Does greater autonomy among women provide the key to better child nutrition?

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Abstract

We use the 3rd Round of the Indian National Family Health Survey, to study the effect of maternal autonomy on child nutrition defined by Height-for-age Z score (HAZ) and Weight-for-height Z score (WHZ). We create an index of maternal autonomy within a latent factor modelling framework, using the full set of sample of women in the dataset, and use in nutrition equations. The autonomy index is allowed to be correlated with factors such as religion, caste, education etc. to account for traditions and social norms. Our results show that maternal autonomy is positively associated with the long-term nutritional status of children as measured by Height-for-Age z-scores however, only for rural children who are aged under 2. One SD increase in our autonomy index is found to increase the HAZ score by 0.046 for these children. Higher autonomy also was found to reduce the probability of being stunted for these children. Ways to enhance women's autonomy must therefore, be an integral and important part of the wider strategy to improve the nutritional status of children in India.

Keywords: *Child Nutrition; Maternal Autonomy; Latent Factor Models; Empirical Bayes; Structural Model; India; National Family Health Survey.*

JEL Classification: C38, I14, I18

1. Introduction

Her son Imran was tiny and had the face of an old man, shrivelled and shrunk. His feet were so thin that we wondered if he would ever be able to walk. His head seemed too big for his small frail body. We assumed he was about eight months old.

'He is eighteen months old', Maimun Nisa said.

Beautiful Country: Stories from another India, (Hameed and Veda, 2012)

Not so long ago, India was characterised as an 'economic powerhouse and nutritional weakling' (Haddad, 2009); since then economic growth rates have plunged, but hunger and malnutrition remain stubbornly high. 45 percent of children under 3 years of age in India are short in relation to their age, 40 percent are underweight in relation to age and, and 23 percent are wasted (IIPS and Macro International, 2007). Among some social groups the situation is worse. There are stark differences between rural and urban areas and across economic strata.

The critical importance of child nutrition cannot be overstated. It is well known that undernourished children grow up to be malnourished adults with low productivity, aptitudes and skills, thus perpetuating the cycle of poverty. Poor nutrition during childhood causes irreversible damage to cognitive development and future health besides increasing the probability of childhood mortality (Saxena, (2011); Victora, *et al*., (2008); Dreze, (2004), Sumner, *et al.*, (2009)). For example, Victora, *et al*., (2008) found that child under nutrition was strongly associated with shorter adult height, less schooling, reduced economic productivity, lower adult body-mass index and mental illness. They concluded that damage suffered in early life leads to permanent impairment, and might also affect future generations. Its prevention will bring about important health, educational, and economic benefits to the individual as well as to society.

India along with many countries is committed to meeting the Millennium Development Goals (MDG). The first MDG is to eradicate extreme poverty and hunger and one of the indicators is to reduce the proportion of underweight children below 3 years from an estimated 52% in 1990 to 26% by 2015. However this proportion has declined by only 3 percentage points during 1998-99 (NFHS -2) to 2005-06 (NFHS-3), that is, from about 43% to about 40%. At this feeble historical rate of decline, it is expected to inch down to about 33% only by 2015. India clearly will not meet its MDG targets in terms of reducing child under nutrition. Given that the country is home to the largest number of malnourished children in the world, this in turn means that globally also, the MDG targets related to child health will not be met.

As the world now prepares for the post MDG scenario, it is important to take stock of where we have erred and what strategies are needed to achieve the targets. One truth that is now realised is that the approach to deal with the problem of malnutrition has to be multi-sectorial and deal with the problem of pervasive poverty, inequality, social discrimination, water and sanitation, diets, disease, caring practices, and most importantly, women's low status and disempowerment.

Research on the links between many of these factors and child malnutrition is ongoing. In this paper, we focus on characteristics of the mother and its relation to the nutritional status of her children. In particular, this paper uses new statistical techniques to study the impact of an intangible latent variable such as maternal autonomy on the nutritional status of young children.

The next section of the paper discusses some of the relevant literature for India. Section 3 describes probable pathways that lead from maternal autonomy to child health. The 4th section discusses the methodology while the 5th provides some descriptive statistics. The results are presented in section 6. The final section weaves the arguments together and concludes.

2. Situation in India: an overview of literature

The image of undernourished, pot-bellied children is usually associated with the poor economies of sub-Saharan Africa, but contrary to such public perception, the truth is that under nutrition afflicts a much larger proportion of children in India—a country that is economically much better off. In fact, half of the world's malnourished children live in just three countries of South Asia; Bangladesh, India and Pakistan. The higher rate of child malnutrition in South Asia compared to anywhere else in the world is what has been called the 'South Asian Enigma' (Ramalingaswami, *et al*., 1996).

A recent article by Panagariya (2013) stirred a hornets' nest when he stated that the perception that India suffers from worse child malnutrition compared to nearly all sub-Saharan African countries is false. He argued that the extent of under nutrition in India is exaggerated and based on 'faulty methodology that the World health Organisation has pushed and the United Nations has supported'. The central problem according to him with the current methodology is the use of common height and weight standards for estimating malnutrition. Thus children who may be short in stature compared to the WHO standard may well be so because of genetic factors, but they will be categorised as malnourished.

A swathe of analytically rich articles contested this assertion (Gillespie, *et al.*, (2013); Coffey, *et al.*, (2013); Gupta, *et al.*, (2013); Jayachandran and Pande (2013)). It was pointed out that the WHO reference standards were adopted following the Multicentre Growth Reference Study (MGRS) involving 8440 children drawn from six countries, one of which was India. The growth of Indian children in the sample matched that of children from Norway, US, Brazil, Ghana and Oman. On the question, is the 'Indian genetic makeup distinct?' Lodha, *et al*., (2013) argue that the available genome data does not suggest a unique genetic makeup of Indians. Consequently, they support the use of a universal standard for comparing the extent of child nutrition across countries. Other studies show that the high burden of under nutrition in India is driven by a range of determinants that include poor diets, high incidence of disease and infections, wide prevalence of open defecation, poor health services and abysmal governance.

Studies show that the nutritional status of children is strongly related to characteristics of the mother. Mother's education is associated with child survival (Murthi, *et al.*, (1995); Cleland, (2010)) and the nutritional status of children (Borooah, (2004); Frost, *et al.*, (2005)). According to Ramalingaswami, *et al.*, (1996) education of girls is the 'key of keys'. The mother's health also gets reflected in health outcomes for children. At birth one third of Indian infants are underweight and 20 percent are stunted because of poor intrauterine growth (Mamidi, *et al.*, (2011); Ramachandran and Gopalan, (2011)). Low birth weight indicates that the mother was malnourished. The proportion of babies with low birth weight therefore reflects the condition of women, and particularly their health and nutrition not only during pregnancy but over the whole of their childhood and young lives (Ramalingaswami, *et al.*, (1996)).

Studies on maternal characteristics and there implications for children are on firm ground so long as the variables are readily definable and easily measureable such as education or health. However, these are not the only factors. There are many other factors that are less tangible but which strongly influence behaviour—attributes like autonomy or status or power. These elusive and abstract concepts are not easily amenable to measurement and pose new methodological challenges.

In recent years there has been a great deal of interest in looking at the impact of autonomy among women and its impact on child related outcomes. Researchers have displayed great diversity in their choice of variables to measure autonomy and in the methodologies they adopted. Most often they have used the answers obtained on a set of

questions and aggregated them to give an index of autonomy. These methodologies, however, fail to capture the essence of women's autonomy and consequently also fail in understanding the impacts.

This paper explores new ground and is an attempt to bridge a major gap in research. The objective is to study the impact of maternal autonomy on the nutritional status of children in India. It uses latent factor models to provide an index of autonomy and is based on data from the third round of the National Family Health Survey (NFHS-3) for India, 2005 (IIPS and Macro International, 2007). The innovative econometric modelling was a major part of the work which gave a macro view of the research problem. To supplement this and understand the faces and facts behind the figures, rapid field surveys and focus group discussions with women were also carried out. These were conducted in three villages in rural areas of Allahabad district in Uttar Pradesh, and with groups of women in urban areas in Pane in the state of Maharashtra. While the full report of the empirical work is discussed in detail in the companion paper (Arulampalam, Bhaskar and Srivastava (2014)), this paper only draws from some of the insights gained.

The NFHS is part of the Demographic and Health survey series conducted for about 70 low to middle income countries.[1] This survey collected extensive information on population, health, and nutrition, with an emphasis on women and young children. In addition, information concerning the household decision making as well as some questions relating to the 'autonomy' status of surveyed women was also collected. The wealth of information collected in the survey has the potential for providing clues to shaping policy and initiatives for addressing critical problems.

3. Autonomy and Its Links with Children's Health

One of the earliest studies by Dyson and Moore (1983) on kinship structures and women's autonomy defined autonomy as the capacity to obtain information and make decisions about one's private concerns and those of one's' intimates. In a similar vein Saflios-Rothschild (1982) in the context of demographic change in the third world defines autonomy as 'the ability to influence and control one's personal environment'. The essential elements of autonomy, namely the ability and capacity to make decisions in a way that can influence one's environment is reflected in other definitions, such as that by Jejeebhoy (2000), according to whom, autonomy is the 'extent to which women exert control over their own

[1] The data are in the public domain and can be downloaded from http://dhsprogram.com.

lives within the families in which they live at a given point of time'. As stated by Agarwal and Lynch (2006), 'these definitions assert a single construct that captures the multifaceted ability to gain control over the circumstances of one's life'.

In essence, autonomy is latent and intangible and expresses itself in a number of ways such as for instance having decision making power, mobility, command and control over resources, and intolerance and unwillingness to put up with violence. The enabling factors in exercising autonomy are education, position in the household, closeness to kin, economic status of the household and of the woman, access and availability of infrastructure, and norms and attitudes of the larger community.

Autonomy has intrinsic relevance for women's own well-being. It determines to a large extent her ability to make effective choices and exercise control over her life. It also has instrumental value in that women's autonomy contributes in large measure to enhancing quality of life for the family and for the community.

Women's autonomy has been examined in previous research in the context of several outcomes, but its effect on child health has been less studied. Recent literature suggests that women's autonomy may be one of the important variables influencing children's nutritional status though many studies give conflicting results (Brunson, *et. al.*, (2009), Shroff (2009), Smith, *et al.*, (2003)). A major reason for this is that the definitions and variables employed by the authors are very different. While the words 'autonomy' or 'child health' is used in many studies, there is little congruence in the definitions or its measurement. Caldwell (1986) for instance defines opportunities for women to receive an education and work outside the home to proxy autonomy, while Mason (1986) uses control over household and societal resources to the same purpose.

Miles-Doan and Bisharat (1990) define autonomy as the mother's position in the household power relations and study the impact on the child's weight for age. Brunson, *et al.*, (2009) on the other hand, define autonomy as the ability to make decisions on one's own, to control one's own body, and to determine how resources will be used without needing to consult with another person. Nutritional status was determined by using short term measures, namely Weight-for-Height Z scores (WHZ) for children in two age groups: 0-36 months and 36 months to 10 years. Using specially conducted survey among a traditionally nomadic population in northern Kenya, they do not find a significant relation between women's autonomy and their younger children's WHZ scores but the impact is significant for older children. Also they find the relationship significant for some locations but not for others.

