age squared, household size and dependency ratio. Furthermore, wealth indicators like farm size, access to credit, total livestock units owned and off-farm income are controlled in the estimation. Considering the importance of on-farm production diversity for the dietary diversity of rural households, we include the number of crop species produced by the household. Since the association of crop diversity with dietary diversity is complex, we control for off-farm income, distance to market and share of produce sold and add their interaction terms to have the most robust estimates possible (Sibhatu *et al*., 2015; Islam *et al*., 2018).

Moreover, to further exemplify the relationship of WPDM with livelihood outcomes, we investigate its association with households' investments in human resources. Here, we define investments in human resources as expenditure and cost $C$ incurred as investment in households' human capital. This includes expenses for education, health and clothing in the past 12 months:

$$C_{human\_resources} = C_{education} + C_{health} + C_{clothing} \tag{2}$$

where:

- $C_{education}$ includes costs like school fees, books and school uniforms
- $C_{health}$ includes costs related to doctor visits, acquiring medicine, etc.
- $C_{clothing}$ includes expenses for clothing (including shoes)

Investments in human resources were chosen both for its indication of household-level orientation on human capital development, which is often strongly influenced by women, as well as for its proxy function of household welfare (Henry *et al*., 2003). To analyse the effect of WPDMI on per capita investment in human resources, a log–linear regression model was selected. As various factors other than gender are known to influence household budg*et al*location, a range of control variables were included in the model.

## 4.4. Descriptive statistics

The results presented in Table 2 show that 13 per cent of the total sample households are headed by a female member. The average education of household heads is 3.3 years of formal schooling, and, when considering the member with the most formal schooling as a proxy for the household's overall education level, the average amount of formal schooling is 6.6 years. Average per capita farm size is 0.24 hectares. Of the sample households, 71 per cent have access to extension services, reported as households having received extension in the past 12 months. This shows that coverage by agricultural extension services

**Table 2.** Socio-economic characteristics of the sample households

| | Mean | SD |
|---|---|---|
| *Demographic characteristics* | | |
| Head gender [1 = male] | 0.87 | 0.34 |
| Head age [years] | 44.49 | 13.91 |
| Head education [years] | 3.32 | 3.64 |
| Highest education within household [years] | 6.60 | 3.40 |
| Household size | 6.48 | 2.22 |
| Dependency ratio | 0.47 | 0.20 |
| Extension [1 = access] | 0.71 | 0.45 |
| Credit [1 = access] | 0.15 | 0.36 |
| Market distance [minutes] | 52.04 | 44.57 |
| Share of produce sold | 0.27 | 0.22 |
| Per capita farm size [ha] | 0.24 | 0.20 |
| Income from livestock [ETB] | 4451.38 | 10752.36 |
| Income from crops [ETB] | 9379.71 | 53598.32 |
| Off-farm income [ETB] | 3046.77 | 7184.69 |
| Expenditure on education [ETB] | 358.02 | 1021.42 |
| Expenditure on clothing [ETB] | 3801.32 | 3078.36 |
| Expenditure on health [ETB] | 487.69 | 1432.17 |
| Crop diversity [crop count] | 4.33 | 2.15 |
| FVS | 11.07 | 3.82 |
| *Female participation in decision-making (WPDM variables)* | | |
| Livestock purchases, sales, etc. | 0.36 | 0.25 |
| Livestock income | 0.38 | 0.26 |
| Technology adoption | 0.20 | 0.27 |
| Household purchases | 0.41 | 0.20 |
| Crops grown | 0.32 | 0.25 |
| Harvest use | 0.36 | 0.24 |
| Input use | 0.31 | 0.26 |
| *N* | 378 | |

*Note*: ETB is the abbreviation for Ethiopian birr. USD 1 = ETB 19.78 and EUR 1 = ETB 27.41 at the time of the survey (Deutsche Bundesbank, 2014).

is good but could be developed further. Only 15 per cent of households have access to financial services. The average household is located 52 minutes away from the closest market, sells 27 per cent of their produce and produces four different crops. The mean FVS is 11, which means there is poor dietary adequacy in the sample households (Savige, Hsu-Hage and Wahlqvist, 1997). Looking into female participation in key domains of household decision-making, on average females participate more in decisions related to household purchases and the use of income from livestock. On average, their participation is very limited in decisions about the agricultural technology adoption. This is an interesting observation and should be further investigated with qualitative methods in future research.

