

The Pitfalls of Proxies of Power in Intra-household Analysis[#]

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Abstract

This paper demonstrates the inconsistency in the effects of different measures of power within the household making it difficult to handle the concept of power empirically. Power is of paramount importance to the empirical literature on intra-household analysis. Using data from Indonesia, I show that the correlation between the alternative measures of power is weak. Moreover, these measures independently generate different results in a standard regression framework, making it difficult to interpret the true effect of bargaining power. This indeterminacy suggests the use of factor analysis as a way of empirically measuring the underlying latent concept of power.

Keywords: Indonesia, intra-household analysis, factor analysis, educational enrollment, child health status, expenditure shares

JEL classification: D13, I21, I12, O12

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I. Introduction

Early research on intra-household resource allocation was based on the assumption that households are groups of individuals who have identical preferences and fully pool their resources. Known as the unitary model, this characterization of the household has, however, been rejected empirically in both developed and developing countries¹. Failure to accept the hypothesis of resource pooling generally leads to the conclusion that there exists some sort of bargaining process within the household. This feature can be incorporated in the collective model - an alternative to the unitary model of the household - which allows for differences of opinion regarding economic decisions among household members. Therefore, when there is disagreement in how to allocate resources between competing uses, how it gets resolved depends on the preferences of the individuals within the household.

The intra-household literature has long been interested in how preferences – in particular, the woman's preferences relative to that of her partner's - affect outcome decisions. When the husband and wife differ in the extent to which they value the outcome variable, be it children's education or expenditure share on food, the result of the negotiation within the couple as far as the outcome is concerned will depend on the relative power² that each spouse has. Thus, women's bargaining power should be an explanatory variable in the analysis of outcome decisions, which are products of household bargaining. The underlying assumption in using power as an explanatory variable, is that when women have more bargaining power, they are better able to influence the household decision making process and hence, how the household's resources are allocated amongst various uses.

However, the key stumbling block in the existing literature has been the problem of turning the theoretical notion of power into a measure that can be used empirically. There are two reasons for this. First, identifying measures of power that can properly be construed as determining the outcome of interest is difficult. The measures that are commonly suggested are often reflections of the same underlying process that also determine the outcome variable – leading to the classic problem of endogeneity. Without suitable instruments, this is an econometrician's nightmare. Second, accurately measuring power using household surveys is not straightforward. This is largely because power is a multi-dimensional concept. Since household members can possibly

¹ See Strauss and Thomas (1995) and Haddad, Hoddinott and Alderman (1997) for reviews.

² As preferences are unobserved, the intra-household literature has used power to represent preferences.

derive power from various sources, it is not easy to summarize such power using a single indicator.

The empirical intra-household literature has suggested several measures of power. For example, Handa (1996) uses maternal education as a measure of power in determining children's schooling. On the other hand, Quisumbing and Maluccio (2003) use assets brought to marriage as the appropriate measure of power in determining children's educational outcomes. Other measures of power include relative control over economic resources (e.g. female share of income and female share of assets accumulated during the marriage) and relative family background and status.

However, these measures of power are substantially different from each other. Thus, empirical work that uses them as proxies for the same concept (i.e. power) is puzzling. Moreover, it is not clear why the different measures of power should all be vested in the same person. For example, a highly educated woman need not bring a higher share of assets to the marriage. Given that there is no reason to believe that these measures should be highly correlated, a detailed analysis of the various measures of power is needed to identify the possible sources of power that can suggest the true measure of power. A comprehensive analysis of this nature is carried out in this paper.

This paper considers six measures of power that have often been used in the literature. They are female share of income, female share of assets accumulated during the marriage, female share of assets brought to marriage, relative family background, relative education and relative age. Their effects on three outcomes - current child enrollment rates, child health status and budget shares on food³ - are individually analyzed. These outcomes are chosen because sufficient previous empirical work shows that women's bargaining power is a significant determinant.

For each of these outcomes, individually quantifying the effects of power (as proxied by the various measures of power) indicates that there is substantial variation in the effects of each individual measure of power on the outcome, signaling the need for a good econometric technique to analyze all these measures together.

³ The first two are individual level outcomes, while the third is a household level outcome.

As a way of combining these various measures, I undertake a factor analytic procedure. The aim of the factor analysis is to capture the underlying latent power concept, by identifying factors that are common to these six measures. The factor analysis indicates that there are two factors – an economic and a social factor - that are common to the six measures of power. These findings indicate that using just one measure of power may not capture the true effect of power on the outcome of interest.

This paper contributes to the intra-household literature in three ways. First, it offers a caution regarding standard empirical methods of operationalizing the concept of power by looking at the existing measures of power that have been used in the intra-household analysis literature and elaborating on the association between the indicators of power. Second, it outlines a way in which power can be dealt with more effectively in intra-household analysis, by suggesting an empirically implementable construct for quantifying power. Third, the importance of perception of power in intra-household analysis is briefly discussed.

The paper is organized as follows. Section II lays out the conceptual framework for the analysis. After describing the data used for the analysis, Section III outlines the various measures of power that can be constructed and presents descriptive evidence of the alternative measures of power. Section IV summarizes the econometric evidence of specifications with the alternative measures of power as explanatory variables. Results are presented using child enrollment status as the dependent variable in this section. Section V explains the results from a factor analytic technique. The paper concludes after briefly discussing the results of the child health status and expenditure share regressions.