Roushdy (2004) identifies four measures of women's status at the individual level (mobility, opinion towards domestic violence, women's control over cash, and their role in decision making related to children) on the height- for- age of children less than 6 months. They find that women's access to cash, and role in decision making, which was expected to be significant, has the expected signs but are not significant. Durant and Sather (2000) are also unable to find significant effect of women's mobility and decision- making autonomy in a child survival model. Moreover, most of the studies are located in very different country contexts.

For the few studies on the subject in the Indian context, there is again a lack of comparability. Imai, *et al.*, (2012), analyse empowerment by means of the relative bargaining index, defined as the share of mothers schooling years over fathers schooling years. The study finds that it positively and significantly influences the Weight-for-Age z-scores (WAZ) and WHZ of children but only at the low end of the conditional distribution of the z-score of those who are stunted.

Shroff (2011) examines maternal autonomy as a determinant of breast feeding and infant growth in young infants (3-5 months old). The data consisted of 600 mother infant pairs in villages in the state of Andhra Pradesh, India. Maternal autonomy was defined on seven dimensions that included household decision making, child related decision making, financial independence, mobility autonomy, actual mobility, non-acceptance of domestic violence, and experience of domestic violence. The results indicated that mothers with higher financial autonomy were more likely to breast feed their infants. Also, the infants of mothers with higher participation in household decision making were less underweight and less wasted.

What are the pathways?

While autonomy has an intuitive linkage with child nutrition, there is no imaginable direct connection between the two. The UNICEF's conceptual framework to understand the determinants of autonomy lays down the immediate determinants of child nutrition (adequate dietary intake and health of child and caregiver) as well as the underlying determinants (household food security, quality of care, breastfeeding practices, psychosocial care, food preparation, hygiene practices, home health and health services) (Engle, *et al.*, 1999). Clearly, women's autonomy is neither an immediate nor an underlying determinant of a child's nutritional status. Rather, as the framework mentions, it is a resource which could be important to ensure the above immediate and underlying needs are met.

Being the primary care givers of their child, mothers are thought to be not only responsible but also best connected with the needs of the child. Whether it be the need for food, water, liquids, health care, warmth, cleanliness or even affection, more autonomous women, i.e., women who can think, express, decide, and act independently would be able to divert time and resources towards her own as well as her child's health and wellbeing. Since autonomy is a multi-dimensional construct, some of the pathways through which these dimensions get translated into outcomes are explored below.

Mobility

> *Women cannot go unaccompanied anywhere, not even to a doctor in our village. When my son was very unwell and was passing blood in his stools I asked my in-laws to take him to a doctor. They did not. When his condition became worse I pleaded with my brother in law. He took me and my son to the doctor on his cycle. When we came back there was aafat (big trouble). My sister in law accused me of stealing her husband. My in-laws were very angry and I was beaten. They said that I had no izzat (honour). They said if I was going to be so independent, I should go back to my father. Two days later my father was called and he took me home.*
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> *Jamuna, Allahabad district field surveys*

Norms of social exclusion restrict women's movements within the village or community as well as outside (Khan, 1999; Mumtaz, *et al.*, 2005). This narrative of a woman who lives with her husband's family in a village in Allahabad district of Uttar Pradesh, while her husband works in the city clearly demonstrates the links between women's restricted mobility and child health. Since villages, typically are located some distance away from primary health centres and hospitals constraints on mobility are a huge barrier to access.

Decision making

Many aspects of autonomy may be important to the decision making process; *inter alia*, these could be a woman's access to resources, freedom of movement, freedom from threat of violence, her education and skills and so on. Since women are the primary care givers for young children, their decision-making autonomy and skills are important both in day-to-day situations (immunization, health check-ups, taking children to early child care) as well as in emergencies. As Desai and Johnson (2005) state, 'If a Nepal woman must wait for her husband to return home before she can take a child suffering from seizure to a doctor, the likelihood of child survival will be lower than if she can independently make decisions regarding health care and immediately take the child to a doctor.'

However, in their study spanning data from 12 countries, Desai and Johnson (2005) show women's decision making authority does not affect health outcomes in all settings. The impact of women's empowerment (the degree of say in decisions making and their attitude to gender norms) is studied on the Height-for-Age z-scores (HAZ) of children 13-36 months. They find that the community effects far outweigh the magnitude of individual effects. In fact, community behaviour is found to be far more important in determining child outcomes than the empowerment of individual mothers. They endorse Kabeer's (2001) argument that when a group or a community challenges existing social norms it has a greater impact than when individual women do so.

Financial Autonomy

> *I never had any money. My husband sends money to my in-laws for our up-keep. If I asked them for money for medicines if my child was not well, they would say your husband sends money to feed you and your children, but not for your illness.*
>
> *When my husband came home, I forced him to send money to me as well. Since I started getting money in my own hand, I am not so helpless. When my son had fever, and no one accompanied me I went out on my own. I went through the back alleys where no one can see me. I met someone from the village on the highway crossing. He was kind and accompanied me. But when I came back I had to listen to the rebukes and taunts of my in-laws. In our village, when women venture out, they have to face a great deal of humiliation. They are told they have no izzat (honour).*
>
> *Sunita, Allahabad district field surveys*

The experience of Sunita--where the simple fact that she had some money enabled her to overcome mobility restrictions and helped in her decision making --illustrates how economic autonomy enables the exercise of autonomy in other spheres. All households, whether poor or rich, must decide on where resources are spent. Investments in children, whether on their education or health, are determined by members of the household. What decisions are taken and by whom is shaped by gender inequalities in the household. In families in which women play an important role in decision making the proportion of family resources devoted to children is greater than in families in which women play a less decisive role (Desai and Johnson, 2005; Duraisamy and Malathy, 1991; Rodgers and Satija, 2012). In a study in Gujarat, about 50 percent of the women interviewed did not feel free to take a sick child to the doctor without the approval of their husband or parent-in-law (Visaria, 1993).

To conclude, it is clear that autonomy can potentially enable women to better take care of themselves and their children. But this may not always be the case. The hypothesis that greater maternal autonomy leads to better child nutrition is based on the assumption that the

woman is aware about best child care practices, is educated, there are supporting infrastructural facilities for working women and that the woman cares most about her child. In the absence of some or all of these *assumptions*, would autonomy still lead to better outcomes in terms of child nutrition? Finally, autonomy often comes at a price—in cases where the woman's autonomy is pegged to her employment and earnings. This may lead to lesser time for child care. Thus, it seems the jury is still out on whether greater autonomy still translates to better nutritional status of children. For these reasons, this study holds special significance.

4. Main Variables of Interest

4.1 Modelling Nutritional Status

The data come from the NFHS-3 for India (IIPS and Macro International, 2007). In order to assess the nutritional status of children and mothers, the survey included an anthropometric component. All children who were aged less than 60 months and living in the household at the time of the survey were weighed and their heights were measured. The survey provided three nutritional status indicators expressed in standard deviation units (z-scores) from the median of the reference population. These were Height for Age Z-score (HAZ score), Weight for Height Z-score (WHZ score) and Weight for Age Z-score (WAZ score).[2] Children who are less than two standard deviations below the median are considered Stunted (HAZ score less than -2), Wasted (WHZ score less than -2) and Underweight (WAZ score less than -2). Each index provides different information about the growth of a child. For example HAZ score provides information about long term nutritional status and does not vary according to recent dietary intake. However, WHZ is an indicator of current nutritional status. A low WHZ score can indicate recent inadequate food intake or recent episode of illness.

The two main outcome variables we consider are HAZ and WHZ. All children in the family who were aged less than 60 months at the time of the interview and, who had valid measurements for these variables, were included in the estimation sample.

[2] The Z scores are the number of standard deviations above or below a set of standard deviation derived growth reference curves by the Centre for Disease Control obtained from a reference population from the United States National Centre for Health Statistics, as recommended by the WHO (2006). The recommendations are based on evidence that differences in "unconstrained growth" across children of different ethnic and racial background, socioeconomic status and feeding, are so minor for children under 5 years of age that it is appropriate to use a common reference.

All equations were specified as a linear regression model and estimated by OLS with standard errors either clustered and/or bootstrapped where necessary. Write equation for the measure of nutritional status y – HAZ and WHZ as:

$$y_{ik} = x_{ik}^{'}\beta + z_{i}^{'}\gamma + \delta\eta_{Fi} + \varepsilon_{ik} \qquad i=1,..,n \quad \text{and} \quad k=1,..,K \qquad (1)$$

where i is the mother index and k is the child index. x_{ik} contains the child specific characteristics such as age, birth-order, gender etc. z_i contains the mother and father specific characteristics such as levels of education, religion, caste, etc. η_{Fi} is the mother's autonomy trait which is the variable of main interest.[3] We discuss next how we proceed with the measurement of this variable.

4.2 Defining and measuring maternal autonomy

The first methodological challenge of dealing with the elusive concept of autonomy is the selection of appropriate indicators that truly reflect our understanding of autonomy. The second challenge is to find a way to combine the selected indicators into an index. Many scholars agree that not all indicators are of equal significance; for example the freedom to take decisions to buy sundry household items may not have as much significance for autonomy as the freedom to decide on the purchase of large household assets or the freedom to visit places outside the village may reflect on greater autonomy than freedom of mobility within the village. However, in most studies, same weights are accorded to all indicators in constructing the index. This means according the same significance to all kinds of freedom, and does not allow for differentiating between women who have more autonomy from those who enjoy less autonomy. Needless to say, the results based on this analysis can be misleading.

Based on the earlier discussion of the published literature on the issue of how best to capture the latent characteristic 'autonomy' we have chosen the answers given to the following questions in the DHS surveys, as ***indicative*** of this trait. These measurements are based on variables which indicate not only the woman's '*freedom*' but also '*ability*' to think, speak, decide and act independently.[4]

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[3] All standard errors are clustered at the Primary Sampling Unit level (PSU).

[4] See Arulampalam, Bhaskar and Srivastava (2012) for a discussion on the choice of measurements used for constructing this index.

The following responses were all coded as binary indicators.

Responses Related to Physical Autonomy

m_1: is allowed to go alone to the market.

m_2: is allowed to go alone to the health clinic.

m_3: is allowed to go alone to places outside the community.

Responses Related to Decision Making Autonomy

m_4: decides alone on purchases for daily needs.

m_5: decides alone or jointly with her husband on her own health care.

m_6: decides alone or jointly with her husband on large household purchases.

m_7: decides alone or jointly with her husband on when they could visit family and friends.

m_8: decides alone or jointly with her husband what to do with husband's money.

Responses Related to Economic Autonomy

m_9: has money of her own that she can decide how to spend.

We construct indexes of autonomy based on various methods and models as follows.

Model 1: Following most of the literature, here we create the index using the average of the nine measurements. This is equivalent to using OLS to estimate the mother-level 'fixed effects' η_{1i} in the specification,

$$m_{ij} = \eta_{1i} + \varepsilon_{ij} \qquad \text{where} \quad j=1,..,9 \ \text{and} \ i \ \text{is the mother.} \qquad (2)$$

The estimator is unbiased although not consistent for a fixed number of measurements.

Model 2: Here we estimate the autonomy index η_{2i} as the first principal component from the set of measurements.

