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Identifying Profiles of Empowerment: Does the Empowerment Mix Matter for Food Security?

LaPorchia A. Collins, U.S. Department of Agriculture, Economic Research Service, laporchia.collins@usda.gov

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LaPorchia A. Collins

USDA, Economic Research Service, 805 Pennsylvania Ave., Kansas City, MO 64105

laporchia.collins@usda.gov

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Abstract

Women's empowerment is one avenue for improving food and nutrition security. Using household survey data, we conduct a latent class analysis to determine individual-level empowerment profiles present among women in rural Bangladesh. We then assess the extent to which women's empowerment is associated with food security. The results suggest a positive association between women's empowerment in agriculture and dietary diversity, a result that is robust to including additional indicators of empowerment that are not captured by the WEAI. The results show that, within Bangladesh, significant heterogeneity exists in empowerment profiles. Previously, only national-level empowerment profiles were established. A better understanding of the underlying heterogeneity in such profiles could aid in the targeting of empowerment initiatives that seek to improve food and nutrition security.

Key words: women's empowerment; food security; nutrition; latent class analysis

JEL codes: Q12; I14; D13

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1.0 Introduction

Though the prevalence of malnutrition has declined in many countries, progress has not been even (UNICEF, WHO, and World Bank 2019). As insufficient dietary intake is a key driver of malnutrition, improving household food security is of interest to policy makers and practitioners aiming to improve health outcomes among vulnerable populations. According to data from the 2014 Demographic and Health Survey (BDHS), Bangladesh has high rates of stunting (36%) and underweight (33%) among children under five; and, micronutrient deficiencies remain an issue (USAID 2018). Women also face issues with malnutrition, with both undernutrition and overweight/obesity present in the adult female population (Hasan et al. 2017). This double burden of malnutrition also exists within households, where roughly six percent of households include both overweight or obese mothers and underweight, stunted, or wasted children (Das et al. 2019).

Women, in particular, play a significant role in agriculture in developing countries. However, Bangladeshi women continue to have limited access to productive and financial resources (ADB 2018); and, according to the 2014 BDHS, only about 32% of employed women with cash earnings identified as being the main decision-maker regarding the use of their own earnings (NIPORT et al. 2016). When compared with 13 other countries, Bangladeshi women were found to have the lowest level of empowerment as measured by the Women's Empowerment in Agriculture Index (WEAI) (Malapit et al. 2014). Results from Sraboni et al. (2014) suggest that the greatest contributors to the disempowerment of women in rural Bangladesh based on the WEAI are a lack of participation in groups, a lack of control over income, and discomfort speaking in public. Sraboni et al. (2014) also find heterogeneity in the level of disempowerment across regions and across socioeconomic groups. Recent estimates

suggest that less than 40% of women in rural Bangladesh have achieved gender parity in empowerment in agriculture (Malapit et al. 2014). Hence, there is still room for improving gender equality in Bangladesh, and further information regarding the extent and effects of women's empowerment would aid policy makers and others interested in improving development outcomes.

The purpose of this study is to assess the linkages between women's empowerment and household food security in Bangladesh, accounting for the multidimensional nature of empowerment. The specific objectives of the paper are (1) to use latent class analysis to determine whether distinct empowerment profiles exist among women in Bangladesh and (2) to identify which profiles of empowerment may be more conducive to food security. We contribute to the literature by taking advantage of panel data from Bangladesh, which permits the use of a fixed-effects estimation strategy to mitigate bias resulting from unobservable factors that influence food security. The main outcome of interest is the household food consumption score, which combines information on dietary diversity and frequency of consumption. Our motivating assumption is that both the overall level of empowerment and the combination of domains in which women are empowered matter for food security.

2.0 Pathways linking women's empowerment and food security

Both food security and women's empowerment are multidimensional constructs. Food security includes four dimensions, namely food availability, food accessibility, utilization, and stability (FAO 2008) and is defined as "a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (World Food Summit 1996). Recent studies

have outlined specific indicators associated with each food security dimension (e.g., Pangaribowo et al., 2013, Lele et al., 2016).