II. Conceptual framework

The theoretical backdrop for the empirical analysis conducted here is the collective bargaining model, proposed by McElroy and Horney (1981) and Mancor and Brown (1980). For simplicity, I assume that the couple (mother, m , and father, f) makes decisions about the outcome (e.g. child enrollment). The utility of the mother U^m and father U^f , depends on X , market purchased goods and Z , home-produced goods. The reservation utility⁴, which is the level of utility that can be achieved outside the household, is V^m and V^f . This reservation utility depends on prices, p the

⁴ This is also known as the threat point.

individual's bargaining power, B_i , and extra household environmental parameters⁵, α_i . Each individual agrees to the marriage only if the difference between the utility from the marriage and their reservation utility is positive. i.e.

$$U^i(X, Z) - V^i(p, B_i, \alpha_i) > 0 \quad \text{for } i = m, f$$

Thus, m and f choose X and Z in order to maximize the product of their utility gain from forming the household.

$$\max_{X, Z} [U^f(X, Z) - V^f(p, B_f, \alpha_f)] * [U^m(X, Z) - V^m(p, B_m, \alpha_m)] \quad (1)$$

subject to

$$(i) \quad pX = w_m T_m + w_f T_f + Y_f + Y_m$$

$$(ii) \quad Z = Z(X; \Omega)$$

The first constraint is the joint full income constraint in which T_i is individual i 's time endowment, w_i , his wage rate, and Y_i , his unearned income. The second constraint is the household production function for the home-produced goods, where Ω is a household production efficiency parameter.

The reduced form demand equation, D_z , that emerges depends on prices, p , individual bargaining power B_i as adequately measured, the efficiency parameter, Ω , and variables which reflect the outside opportunities as given by α .

$$D_z = Z(p, B_i; \alpha_i, \Omega) \quad (2)$$

The empirical version of (2) is

$$D_z = Z(p, \psi; \Omega) \quad (3)$$

where ψ is the set of variables reflecting each member's relative bargaining power within the household and which will affect the household demand for goods. The set of variables in ψ now include both the bargaining power variables as well as the environmental parameters. Thus, from an empirical perspective, any variable that reflects relative authority of bargaining power within the household is a suitable candidate for ψ .

⁵ Some examples of α are wage rates, age-specific sex ratios, and variables describing the legal or social framework.

The next section describes several variables that have been suggested as proxies for ψ . Subsequently, they will be introduced in the reduced form specification to test their effects on the dependent variables.

III. Data

The data set is of particular importance to an analysis of this nature. A comprehensive data set, from which several alternative measures of power can be constructed, is needed. This requirement is met by the second wave of the Indonesia Family Life Survey (IFLS2), fielded in 1997 by RAND in collaboration with UCLA and Lembaga Demografi, University of Indonesia.

The IFLS2 is particularly advantageous as information on income, asset ownership, family status and background, education etc. are available. More importantly, in order to get a handle on the perception of power, both the husband and wife were questioned about each other's earned or unearned income, about each other's family status at marriage and about household decision making processes. It is thus possible to obtain the wife's view about a certain measure of power and contrast or reconcile it with her husband's view about the same measure of power. This is a relatively easy exercise if the measures of power are directly observed and quantified, for example age and education. However, there are other measures of power (e.g. family background) which cannot be easily observed, and which may contribute more to the power play in the household.

The analysis is restricted to monogamous households where both husband and wife are present, and the spouses have been living together for at least the past six months. This sample restriction results in about 5000 couples⁶.

⁶ I acknowledge that there can be possible sample selection biases by analyzing couples that are currently married. It is possible that couples with the most disagreement are more likely to split. Hence, our sample may be over-represented by the more harmonious couples. But I do not address these issues in this paper.

Measures of power

A) Traditional economic measures of power

Female share of earned income and current assets

Female share of income (Hoddinott and Haddad 1995⁷) is the first measure of power that is considered here. Incomes are reported by both the household head for each income earner in the household, and by other adult respondents who report their own as well as their spouse's income⁸. However, this measure is almost certainly endogenous to any outcome variable. Individual labor supply which leads to control over economic resources, can itself be thought of as an outcome of the bargaining process within the marriage between the husband and wife.

Researchers have, thus, relied on unearned income (Thomas 1990⁹) or relative asset control by each partner (e.g. Doss 1996, Kusago and Barham 2001) as more exogenous measures of power. To create these asset shares, I used the information that the IFLS2 gathered by asking each partner about the value and ownership of all assets¹⁰ owned by any member of the household. For assets for which some proportion was owned by either the husband or wife (or both), each respondent was asked to report the proportion that the respondent and his or her partner owned. The assumption that is inherently made when using asset share as a measure of power is that attribution of asset ownership is an indicator of power over decision making. However, it is possible that an individual has merely titular ownership of assets, and does not have any real control over them. This possibility is ruled out since ethnographic literature (Geertz 1961) indicates that resources accumulated during the marriage by a woman tend to be under her control¹¹ should the marriage dissolve.

⁷ Since explicit questions were not asked about how much agricultural income is controlled by each individual member of the household, the authors attempt to disaggregate income earned by gender by using ethnographic evidence to identify gender control over agricultural cash crops. They find that controlling for household characteristics, wives' share of cash income has a positive and significant effect on budget shares of food and a negative and significant effect on meals eaten out, children's clothing, adult clothing, alcohol and cigarettes.

⁸ Thomas et al (1999) use all three measures in order to control for income, to test the impact of power on child health. They find that their models are robust to all specifications, whether they use what the head reports or whether they use what the individual earner reports. Hence, in this paper, I use income shares created from what the head reports of income earners in his or her household.

⁹ Information on non-wage income (such as pensions, social security and workers compensation etc.) was collected.

¹⁰ The assets that are covered in the questionnaire are the house occupied by the household, other house or building, farm land, livestock, vehicles, household appliances, savings or certificates of deposits, receivables, jewelry, furniture and utensils.

¹¹ This is confirmed in the data from the IFLS where questions about customs were asked to heads of villages, who are experts in traditional law.

However, in a model of decision making over the life cycle, non-labor income is the outcome of past labor supply and consumption decisions. Hence, it should also be treated as an outcome of the inter-temporal household allocation process, making it potentially endogenous to the household outcomes that the researcher is interested in.