## 5. Results and discussion

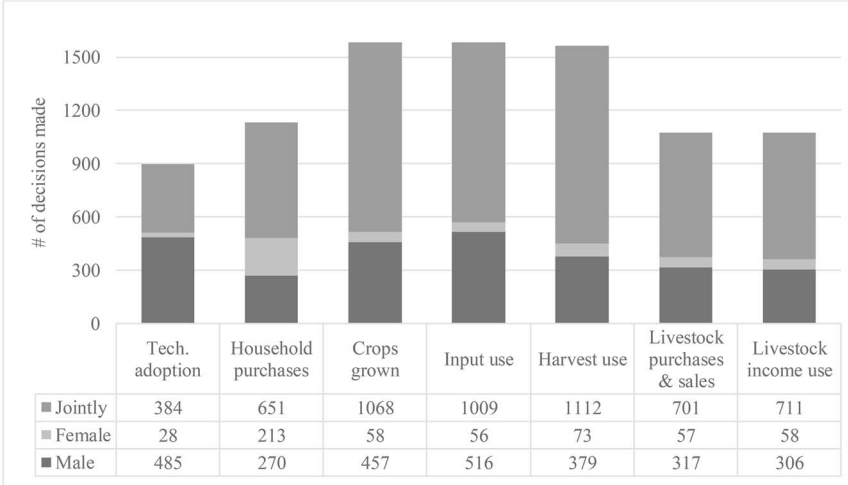
This section firstly addresses the key hypothesis by presenting the occurrence of different decision-making behaviours in the households. Then, it describes how the suggested index is generated. In the final section, we estimate the association between females' participation in domestic decision-making and two indicators of human capital investment.

### 5.1. Decision-making behaviour

Addressing the hypothesis that many household members can extensively participate in decision-making processes, Figure 1 presents the number of cases in which decisions were made by females alone, males alone and jointly by two or more members, along key decision domains. In Figure 2, we identify the cases in which decisions were made solitarily, by two members only and by more than two members. Variations in decision-making patterns of sample households show that different decision-making behaviours are present in all key household decision-making processes. Regarding agricultural decisions (crop choice, inputs, harvest use, livestock marketing and use of livestock income) about 25–35 per cent of households show sole deciders and 65–75 per cent show some sort of bargaining between genders. Regarding technology adoption, the majority of households decide solitarily. In all other domains of decision-making, households decide jointly with two or more members. In all domains, joint decision-making of more than two members is more common than joint decision-making of two members. Considering this and further exploring the dataset, we observe (in Figure A1 in Appendix A) that, depending on the family structure, aside from the head and his/her spouse, elderly parents, adult sons and daughters and adult brothers and sisters participate extensively in decision-making. In the sample, daughters of the household heads appear in the decision-making regarding household purchases more than other family members, while, in all remaining decision domains, their sons appear more than any other members.

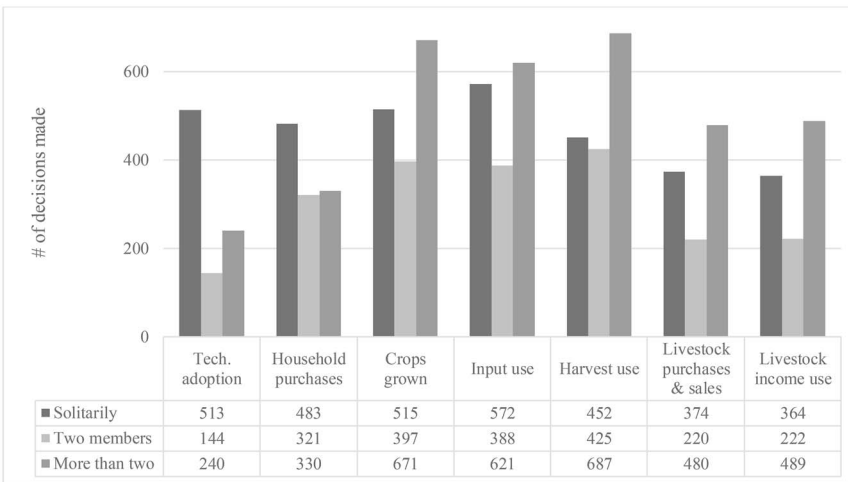
### 5.2. Generating the WPDMI using principal component analysis