There are multiple widely accepted frameworks of empowerment (Lukes, 1974; Rowlands, 1998; Kabeer, 1999; Alsop, Bertelsen, & Holland, 2006; and Martinez & Wu, 2009). These frameworks are combined and expanded in van Eerdewijk et al. (2017) to define empowerment as "expansion of choice and strengthening of voice through the transformation of power relations" to promote more control over one's life and future (van Eerdewijk et al. 2017, p.13).

Several existing studies have produced conceptual models illustrating how changes in women's empowerment may affect food security. Gillepsie et al. (2012) reviewed studies assessing women's empowerment in India and identified three pathways through which empowerment influences nutrition outcomes, all of which begin with women's employment. Their model suggests that women's employment impacts child and maternal nutrition outcomes because employment affects women's socioeconomic power to make household expenditure decisions, their ability to care for children, and their energy expenditures (which affect weight status).

The direction of the relationship between empowerment and nutrition outcomes is not certain. Existing evidence suggest that women's control of income is associated with increased expenditures on food and basic needs within the household (e.g., Smith et al. 2003) as well as with increased productivity (Hillesland 2016). However, increasing other aspects of empowerment such as improved labor market access may result in negative nutrition outcomes if it increases labor and time requirements (Malapit et al. 2014). For example, Herforth and Harris (2014) caution that agricultural interventions must be careful not to add to women's time

burdens, as doing so may offset gains obtained through the income pathway by reducing the time and energy available for childcare (e.g., Bennett 1992, Berman et al. 1997). Moreover, researchers found that the industry in which a woman is employed impacts BMI, with agriculture-related employment associated with malnutrition as indicated by low protein intake (Panwar 1998) and a higher likelihood of being underweight (Griffiths and Bentley 2001).

In addition, evidence suggests that interventions to increase household food production have promise for improving nutrition outcomes for women and children (Girard et al. 2012). Hillesland (2016) uses the Gender Integration Framework to link women's empowerment to agricultural productivity, a key driver of household food availability. Empowerment in decision-making over production and access to and control over productive resources were found to have a direct relationship with household agricultural productivity, while other dimensions (control over income, time use, and leadership and social capital) were found to influence productivity indirectly. Production diversity may directly impact nutrition through increased diet diversity for households engaged in subsistence production (Malapit et al. 2014). Per capita calorie availability and household dietary diversity are also positively associated with women's empowerment as measured by empowerment scores, the number of group memberships, and the number of assets for which the woman has sole/joint ownership (Sraboni et al. 2014).

3.0 Methods

To identify classes of empowerment among Bangladeshi women, we use a latent class model. Latent class analysis (LCA) is a way of categorizing individuals with respect to some latent, or unobserved, variable using data from a set of observed variables. Women's empowerment may be thought of as an increase in a woman's power to make decisions regarding her life and future.

A woman's decision-making power is unobservable. Instead, we observe proximate outcomes of decision-making power as a woman exercises agency and control over resources.

Latent class models may also be considered a type of data reduction technique that can be used to combine several measures into one index. Given the multidimensional nature of women's empowerment, the latent class model permits an analysis of empowerment that accounts for multiple dimensions simultaneously and provides insights as to which aspects of empowerment tend to be observed together within a given household. Hence, the resulting latent classes segment the population into groups of households with similar manifestations of empowerment.