Female share of assets brought to the marriage

A more exogenous economic measure of power is female share of assets brought to the marriage, as suggested by Quisumbing(1994) and Thomas et al.(1999). The IFLS asks respondents to report the nominal value of assets that they owned at the time of their marriage and the date of marriage. Unlike current assets where each spouse reports what he or she owns, I only have one report for assets brought to marriage. Each individual reports the value of his or her assets at the time of marriage. Relative asset position at the time of marriage can possibly indicate economic independence within the marriage. It is thus an important source and measure of power.

The key problem in using assets brought to the marriage is that it is very likely to be contaminated with reporting error, since this data is based on recall of events that occurred several years before.

Table 1: Descriptive statistics of various income/asset share measures.

	Mean	Std. Dev
Male share of income	0.796	0.276
Female share of income	0.186	0.255
<i>Household assets</i>		
Male share of household assets - reported by husband	0.536	0.286
Female share of household assets - reported by husband	0.385	0.242
Male share of household assets - reported by wife	0.469	0.267
Female share of household assets - reported by wife	0.456	0.261
<i>Total assets</i>		
Male share of total assets – reported by husband	0.543	0.285
Female share of total assets – reported by husband	0.307	0.236
Male share of total assets – reported by wife	0.459	0.261
Female share of total assets – reported by wife	0.391	0.242
<i>Assets brought to marriage</i>		
Female share	0.206	0.366
Male share	0.307	0.428

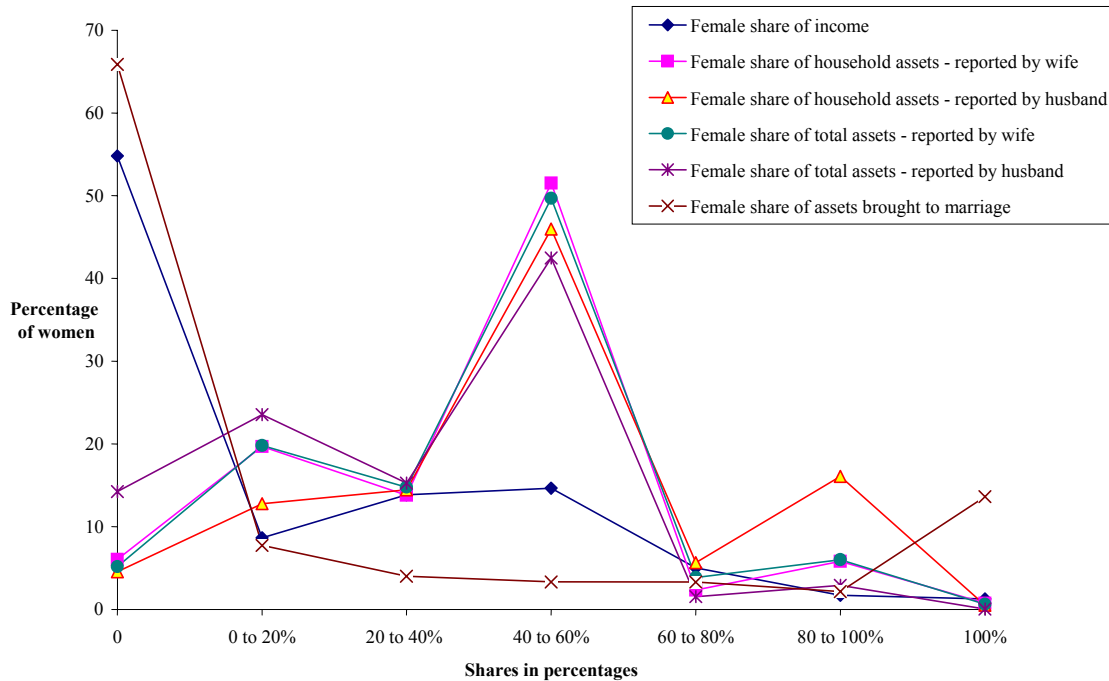
Notes: Household assets comprise the house they occupy, vehicles, appliances jewelry, furniture and utensils.

Table 1 presents the descriptive statistics of the traditional, economic measures of power available in the IFLS. As expected, male share of income is much higher than female share of income. Husbands also bring more assets to the marriage than their wives. Two types of asset shares are created.

The differences in the means of the various share variables ought to be highlighted. While female share of income is only about 20%, female share of household assets as reported by the husband is about 30%. This implies that even if the woman is not earning any income, she still has control over asset shares, suggesting that income measures may systematically understate a woman's power in the household. This observation is further highlighted if we plot the percentage of women in each share category against the share category. This is shown in Figure 1 below. One can observe that more than 55% of women report that they have no share of income – most certainly because they are not working, while less than 10% of wives report that they do not have any share of current household assets.

This issue of income shares' bias is further underscored in the household decision making module where husbands were asked who decided whether the wife works. While this decision was often made jointly, in about 30% of the couples, it was made solely by the husband. Clearly, female share of income is an endogenous measure of power.

Figure 1



Both Table 1 and Figure 1 also indicate that the wife’s share of assets as reported by the husband is consistently lower than the share of assets reported directly by the wife¹². If one assumes that the wife’s report is the truth, this suggests that husbands are under-reporting the percentage of assets the wife owns.

This suggests that in addition to power, the perception of power is also an important concept in empirical intra-household analysis. The importance of perception of power has been recognized by researchers in the field who note that ‘*it is critical to collect data from the individual in question to the extent possible*’ (Fuwa et al 1995).

In most survey data, it is often the case that only the husband or the household head’s report¹³ is available. Although, when measures of power are considered for empirical analysis, it is important to use what each respondent reports, since the response by the spouse can either under or over report the true distribution of power within the couple. The resulting errors in variables

¹² The differences in the mean of asset shares reported by the husband and wife are also statistically significant at 5%.

¹³ If husbands or the household heads do not have accurate information about their spouses, this can lead to incorrect reporting which leads to measurement error.

problem will necessarily introduce bias and inconsistency akin to that due to classic endogeneity problems.

