8-12-2013

Mothers' Empowerment, Children's Inoculations and Schooling in Pakistan: Urban vs Rural Areas, Daughters vs Sons and 1998-99 vs 2007-08

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Mothers' empowerment is thought to have considerable impact on children's health and schooling. But the evidence for developing countries of the magnitudes of such effects, how they differ between urban and rural areas, whether they differ for daughters versus sons and whether they are changing over time is limited, particularly for countries that are characterized as having relatively great gender inequality. We construct a mothers' empowerment index from Pakistani household survey data for 1998-99 and 2007-08 and investigate the associations between mothers' empowerment and children's inoculations and schooling. Because mothers' empowerment may be endogenous, we explore instrumental variable estimates using women's ages at the time of marriage as the identifying instrument. We find that the greater mothers' empowerment: the more likely that preschool-age children have complete inoculations and the younger is the age of starting school and the greater is the schooling progression rate. These effects are larger in absolute magnitude for urban than for rural areas (though significantly so at the 5% level only for inoculations), suggesting that the urban context facilitates the effectiveness of mothers' empowerment on investments in children's human capital. They also are larger in absolute magnitude for daughters than for sons (though significantly so only for the schooling progression rate), suggesting some intergenerational own-gender reinforcement. Finally, these effects are significantly larger in absolute magnitudes for 2007-08 than for 1998-99, suggesting increased impact of a given degree of mothers' empowerment in the first decade of the 21st century.

Keywords
Child health, Child schooling, Intergenerational relations, Mothers' empowerment

Disciplines
Behavioral Economics | Demography, Population, and Ecology | Health Economics

Comments
Kiani, Adiqa K. and Jere R. Behrman. 2013. "Mothers' Empowerment, Children's Inoculations and Schooling in Pakistan: Urban vs Rural Areas, Daughters vs Sons and 1998-99 vs 2007-08." GCC Working Paper Series, GCC 13-06.

Mothers' Empowerment, Children's Inoculations and Schooling in Pakistan: Urban vs Rural Areas, Daughters vs Sons and 1998-99 vs 2007-08

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12 August 2013

Abstract

Mothers' empowerment is thought to have considerable impact on children's health and schooling. But the evidence for developing countries of the magnitudes of such effects, how they differ between urban and rural areas, whether they differ for daughters versus sons and whether they are changing over time is limited, particularly for countries that are characterized as having relatively great gender inequality. We construct a mothers' empowerment index from Pakistani household survey data for 1998-99 and 2007-08 and investigate the associations between mothers' empowerment and children's inoculations and schooling. Because mothers' empowerment may be endogenous, we explore instrumental variable estimates using women's ages at the time of marriage as the identifying instrument. We find that the greater mothers' empowerment: the more likely that preschool-age children have complete inoculations and the younger is the age of starting school and the greater is the schooling progression rate. These effects are larger in absolute magnitude for urban than for rural areas (though significantly so at the 5% level only for inoculations), suggesting that the urban context facilitates the effectiveness of mothers' empowerment on investments in children's human capital. They also are larger in absolute magnitude for daughters than for sons (though significantly so only for the schooling progression rate), suggesting some intergenerational own-gender reinforcement. Finally, these effects are significantly larger in absolute magnitudes for 2007-08 than for 1998-99, suggesting increased impact of a given degree of mothers' empowerment in the first decade of the 21st century.

Keywords: mothers' empowerment, child schooling, child health, intergenerational relations

JEL Codes: D1, I2, J1

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1. Introduction

There is strong advocacy for increasing women's empowerment in developing countries, not only to achieve greater equality for women but also to facilitate the broader development process, in part through enhancing investments in the human capital of the next generation. Nobel Laurate Amartya Sen, for example, in his comments of 27 September 2012 at a panel on "Securing the Future We Want: Gender Equality, Economic Development, and Environmental Sustainability" alongside the 67th United Nations General Assembly, emphasized that empowering women and girls with more choices and more freedoms is crucial to achieving a better future for all.[2]

Despite such advocacy, however, there is limited evidence on the relations between mothers' empowerment and investments in their children's human capital, how these relations differ in urban versus rural contexts, whether they differ for daughters versus sons and whether those relations have been changing recently, particularly in the type of developing country contexts in which there is relatively great gender inequality. The contribution of this study is to investigate these associations between mothers' empowerment and children's inoculations and schooling in the early 21st century in one such country, Pakistan. Pakistan is of particular interest because it is a populous country characterized as having relatively high gender inequality, ranking 134 among 196 countries on the United Nations Development Program (UNDP) gender inequality index for 2011. We proceed by first defining mothers' empowerment and then reviewing previous related studies. We then present our data, estimates and discussion.