3.1 The LCA Model

The latent class model (LCM) may be considered a special type of finite mixture model in which both the latent variable and the observed variables are categorical (Lazarsfeld and Henry 1968, Masyn 2013). Following closely the notation used in Masyn (2013), we assume there is an underlying categorical latent class variable, *c*, with *K* mutually exclusive classes where $c_i = k$ if individual *i* belongs to Class *k*. Let π_k denote the proportion of individuals in Class *k*, $Pr(c = k)$, where $\sum_{k=1}^{K} \pi_k = 1$. Further assume that class membership may be inferred from responses to *M* items, or latent class indicators. Let $u = (u_1, \dots, u_M)$ be a vector of responses to the *M* items observed for N study participants, such that u_{mi} is the observed response on item *m* for individual *i*. The probability of observing a particular response pattern for individual *i* conditional on being in Class *k* may be expressed as follows

$$\Pr(u_{1i}, u_{2i}, \dots, u_{Mi}) = \sum_{k=1}^{K} \left[\pi_k \cdot \left(\prod_{m=1}^{M} \Pr\left(u_{mi} | c_i = k\right) \right) \right], \quad (1)$$

where $\Pr\left(u_{mi} | c_i = k\right)$ are item-response probabilities conditional on class membership. Equation (1) assumes *local independence* of the *M* response items. In other words, it assumes

class membership explains all of the associations among the *M* manifest variables, the fundamental assumption of latent class models (Goodman 1974; Dayton and Macready 1988; Masyn 2013).

To carry out the analysis, we first estimate unconditional latent class models (LCMs) to identify the optimal number of classes. The optimal number of classes is chosen by comparing model fit statistics of LCMs with differing numbers of classes (e.g., the AIC, BIC, and entropy) and by considering the interpretability (or distinctness) of latent classes within each model following the recommendations in Masyn (2013). After the appropriate number of classes is chosen, we group households into each latent class based on the predicted probabilities of class membership using the most-likely class membership approach.

3.2 Empirical Model

We use a fixed effects (FE) linear regression model to estimate the effects of women's empowerment in agriculture on food security using the WEAI's five domains of empowerment (5DE) score as our empowerment measure of interest. The fixed effects model controls for unobservable factors that are constant for a given household across time (household fixed effects) and constant across time for all households (survey round fixed effects). We include the following demographic characteristics as controls: the age, gender, and education level of the household head, household size, and the number of dependents within the household, including children and the elderly. We also control for the number of crops grown, the quantity of cattle raised, the use of fertilizers, the availability of electricity in the home, ownership of a tube well, and ownership of a telephone.

A separate specification includes additional controls for other forms of (dis)empowerment, including the ability to travel outside of the village to visit friends and family, access to media, experiences of physical and verbal abuse, and threats of divorce.

4.0 Data

The data are derived from the Bangladesh Integrated Household Survey (BIHS) administered in 2011-2012 and 2015. The BIHS is a comprehensive, nationally representative survey that tracks the same rural households over time. Ahmed (2016) provides details on the sampling procedure. Indicators measuring empowerment in agriculture are obtained from the BIHS harmonized dataset that combines data collected in the two rounds (IFPRI 2017). As the amount of household variables provided in the harmonized dataset is limited, we link these data to information in the raw BIHS data files to obtain measures of food security outcomes and group membership. As our main variable of interest measures empowerment in agriculture, we restrict our analyses to those households where either the household head or primary female identified as a farmer, which includes but is not limited to crop production, fishing, raising livestock, and agricultural wage labor.

Empowerment in agriculture. To measure empowerment in agriculture, we use the 10 indicators that form the WEAI 5DE scores. Specifically, the indicator measures whether women have input in productive decisions; autonomy in production; ownership of assets; input in decisions regarding the purchase, sale, or transfer of assets; access to and input in decisions about credit; control over the use of income; group membership; speaking in public; workload; and satisfaction regarding leisure time (Alkire et al. 2012).

Food security. We measure food security using the household food consumption score (HFCS). The HFCS combines information on dietary diversity (number of food groups

consumed) and frequency of consumption. Diet diversity is important for preventing hidden hunger, or micronutrient deficiencies (Arimond et al 2010). In brief, the variable is computed by summing the number of days in which a given food group was eaten in the prior week based on a 7-day recall period and then multiplying those frequencies by weights based on the expected nutrient density of the food group. The HFCS is computed using the standard method described in WFP (2008).