B) Socioeconomic measures of power

Family background and status

The empirical literature has mostly suggested that bargaining power can be represented by the share of resources (although potentially endogenous) allocated to an individual in the household. Recent studies try to circumvent the endogeneity problem described earlier. For example, Beegle, Frankenberg and Thomas (2001) introduced individual status and family background¹⁴ at the time of marriage as alternative measures of power. They find that women from families of higher social status are more likely to obtain prenatal and delivery care

Relative family background and status as a measure of power is constructed from the following question in IFLS2 that both the husband and wife answered:

At the time of marriage, how did the status of your parents compare to the status of your parents-in-law? Eight categories¹⁵ were specified.

Looking at the relative status of the husband's and wife's family can capture an important indicator of power, since resources that come from a person's family can be a source of support and assistance should the marriage fail. Social domains of power are important, and the family background can play a role in moderating power within the household. Moreover, power relations are often established early in the marriage. Thus the family background at the time of marriage can be an important influence of marital dynamics and power within the household. Table 2 shows the descriptive statistics of these variables, as reported by the husband and wife.

¹⁴ Ethnographic literature is cited to justify relative family status as a measure of power. Thus, economists are increasingly relying on ethnographic evidence to help identify appropriate measures of bargaining.

¹⁵ These categories are father's job, father's education, mother's education, position in community, quality of housing/neighborhood, earnings, land and other assets.

Table 2: Descriptive statistics of measures of family background as perceived by the husband and wife¹⁶

	Husband and wife are of equal status at the time of marriage			
	Husband's response		Wife's response	
	Mean	Std. Dev.	Mean	Std. Dev.
Father's job	0.338	0.473	0.333	0.471
Father's education	0.349	0.477	0.342	0.475
Mother's education	0.548	0.498	0.546	0.498
Position in community	0.605	0.489	0.611	0.487
House quality	0.537	0.499	0.531	0.499
Earning	0.467	0.499	0.477	0.500
Land*	0.434	0.496	0.451	0.498
Assets*	0.541	0.498	0.554	0.497

	Husband is of higher status than wife at the time of marriage			
	Husband's response		Wife's response	
	Mean	Std. Dev.	Mean	Std. Dev.
Father's job*	0.110	0.313	0.092	0.290
Father's education*	0.094	0.291	0.073	0.260
Mother's education*	0.080	0.272	0.062	0.241
Position in community*	0.138	0.345	0.105	0.306
House quality*	0.160	0.366	0.139	0.346
Earnings*	0.190	0.393	0.172	0.378
Land	0.202	0.401	0.195	0.396
Assets	0.148	0.355	0.140	0.347

	Husband is of lower status than wife at the time of marriage			
	Husband's response		Wife's response	
	Mean	Std. Dev.	Mean	Std. Dev.
Father's job*	0.083	0.276	0.095	0.293
Father's education*	0.081	0.273	0.092	0.290
Mother's education*	0.079	0.270	0.093	0.290
Position in community*	0.089	0.285	0.112	0.315
House quality*	0.136	0.343	0.158	0.365
Earning	0.172	0.377	0.176	0.381
Land*	0.195	0.396	0.179	0.384
Assets*	0.140	0.347	0.130	0.337

Note: * signifies that the difference in mean in husband's and wife's reporting is statistically significant at 5%.

It is evident from the above table that perception of power matters. While, 9.2% of women say that their fathers are more educated than their fathers-in-law, only 8.1% of men claim that their fathers are less educated than their fathers-in-law. These two numbers should be equal especially since educational attainment is a relatively objective and readily observable variable. If the wife's

¹⁶ Means for each category (higher, lower and equal) do not add to one, as there were several couples for whom comparisons were not possible as either of the parents were dead.

father is more educated than the husband's father, then it necessarily has to be the case that the husband's father is less educated than the wife's father. Yet, a significant number of couples exhibit a substantial discrepancy¹⁷.

Relative education of the spouse

There is a substantial literature that relates women's education to the choices that they make. For example, Basu (1992) documents the role of female education in lowering fertility. The basis for this argument is that education is a measure of power and that more powerful women are able to assert their preferences towards the increased use of contraceptives resulting in reduced fertility.

While maternal education has several roles¹⁸, Handa (1996) suggests using education attainment by women as representing her bargaining power. Since education affects income-earning opportunities, it can be hypothesized that education can cause a shift in the bargaining power, increasing the demand for goods that the woman prefers. Thomas (1994) also uses women's education as a measure of bargaining power. In three countries – the U.S., Ghana and Brazil - he finds that the education level of the mother has a larger effect on the daughter's height controlling for sex and age while the education of the father has a larger effect on the son's height controlling for sex and age.

In the sample that is used here, husbands are on average better educated than their wives. Husbands tend to have about 5.7 years of education while wives' have about 4.5 years of education.

Age

Age is the final measure of power that I use. The underlying assumption here is that if the husband is older than his wife, he is likely to wield more power in the household. Husbands are on average about 5.6 years older than their wives.

¹⁷ It is also interesting to note, however, that in most cases, couples that do marry are somewhat equal in most aspects of family background.

¹⁸ In the education literature, woman's education can represent genetic or innate ability, income effects of more effective use of inputs (Wolfe and Behrman 1984). In the health literature, it can represent better information processing and knowledge of health care (Barrera 1990).

The correlation¹⁹ between the different measures is quite low. Table 3 documents the partial correlation coefficients between the alternative measures of power. These were obtained using Ordinary Least Squares (OLS) regression²⁰ (controlling for husband's age and education) on each measure of power using the other measures of power as explanatory variables. This exercise shows that these measures are at best only weakly correlated. Moreover, several of these are also non-positive.

[Table 3 about here]

Controlling for other household characteristics, Table 3 shows that wife's education is highly correlated with both the economic and socioeconomic measures of power. However, wife's age and status variables have almost no effect on the economic measures of power. This is preliminary evidence that there are possibly two dimensions of power – an economic dimension, and a social dimension.