Seven WPDM (i.e. decision) variables calculated from Equation (1) are employed in PCA. The factor analyses of these seven decision variables revealed only one factor with an eigenvalue larger than 1 that could hence remain in the analysis (Kaiser, 1960; cited in Field 2009: 640), as it may be interpreted as the participation in decision-making. The key results of the PCA for this factor are shown in Table 3. It captures approximately 71 per cent of the variation in the decision variables. All decision variables have absolute factor loadings greater than 0.4, implying that all are important for the factor, that is, the participation in decision-making. All decision variables have values close to 1 and the overall KMO is 0.86, indicating adequate sampling. With respect to




| | Tech. adoption | Household purchases | Crops grown | Input use | Harvest use | Livestock purchases & sales | Livestock income use |
|---|---|---|---|---|---|---|---|
| Jointly | 384 | 651 | 1068 | 1009 | 1112 | 701 | 711 |
| Female | 28 | 213 | 58 | 56 | 73 | 57 | 58 |
| Male | 485 | 270 | 457 | 516 | 379 | 317 | 306 |

**Fig. 1.** The number of decisions made by a male, a female and jointly in key decision domains. *Note*: the number of decisions varies among households depending on the number of crops produced, practices adopted, inputs used and so on.




| | Tech. adoption | Household purchases | Crops grown | Input use | Harvest use | Livestock purchases & sales | Livestock income use |
|---|---|---|---|---|---|---|---|
| Solitarily | 513 | 483 | 515 | 572 | 452 | 374 | 364 |
| Two members | 144 | 321 | 397 | 388 | 425 | 220 | 222 |
| More than two | 240 | 330 | 671 | 621 | 687 | 480 | 489 |

**Fig. 2.** The number of decisions made by different numbers of household members in key decision domains. *Note*: the number of decisions varies among households depending on the number of crops produced, practices adopted, inputs used and so on.

the corresponding factor loadings, decisions related to technology adoption and household purchases showed good results, and decisions related to cropping and livestock showed great results. All validity tests yielded positive results, meaning that the predicted values referring to WPDMI effectively present the information contained in the decision variables.

**Table 3.** Means and factor loadings from principal component analysis

| Decision related to . . . | Mean (sd) | Factor loading | KMO |
|---|---|---|---|
| Technology adoption | 0.20 (0.27) | 0.80 | 0.93 |
| Household purchases | 0.41 (0.20) | 0.74 | 0.97 |
| Crops grown | 0.32 (0.25) | 0.88 | 0.85 |
| Input use | 0.31 (0.26) | 0.90 | 0.90 |
| Harvest use | 0.36 (0.24) | 0.87 | 0.89 |
| Livestock purchase, sale, etc. | 0.36 (0.25) | 0.87 | 0.79 |
| Livestock income use | 0.38 (0.26) | 0.84 | 0.77 |
| Eigenvalue = 5.00 | | | |
| $KMO_{total} = 0.86$ | | | |