Model 3: The model estimated here is the latent factor model. Since all measurements (*j=1,.., 9*) are binary we specify a logit model for woman *i* (conditional on her autonomy trait η_{3i}) as

$$m_{ij}^{*} = \delta_j + \lambda_j \eta_{3i} + \varepsilon_{ij} \quad \text{with} \quad m_{ij} = 1 \text{ if } m_{ij}^{*} > 0 \text{ and =0 else.} \tag{3}$$

δ_j and λ_j are the intercepts and factor loadings respectively.[5] Identification of the parameters requires some normalisation of the coefficients in (3). We impose the restriction that the first loading is 1. This implies that all the other loadings are estimated relative to the first one. This also enables us to estimate the variance of the autonomy trait freely. The model is estimated using maximum likelihood (ML) method under the assumption that η_{3i} s are normally distributed.[6] We then use the estimated posterior conditional mean (also known as the Empirical Bayes estimate) $E(\eta_{3i}|\text{data})$ of the latent variable η_{3i} to construct our index of autonomy for every woman in the sample.[7]

Model 4: Here we extend Model 3 to allow the autonomy trait to depend on variables (*z*) that proxy traditions and cultural norms. The model is given by

$$m_{ij}^{*} = \delta_j + \lambda_j \eta_{4i} + \varepsilon_{ij} \quad \text{with} \quad m_{ij} = 1 \text{ if } m_{ij}^{*} > 0 \text{ and =0 else.} \tag{4}$$

$$\eta_{4i} = \theta' z_i + u_i \tag{5}$$

Again, the Model given by (3) and (4) are jointly estimated using ML methods with the additional assumption that u_i s are normally distributed. As in Model 3, we use Empirical Bayes estimate of η_{4i} to construct our index.

The main issue here is whether we are able to identify the 'causal' effect of maternal autonomy on child nutrition. As discussed earlier, maternal autonomy is an unobserved trait. All our constructed indexes are going to be some kind of proxy for this. Hence the question one needs to ask is whether the measurement error introduced into the models when these

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5 We also allow for clustering at district levels but do not show in the above to keep the notation uncluttered.

6 We use gllamm in Stata 13 to estimate all the models.

7 This is known as the Bayesian shrinkage estimator, see Goldstein (2003). This method of estimating unobserved individual specific heterogeneity is equivalent to estimating taste parameters in mixed models of choice (Train, 2009: Chapter 11). Also see the recent literature on the estimation of 'Teacher Effectiveness' (Kane and Staiger, 2008; Chetty, et al. 2014a and 2014b).

indexes are used is uncorrelated with the included covariates in equation (1). We check our results for sensitivity of using different measures. In addition to the above specifications, we also experimented with different set of covariates in *z* in equation (5). We distinguish between three different specifications here. In Model 4a, we include a set of basic characteristics which are essentially control variables. These are: wealth score, dummy for nuclear family, mother's age, Indicators for nuclear family, caste, religion, father's education, mother's education, age difference between the partners, state dummies.[8] Model 4b extends Model 4a with an additional indicator variable for whether the woman's first child was a boy. There is evidence to suggest that families do not gender select their first child. If this is true, this variable would have induced an exogenous shift to mother's autonomy. Model 4c extends Model 4b with additional indicator variables to pick up the parental occupations and mother's work-status. Model 4d drops the indicator for 'first boy' from Model 4c.

Full details of the variables and their definitions are given in Table 1 and a discussion is provided in the next section.

In order to assess the importance of the autonomy index in explaining the observed variations in the measurements, one can use what is called a 'reliability' measure. This is given by

$$\lambda_j^2 * var(\eta_F) / \left[\lambda_j^2 * var(\eta_F) + var(\textit{district-level unobservable}) + \pi^2 / 3 \right] \qquad (6)$$

This is the proportion of the total variance in that particular measurement that is attributed to the 'unobserved autonomy' trait.

5. Descriptive Statistics of the Variables

The anthropometric information was collected on surviving children who were under 5 years old at the time of the interview. Descriptive statistics for the variables used in the construction of the autonomy index as well as the analyses of the nutritional status, are given in Table 1.

Unsurprising, more women living in urban households enjoy autonomy in most of the spheres compared to the number of women living in rural areas. Average score from the measurements is slightly higher for urban women (5.18 vs 4.24). The average age of women in the sample is similar across both groups. With regard to caste, there are more scheduled

[8] The urban model estimations also include additional binary indicators for the size of the city/town.

tribe and schedule caste women in our rural sample. Also, there are relatively more Muslim women in our rural sample.

The women in our urban sample are more educated in general. They are also more likely to be staying at home which is not surprising given the presence of very young children in the family. However, it is also the case that among these younger women, women living in urban areas are more likely to be staying at home compared to those living in rural areas.

We now turn to the nutritional status variables which are provided in Table 2. In terms of the two indexes (HAZ and WHZ), urban children are doing slightly better than the rural children on average. Figures 1a and 1b plots the average HAZ by age in months for the children living in rural and urban areas respectively. Similarly, Figures 2a and 2b plots the WHZ scores. HAZ scores go down till they are about 2 years old and then it seems to stabilise at a low score. In contrast, WHZ score plots in Figures 2a and 2b generally show no deterioration over time although there is a slight increase in WHZ scores with age among the urban children.

Figures 3 and 4 plot the proportion of children who are classified as 'stunted' and 'wasted' separately. Proportion of children who are 'stunted' goes up with age, although urban children fare slightly better than their rural counterparts. Interestingly, the proportion of children who are classified as 'wasted' goes down with age and this also stabilises at the age of about 24 months.

6. Results

6.1 Autonomy Index

We first present the distribution of the sum of the measurements in Table 3. About 8% of rural women do not have any autonomy at all according to our chosen measurements. This is slightly lower at 4% among the urban women. There is only a very small proportion of women (2.2% in rural areas and 4.3% in urban areas) who have reported saying that they have full autonomy.

We have estimated six different autonomy indexes as discussed in Section 4.2. The plots of the estimated indexes are given in Figures 5 and 6 distinguished by rural and urban. In sum, we find that (i) Models 1 and 2 (averaged measurements and PCF) provide very similar pictures; (ii) The indexes created by factor models (Model 4) are almost the same for the urban sample. However there are some differences in the rural sample.

An interesting question is whether these different indexes are ranking the women differently. The Spearman rank correlation coefficients are given in Table 4. These reinforce what was found in the above plots. In particular, the Models 1 and 2 produce similar ranking although not the same. However, there are some interesting rural/urban differences between the other indexes. In the urban case, all indexes created using factor models that include different set of covariates to account for customs and traditions rank the women the same way. When there are no adjustments made, the ranking is very similar to the indexes created with adjustments. However, in the rural case, the indexes can be grouped into two with Models 4a and 4c on the one hand and Models 4b and 4d on the other hand. The main reason for this seems to be that including either the indicator for whether the first child was a boy (Models 4a and 4c) or instead a set of job/work characteristics (Models 4b and 4d), is producing the same ranking.

The results from the estimation of equations (4) and (5) are presented in Tables 5 and 6. We have chosen to present the results from Model 4d since the indicator for whether the first child was a boy or not was never significant. We first discuss the results of equation (5) presented in Table 6.

Household wealth is only found to be associated with higher general autonomy in the rural areas. As expected, having a nuclear family appears to have a significant positive impact. In a nuclear family, there would often be no option but for women to step out and go alone to places such as the market and health care facility. Women's autonomy is found to be positively and significantly associated with their age. This is interesting as it points to the fact that with age, women tend to become more autonomous in general. Women whose partners are older than them by two years or more are found to have more autonomy – however only in the rural areas.

Compared to women of the 'general caste', women's 'Scheduled Tribe' status appears to have a significantly positive impact on women's autonomy. On the other hand, 'Scheduled Caste' and 'Other Backward Caste' status of women are not found to be significant in rural areas but has significant negative impact on autonomy in urban areas. Religious status of women also has a significant impact on autonomy. Compared to Hindu women, Christian women and women belonging to 'other religions', enjoy greater autonomy in rural as well as urban areas. Muslim religious status is found to be associated with lower autonomy.

Women's education level, as expected has a very significant positive impact on their level of autonomy. However, what is interesting is that it appears that partner's educational status is found to be associated negatively with women's autonomy.

As expected, exposure to media has a significant impact upon autonomy in both rural and urban areas. Relative to not-working, working women have more autonomy. It not only allows her more freedom to move around, but also provides opportunities for meeting other people and interacting with them. Most importantly, it provides her with an income which boosts her feelings of self-worth and helps her to deal with her circumstances.

A great degree of the variation in women's autonomy cannot be explained by any of the above socio economic or demographic factors but by historical, traditional, political, institutional and cultural factors which vary, largely, across states in India. To capture this variation state dummies were included in the model with the reference state being Uttar Pradesh (U.P.). U.P. is the largest state in the country comprising of over 16% of the country's population. It is interesting to note that, for the rural sample, the coefficients of nearly all states are positive and significant. Given the base state of UP, women in almost all of the other states (with similar socio-economic characteristics) enjoy a higher freedom – measured in terms of the autonomy index. The only exceptions are Orissa and Chhattisgarh (which have negative coefficients) and, the coefficient is insignificant in three states (Nagaland, Karnataka and Madhya Pradesh). Orissa and Chhattisgarh are thus the only states where a woman with similar socio-economic characteristics as a woman in UP would have a lower autonomy index. It is hard to say whether this is because of historical cultural factors or because of a lack of institutions and activities which promote autonomy amongst women or both. The situation is very different for urban areas where nearly 13 states have significant negative or insignificant coefficients in the measure of autonomy. The largest positive state effect is for Mizoram in the Rural Sample. This is followed by Himachal Pradesh. The South Indian state of Tamil Nadu also has significantly positive and large coefficients. In the urban sample, the largest state effect is for the state of Himachal Pradesh followed by Mizoram. The worst state effect is for Orissa for both the urban and rural sample. This is followed by Chhattisgarh in the rural sample. In the urban sample, this is followed by Karnataka.

We now turn to the discussion of the estimated factor loadings, given by equations (3) and (4) and presented in Table 5. For comparison with standard methods, we present two sets of results: one that only uses equation (3) called ''unadjusted' model/index [Model 3]

("without covariates") and the other which uses both equations (1) and (2) [Model 4d] called 'adjusted' model/index ("with covariates").

The estimation of the model requires a normalisation and the measurement related to whether the woman is allowed to go to the market alone is normalised to 1. Bottom of the table lists the 'reliability' measure. This is calculated as the proportion of variance explained by the autonomy index in the total variation of the measures (m1-m9) individually.[9] In the 'unadjusted' model, the latent factor plays an important role in explaining the observed variations in the 'decision making' autonomy measures. However, what is interesting here is that once we allow the latent factor to be correlated with characteristics, the latent autonomy variable plays a bigger role in explaining the variations in the physical autonomy measures.

6.2 Nutritional Status

The results of the study mark a significant deviation from earlier concepts of women's autonomy and its relationship with child health. The study has led to several path breaking results which would go a long way in informing and giving direction to future research as well as policy on the subject.

We present a series of linear regression results modelling the determinants of child nutritional status measured as (i) the Height for Age Z (HAZ) score; (ii) an indicator for whether the child is 'stunted' according to the WHO (2006) definition where the HAZ score is less than -2; (iii) Weight for Height (WHZ) Z score; (iv) an indicator for whether the child is 'wasted' according to the WHO (2006) definition where the HAZ score is less than -2.[10]

If a child has died in the past because of severe malnutrition then the sample of surviving children for whom we have a valid measurement of nutritional status is an endogenously selected sample. In the absence of possible instruments to account for this selection, we have included in all our regressions an indicator variable that accounts for whether the mother has experienced child death in the past.