IV. Empirical Evidence

This section presents empirical evidence on the effect of women's power on the probability that a child in the household is currently enrolled in school²¹.

The effect of women's bargaining power on children's educational outcomes has been studied with great interest. Handa (1996) finds that in male-headed households, where the woman's relative bargaining power is likely to be more important than in female-headed households, the impact of her education is 1.5 to 5 times larger. By strengthening the bargaining power of the mother in the household, she is able to select better educational outcomes for children. Kambhupati and Lal (2001) find that the father's education has a significant impact on both boys' and girls' education at the primary level while the mother's literacy has a greater impact on the chances of daughters being educated than sons in India. Using data from four different countries - Ethiopia, Bangladesh, Indonesia and South Africa - Quisumbing and Maluccio (2003) find that

¹⁹ Results of the pair-wise correlation coefficients are available from the author.

²⁰ In each regression, other explanatory variables included log real monthly per capita expenditure, household size, urban-rural dummy and provincial dummies

²¹ The penultimate section discusses the results of the health and food share regressions.

male and female assets brought to marriage have different impacts on resource allocation toward educational outcomes²².

Child enrollment rates

The formal school system in Indonesia consists of the following levels of education - basic education, secondary education, and higher education. Basic education is in principle a general education of nine years, consisting of six years of primary school education (between ages 7 and 12 years) and three years of junior high school education, where the child is between 13 and 15 years. Secondary education consists of another three years, which takes the individual on to an undergraduate program. Secondary education comprises three years of senior high school.

Table 4: Enrollment rates, by age and gender

Age of child (in years)	Enrollment rate		
	Male	Female	Average
7	0.893	0.922	0.907
8	0.959	0.981	0.969
9	0.982	0.982	0.982
10	0.980	0.971	0.976
11	0.961	0.976	0.969
12	0.906	0.946	0.926
13	0.870	0.861	0.865
14	0.811	0.853	0.831
15	0.735	0.748	0.741
16	0.633	0.646	0.639
17	0.591	0.623	0.606
18	0.398	0.463	0.430

Table 4 shows current school enrollment rates, stratified by both gender and age. Initially, there is high enrollment in schools. Nearly 91% of all children in the sample are currently enrolled in first grade. Current enrollment rates start to fall at around 12 years, just as children are completing primary school education. Table 4 also shows that for most ages, the enrollment rate for boys is lower than that for girls.

²² However, the mechanism underlying the results differs across the countries. For example, they find that in Bangladesh, father's schooling has a negative effect on girls' schooling, but parental assets do not have differential effects on daughters relative to sons. It is just the opposite in South Africa.

The effect of woman's bargaining power on child enrollment is estimated following Thomas (1990). Child's enrollment status is estimated as a function of child characteristics and parental characteristics²³. The demand function for child education derived from equation (3) can be stated as

$$E_{ij}^* = \beta_0 + \beta_1 C_{ij} + \beta_2 H_j + \beta_3 X_j + \beta_4 Z_j + \varepsilon_{ij} \quad (4)$$

where:

E_{ij}^* is a dichotomous variable, taking a value of 1 if the child i in household j is currently enrolled in school and a value of 0 otherwise

C_{ij} is the vector of child characteristics, such as gender, age and its square term, and the number of siblings the child has in discrete age groups.

H_j is the vector of household characteristics such as LNPCE (log real monthly per capita expenditure) and mother's bargaining power.

X_j is the vector of location and provincial dummies.

Z_j is the set of community-level variables indicating availability and quality of schools. Two variables – the number of schools in the Enumeration area and the age of the first primary school built – proxy for the supply-side variables in the schooling equation.

ε_{ij} is the error term.

The β parameters have to be estimated²⁴. Since the dependent variable, current enrollment, is binary, a probit model is estimated.

²³ Table A1 in the Appendix gives the descriptive statistics of all the variables used in the regressions.

²⁴ It is possible that there are household-level factors that are correlated with some of the included explanatory variables. Thus rightfully, fixed effects estimation should be carried out. However, since the bargaining power variables that I am interested in are also constant for all children in the household, it is impossible to investigate their effects in a fixed effects model. Thus, levels estimates are reported here.

LNPCE is used as a proxy for household permanent income and is potentially endogenous in the demand for schooling as household expenditure is likely to be correlated with the unmeasured determinants of child schooling. One therefore needs to use instruments²⁵. The Rivers and Vuong (1988) methodology is used.

Each specification uses a different measure of power – relative age, relative education, female share of income²⁶, female share of current household assets, female share of assets brought to marriage and two variants of family background variables. The first set of family background variables are an index²⁷ created from the 8 categories, differentiated by husband's and wife's responses. The second set of variables are dummy variables equaling one if the wife was from a higher position in the community at the time of marriage compared to her husband. Husband's and wife's reports of this variable were created.

Table A2 in the Appendix shows the results from the base specification – one without any measures of bargaining power. Both the OLS and IV estimates are shown. I discuss the IV estimates here as exogeneity of LNPCE was strongly rejected²⁸.

Gender of the child had a significant and negative effect on enrollment, suggesting that boys were less likely to be currently enrolled in school compared to girls. The relation between enrollment and age was quadratic. This suggests that an increase in the age of the child is associated with an increase in the probability that the child is enrolled in school, but beyond a certain age (around

²⁵ In addition to the demographic variables, child specific variables and location dummy variables, instruments for LNPCE are 1993 log real monthly per capita expenditure, dummy variable equaling one if the walls are made of cement or prefabricated wood, dummy variable equaling one if roof is made of concrete or wood, dummy variable equaling one if there is a television in the house, number of rooms per capita in the house, dummy variable equaling one if the floor is made of cement, ceramic or tiles, nominal variable equaling zero if the household does not have proper toilet facilities, one if the household uses shared toilets and two if the householders have their own toilet. These variables were individually and jointly significant at 10% and explained about 52% of total variation. These first stage results can be obtained from the author.