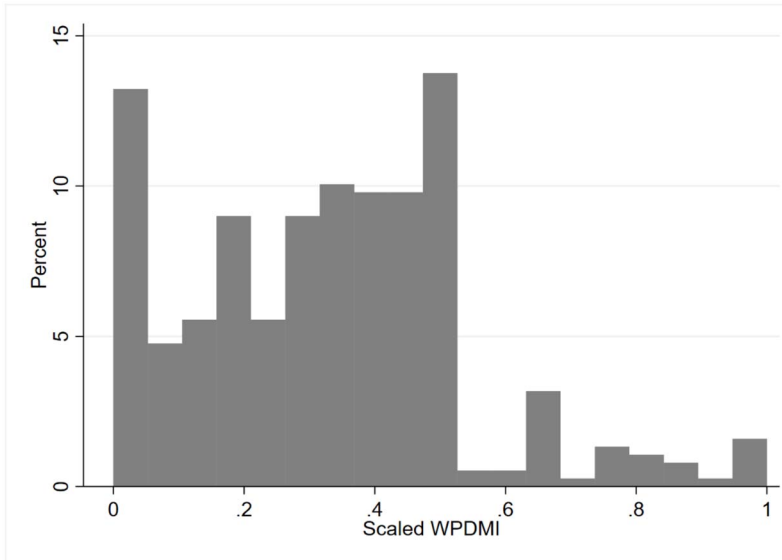



**Fig. 3.** Histogram of scaled WPDMI.

The generated index ranges from −1.52 to 3.16. For ease of understanding, here only, we scale WPDMI to range from 0, no female participation to 1, sole female decision-making. In Figure 3, we observe that in most of the sampled households, female participation in intra-household decision-making is low.

## 5.3. Association of WPDM with dietary diversity and investments in human resources

In order to exemplify the use of WPDMI, we investigate the association between WPDM and dietary diversity in a Poisson model in Table 4. In the

**Table 4.** Decision-making and dietary diversity

| Variables | WPDMI | Head as the main decision-maker | Decision-making categories |
|---|---|---|---|
| Head gender [1 = male] | 0.002 | −0.035 | −0.007 |
| | (0.053) | (0.049) | (0.068) |
| WPDMI | 0.027** | | |
| | (0.011) | | |
| More than two decision-makers | | | 0.095** |
| | | | (0.037) |
| Household size | 0.010 | 0.009 | 0.008 |
| | (0.009) | (0.009) | (0.009) |
| Dependency ratio | −0.180** | −0.171* | −0.107 |
| | (0.090) | (0.091) | (0.109) |
| Head education [years] | 0.001 | 0.002 | −0.001 |
| | (0.007) | (0.007) | (0.007) |
| Head age | −0.014*** | −0.014*** | −0.014* |
| | (0.005) | (0.005) | (0.007) |
| Head age squared | 0.0001*** | 0.001*** | 0.0001* |
| | (0.00004) | (0.00004) | (0.00006) |
| Farm size | 0.005 | 0.004 | 0.012 |
| | (0.016) | (0.016) | (0.022) |
| Credit [1 = access] | 0.111*** | 0.109*** | 0.121** |
| | (0.040) | (0.040) | (0.048) |
| Livestock units owned | 0.010*** | 0.010*** | 0.008* |
| | (0.003) | (0.003) | (0.004) |
| Extension [1 = access] | 0.200*** | 0.201*** | 0.184*** |
| | (0.031) | (0.032) | (0.042) |
| Crop diversity | 0.005 | 0.009 | 0.020 |
| | (0.025) | (0.025) | (0.031) |
| Off-farm income [1,000 ETB] | 0.015*** | 0.015*** | 0.017* |
| | (0.004) | (0.004) | (0.010) |
| Share of produce sold | 0.035 | 0.038 | 0.115 |
| | (0.196) | (0.197) | (0.169) |
| Market distance [minutes] | −0.001 | −0.001 | −0.001 |
| | (0.001) | (0.001) | (0.002) |
| [Crop diversity] × [market distance] | 0.0003 | 0.0003 | 0.00 |
| | (0.0002) | (0.0002) | (0.00) |
| [Crop diversity] × [off-farm income] | −0.001 | −0.001 | −0.002 |
| | (0.001) | (0.001) | (0.002) |
| [Crop diversity] × [share sold] | −0.003 | −0.003 | −0.007 |
| | (0.033) | (0.034) | (0.033) |
| Pseudo $R^2$ | 0.057 | 0.056 | 0.048 |
| Wald $\chi^2$ | 498.85*** | 519.32*** | 335.55*** |
| *N* | 378 | 378 | 236 |

*Note*: Village-level clustered standard errors in parentheses.
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

first column of the table, we show the respective regression results with FVS as the outcome variable and WPDMI as the main independent variable of interest. To understand the value of considering other household member's participation in decision-making, in the second column we revert to what has been widely done in the literature that is to assume the household head as the main decision-maker in the household. Moreover, in cases when households