In the interest of space, we only present the results for our main variable of interest which is the maternal autonomy.[11] Table 7 reports the results from a model which includes

[9] See equation (3).
[10] All models are estimated using OLS but allows for clustering at the PSU level.
[11] The rest of the results are available on request from the authors.

the basic set of characteristics (see footnote (v)) and the one with the full set of characteristics, both distinguished by rural/urban and also HAZ/WHZ.[12]

In the models without any control for the autonomy variable is estimated to have a significant positive effect on HAZ and WHZ, for children living in both rural as well as urban areas. The effects are also large for HAZ which is an indicator of long-term nutritional status. One standard deviation increase in maternal autonomy is estimated to increase the nutritional status HAZ on average by 0.13 standard deviation (SD from now on) for children in rural areas (column [1]), *ceteris paribus*. Autonomy is also estimated to significantly reduce the probability of being stunted. On average, one SD increase in autonomy reduces the probability of being stunted by 0.035 percentage points (column [3]). Autonomy effect on WHZ and 'wasted', although significant generally, the effects are lower than those found in the HAZ/Stunted regressions. The important point to bear in mind here is that the effects of the covariates that were allowed to be correlated to the autonomy index in our 'adjusted' measure, is assumed to act only through the mother's autonomy. For example, the simple specification in the first panel assumes that the mother's education only influences her 'autonomy' status and does not directly affect the nutritional status of her children conditional on her autonomy. The effect of autonomy becomes insignificant when all other covariates are added (panel [2]).

6.3 Extensions

Effects of different Indexes

We now check for differences in the estimates between our autonomy indexes and those that are more commonly used in the literature. In Table 8, we present results from using the indexes created from Model 3 and Model 1. Model 3 is a factor model but does not allow traditions and customs to play a role. Model 1 on the other hand creates the index using the simple average of the nine measurements.[13] Both indexes are standardised to have 0 mean and variance of 1. We find the effect of the autonomy indexes were significant but only for the rural children and also only in the model for long-term nutrition indicator HAZ. The effect of autonomy when constructed as in Model 1 was slightly lower than the one from Model 3

[12] The maternal autonomy indexes used in the models have been standardised to have 0 mean and variance 1 in the population of women in India distinguishing by rural/urban residences.

[13] The nine measurements when entered separately were general insignificant jointly as well as on their own and hence we do not report them here.

which was constructed using a factor model. The effect on the probability of being stunted is also found to be significantly affected by the autonomy status of the mother but only for the rural children.

Age differences

We next check for differences in the effect of autonomy on different age groups of children. Table 9 reports the results from using our preferred index created from Model 4d where we have used factor model specification and allowed the family characteristics to affect autonomy. Maternal autonomy is now significant predictor of long-term nutrition of children aged under 2 living in rural areas. One SD increase in autonomy increases HAZ score by 0.046 SD. For this group of children, we also find maternal autonomy to have a positive effect of reducing the probability of being stunted.

7. Discussion and Conclusion

The study helps to fill several gaps in our understanding of an extremely important issue facing developing countries, particularly the South Asian countries such as India, Pakistan and Bangladesh. The use of latent factor modelling enables us to construct an index of maternal autonomy which is an abstract concept that has been difficult to estimate in the previous literature. Autonomy index, and its effect on child nutrition, was not sensitive to inclusion of some of the variables used in the literature, once a certain critical number of important variables have been used.

The finding that higher maternal autonomy leads to better long-term nutritional status among children living in rural areas, is an important finding and has policy implications. It is well known that the 0-2 year age group is the most important 'window of opportunity' to make a long term impact upon children's nutritional status. Greater autonomy therefore is an important requirement to ensure India achieves its Millennium Development Goals. However, in order to make appropriate policy interventions to promote women's autonomy, it is important to first understand the social, cultural, institutional as well as economic constraints to greater women's autonomy. However, one thing is clear – that the assumption that more autonomous women can take better care of their children irrespective of the institutional and support setting does not hold good. It may be true that mothers are the primary care givers of their children and have the responsibility for child care. However, in

the absence of a proper support system, they may not be able to take appropriate care of their children.

Some of the potential impacts of greater maternal autonomy are delayed marriage and pregnancies, lesser number of children and appropriate birth spacing. All these factors are found to be highly significant factors in explaining children's nutritional status. Indeed interviews of women with young children, which were conducted as a part of the project to better understand the results, showed that women desired delayed pregnancies, less number of children and larger gaps between births. They 'longed' to take care of their child and breastfeed them till they were 3 years old. However, others in the family, including the husband, mother in law and even the woman's mother, would convince the woman to have children immediately in succession after marriage. One woman in Pune, who was pregnant in her fifth month narrated that her first child, who was 1.5 years old, had been sent away to the village because she would want to be breastfed. However, if the child was breastfed, it would delay the woman's pregnancy which was not desirable to the others in the family. The woman mentioned that she missed her child and wished to be able to breastfeed her. These interviews revealed that it was indeed a common belief, especially among poor families, that women should get married early in order to ensure that she does not get older and run away with some man after falling in love with him. Once she gets married, she should fulfil her marital responsibility of producing children in quick succession. This was important for many reasons, including to prove the man's sexual potency – for 'if a woman does not produce babies soon after birth, people would doubt if the man is 'manly' enough'. Producing children in quick succession ensures that women can fulfil their reproductive responsibilities 'at one go'. This reduces the age gap between children and ensures that child care is a one continuous phenomenon which lasts a relatively shorter period. It also ensures that children grow up along the same time and hence can give each other company.

These are just some of the findings that came out during the field study which help explain how maternal autonomy can play a role on children's health and nutrition. However, more detailed and in-depth qualitative research needs to be conducted along with proper quantitative research, to find the precise pathways by which autonomy leads to improved nutritional status of young children. Such studies would help to identify these constraints and devise appropriate intervention strategies.

References

Agarwala, R. and Lynch, L. M. (2006). Refining the measurement of women's autonomy: an international application of a multi- dimensional construct. *Social Forces*, Vol. 84(4), 2077-98.

Arulampalam, W., Bhaskar, A., and Srivastava, N. (2012). Maternal autonomy: a new approach to measuring an elusive concept. Mimeo.

Borooah, V. K. (2004). Gender bias among children in India in their diet and immunisation against disease. *Social Science & Medicine*. Vol. 58(9), 1719-31.

Brunson, E.K., Shell-Duncan, B., and Steele, M. (2009). Women's autonomy and its relationship to children's nutrition among the Rendille of Northern Kenya. *American Journal of Human Biology*, Vol. 21, 55-64.

Caldwell, J.C. (1986). Routes to low mortality in poor countries. Population Development Review, Vol. 12, 171–220.

Chetty, R., Friedman, J. and Rockoff, J. (2014a). Measuring the Impacts of Teachers I: Evaluating Bias in Teacher Value-Added Estimates. American Economic Review. 104(9): 2593-2632.

Chetty, R., Friedman, J. and Rockoff, J. (2014b). Measuring the Impact of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood. American Economic Review. 104(9): 2633-2679.

Cleland, J. (2010). The benefits of educating women. The Lancet, 376(9745), 933-934.

Coffey D, Angus Deaton, Jean Dreze, Dean Spears, and Alessandro Tarozzi (2013), Stunting among Children: Facts and Implications, *Economic and Political Weekly*. Vol 48, No 34, August 24.

Desai, S. and Johnson, K. (2005). Women's Decision-making and Child Health: Familial and social hierarchies, in Kishor, S. ed., A Focus on Gender: Collected papers on gender using DHS data. ORC Macro and USAID, Maryland, USA.

Dreze, J. (2004). Democracy and the Right to Food, *Economic and Political Weekly*, April 24.

Dubey, A. and Thorat, S. (2012). Has Growth been Socially Inclusive during 1993-94 to 2009-10? *Economic and Political Weekly*, Vol. XLVII (10), March 10, 43-54.

Duraisamy, P. and Malathy, R. (1991). Impact of public programs in fertility and gender specific investment in human capital of children in India: cross sectional and time series analysis. In *Research in population economics*, Vol 7.

Durrant, V. L. and Sathar, Z.A. (2000). Greater investments in children through women's empowerment: a key to demographic change in Pakistan? Policy Research Division No 137. Population Council, New York.

Dyson, T. and Moore, M. (1983). On Kinship Structure, Female Autonomy, and Demographic Behavior in India. *Population and Development Review*, Vol. 9, 35-60.

Engle, P.L., Menon, P., and Haddad, L. (1999). Care and Nutrition: Concepts and Measurement. *World Development*. Vol. 27(8), 1309-1337.

Ferguson, A. and Hennessy, R. (2010). Feminist Perspectives on Class and Work. *The Stanford Encyclopedia of Philosophy* (Winter Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/win2010/entries/feminism-class/>.

Frost, M. B., Forste, R., & Haas, D. W. (2005). Maternal education and child nutritional status in Bolivia: Finding the links. *Social Science and Medicine.* Vol. (60), 395-407.

Gelles, R.J. (1974). The Violent Home, New Delhi. Sag.

Gelles, R.J. (1978) Violence in the American Family, in J.P. Martin (ed) Violence in the Family, John Wiley & Sons.

Gillespie, Stuart (2013): "Myths and Realities of Child Nutrition," *Economic and Political Weekly*. Vol 48, No 34, August 24.

Glick, P. (2002). Women's Employment and Its Relation to Children's Health and Schooling in Developing Countries: Conceptual Links, Empirical Evidence, and Policies.

Goldstein, H. (2003). Multilevel statistical models. 3rd Edition, Kendall's Library of Statistics 3, Arnold, London.

Gupta, A, Biraj Patnaik, Devika Singh, Dipa Sinha, Radha Holla, R Srivatsan, Sachin Jain, Samir Garg, Sejal Dand, Sulakshana Nandi, Vandana Prasad, and Veena Shatrugna (2013),, Are Child Malnutrition Figures for India Exaggerated?, *Economic and Political Weekly*. Vol 48, No 34, August 24.

Haddad, L. (2009). Introduction – Lifting the Curse: Overcoming Persistent Undernutrition in India. Institute of Development Studies, Bulletin, Vol. 40 (4).

Haddad, L., Sumner, A., Lindstrom, J. (2008). Improving the nutrition status of children and women. *Insights*, No. 73, Institute of Development Studies.

Hameed, S. and Veda, G. (2012). Beautiful Country: Stories from another India. Harper Collins.

Hellen Keller International. (2006). Female Decision Making Power and Nutritional Status within Bangladesh's Socio-Economic Context. Nutrition Surveillance Project Bulletin No. 20.

Imai, K. S, Annim, S. K., Gaiha, R., and Kulkarni, V. S. (2012). Does Women's Empowerment Reduce Prevalence of Stunted and Underweight Children in Rural India? Mimeo, RIEBA, Kobe University.

International Institute for Population Sciences (IIPS) and Macro International Inc. (2007). National Family Health Surveys (NFHS-3), 2005-06: India: Volume I. Mumbai: IIPS.

Jejeebhoy, S. (2000). Women's autonomy in rural India: its dimensions, determinants and the influence of context, in Harriet, P., Gita Sen Editors. *Women's Empowerment and Demographic Processes: Moving beyond Cairo*, Oxford University Press, Oxford.