5.0 Results

To identify empowerment profiles (latent classes) among Bangladeshi women, we estimated a series of latent class models independently by round, successively increasing the number of classes from one to eight. Model diagnostics shown in figure 1 and assessments of class homogeneity and separation reveal that the number of empowerment profiles changed between the two survey rounds. Appendix table A1 provides more detailed statistics on model diagnostics.

<Figure 1 about here>

Parameter estimates for the selected latent class models are shown in appendix table A2. Figure 2 below illustrates the empowerment profiles identified in each round. For round one, we identified four empowerment profiles. Twenty-three (23) percent of women were in the *Empowered* group, which is characterized by empowerment in all five domains of the WEAI: production, resources, income, leadership, and time. Forty-four (44) percent of women were in the *Isolated Empowered* group, characterized by being empowered to some extent in each domain except leadership. Women in the isolated empowered group have decision-making power and autonomy regarding productive decisions and income, and they own and make decisions about the purchase, sale, and transfer of assets. Unlike the empowered group, those in

the isolated empowered group are unlikely to be members of social or economic groups, and they are not characterized has having decision-making power with respect to credit. Twenty (20) percent of women fell in the *Asset Constrained* group, which may be distinguished from all other groups by disempowerment with respect to making decisions regarding the purchase, sale, and transfer of assets. Lastly, 14 percent of women were in the *Income and Network Constrained* group, which is characterized by disempowerment in both the income and leadership domains. These women do not have decision-making power regarding agricultural production and input choices nor with respect to how income is spent; and they are unlikely to serve as active members in economic or social groups and are likely to be uncomfortable speaking in public.

The time domain of the WEAI, which includes the leisure and workload indicators, did not distinguish empowerment profiles in either period, which implies that, regardless of empowerment profile, women were highly likely to report satisfaction with their available time for leisure and had decision-making power to determine their time allocation between productive and domestic tasks.

<Figure 2 about here>

In 2015, we identified two empowerment profiles: *Isolated Empowered* and *Asset Constrained*. Though bearing the same name, these profiles differ slightly from those in 2011-12 (figure 2). In 2015, the isolated empowered group, which included 75 percent of women, were empowered to some extent in each domain but had a low likelihood of being group members. The other 25 percent of women were in the asset constrained group, which could be distinguished from the isolated empowered group mainly by the significantly lower likelihood of having decision-making power regarding the use of assets.

Overall, results from the latent class estimates reveal distinct empowerment profiles among Bangladeshi women. Improvements in women's empowerment are evident between the two survey rounds, though, consistent with findings from Sraboni et al. (2014), the majority of Bangladeshi women still did not participate in social or economic groups in 2015.

Results from the fixed effects models are displayed in table 1. Using the Hausman test, we reject the null hypothesis that the household-specific errors are correlated with the regressors ($p < 0.01$), indicating that the fixed effects model is preferred over the random effects model. Both fixed effects model specifications include household and survey round fixed effects along with demographic and socioeconomic control variables. Results from specification 1 suggest a positive association between women's empowerment, as measured by women's 5DE scores. After including additional empowerment controls, we obtain a similar result, with women's empowerment in agriculture being positively correlated with household food consumption scores.

<Table 1 about here>

6.0 Conclusion

The purpose of this study was to investigate whether women in rural Bangladesh have distinct profiles of empowerment and whether women's empowerment is associated with food security outcomes. The results suggest that not all subgroups of the population share the same empowerment challenges, and these various challenges have implications for food security and nutrition outcomes. Despite not being able to ascertain the specific mechanisms, the results provide suggestive evidence that significant improvements in women's empowerment occurred in Bangladesh between 2011-12 and 2015.