**Table 5** WPDM and its association with per capita investment in human resources

| Variables | Coefficient | Significance | Standard errors |
|---|---|---|---|
| WPDMI | 0.190 | *** | (0.050) |
| Head gender [1 = male] | 0.111 | | (0.146) |
| Head education [years] | 0.015 | | (0.022) |
| Head age | 0.009 | | (0.022) |
| Head age squared | −0.0001 | | (0.0001) |
| Household size | −0.030 | | (0.023) |
| Dependency ratio | −0.429 | * | (0.227) |
| Farm size | 0.224 | *** | (0.040) |
| Credit [1 = access] | −0.032 | | (0.130) |
| Income from livestock [1,000 ETB] | 0.009 | *** | (0.003) |
| Off-farm income [1,000 ETB] | 0.008 | | (0.007) |
| Income from crops [1,000 ETB] | 0.001 | ** | (0.0004) |
| Market distance [minutes] | −0.0003 | | (0.001) |
| Sickness in past 12 months [1 = yes] | 0.691 | *** | (0.119) |
| *R*-squared | 0.246 | | |
| Observations | 378 | | |

*Note*: The expenditures are based on the respondent recall. Prices are not available to include in the equation, and this may have affected the estimates. Village-level clustered standard errors in parentheses.
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

report joint decision-making, we are interested to know if there is any gain from capturing potential participation of household members other than the two main decision-makers. Thus, in the third column, to further investigate the importance of considering potential participation of many household members in the analysis, first, we limit the sample to those households that reported joint decision-making in food purchases (here considered proxy for household consumption decision) and divide household into two categories. The first category is where decision-making involves two members, and second category is where decision-making involves more than two household members.

The findings support the hypothesis of a significantly positive association between WPDM and food consumption patterns of households. Results indicate that, ceteris paribus, a unit increase in the WPDMI, is associated with a 2.6 per cent increase in FVS. This supports the assumed and often observed positive association between women's empowerment and household dietary diversity (see, e.g. Sraboni *et al.*, 2014; Yimer and Tadesse, 2016). In the second column, however, where we assume the household head to be the main decision-maker, the results suggest no differences between male and female heads. Moreover, in the third column, we observe that there is a significant difference (i.e. 10 per cent higher for the second category) with regard to the FVS comparing households where consumption decisions are made by two members jointly with households where more than two members participate in the decision-making. For households that report joint decision-making, this

result supports the significance of considering the potential preferences of members other than the two main decision-makers. Moreover, we also want to investigate if the association is driven by the fact that women participate more in the decision-making or by the fact that more persons make decisions. We run regressions with (i) WPDMI and the number of decision-makers that make the food purchase decision-making (FPDM) and (ii) without WPDMI and with FPDM. Results (Table A1 in Appendix A) show that in the first scenario, WPDMI is positive and FPDM is insignificant and in the second scenario, FPDM is again insignificant. This shows that the association is driven by WPDM and not by the fact that more than one (or two) members make the decision.

To further exemplify the use of WPDMI, we analysed the association of the index with per capita investment in human resources in a log–linear model that is presented in Table 5. We observe that WPDMI is positively associated with higher per capita investment in human resources at the household level. The results show that more female participation in household decision-making processes is associated with expenses that are directed more towards health, education and clothing. This is in line with findings of other researchers like Doss (1996a), Minsoo, Jeungil and Sora (2011), Thomas (1993) and Phipps and Burton (1998).

## 6. Conclusion

The main objective of this article was to suggest a metric that captures female participation in different decision domains and summarise it into one index. To exemplify the suggested index, we investigated the association of WPDM with two indicators of investment in human capital that are household-level dietary diversity and per capita investment in human resources like education, health and clothing.

The descriptive analysis of different decision domains within a household revealed that besides husband and wives, other household members are also involved in decision-making processes that formulate household livelihoods. In fact, differences are even observed within the same household, depending on the decision domain or specific decision to be made, and households are very likely to show variation with regard to the number and gender of decision-makers. Therefore, the suggested approach is justified. Considering seven key fields of household decision-making, PCA was employed to generate the WPDMI.