²⁶ As explained earlier, female share of income is potentially endogenous. In addition to the demographic variables, child specific variables and location dummy variables, instruments for female share of income are difference in age between the husband and wife, difference in years of education between the husband and wife, a selectivity correction term accounting for households where share of income equaled zero, wife's age and a dummy variable equaling one if the wife attended at least junior high school.

²⁷ The reliability coefficient (Cronbach's Alpha) for the status scale for wife's reporting and husband's reporting is 0.91 and 0.92 respectively. Cronbach's alpha is a measure of internal consistency, based on the average correlation between items. It is assumed that items are positively correlated with each other because they are attempting to measure a common construct; thus, a Cronbach's alpha close to 1 indicates a perfect consistency between items.

²⁸ In fact, exogeneity of LNPCE was rejected for all specifications.

8.6 years) the effect becomes negative. Wealthier households are more likely to enroll children in school. An increase in the permanent income of the household is always associated with an increase in educational attainment. This essentially implies that child schooling is a normal good.

Having siblings, who were either older (between 12-18 years of age) or younger (less than 7 years of age), was likely to increase the chances of a child being enrolled in school. This can be explained in several ways. Fertility choices and outcomes are presumably correlated with wealth. Alternatively it can suggest that sibling rivalry for the household resources does not exist. The number of siblings less than 7 years of age is likely to have a positive effect on being in school, as these children have not yet started school. As for the older siblings, it is possible that they have stopped studying and are contributing to the household income pool. It is also possible that parents realize the benefits of education through their earlier children, and are more likely to keep subsequent children in school.

Finally, community variables indicating availability and quality of schools in the community had a positive effect on current enrollment. This suggests that the availability of schools in the community is an important consideration in parents' decision to send their children to school. These results are consistent with the empirical findings on determinants of current school enrollment (e.g. Maitra 2001). Moreover, these results hold for every specification run, irrespective of the measure of power used, suggesting that these results are robust.

Table 5 describes the effects and statistical significance of the various bargaining measures of power on school enrollment. It is evident that there is substantial inconsistency in the effect of power on the outcome variable.

[Table 5 about here]

It is believed that women's bargaining power in the household should increase the probability that a child should be currently enrolled in school. However, for several measures of power, there is no relation between bargaining power and child enrollment. These were largely the economic measures of power.

On the other hand, female share assets brought to the marriage and both variants of the status measures of power are positive and significant. This implies that women's bargaining power as proxied by these measures leads to better schooling outcomes. Parental education increases the probability that a child is enrolled in school, with mother's education having a bigger²⁹ effect than father's education.

Moreover, who answers the survey questionnaire also seems to matter in predicting the relation between the outcome and power. This is clearly evident for the second variant of the status, which compares husband's and wife's positions in the community. If the wife says that she comes from a better position in the community than her husband, this increases the probability that the child is enrolled in school. However, the husband's response (that his wife is of a better position than he is) does not have any effect on schooling.

Thus, each measure of power independently generates different results in a standard regression. The relationship between *power* and child educational outcomes can be consistent with any economic theory. This lack of apparent robustness makes empirical research using any single proxy for power somewhat suspect.

V. Factor Analysis

The previous section showed that there was substantial inconsistency in determining the effect of power on children's enrollment in school. Therefore, one might reasonably seek some method to extract the common covariate of all proxies, the latent power variable. Factor analysis is a way of tying the alternative measures together.

Two assumptions are needed in order for factor analysis to be useful. First, there is an underlying latent concept called intra-household power that can be derived from the alternative measures of power. Second, the measures that are used in the factor analysis are truly proxies or measures of power. Given that all the measures of power suggested in this paper have previously been used in the empirical intra-household literature as measures of power, these assumptions are justified.

²⁹ The difference is about 2 percentage points.

To construct an index of power one needs a set of weights for each power measure. That is, we want an index of the form

$$P_i = \alpha_1 p_{i1} + \alpha_2 p_{i2} + \dots + \alpha_n p_{in} \quad (5)$$

where P is the power index, p_i s are the individual power measures gathered from the various modules in the survey and the α s are the weights, which need to be estimated. The true relationship between the various measures is largely unknown. Hence, rather than imposing arbitrary weights, I use factor analysis, which allows the weights to be determined in the data. This technique has been used previously in the literature³⁰, to explore the effect of expenditure quantities on welfare when expenditure data is not available.

Factor analysis accounts for the covariance of the power measures in terms of a much smaller number of hypothetical common covariates, or factors. Moreover, power-specific influences can explain the remaining variances. In other words, all of the common factors are not forced to explain the entire covariance matrix. In this case, I do not assume that there is an overwhelming factor at the outset. Rather, I let the data determine the number of factors that should be kept and will try to see if they can be interpreted in a meaningful way.

Where there were multiple responses for the same measure of power (as in the case of share of household assets), the wife's response was taken to be more appropriate. This was done to eliminate any bias that may result from the husband's reporting.

Table 6: Factor loadings for the power index

Variable	Factor 1	Factor 2
Female share of income	-0.075	0.060
Female share of assets brought to marriage	0.051	0.101
Husband's age	0.846	0.088
Wife's age	0.831	0.017
Husband's education (in years)	0.042	0.722
Wife's education (in years)	0.096	0.728
Female share of household assets as reported by wife	-0.055	-0.046
Alpha-Cronbach index of status as reported by wife	0.213	0.209

³⁰ Filmer and Pritchett (2001) and Sahn and Stifel (2002) use factor analysis to construct an asset index using the Demographic Health Surveys, which do not contain expenditure or income data.

Table 6 shows the results of the factor analysis. The first factor relies mostly on information in the age variables. Both the age of the husband and wife load highly positively in this factor, implying that increases in age controlling for all the other variables, increase the effect of this factor³¹. The economic measures of power have little weight in this factor. In particular, female share of income and assets load negatively in this factor.