Jayachandran, Seema and Pande, Rohini (2013), Choice Not Genes: Probable Cause for the India-Africa Child Height Gap, *Economic and Political Weekly*. Vol 48, No 34, August 24.

Jones. G., Schultink, W., and Babille, M. (2006). Child Survival in India. *Indian Journal of Paediatrics.* Vol.73(6), 479-487.

Kabeer, N. (2001). Reflections on the measurement of women's empowerment. In Discussion women's empowerment –theory and practice. Sida Studies No 3. Stockholm: Novum Grafiska AB.

Kane, T. J. and Staiger, D. O. (2008). Estimating teacher impacts on student achievement: an experimental evaluation. NBER Working Paper 14607.

Khan, A. (1999). Mobility of women and access to health and family planning services in Pakistan. *Reproductive Health Matters*, 7(14), 39-48.

Lodha R, Yogesh Jain, and C Sathyamala Reality of Higher Malnutrition among Indian Children, *Economic and Political Weekly*. Vol 48, No 34, August 24.

MARG. (1998). Within the four walls: a profile of domestic violence, Multiple Action Research Group (MARG), Delhi.

Mason, K. (1986). The status of women: conceptual and methodological issues in demographic studies. *Sociological Forum*, 1(2), 284-300

Miles-Doan, R., & Bisharat, L. (1990). Female autonomy and child nutritional status: the extended-family residential unit in Amman, Jordan. *Social Science and Medicine*, 31(7), 783-789.

Mumtaz, Z. and Saway, S. (2005). 'I never go anywhere': extricating the links between women's mobility and uptake of reproductive health service in Pakistan. *Social Science and Medicine.* 60(8), 1751-65.

Murthi, M., Guio, A., and Dreze, J. (1995). Mortality, fertility and gender-bias in India: A district level analysis. *Population and Development Review* Vol. 21(4), 745-782.

Omvedt, G. (1990). Violence against women: new movements and new theories in India, New Delhi, kali for Women.

Panagariya, A (2013): "Does India Really Suffer from Worse Child Malnutrition Than Sub-Saharan Africa?", Economic & Political Weekly, 48(18), May 4.

Rabe-Hesketh, S., Skrondal, A. and Pickles, A. (2004).Generalized multilevel structural equation modelling. Psychometrika. 69(2), 167-190.

Ramachandran, Prema and H S Gopalan (2011): "Assessment of Nutritional Status in Indian Preschool Children Using the WHO 2006 Growth Standards", Indian Journal of MedicalResearch, 134.

Ramalingaswami, V, U Jonsson and J Rohde (1996): "Commentary: The Asian Enigma", *The Progress of Nations 1996*, UNICEF, New York.

Rodgers, D., and S. Satija. (2012). Understanding the Tipping Point of Urban Conflict: The Case of Patna, India, Urban Tipping Point project working Paper no. 5, Manchester: University of Manchester.

Roushdy, R. (2004). Intrahousehold resource allocation in Egypt: does women's empowerment lead to greater investments in children? Population Council, West Africa and North Asia Region.

Safilios-Rothschild, C. (1982). Female power, autonomy and demographic change in the Third World in R. Anker, M. Buvinica and N. Youssef, editors. Women's Role and Population Trends in the Third World. Croom Helm.

Saxena, N.C. (2011). Hunger, Under-Nutrition and Food Security in India. Chronic poverty research centre and IIPA, working paper no 44. New Delhi.

Saxena, N.C., and Srivastava, N. (2009). ICDS in India: Policy, Design and Delivery Issues. In Haddad, L., and S Zeitlyn (ed) Special Issue: Lifting the curse: overcoming persistent undernutrition in India. IDS Bulletin, Volume 40, Issue 4, 45–52.

Shroff, M., Griffiths, P., Adair, L., Suchindran, C. and Bentley, M. (2009). Maternal autonomy is inversely related to child stunting in Andhra Pradesh, India. *Maternal & Child Nutrition*, 5: 64–74.

Shroff, M., Griffiths, P., Suchindran, C., Nagalla, B.,Vazir, S., and Bentley, M. (2011). Does maternal autonomy influence feeding practices and infant growth in rural India?. *Social Science & Medicine*, 73(3): 447-455.

Sivakami, M. (1997). Female work participation and child health: an investigation in rural Tamil Nadu, India. *Health Transition Review.* Vol 7. 21-32.

Smith, L. C., Ramakrishnan,U., Ndiaye, A., Haddad, L., and Martorell, R. (2003). The importance of women's status for child nutrition in developing countries. In Household decisions, gender, and development: a synthesis of recent research, ed. A.R. Quisumbing. Washington, D.C. IFPRI.

Spears, Dean (2011): "Height and Cognitive Achievement among Indian Children", *Economics and Human Biology*, viewed on 10 May 2013 (http:// works.bepress.com/spears/2).

Srivastava, N. (2002). Contextualising Violence at Macro and Micro Levels: The Multiple Dimensions of Violence against Women in Uttar Pradesh, India, in K. Kapadia (Ed) *The Violence of Development: The Politics of Identity, Gender and Social Inequalities in India;* New Delhi, Kali for Women.

Sumner, A., Haddad, L. and Climent, G. (2009). Rethinking Intergenerational Transmissions(s): Does a Wellbeing Lens Help? The Case of Nutrition. IDS Bulletin, Vol. 40 (1).

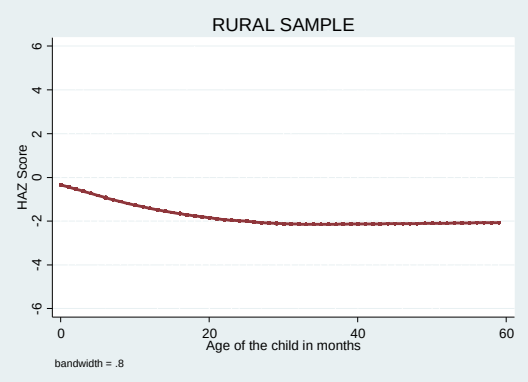
Train, K. (2009). Discrete Choice Methods with Simulation, Cambridge University Press, Cambridge, UK.

Victora, C.G., Adair, L. Fall, C., Hallal, P. C., Martorell, R., Richter, L. Sachdev, H. S. (2008). Maternal and Child Undernutrition: Consequences for Adult Health and Human Capital. *The Lancet*. 26; 371(9609): 340–357.

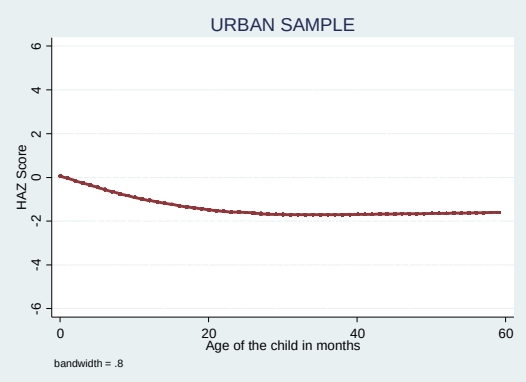
Visaria, L. (1993). Female autonomy and fertility behaviour: an exploration of Gujarat data. In Proceedings of Internal Population Conference of International Union for Scientific Study of Population, Montreal.

World Health Organisation Multicenter Growth Reference Study Group. (2006). WHO child grow standards: length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age-methods and development. Geneva: World Health Organisation.