Regarding the WPDMI, all validity tests of PCA yielded adequate results to conclude that the index is excellent at capturing the common information, that is, WPDM, presented in the most important fields of household decision-making. This implies that the suggested index adequately considers all female and/or male decision-makers in a household to be participants of decision-making processes. Hence, the prevailing conceptual flaw may be closed to some extent. What remains unsolved by design is whether an increase from none to some level of female participation should be valued more, less or

equally to an increase from some level of participation to a total control over decisions. It is also undetermined whether all participating members enjoy the same level of power in freely declaring their preferences. In order to address these research questions, it appears necessary to follow up with more qualitative-oriented research approaches in the future.

Looking at the FVS as an indicator for household-level dietary diversity, an increase of WPDM is associated with improved diversity in household diet. For further verification, we investigated if the participation of more than two members in decision-making is significantly different in terms of dietary diversity when compared with joint decision-making of two members. Moreover, we investigate if the association is driven by the gendered preferences declared in the decision-making or by the fact that more persons make decisions. We found a significant difference between two specifications and highlighted the importance of gendered preferences brought to the decision-making. In the presence of strong social norms, any attempt to increase WPDM processes can be expected to take a long time but is worthwhile.

Moreover, we found that a higher participation of women in decision-making is associated with higher financial investments in the human resources of the household. The findings are consistent with the literature, supporting the approach of women's empowerment for better health, educational and nutritional outcomes for society. To draw lessons from these findings, we conclude that Ethiopian policy reforms directed towards improving education, health and nutrition should work together with interventions directed at women's empowerment. More in general, another implication may be that social programmes aiming to alleviate poverty through direct money transfers could achieve a multiplier effect by specifically targeting women.

The data reflects the answers to structured questions about who makes decisions with respect to various decision domains. The information may be misreported, leading to under- or overestimation of the participation of women or men. An option could be to have respondents of both genders answering the questions related to decision-making. This would enable cross-checking and help with the identification of the decision-makers within the household more precisely. However, overall the article suggests a useful approach for capturing intra-household decision-making.

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## Appendix A

**Table A1** Decision-making and dietary diversity—exploring if the association is driven (i) by the fact that women participate more in the decision-making or (ii) only by the fact that more persons take decisions

| Variables | (i) | (ii) |
|---|---|---|
| Head gender [1 male] | 0.001 | −0.036 |
| | (0.055) | (0.049) |
| WPDMI | 0.026** | |
| | (0.012) | |
| FPDM | 0.001 | 0.005 |
| | (0.012) | (0.011) |
| Household size | 0.010 | 0.009 |
| | (0.008) | (0.008) |
| Dependency ratio | −0.177* | −0.160 |
| | (0.100) | (0.099) |
| Head education [years] | 0.001 | 0.002 |
| | (0.007) | (0.007) |
| Head age | −0.014*** | −0.014*** |
| | (0.005) | (0.005) |
| Head age square | 0.0001*** | 0.0001*** |
| | (0.00004) | (0.00004) |
| Farm size | 0.005 | 0.003 |
| | (0.016) | (0.016) |
| Credit [1 access] | 0.111*** | 0.109*** |
| | (0.040) | (0.040) |
| Livestock unit owned | 0.010*** | 0.010*** |
| | (0.003) | (0.004) |
| Extension [1 access] | 0.200*** | 0.202*** |
| | (0.031) | (0.032) |
| Crop diversity | 0.005 | 0.008 |
| | (0.025) | (0.024) |
| Off-farm income [1,000 ETB] | 0.00001*** | 0.00001*** |
| | (0.000) | (0.000) |
| Share of produce sold | 0.034 | 0.035 |
| | (0.195) | (0.196) |
| Market distance [minutes] | −0.001 | −0.001 |
| | (0.001) | (0.001) |
| [Crop diversity] × [off-farm income] | −0.000 | −0.00 |
| | (0.000) | (0.00) |
| [Crop diversity] × [share sold] | −0.003 | −0.003 |
| | (0.033) | (0.034) |
| [Crop diversity] × [market distance] | 0.0003 | 0.0003 |
| | (0.0002) | (0.0002) |
| Pseudo $R^2$ | 0.057 | 0.056 |
| Wald $\chi^2$ | 509.53*** | 519.29*** |
| Observations | 378 | 378 |