The study has some limitations. The WEAI may underestimate empowerment for women whose decision-making power is primarily with respect to nonagricultural activities or overestimate empowerment for women that are not in male-headed households (Malapit et al. 2014) and could exclude other potentially important domains of empowerment, such as sexual reproductive rights and mobility (Malapit et al. 2014) and critical consciousness (O'Hara and Clement 2018). However, the population of interest is rural Bangladesh and we restrict our sample to farm households, reducing the likelihood of misclassification of households as disempowered; and, in Bangladesh, women's empowerment in agriculture was found to be positively associated with decision-making power and autonomy in other areas such as minor household expenditures, protection from violence, autonomy regarding daily tasks, and family planning (Sraboni et al. 2014).[1]

Moreover, the extent of empowerment varies across countries as does the underlying institutional and environmental contexts, so the results of this study may not be generalizable outside of Bangladesh. One implication, however, is that country-specific analyses may be beneficial to better understand the extent and heterogeneity of empowerment; and the link between empowerment and food security outcomes in other contexts should be assessed.

This research may be expanded to include utilizing the predicted empowerment profiles as an alternative measure of empowerment in the fixed-effects model to assess which combinations of empowerment are more conducive to food security and incorporating instrumental variables to mitigate endogeneity bias associated with the empowerment measures.

[1] In preliminary latent class analyses, we explored incorporating combinations of the following empowerment indicators in addition to the WEAI: input in decision-making regarding visiting family and friends outside of one's village (mobility), experiences with threats of divorce, physical abuse, literacy, completion of primary education, and access to a telephone or television. Ultimately, these additional indicators did not result in good separation among latent classes within the sample. Hence, we opted for a more parsimonious model and restrict the latent class analysis to the WEAI indicators.

Lastly, the study may be expanded to assess links between women's empowerment and nutrition security outcomes, such as the presence of child malnutrition and the double burden of malnutrition within a household.