Smoothed Plots of HAZ by Age in Months

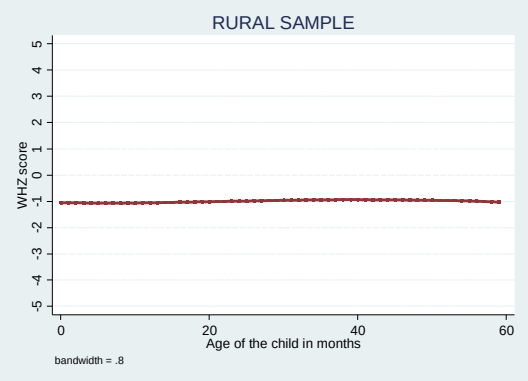


Rural Sample – Figure 1a

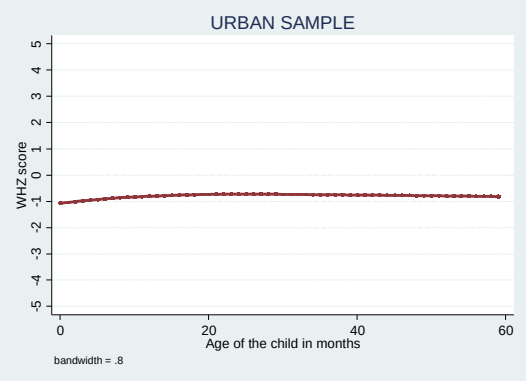


Urban Sample – Figure 1b

Smoothed Plots of Average WHZ by Age in Months

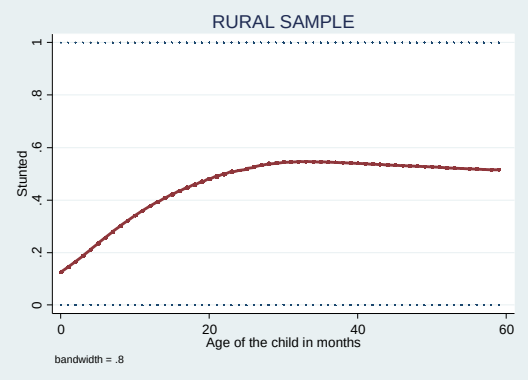


Rural Sample – Figure 2a

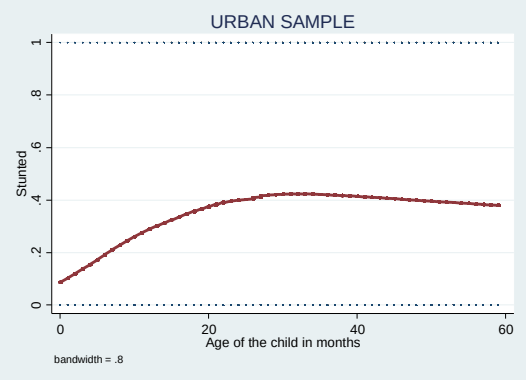


Urban Sample – Figure 2b

Proportion of children who are classified as 'stunted' by Age in Months

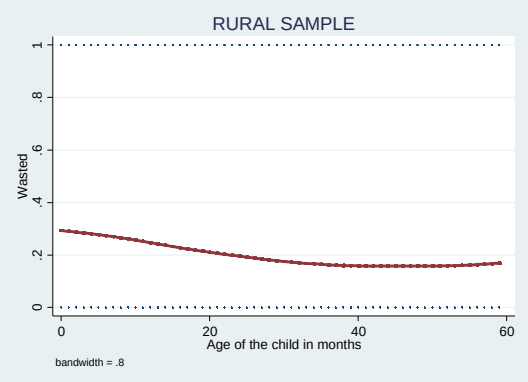


Rural Sample – Figure 3a

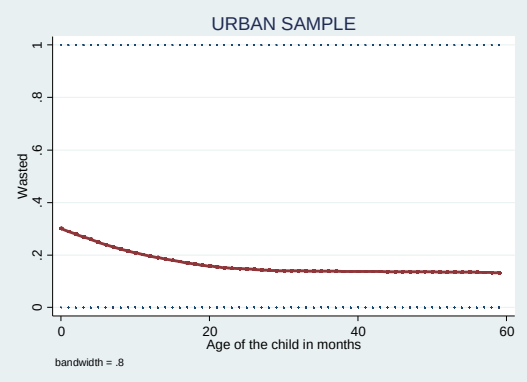


Urban Sample – Figure 3b

Proportion of children who are classified as 'wasted' by Age in Months



Rural Sample – Figure 4a



Urban Sample – Figure 4b

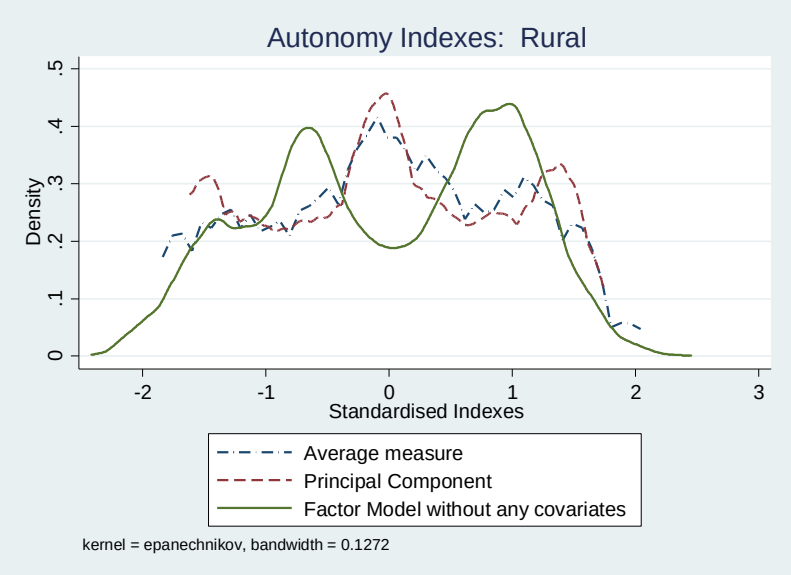


Figure 5a – Indexes created using Models 1 – 3 – Rural

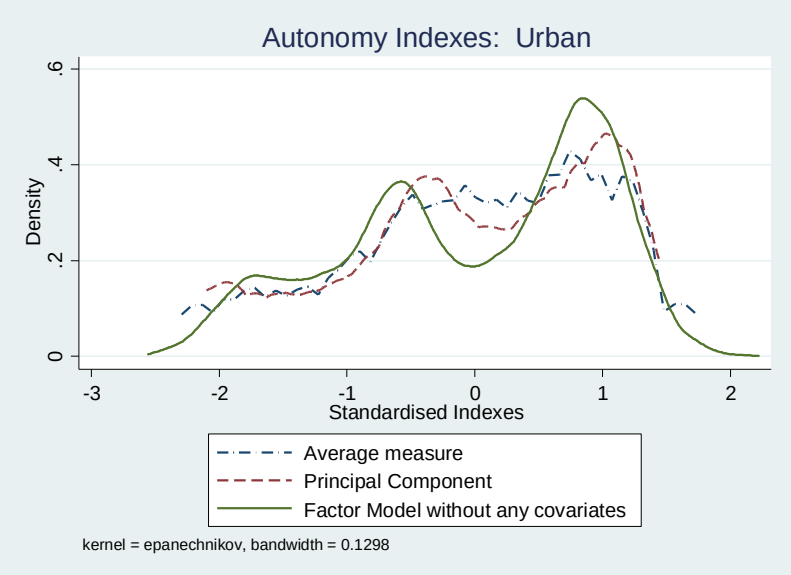


Figure 5b – Indexes created using Models 1-3: Urban

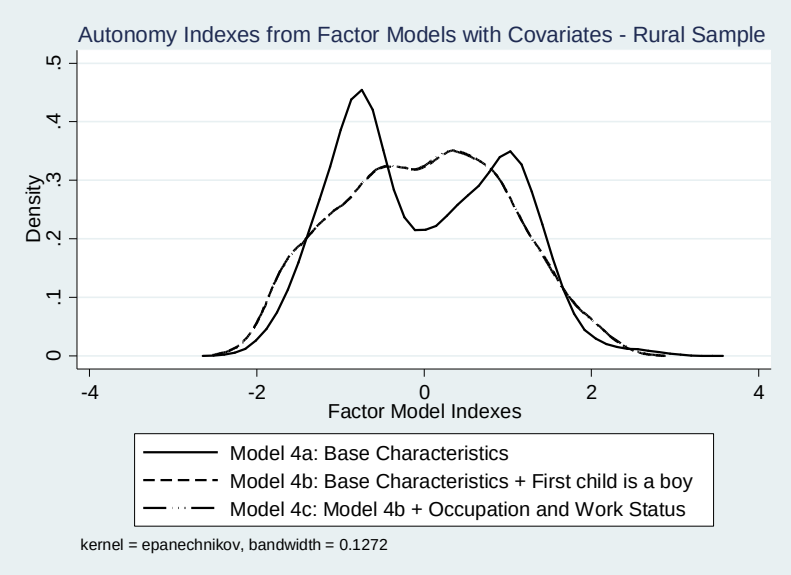


Figure 6a - Indexes created using Model 4– Rural

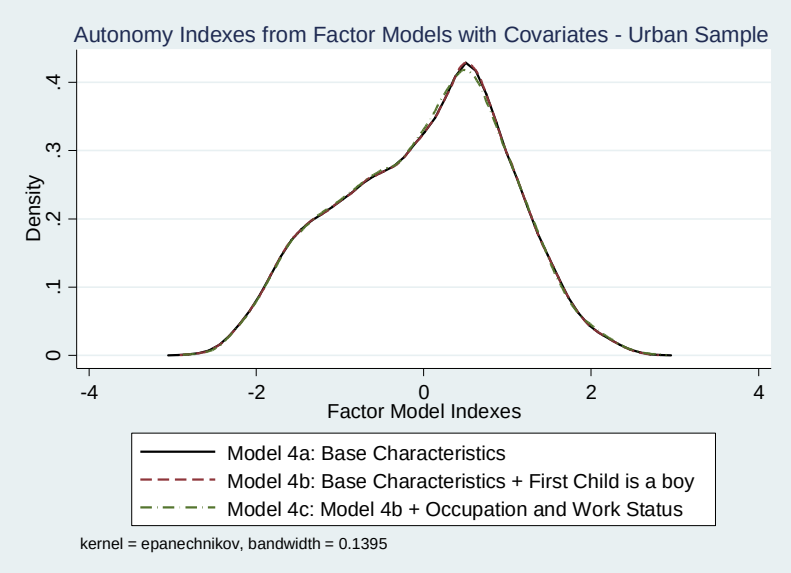


Figure 6b - Indexes created using Model 4– Urban

Note: Base characteristics included are: wealth score, dummy for nuclear family, mother's age, Indicators for nuclear family, caste, religion, father's education, mother's education, age difference between the partners, state dummies. Additionally, binary indicators for the size of the city/town were included in the urban estimations.

Table 1– Descriptive Statistics (mean (S.D))

	Rural [1]	Urban [2]
Measurements used in the construction of the Autonomy Index		
Woman is allowed to go to the:		
market alone (m1)	0.48	0.66
health facility alone (m2)	0.45	0.60
places outside the community alone (m3)	0.36	0.42
Woman has the final say alone on purchases for daily needs (m4)	0.29	0.36
Woman has the final say together on: own health care (m5)	0.61	0.70
large household purchases (m6)	0.50	0.60
visiting family and friends (m7)	0.58	0.69
what to do with husband's money (m8)	0.62	0.67
Woman has money for her own use (m9)	0.36	0.48
Average Score (Std Dev)	4.24 (2.48)	5.18 (2.39)
Wealth index factor score/100000	-0.58 (0.78)	0.49 (0.87)
Family is a nuclear family	0.47	0.49
Woman's characteristics		
Age in years	27.03 (5.8)	27.28 (5.12)
Caste		
'Normal' caste (used as the base category in the analysis)	0.25	0.40
Schedule caste	0.18	0.16
Schedule tribe	0.20	0.09
OBC (Other Backward Caste)	0.33	0.32
Caste information is missing	0.05	0.04
Religion		
Hindu (used as the base category in the analysis)	0.74	0.68
Christian	0.10	0.09
Muslim	0.13	0.19
Other Religion	0.03	0.04
Education		
No education or primary not completed (used as base category)	0.57	0.29
Completed primary	0.36	0.45
Completed secondary	0.03	0.09
Completed higher education	0.03	0.17
Woman's Occupation		
No occupation (base category)	0.55	0.78
Professional, Technical, Managerial; Clerical, Sales, Services	0.04	0.12
Agricultural employee	0.33	0.03
Skilled and Unskilled Manual	0.08	0.07
Woman's working and earning status		
Not working (base group)	0.54	0.78
works all year for cash	0.11	0.15
works all year for non-cash (not paid, paid in kind)	0.13	0.02
seasonal or occasional work	0.22	0.05
Media Exposure		
Woman reads newspapers or watches TV or listens to the radio	0.51	0.84

Table 1– Descriptive Statistics (mean (S.D)) - continued

	Rural [1]	Urban [2]
Partner's Education		
No education (used as the base category in the analysis)	0.46	0.25
Completed primary	0.45	0.50
Secondary or higher education	0.02	0.02
Education information missing or not known	0.07	0.22
Partner's Occupation		
Skilled and Unskilled Manual (base category)+ a handful of 'unemployed'	0.38	0.45
Professional, Technical, Managerial	0.05	0.13
Clerical	0.03	0.07
Sales	0.09	0.22
Agricultural employee	0.40	0.05
Services	0.05	0.08
Partner's age-woman's age		
Age difference between the woman and her partner < years (used as the base category in the analysis)	0.12	0.12
Age difference between the woman and her partner >2-5 years	0.47	0.47
Age difference between the woman and her partner > 6-10 years	0.30	0.32
Age difference between the woman and her partner > 10 years	0.11	0.09
Proportion of women with one child	0.59	0.51
URBAN - binary indicators		
Large city (used as the base category)		0.33
Mega city		0.11
small city		0.16
large town		0.08
small town		0.32
State/Union Territory		
Jammu and Kashmir	0.03	0.01
Himachal Pradesh	0.03	0.02
Punjab	0.03	0.03
Uttaranchal	0.03	0.02
Haryana	0.03	0.02
Delhi		0.04
Rajasthan	0.05	0.03
Uttar Pradesh (used as the base state)	0.13	0.10
Bihar	0.05	0.03
Sikkim	0.02	0.01
Arunachal Pradesh	0.02	0.01
Nagaland	0.04	0.04
Manipur	0.04	0.05
Mizoram	0.02	0.02
Tripura	0.02	0.01
Meghalaya	0.02	0.01
Assam	0.04	0.02
West Bengal	0.05	0.05

Table 1– Descriptive Statistics (mean (S.D)) - continued

	Rural	Urban
	[1]	[2]
Jharkhand	0.04	0.02
Orissa	0.05	0.03
Chhattisgarh	0.04	0.02
Madhya Pradesh	0.05	0.07
Gujarat	0.03	0.03
Maharashtra	0.03	0.10
Andhra Pradesh	0.03	0.07
Karnataka	0.04	0.03
Goa	0.02	0.03
Kerala	0.02	0.02
Tamil Nadu	0.03	0.05
Number of mothers	17,749	11,187

Notes: Sample is the women who had children who were less than 5 years old at the survey time and thus contributed to the 'nutrition' analyses. See text for further details.