*Note*: village-level clustered standard errors in parenthesis.
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

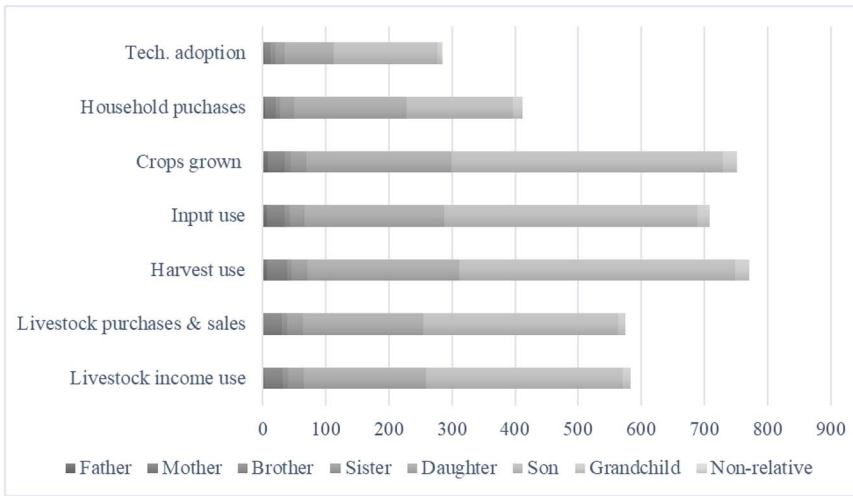


**Fig. A1.** The number of times family members and non-family individuals appear in decision-making processes in key decision domains. *Note*: the number of decisions varies among households depending on the number of crops produced, practices adopted, inputs used and so on.

## Decision-making questions

Decision-making question regarding agricultural technology adoption:

*Who decided to establish [practice]?*

1. *. . . single household member* $\gg$ *ID1*
2. *. . . jointly, two HH-members* $\gg$ *ID1* + *ID2*
3. *. . . jointly, whole family/all HH-members*
4. *. . . other, specify* _____

Decision-making question regarding crop production:

*Who mainly or jointly made the decision on [CROP] grown?*

1. *. . . single household member* $\gg$ *ID1*
2. *. . . jointly, two HH-members* $\gg$ *ID1* + *ID2*
3. *. . . jointly, whole family/all HH-members*
4. *. . . other, specify* _____

*Who mainly or jointly made the decision about harvest use?*

1. *. . . single household member* $\gg$ *ID1*
2. *. . . jointly, two HH-members* $\gg$ *ID1* + *ID2*

3. *. . . jointly, whole family/all HH-members*
4. *. . . other, specify ___*

*Who made the decisions on input use for [CROP]?*

1. *. . . single household member ≫ ID1*
2. *. . . jointly, two HH-members ≫ ID1 + ID2*
3. *. . . jointly, whole family/all HH-members*
4. *. . . other, specify*

Decision-making question regarding animal production:

*Who mainly or jointly decided on animal purchase and input use?*

1. *. . . single household member ≫ ID1*
2. *. . . jointly, two HH-members ≫ ID1 + ID2*
3. *. . . jointly, whole family/all HH-members*
4. *. . . other, specify _____*

*Who mainly or jointly decided on the use of income from the sale of these animals?*

1. *. . . single household member ≫ ID1*
2. *. . . jointly, two HH-members ≫ ID1 + ID2*
3. *. . . jointly, whole family/all HH-members*
4. *. . . other, specify _____*

Decision-making question regarding household purchases:

| | *EXPENDITURE TYPE* | *Q1. Who mainly or jointly decides on purchases of [TYPE]?*<br>*1 ...single household member ≫ ID1*<br>*2...jointly, two HH-members ≫ ID1 + ID2*<br>*3 ...jointly, whole family/all HH-members*<br>*4...other, specify* | | |
|---|---|---|---|---|
| | | *CODE* | *ID 1* | *ID 2* |
| *1.* | *Food* | | | |
| *2.* | *Clothing* | | | |
| *3.* | *Household assets* | | | |
| *4.* | *Agricultural assets* | | | |