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Figures

Figure 1. Latent class model diagnostics

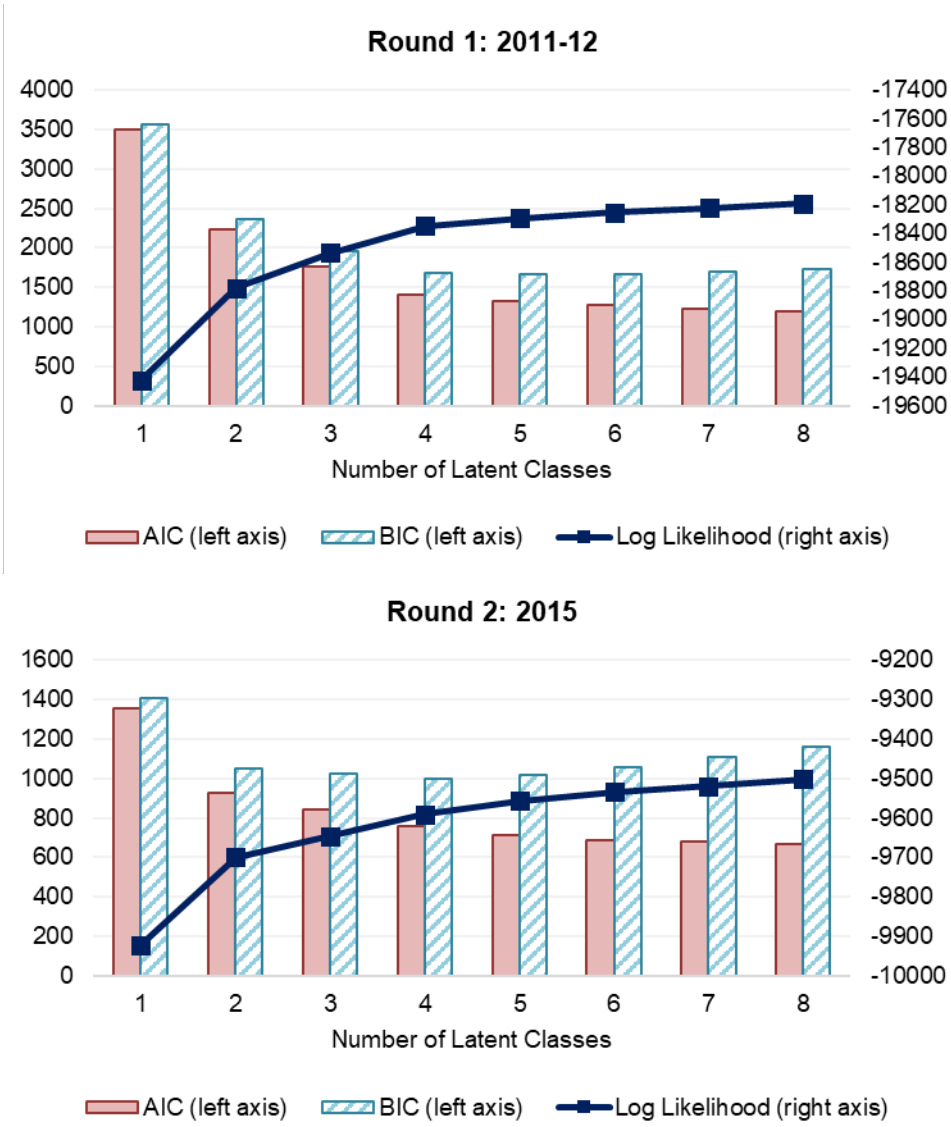
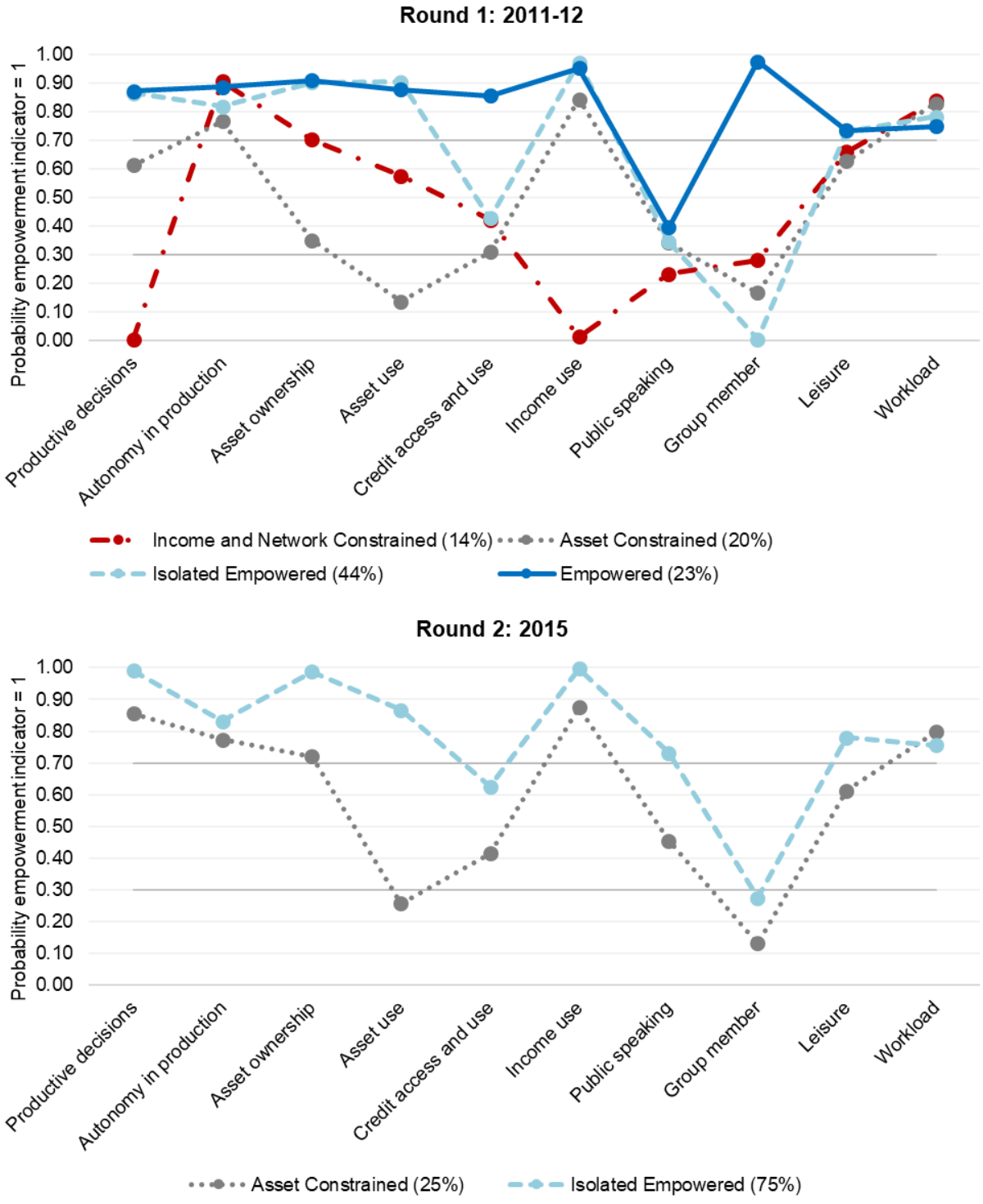


