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Measuring Women's Empowerment in Collective Households[†]

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Measuring women's empowerment within families is challenging. Social scientists often rely on close-ended survey questions on women's participation in household decisions, domestic abuse, and autonomy to measure women's power and agency. Recent advances in family economics have allowed researchers to identify and estimate structural measures of women's power and resource control based on the collective household model. We provide a brief overview of this literature. We then apply machine learning techniques to answer the following questions: How do such measures compare to women's responses to close-ended survey questions? Which survey questions are most predictive of model-based estimates of women's empowerment?

I. Theoretical Framework

Various approaches can be used to describe household behavior. However, starting from the assumptions that (i) it is individuals, not households, who have preferences, and (ii) individuals who reside in the same family may differ in their tastes, households' behavior must arise from a decision process that combines the underlying preferences of family members.

The collective household model (introduced by Chiappori 1988, 1992; and Apps and Rees 1988) has emerged as a convenient and often appropriate framework to study household decisions. The key assumption regarding decision-making within the household is that outcomes are Pareto efficient. In other words, the collective model posits that, however resources are allocated within the family, none are left on the table.

In what follows, we introduce the main components of the model. Our focus is on the framework of Browning, Chiappori, and Lewbel (2013). This is a static model of household consumption decisions. It abstracts from time use and saving decisions, and from life-cycle considerations.

Individual Preferences.—Household members each have their own preferences over consumption goods. Altruism is allowed, as everyone may care about the well-being of other household members.

Consumption Technology.—Economies of scale may arise from sharing of goods and joint consumption within a family. A consumption technology function accounts for economies of scale by transforming the bundle of goods purchased by the household into bundles of goods consumed by each household member.

Pareto Weights.—The household maximizes a weighted sum of the individual utility functions, subject to a budget constraint and the consumption technology function. Pareto weights (which may depend on prices, income, and other household characteristics) capture one's influence in the household decision process and are traditionally interpreted as measures of intrahousehold bargaining power. Variables with no direct impact on preferences, the consumption technology, or the budget constraint, but that may influence the decision process are called *distribution factors*.

Resource Shares.—These are the fractions of household total resources allocated to each household member. The function summarizing how resource shares depend on prices, the household's budget, and other covariates is known as the *sharing rule*.

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Under some mild assumptions, there exists a monotonic correspondence between Pareto weights and resource shares. Consequently, resource shares may also be interpreted as a measure of intrahousehold bargaining power. In effect, these are more tractable measures of power, as they are invariant to unobservable cardinalizations of the utility functions. Focusing on bargaining among adults, the higher a woman's resource share relative to her husband's, the higher is her power.

II. Identification

Measuring intrahousehold power using resource shares, however, suffers from a key limitation. Standard survey data measure how much the household spends, but not how much individuals consume nor the extent of joint consumption. As a result, resource shares are typically not observable. To overcome this limitation, recent works have devised approaches to identify and estimate the intrahousehold allocation of resources and the extent of consumption sharing from household-level data. While the assumption of Pareto efficiency is typically necessary, it is not sufficient, and more structure is required. Below, we provide a brief summary of some of these works.

Browning, Chiappori, and Lewbel (2013) provide the first point-identification result by imposing additional structure to the framework presented in Section I. They recover both how resources are allocated within the household and details of the consumption technology function by imposing restrictions on how preferences for goods vary across single and married individuals. The general idea behind their approach is that if preferences are fixed between singles and individuals living in a couple, then any variation in consumption patterns can be attributed to variation in the individuals' shadow budget. Given that one's shadow budget is determined by her resource share and the degree of joint consumption, their approach allows for the identification of individual-level consumption from household-level demand functions. The identification of the consumption technology function requires observable price variation, which may not be available in many datasets.

Previous work by Lewbel and Pendakur (2008) provides a way to obtain identification without price variation, while maintaining the requirement of observing singles' consumption choices. Their approach essentially recasts the framework of Browning, Chiappori, and Lewbel (2013) from a nonlinear demand system with price variation to a nonlinear Engel curve system. It also imposes additional restrictions: first, it requires that resource shares do not vary with household expenditure (sometimes referred to as *expenditure invariance*); second, it assumes that scale economies can be summarized through a scalar-valued function, which is also assumed to be independent of household expenditure (*independence of base*).

One limitation of these two approaches is that they cannot be applied to children, as children do not live alone. It can also be difficult to apply them to developing country contexts, where one-person households are rare. Cultural norms in specific regions of the world may attach a strong social stigma to women living alone. So, observing the consumption choices of singles (women in particular) may be challenging in many such contexts.

Dunbar, Lewbel, and Pendakur (2013) circumvent this issue by imposing semiparametric preference restrictions across different family members (e.g., men, women, and children), or types of households (e.g., small and large households). Like Lewbel and Pendakur (2008), they require that resource shares do not vary with household expenditure. With these restrictions, they prove that one can identify resource shares using Engel curves of private assignable goods (goods that are exclusively consumed by women, men, or children, for instance). Unlike the first two approaches, however, Dunbar, Lewbel, and Pendakur (2013) do not identify the degree of joint consumption. In other words, this approach can recover how resources are allocated within the household, but not economies of scale in consumption.

Bargain and Donni (2012) provide an alternative identification method to recover resource shares for all household members, and scale economies for adults (but not children). They impose stronger preference restrictions across household compositions than Dunbar, Lewbel, and Pendakur (2013) and require singles' data. These additional structure and data requirements are what allows them to identify scale economies and not only resource shares.