Table 2: Descriptive Statistics of Child and Mother Covariates used in the Nutrition regressions – Mean (Std Deviation)

	RURAL	URBAN
CHILD COVARIATES		
HAZ – Height for Age Z scores	-1.86	-1.48
	(1.66)	(1.63)
WHZ – Weight for Height Z scores	-0.99	-0.77
	(1.30)	(1.35)
WAZ – Weight for Age Z scores	-1.76	-1.38
	(1.23)	(1.24)
Binary Indicators		
Stunted (HAZ<-2)	0.48	0.37
Wasted (WHZ<-2)	0.19	0.17
Stunted but not wasted	0.39	0.32
Not stunted but wasted	0.11	0.10
Neither stunted nor wasted	0.41	0.53
Stunted and wasted	0.09	0.05
Girl	0.48	0.48
Age in months	30.21	30.82
	(16.97)	(16.72)
Twin	0.01	0.01
Birth Order - 1	0.27	0.36
Birth Order - 2	0.26	0.32
Birth Order - 3	0.18	0.15
Birth Order - 4	0.11	0.08
Birth Order – 5 or more	0.18	0.09
Preceding birth interval		
< 18 months	0.08	0.08
18-24 months	0.15	0.12
25-36 months	0.51	0.54
>36 months	0.27	0.27
MOTHER COVARIATES		
Child had died in the family	0.20	0.12
Whether the mother is anaemic i.e. haemoglobin<11gm/dl	0.40	0.49
Mothers height less than 145cm	0.10	0.10
Mother has low BMI i.e. BMI<18.5	0.14	0.23
BMI missing	0.14	0.01

Notes: (i) Rural sample has 23,878 children and the urban sample has 14,186. (ii) The nutritional status variable definitions are based on the World Health Organisation standards. The Rural sample excludes Delhi.

Table 3
Frequency distribution of the sum of the measurements used in the construction of the autonomy index

	Rural			Urban		
Sum	# of women	%	Cumulative %	# of women	%	Cumulative %
0	1,454	8.2	8.2	473	4.2	4.2
1	1,729	9.7	17.9	623	5.6	9.8
2	1,589	9.0	26.9	634	5.7	15.5
3	1,976	11.1	38.0	952	8.5	24.0
4	2,800	15.8	53.8	1,463	13.1	37.1
5	2,355	13.3	67.1	1,549	13.9	50.9
6	1,784	10.1	77.1	1,498	13.4	64.3
7	2,103	11.9	89.0	1,871	16.7	81.0
8	1,564	8.8	97.8	1,642	14.7	95.7
9	395	2.2	100.0	482	4.3	100.0

Notes: (i) See Table 1 for the definitions of the measurements. (ii) Number of women in the rural sample=17,749 and urban sample=11,187.

Table 4: Spearman Rank Correlation Between the Indexes

RURAL SAMPLE

	Model 1	Model 2	Model 3	Model 4a	Model 4b	Model 4c	Model 4d
Model 1	**1**						
Model 2	**0.99**	**1.00**					
Model 3	**0.79**	**0.78**	**1.00**				
Model 4a	**0.82**	**0.87**	**0.51**	**1.00**			
Model 4b	**0.80**	**0.80**	**0.95**	**0.58**	**1.00**		
Model 4c	**0.82**	**0.87**	**0.51**	**1.00**	**0.57**	**1.00**	
Model 4d	**0.81**	**0.81**	**0.95**	**0.58**	**1.00**	**0.58**	**1.00**

URBAN SAMPLE

Model 1	**1.00**						
Model 2	**0.99**	**1.00**					
Model 3	**0.78**	**0.79**	**1.00**				
Model 4a	**0.77**	**0.79**	**0.95**	**1.00**			
Model 4b	**0.77**	**0.79**	**0.95**	**1.00**	**1.00**		
Model 4c	**0.78**	**0.80**	**0.95**	**1.00**	**1.00**	**1.00**	
Model 4d	**0.78**	**0.80**	**0.95**	**1.00**	**1.00**	**1.00**	**1.00**

Notes: Model 1: Average of the measurements.
Model 2: Principal Component.
Model 3: Factor Model without any covariates.
Model 4a: Factor Model with basic characteristics (see notes to Figure 2)
Model 4b: Model 4a + indicator for whether the first child was a boy.
Model 4c: Model 4b + occupation and work status indicators.
Model 4d: Model 4c without the first boy indicator.

Table 5 Estimates of Equation (4) Parameters (Standard errors) in MODEL 4d

	RURAL		URBAN		RURAL		URBAN	
MEASUREMENTS	**Without covariates [1]**	**With covariates [2]**	**Without covariates [3]**	**With covariates [4]**	**Without covariates [5]**	**With covariates [6]**	**Without covariates [7]**	**With covariates [8]**
	FACTOR LOADINGS				**INTERCEPTS**			
woman is allowed to go to market alone – intercept constant	1	1	1	1	0.156***	-8.078***	0.849***	-0.380***
					(0.042)	(0.513)	(0.031)	(0.093)
woman is allowed to go to health facility alone	1.572***	1.171***	0.908***	0.874***	-0.779***	-1.914***	-0.309***	-0.168***
	(0.057)	(0.044)	(0.047)	(0.037)	(0.086)	(0.347)	(0.031)	(0.054)
woman is allowed to go to places outside community alone	0.786***	0.671***	0.819***	0.816***	-1.277***	1.381***	-1.161***	-0.965***
	(0.018)	(0.023)	(0.047)	(0.038)	(0.041)	(0.297)	(0.031)	(0.060)
final say alone on purchases for daily needs	0.164***	0.141***	0.839***	0.828***	-1.152***	5.887***	-1.471***	-1.295***
	(0.006)	(0.005)	(0.056)	(0.044)	(0.041)	(0.453)	(0.031)	(0.068)
final say together on own health care	0.150***	0.136***	2.848***	2.153***	0.470***	7.571***	0.546***	-0.919***
	(0.006)	(0.005)	(0.151)	(0.100)	(0.041)	(0.455)	(0.041)	(0.112)
final say together on large household purchases	0.167***	0.154***	4.640***	3.404***	-0.058	6.894***	0.129**	-2.903***
	(0.006)	(0.005)	(0.254)	(0.172)	(0.040)	(0.447)	(0.053)	(0.213)
final say together on visiting family and friends	0.158***	0.151***	5.054***	3.827***	0.337***	7.323***	1.077***	-2.469***
	(0.006)	(0.005)	(0.305)	(0.197)	(0.041)	(0.448)	(0.081)	(0.244)
final say together on what to do with husband's money	0.105***	0.103***	2.047***	1.566***	0.471***	7.841***	0.170***	-0.562***
	(0.005)	(0.005)	(0.109)	(0.074)	(0.041)	(0.468)	(0.035)	(0.079)
woman has money for her own use	0.078***	0.052***	0.254***	0.160***	-0.756***	7.020***	-0.881***	0.138
	(0.005)	(0.004)	(0.039)	(0.029)	(0.041)	(0.492)	(0.030)	(0.091)

Table 5: Continued

	RURAL		URBAN	
MEASUREMENTS	**Without covariates [1]**	**With covariates [2]**	**Without covariates [5]**	**With covariates [6]**
Estimated variance of woman level heterogeneity	0.501***	18.775***	0.454***	0.571
	(0.034)	(0.901)	(0.041)	(0.042)
Estimated variance of district level heterogeneity	0.629***	0.683***	0.540***	0.513***
	(0.022)	(0.013)	(0.026)	(0.027)
'RELIABILITY' MEASURE+ (percentage)				
woman is allowed to go to market alone	81.1	83.4	10.6	10.4
woman is allowed to go to health facility alone	87.1	85.5	8.9	8.2
woman is allowed to go to places outside community alone	77.1	77.1	7.4	7.2
final say alone on purchases for daily needs	41.3	41.4	7.7	7.4
final say together on own health care	39.1	40.6	49.0	32.6
final say together on large household purchases	41.7	43.6	71.8	50.4
final say together on visiting family and friends	40.4	43.1	75.2	54.5
final say together on what to do with husband's money	31.0	34.1	33.2	21.5
woman has money for her own use	25.1	20.7	0.8	0.3

***, **, * p-value<0.01, 0.05 and 0.10 respectively. (ii) The model is estimated using the full sample of women. (iii) All are binary indicators except the Wealth score variable and the woman's age variable. (iv)There were not enough women in the rural sample living in Delhi and these women were dropped from the rural analyses. (v) + The 'reliability' measure provides the percentage of variation attributed to the autonomy variable in the total variation observed in that **particular** measurement. See equation (3).

Table 6 – Estimates of Equation (5) Parameters (Standard errors) in MODEL 4d

	RURAL	URBAN
Wealth index factor score/100000	0.103	-0.079***
	(0.079)	(0.018)
Family is a nuclear family	1.670***	0.384***
	(0.097)	(0.024)
Woman's characteristics		
Age in years	0.164***	0.027***
	(0.009)	(0.002)
Caste: **base case is 'normal'**		
Schedule Caste	0.098	-0.026
	(0.137)	(0.030)
Schedule Tribe	0.301*	0.121**
	(0.160)	(0.052)
Other Backward Caste	-0.202	0.025
	(0.124)	(0.025)
Caste missing	0.067	-0.003
	(0.269)	(0.057)
Religion: base case is 'Hindu'		
Christian	0.454*	0.211***
	(0.236)	(0.053)
Muslim	-1.102***	-0.029
	(0.166)	(0.027)
Other	0.501**	0.059
	(0.220)	(0.051)
Education: **base is no education**		
Completed primary or incomplete secondary	0.615***	0.120***
	(0.112)	(0.026)
Completed secondary education	1.585***	0.164***
	(0.255)	(0.042)
Higher education	2.264***	0.298***
	(0.238)	(0.044)
Media Exposure		
Listens to either radio or watches tv or reads newspapers at least once a week	0.687***	0.117***
	(0.106)	(0.029)
Woman's Occupation – base: no occupation		
Professional, Technical, Managerial; Clerical, Sales, Services	1.427**	-0.049
	(0.635)	(0.145)
Agricultural employee	0.392	-0.159
	(0.617)	(0.153)
Skilled and Unskilled Manual	0.267	-0.148
	(0.630)	(0.149)
Woman's working status – base: not working		
works all year for cash	1.597***	0.381**
	(0.611)	(0.149)
works all year for non-cash (not paid, paid in kind)	0.610	0.357**
	(0.591)	(0.139)
seasonal or occasional work	0.455	0.240
	(0.606)	(0.149)