Figure 2: Empowerment profiles among Bangladeshi women, 2011-12 and 2015



Table

Table 1. The effect of women's empowerment on household food consumption scores

Specification	(1)	(2)
Women's 5DE score	4.1272*	3.9624*
Household Fixed Effects	Y	Y
Round Fixed Effects	Y	Y
Additional Empowerment Controls	N	Y
N	4,372	4,154
Adj. R-squared	0.188	0.196

Note: * indicates statistical significance at the 10% level. Both specifications include controls for household demographic and socioeconomic characteristics.

Appendix

Table A1. Detailed latent class model diagnostics

	NUMBER OF CLASSES	LOG LIKELIHOOD	G SQUARED	AIC	BIC	CAIC	ABIC	ENTROPY
Round 1	1	-19423.26763	3482.561	3502.561	3563.782	3573.782	3532.007	1
	2	-18777.32876	2190.683	2232.683	2361.247	2382.247	2294.52	0.680239
	3	-18534.43366	1704.893	1768.893	1964.799	1996.799	1863.121	0.740768
	4	**-18344.76741**	**1325.56**	**1411.56**	**1674.81**	**1717.81**	**1538.179**	**0.802677**
	5	-18292.51465	1221.055	1329.055	1659.647	1713.647	1488.064	0.80097
	6	-18254.31362	1144.653	1274.653	1672.588	1737.588	1466.053	0.814919
	7	-18223.31706	1082.66	1234.66	1699.937	1775.937	1458.45	0.799804
	8	-18191.72482	1019.475	1193.475	1726.096	1813.096	1449.657	0.748652
Round 2	1	-9921.802065	1332.209	1352.209	1408.82	1418.82	1377.049	1
	2	**-9699.211004**	**887.0273**	**929.0273**	**1047.909**	**1068.909**	**981.1901**	**0.597144**
	3	-9645.777649	780.1605	844.1605	1025.314	1057.314	923.6467	0.588917
	4	-9590.465989	669.5372	755.5372	998.9627	1041.963	862.3468	0.677197
	5	-9556.77753	602.1603	710.1603	1015.857	1069.857	844.2933	0.568096
	6	-9534.875985	558.3572	688.3572	1056.326	1121.326	849.8136	0.593469
	7	-9519.863805	528.3329	680.3329	1110.573	1186.573	869.1126	0.805997
	8	-9502.239588	493.0844	667.0844	1159.596	1246.596	883.1875	0.841857