Husband's and wife's education load positively in the second factor suggesting that increases in the education of both husband and wife contribute to an increase in this factor. The economic proxies of power (such as female share of assets brought to marriage and female share of income) load much higher on this factor than the first factor. Thus this can be thought of as an education³²(and hence economic) factor. Although, status has weights in positively in both the factors, it has a higher weight in the first factor. Thus, the first factor can be thought of as a social factor.

Results of the regression of the explanatory variables including factor scores on child enrollment status are given in Table 7.

[Table 7 here]

Both factors are significant predictors of child enrollment. The second factor (economic factor) has a larger effect on the outcome than the first (i.e. the social factor). Table 7 suggests that using any one measure of power can lead to incorrect estimates, reinforcing the fact that power is a multidimensional concept. Rather, the full effect of the women's bargaining power is shown by taking the effect of both factors together. These two factors have incorporated all the information present in the measures of power and they confirm the finding that woman's bargaining power leads to desirable schooling outcomes.

Thus, the factor analysis suggests that previous empirical work that used just one measure of power may not have adequately captured the true effect of woman's bargaining power on child's educational enrollment. For example, while mother's share of assets brought to the marriage has a positive effect on educational enrollment of her children it is possible that the coefficient on the asset variable may not be the true effect of women's bargaining power because of an omitted

³¹ The factor analysis is quite robust to specification, whether I use ages of husband and wife in levels or just one variable to represent the difference in age.

³² Education also increases the income earning opportunities, thus making it more of an economic factor.

variable. The omitted variables bias arises from the fact that a proxy of power representing the social dimension of power was not included in the regression.

To test this hypothesis, the effect of female share of assets brought to marriage was reconsidered as an explanatory variable measuring power. However, the status variables³³ were also included as measures of power. Thus, both the economic and social dimensions of power are accounted for. I find that both the measures of power are highly significant and positive³⁴. This suggests that the estimate of female share of assets in Table 5, understated the true effect of power.

VI. Robustness Check

This section presents results using measures of power as explanatory variables in regressions where child health status and budget share on food are the dependent variables.

Child Health Status

Previous work has found that women's bargaining power is a significant determinant of improved child health status (e.g. Thomas, Strauss and Henriques 1991, Thomas 1994). Thomas (1990) finds that the mother's bargaining power (as measured by her unearned income) has a bigger impact on child survival probability³⁵ as compared to income controlled by the father.

The effect of woman's bargaining power on child health status is estimated following Thomas, Contreras and Frankenberg (1999). Occurrence of morbidity³⁶ is taken as an indication of child's health status. The Indonesia Family Life Survey asks each respondent or his or her mother³⁷ or care-taker specific questions about health during the four weeks prior to the interview. The questions focus on experience with any of a list of symptoms (e.g. runny nose, headache, fever etc.) whether normal daily activities have been disrupted by ill health, whether health status required the respondent to stay in bed, and the respondent's ranking of his or her general health status.

³³ Both variants of the status variables were included separately in this regression.

³⁴ Results can be obtained from the author.

³⁵ This effect is almost 20 times larger.

³⁶ While anthropometric data would serve as a better indicator of long term child health and nutritional status, the data has not yet been released by RAND.

³⁷ For children 10 and below questions are directed to the mother or care-taker. Children older than 10 typically report for themselves.

The dependent variable is the occurrence of any morbidity in the past four weeks. This is an indicator of poor health. The analysis is restricted to children under the age of 10. This short-term indicator of child health is estimated as a function of child characteristics and parental characteristics. As derived from equation (3) this can be stated as

$$H_{ij}^* = \beta_o + \beta_1 C_{ij} + \beta_2 H_j + \beta_3 X_j + \beta_4 Z_j + \varepsilon_{ij} \quad (6)$$

where:

H_{ij}^* is a dichotomous variable, taking a value of 1 if the child, i in household j experienced any morbidity and a value of 0 otherwise.

C_{ij} is the vector of child characteristics, such as gender, age of child in year dummies, the number of siblings that the child has and a dummy variable equaling one if the child is the head's offspring.

H_j is the vector of household characteristics such as LNPCE, the mother's bargaining power and the number of adults who live in the household

X_j is the vector of location and provincial dummies.

Z_j is the set of community-level variables indicating availability health care. Two variables - the number of mass vaccinations that took place in that Enumeration Area since 1992 and the number of health care facilities that the population has access to – are used to proxy for the availability of health care.

ε_{ij} is the error term.

The β parameters have to be estimated³⁸. Since the dependent variable, occurrence of any morbidity, is binary, a probit model is estimated.

Approximately 70% of children experienced at least one form of morbidity during the month prior to the survey. In all specifications run, LNPCE³⁹ was significant and positive, indicating that wealthier households were more likely to report having experienced morbidity. Since we are looking at self-reported morbidity, this can be explained by acknowledging that wealthier households are more likely to seek health care and are more knowledgeable about diseases, which results in them reporting them more. Younger children are more likely to suffer from morbidities than are older children. The availability of several health care and mass vaccinations lowers the

³⁸ Again levels rather fixed effects estimation is carried out. Results of this estimation can be obtained from the author.

³⁹ Exogeneity of LNPCE was rejected for all specifications at the 10%.

occurrences of morbidity. Moreover, if the child is an offspring of the head of the household, he or she is less likely to fall ill.

Table A3 in the Appendix shows the effects of each measure of power, as individual explanatory variables. Once again, there is substantial inconsistency in the effect of measures of power on the occurrence of morbidity. Women's education (in years), female share of income reduce the probability of a morbidity occurring in children. However, the assets measures have no effect on morbidity occurrences.

If the wife reports that her husband has a better position in the community than herself⁴⁰, there is a higher probability that the child had experienced some form of morbidity. On the other hand, the variable created from the response of the husband, does not have a significant effect. Thus, perception of power matters. Given that in most surveys, the husband (or the head of the household who is a male) is called upon to answer the questions, this indicates that the true effect of power may not be captured.