Recent work by Calvi et al. (2021) brings these previous results together to identify resource

shares and scale economies for all household members (including children) using standard household-level demand data. Specifically, they combine semiparametric restrictions on individual preferences for a private assignable good with independence of base and expenditure invariance. They also require the Engel curves of such goods to display some degree of nonlinearity. Since it does not require observing the consumption choices of people living alone, this approach is able identify measures of joint consumption not only for adults but also for children and is suitable for applications in developing countries and more traditional societies.

III. Empirical Analysis

Applying their methodology to detailed consumption data from the first two waves of the Bangladesh Integrated Household Survey, Calvi et al. (2021) estimate resource shares for women, men, and children, alongside measures of scale economies in consumption. While their analysis includes various family structures, we focus here only on nuclear families with children for whom responses to various survey questions about women's empowerment are available (1,286 households).

They find that women command, on average, 28 percent of family resources, while men's resource control is substantially larger (39 percent). The remainder is allocated to children. Note that the higher the number of children, the lower might be the share of resources commanded by adults. So, a more insightful measure of women's bargaining power is the ratio of women's resource shares over men's.

Figure 1 plots the empirical distribution of the estimated *resource share ratio* for the subsample described above. As the resource shares vary with a wide set of household traits (including women's and men's age and education, number and age of children, and region of residence), there is substantial variation around the average ratio of 0.84.

Model-Based and Survey-Based Measures of Empowerment.—The questions we wish to answer are the following: How do such measures compare to women's responses to close-ended survey questions about their empowerment and autonomy? Which survey questions are most predictive of relative resource shares?

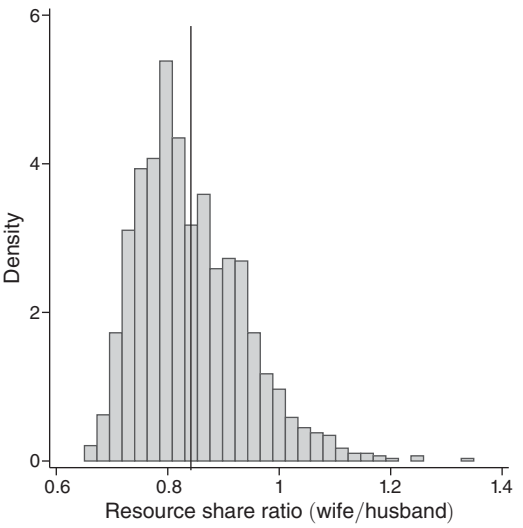

Figure 1. Resource Share Ratio

Notes: The figure shows the empirical distribution of the estimated resource share ratio in nuclear households with children from Calvi et al. (2021). Estimates are obtained using the first two rounds of the Bangladesh Integrated Household Survey.

To this aim, we apply the LASSO stability selection algorithm, where the most predictive questions are those most frequently selected when LASSO is repeatedly run on subsamples of the data (Meinhausen and Bühlmann 2010). Recent work by Jayachandran, Biradavolu, and Cooper (2021) apply this approach to identify close-ended survey questions that better predict measures of women's empowerment and agency obtained from open-ended questions in qualitative interviews.

From modules Z (Women's Status) and WEAI (Women's Empowerment in Agriculture) of the Bangladesh Integrated Household Survey, we focus on 61 close-ended survey questions on employment, work earnings, freedom of mobility and autonomy, reproductive decisions, domestic violence and threats, life satisfaction, women's empowerment and participation in agriculture, and their leadership in the community. We apply the selection algorithm as follows. We draw a 50 percent subsample of observations without replacement, run LASSO regressions of the estimated resource share ratio on the survey responses, and record those whose coefficient is not shrunk to zero. We repeat this procedure 1,000 times.

Table 1—Top Questions Using LASSO Stability Selection

	Percent times selected
Did you participate in the past 12 months in nonfarm economic activities: small business, self-employment, buy-and-sell?	100
When decisions are made regarding your own wage or salary employment, who is it that normally takes the decision?	100
In comparison to your partner do you earn less?	100
Ability to be interviewed alone.	99.9
Did you participate in the past 12 months in livestock raising?	99.9
How would you rate your satisfaction with your available time for leisure activities like watching TV, listening to radio, seeing movies, or doing sports?	99.9

Notes: The table lists the survey questions that are consistently selected by the LASSO selection algorithm. Within each of the 1,000 iterations, the LASSO tuning parameter is chosen within each iteration by 10-fold cross-validation. The complete list of questions is available in the online Appendix.

There are six questions that are almost always selected by the LASSO regularization (that is, they are selected in all repetitions but one). As shown in Table 1, four of these questions pertain to women's participation in economic activities, their relative earnings, and their ability to control them. The other two variables that consistently predict relative resource shares are women's satisfaction with their available time for leisure activities and the survey enumerator's entry for whether the female survey respondent could be interviewed alone (that is, without other family members being present).

IV. Concluding Remarks

The collective household model provides a measure of women's power based on their relative resource control. In practice, constructing such a measure is hard since consumption data is time-consuming to collect and rarely available at the individual level. Therefore, relative resource control needs to be identified and estimated using household-level data.

This article provides an overview of various approaches to do so. We also juxtapose model-based measures of women's power with a battery of close-ended survey questions that are often used to measure women's empowerment and agency and use machine learning methods to select those questions that consistently predict women's resource control within families in Bangladesh.

Since our results may be context-specific, we encourage researchers to implement this type of analysis in different settings. There are now several convincing structural estimates of *resource share ratios* from various countries around the world and close-ended survey questions about power are abundant and typically easier to collect. By comparing and combining various approaches and measures, we hope to better understand the multidimensionality of women's empowerment and improve our approach to measure it. As accurate measurement is critical for policy, doing so would represent a significant step toward eliminating gender inequality globally—a United Nations Sustainable Development Goal to be achieved by 2030.

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