Table 6– Continued

	RURAL	URBAN
Partner's Characteristics		
Education: base is no education		
Completed primary or incomplete secondary	-0.205*	0.001
	(0.107)	(0.026)
Completed secondary education	-1.296***	0.082
	(0.482)	(0.066)
Higher education	-0.174	0.040
	(0.250)	(0.039)
Occupation – Base: no occupation		
Professional, Technical, Managerial	0.126	0.029
	(0.358)	(0.035)
Clerical	-0.164	0.032
	(0.401)	(0.040)
Sales	-0.547	-0.045*
	(0.343)	(0.025)
Agricultural employee	-0.811**	0.008
	(0.331)	(0.045)
Services	0.539	-0.001
	(0.359)	(0.036)
Skilled and Unskilled Manual	-0.047	
	(0.323)	
Age difference between the partners		
Base: less than 2 years		
Husband older by 2-5 years	0.289**	0.064**
	(0.136)	(0.030)
Husband older by 6-10 years	0.445***	0.053
	(0.148)	(0.032)
Husband older by more than 10 years	0.516***	-0.006
	(0.177)	(0.042)
URBAN – base: large city		
Mega city		-0.009
		(0.055)
small city		-0.115***
		(0.035)
large town		-0.098*
		(0.050)
small town		-0.098***
		(0.033)
State/Union Territory (base: Uttar Pradesh)		
Jammu and Kashmir	4.839***	-0.686***
	(0.386)	(0.096)
Himachal Pradesh	6.025***	-0.115
	(0.325)	(0.083)
Punjab	0.824***	0.085
	(0.303)	(0.073)
Uttaranchal	2.024***	-0.068
	(0.261)	(0.082)
Haryana	1.643***	0.389***
	(0.271)	(0.097)
Delhi	+++	0.149*
		(0.077)
Rajasthan	1.158***	-0.148*
	(0.249)	(0.077)
Bihar	0.655**	-0.140**
	(0.286)	(0.066)

Table 6 - Continued

	RURAL	URBAN
Sikkim	5.415***	0.631***
	(0.379)	(0.128)
Arunachal Pradesh	3.166***	0.162
	(0.400)	(0.114)
Nagaland	0.134	0.709***
	(0.314)	(0.085)
Manipur	3.920***	0.599***
	(0.316)	(0.075)
Mizoram	9.807***	0.736***
	(0.601)	(0.127)
Tripura	2.386***	-0.072
	(0.318)	(0.121)
Meghalaya	1.848***	0.163
	(0.522)	(0.114)
Assam	1.369***	0.766***
	(0.235)	(0.093)
West Bengal	1.119***	-0.353***
	(0.218)	(0.055)
Jharkhand	1.475***	-0.091
	(0.265)	(0.074)
Orissa	-1.909***	0.110
	(0.256)	(0.081)
Chhattisgarh	-0.434*	-0.085
	(0.243)	(0.073)
Madhya Pradesh	-0.134	-0.244***
	(0.232)	(0.050)
Gujarat	2.141***	-0.273***
	(0.310)	(0.065)
Maharashtra	2.117***	0.265***
	(0.265)	(0.049)
Andhra Pradesh	1.221***	-0.230***
	(0.324)	(0.050)
Karnataka	-0.027	-0.089
	(0.298)	(0.066)
Goa	3.248***	0.078
	(0.333)	(0.078)
Kerala	2.183***	0.410***
	(0.279)	(0.083)
Tamil Nadu	4.684***	0.144**
	(0.306)	(0.070)
Number of Mothers	17.749	11,187

Notes: (i) ***, **, * p-value<0.01, 0.05 and 0.10 respectively. (ii) All are binary indicators except the Wealth score variable and the woman's age variable. (iii) +++ There were not enough women in the rural sample living in Delhi and these women were dropped from the rural analyses.

Table 7 –Nutritional Status: Coefficient Estimate (std error) [uses Models 4d index of autonomy]

	SIMPLE SPECIFICATION PANEL [1]				EXTENDED SPECIFICATION WITH ALL COVARIATES PANEL [2]			
	RURAL	**URBAN**	**RURAL**	**URBAN**	**RURAL**	**URBAN**	**RURAL**	**URBAN**
VARIABLES	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**	**[8]**
	HAZ	**HAZ**	**STUNTED**	**STUNTED**	**HAZ**	**HAZ**	**STUNTED**	**STUNTED**
Autonomy	0.129***	0.069***	-0.035***	-0.013***	0.010	0.019	-0.004	-0.000
	(0.012)	(0.016)	(0.004)	(0.005)	(0.014)	(0.018)	(0.004)	(0.006)
Constant	-0.702***	-0.317***	0.207***	0.169***	-0.927***	-0.956***	0.245***	0.378***
	(0.043)	(0.053)	(0.009)	(0.012)	(0.097)	(0.125)	(0.026)	(0.039)
R-squared	0.090	0.076	0.057	0.036	0.173	0.208	0.132	0.157
	WHZ	**WHZ**	**WASTED**	**WASTED**	**WHZ**	**WHZ**	**WASTED**	**WASTED**
Autonomy	0.056***	0.082***	-0.008**	-0.010***	-0.007	-0.003	0.002	0.002
	(0.011)	(0.013)	(0.003)	(0.004)	(0.012)	(0.016)	(0.003)	(0.004)
Constant	-1.022***	-0.994***	0.276***	0.278***	-0.563***	-0.796***	0.155***	0.226***
	(0.039)	(0.048)	(0.011)	(0.013)	(0.076)	(0.106)	(0.024)	(0.030)
R-squared	0.004	0.007	0.015	0.014	0.089	0.086	0.063	0.062
Number of Children	23,878	14,186	23,878	14,186	23,878	14,186	23,878	14,186
Number of Mothers	17,749	11,187	17,749	11,187	17,749	11,187	17,749	11,187

Notes: (i) Bootstrapped standard errors (allows for clustering at the district level) in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) The dependent variable used in columns headed HAZ (Stunted) is the Height-for-Age Z-scores defined according to the World Health Organisation (a binary indicator taking the value of 1 if the child's HAZ is less than -2 from the median value of 0). Similarly WHZ (Wasted) is the Weight-for-Height Z-scores defined according to the World Health Organisation (a binary indicator taking the value of 1 if the child's HAZ is less than -2 from the median value of 0) (iv) The Autonomy measure is the one constructed using our model specification given in equations (4) & (5). (v) Only other covariates in the models presented in columns [1]-[4] are the binary indicators for the age of the child : 7-12, 13-18, 19-24, 24-36, 36-48, 49-59 all measured in months. All Covariates from Tables 1 and 4 are included in the model presented in columns [5]-[8] along with an indicator for whether the mother had experienced a child death.

Table 8 –Nutritional Status- Coefficient Estimate (std error)

	UNADJUSTED AUTONOMY MEASURE (Model 3) PANEL [1]				AVERAGE OF THE MEASUREMENTS (Model 1) PANEL [2]			
	RURAL	**URBAN**	**RURAL**	**URBAN**	**RURAL**	**URBAN**	**RURAL**	**URBAN**
VARIABLES	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**	**[8]**
	HAZ	**HAZ**	**STUNTED**	**STUNTED**	**HAZ**	**HAZ**	**STUNTED**	**STUNTED**
Autonomy	0.028**	0.012	-0.012***	0.001	0.023*	0.024	-0.010***	-0.002
	(0.013)	(0.014)	(0.003)	(0.005)	(0.012)	(0.015)	(0.004)	(0.005)
Intercept	-0.916***	-0.972***	0.241***	0.380***	-0.918***	-0.957***	0.242***	0.376***
	(0.094)	(0.128)	(0.026)	(0.035)	(0.090)	(0.129)	(0.028)	(0.038)
R-squared	0.173	0.208	0.132	0.157	0.173	0.208	0.132	0.157
	WHZ	**WHZ**	**WASTED**	**WASTED**	**WHZ**	**WHZ**	**WASTED**	**WASTED**
Autonomy	-0.008	-0.003	-0.001	0.003	-0.007	-0.001	0.000	0.002
	(0.009)	(0.013)	(0.003)	(0.004)	(0.010)	(0.013)	(0.003)	(0.004)
Intercept	-0.559***	-0.795***	0.151***	0.226***	-0.559***	-0.793***	0.152***	0.225***
	(0.080)	(0.108)	(0.023)	(0.028)	(0.079)	(0.109)	(0.023)	(0.027)
R-squared	0.089	0.086	0.063	0.062	0.089	0.086	0.063	0.062
Number of Children	23,788	14,070	23,788	14,070	23,788	14,070	23,788	14,070
Number of Mothers	17,749	11,187	17,749	11,187	17,749	11,187	17,749	11,187

Notes: (i) Bootstrapped standard errors (allows for clustering at the district level) in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) The dependent variable used in columns headed HAZ (Stunted) is the Weight-for-Height Z-scores defined according to the World Health Organisation (a binary indicator taking the value of 1 if the child's HAZ is less than -2 from the median value of 0). Similarly WHZ (Wasted) is the Weight-for-Height Z-scores defined according to the World Health Organisation (a binary indicator taking the value of 1 if the child's HAZ is less than -2 from the median value of 0) (iv) All Covariates from Tables 1 and 4 are included in the model along with an indicator for whether the mother had experienced a child death. The rest of the estimates are available on request.

Table 9- Model Extensions: Age Differences; Coefficient Estimate (std error); Full Model Using Autonomy index from Model 4d

	AGE < 24 MONTHS PANEL [1]				AGE > 23 MONTHS PANEL [2]			
	RURAL	**URBAN**	**RURAL**	**URBAN**	**RURAL**	**URBAN**	**RURAL**	**URBAN**
VARIABLES	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**	**[8]**
	HAZ	**HAZ**	**STUNTED**	**STUNTED**	**HAZ**	**HAZ**	**STUNTED**	**STUNTED**
Autonomy	0.046**	0.042	-0.012*	-0.000	-0.015	0.005	0.001	0.001
	(0.023)	(0.027)	(0.006)	(0.008)	(0.016)	(0.020)	(0.005)	(0.006)
Intercept	-0.803***	-0.883***	0.236***	0.386***	-2.478***	-2.519***	0.601***	0.665***
	(0.147)	(0.189)	(0.043)	(0.051)	(0.107)	(0.130)	(0.035)	(0.045)
R-squared	0.192	0.211	0.159	0.161	0.111	0.183	0.096	0.152
	WHZ	**WHZ**	**WASTED**	**WASTED**	**WHZ**	**WHZ**	**WASTED**	**WASTED**
Autonomy	-0.028	0.012	0.003	0.003	0.004	-0.011	0.002	0.001
	(0.020)	(0.027)	(0.006)	(0.007)	(0.012)	(0.018)	(0.004)	(0.005)
Intercept	-0.694***	-0.971***	0.171***	0.263***	-0.351***	-0.386***	0.029	0.066**
	(0.132)	(0.167)	(0.040)	(0.049)	(0.089)	(0.125)	(0.027)	(0.030)
R-squared	0.091	0.092	0.064	0.078	0.102	0.097	0.054	0.058
Number of Children	23,788	14,070	23,788	14,070	23,788	14,070	23,788	14,070
Number of Mothers	17,749	11,187	17,749	11,187	17,749	11,187	17,749	11,187

Notes: (i) Bootstrapped standard errors (allows for clustering at the district level) in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) The dependent variable used in columns headed HAZ (Stunted) is the Weight-for-Height Z-scores defined according to the World Health Organisation (a binary indicator taking the value of 1 if the child's HAZ is less than -2 from the median value of 0). Similarly WHZ (Wasted) is the Weight-for-Height Z-scores defined according to the World Health Organisation (a binary indicator taking the value of 1 if the child's HAZ is less than -2 from the median value of 0) (iv) All Covariates from Tables 1 and 4 are included in the model along with an indicator for whether the mother had experienced a child death. The rest of the estimates are available on request.