The factor analysis⁴¹ suggests two factors. The first loads heavily on husband and wife's age along with female share of current assets and female share of income. This can once again be called the economic factor. The status variables and education contribute heavily to the second factor. However, female share of assets brought to the marriage also loads on the second factor. While, this has been considered as an economic measure of power, it is very likely that families of higher social status are more likely to endow their children with more assets at marriage. Thus, female share of assets at marriage can also represent social status in a limited way. Thus, an economic and social factor of power can be identified in the factor analysis.

Using these factors in the regression shows that both these factors have a significant and negative effect on the occurrence of morbidity, confirming the stated belief that women's bargaining power decreases the occurrences of reported morbidity.

⁴⁰ Since this variant of the status measure is a 0-1 dummy, this necessarily implies that the wife reports that she is of a lower position in the community which indirectly suggests that she has lower power than her husband.

⁴¹ The results can be obtained from the author.

Budget share on food

To estimate the effect of women's bargaining power on food shares, the econometric methodology outlined in Hoddinott and Haddad (1995) is followed. An extension of the Working-Leser expenditure function is estimated in the following way.

$$F_j = \beta_o + \beta_1 H_j + \sum_{k=1}^{K-1} \beta_{kj} D_k + \beta_3 Z_j + \varepsilon_j \quad (7)$$

where

F_j is the budget share on food eaten at home in household j .

H_j is the vector of household characteristics such as LNPCE and household size in log terms, and the wife's bargaining power.

D_k is the vector of demographic variables. These are dummy variables indicating the proportions of different demographic groups (for example, the number of boys and girls under the age of 7).

Z_j is the vector of location and provincial dummies.

ε_j is the error term.

The β parameters have to be estimated. As LNPCE is potentially endogenous, two Stage Least Squares (2SLS) is used to estimate (7).

The effects of the demographic variables are of the expected nature. Since the expenditure category is food eaten at home, it is not surprising that LNPCE has a negative effect, implying that the wealthier households are less likely to spend on food. Larger households spend less on food possibly because economies of scale exist (Deaton and Paxson 1998). There is evidence of some gender bias against girls as indicated by the negative sign on proportion of females aged 7 to 18 years. Since the omitted category is boys aged 7 to 18 years, this negative sign implies that having girls in that same age group decreases expenditures on food.

Table A4 in the Appendix shows the effects of each measure of power, as individual explanatory variables. Some measures of power (for example, relative education of the wife, female share of assets brought to the marriage) have a negative effect on food expenditures. Several other measures have no effect on food expenditures. In particular, the status variables have no effect in determining budget shares allocated towards food.

The negative effect of women's power seems surprising at first glance, since other studies from Sub-Saharan Africa (Doss 1996; Hoddinott and Haddad 1995) show that increasing the share of resources controlled by women is associated with an increased food budget share.

These results may be affected by factors specific to the Indonesian situation where women are the primary decision makers regarding food eaten at home. The decision making module of the IFLS shows that in about 80% of the households, both husbands and wives agree that the wives make the decisions about expenditures on food eaten at home. Using budget shares captures the allocation decisions among different commodities. An increase in the budget share on one category causes the budget share on another category to fall, thus capturing the trade off that households have to make in allocating income among competitive expenditure categories. Thus, the negative effect that is being captured here may be reflective of the woman's preferences towards other expenditure categories (such as children's' education and health expenditure)⁴².

The factor analytic procedure again indicates the existence of two factors. The first factor depends on education and status, while the second depends on female share of assets brought to marriage and female share of assets accumulated during the marriage. The second factor is the economic measure in this case, while the first factor is the social factor. The first (or social) factor is highly significant and negative, while the first factor is not as significant⁴³.

The results presented here using health and expenditure share regressions, confirm the findings that were obtained in the earlier section using current enrollment of children as the outcome variable.

VII. Conclusion

Pollak (1994) criticized economic models of intra-household resource allocation for the exclusion of 'noneconomic' variables such as power. Since then, researchers have acknowledged that the importance of bargaining power between spouses plays an important role in empirical intra-household analysis. However, a good measure and proxy of power has not yet been found.

⁴² This is similar to Thomas (1993) who finds that the proportion of the budget spent of food declines if income is in the hands of women. However, nutrient intake increases. This could suggest that women are more likely to substitute towards investments in human capital and also goods that are substitutes for the woman's own time.

⁴³ It is negative and significant at 13%.

Using data from the Indonesia Family Life Survey, fielded in 1997, this paper shows the effect of various measures of power as explanatory variables in a standard regression framework. Three dependent variables – child current enrollment status, child health status, and budget share on food – were looked at.

For each outcome, it was shown that there was substantial discrepancy in the effect of power. In some cases, the relation between power and the outcome variable was of the desired and expected sign, while in others it was insignificant. Thus, they give inconsistent results in regression analysis. This suggests that given the data, it is entirely possible to justify the choice of a proxy of power to confirm the stated hypothesis. Moreover, these measures of power are at most weakly correlated with each other.

However, social scientists do understand and agree that intra-household power matters to behavior and household decision making, which suggests the use of factor analysis in combining the various measures together to come up with one or two underlying factors that can be thought of representing the power concept in household bargaining. This can also help us identify the possible sources of power.

In each case, two interpretable factors – an economic and a social factor - were obtained from the factor analysis. These factors were subsequently used in the regression analysis in the hope of eliciting the true effect of the latent power concept. In most cases, these factors were significant suggesting that using just one measure of power will probably understate the true effect of power. Moreover, it is possible that the estimates of the effect of power, when just one measure of power is used, are likely to be biased. The bias arises because of the omitted variables problem, from failing to incorporate the effect of the power as proxied by the other dimension of power.

This paper suggests that woman's bargaining power is not adequately summarized by a single measure of power but spans multiple dimensions, including economic and social aspects. Focusing attention on just one single indicator of power – be it economic or social – is likely to miss an important part of the intra-household decision making process.

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