2. Defining Empowerment

Empowerment is defined in the literature in multiple ways (see Ibrahim and Alkire 2007 for a complete review). Alsop (2006) explains empowerment as "a group's or individual's capacity to make effective choices, that is, to make choices and then to transform those choices into desired actions and outcomes". This definition has two components – the component related to Amartya Sen's concept of agency (the ability to act on behalf of what you value and have reason to value) – and the component related to the institutional environment, which offers people the ability to

[2] (http://www.undp.org/content/undp/en/home/presscenter/articles/2012/09/27/empowering-women-is-key-to-building-a-future-we-want-nobel-laureate-says.html, accessed 10 February 2013).

exert agency fruitfully (Ibrahim and Alkire 2007). Narayan (2002) defines empowerment as "the addition of assets and capabilities of poor people to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives," stressing four main elements of empowerment: access to information, insertion and contribution, responsibility and local managerial aptitude. Mahmud, Shah, and Becker (2012) emphasize the access to and control of material, human and public resources.

Women's empowerment is multifaceted and affects many phases of life, including family relationships, physical health, as well as economic and social power. Jejeebhy and Sathar (2001) define a woman's empowerment as pertaining "to what extent she has equal rights with man, about the decision making about herself and about her families, how much control she has over the household resources, whether she is fully aware of the household issues and problems, has full access to information on family matters, and how much power she has to take any decision, freedom of her physical mobility and about the choices of her personal matters including marriage, number of children born and birth control and ability to develop relationships with other families."

Women's empowerment may differ in different fields of life -- familial/household, legal, economic, political, with spheres of influence defined by her husband or the head of the household and the particular cultural context (Malhotra and Schuler 2005; Kishor 2000; Malhotra and Mather 1997). Empowerment is not necessarily stationary, but may vary with time, life cycle stage and place (Dyson and Moore 1983; Mason 1986; Gage 2000; Malhotra, Schuler et al. 2002). For example, in South Asia, mothers-in-law are usually more empowered than daughters-in-law and they have more hold and command over household matters as reported in various cross-sectional studies (Mason 1986; Kabeer 2001). Some studies also indicate that women's empowerment varies by their schooling attainment, age of marriage, age, age differential with spouse, marital status and employment status (Standing 1991; Das Gupta 1996; Gage 2000; Hindin 2002). Much attention has been paid to the status of women as an important determinant of fertility and child development in developing countries, with emphasis on the empowering roles of employment and education (Santhya et al. 2010).

Conventional wisdom is that in Pakistan women's status in society traditionally has been very low, particularly in rural areas. There has been emphasis on the need to help improve women's social status. Women's schooling and labor force participation have increased and woman's empowerment is thought to be gradually improving. Yet, progress so far appears to have been limited.

3. Literature on Mothers' Empowerment and Investments in Children

Many researchers suggest that mothers are more child-oriented than fathers, perhaps because of their different biological roles in child bearing and initial feeding, or because of differential social biological incentives that lead mothers to focus more on the quality of children and fathers to focus more on the quantity of children or because of different roles in traditional societies related to the greater demands for physical strength in some tasks such as plowing (Boserup 1970; Pitt, Rosenzweig and Hassan 1990; Alesina, Giuliano and Nunn 2013). If mothers are more child-oriented than fathers on average for any one or more of these reasons, greater empowerment of mothers is likely to lead to more investments in the human capital of children. Following are summaries of some illustrative studies that address such issues.

Fernandez (1997) investigated whether women in five small rural Mexican communities were more empowered when their husbands migrated to the United States and, if so, whether that increased empowerment enhanced allocation of resources for children's health. She used simultaneous equations techniques and fixed-effects procedures to attempt to control for the endogeneity of the migration decision. She found that the absence of fathers empowered the mothers to some extent, but such increased empowerment did not enhance allocation of health-related resources to children.

Schuler and Elisabeth (2010) examined women's empowerment using ten years of data from rural Bangladesh. They concluded that women's empowerment has beneficial influences on women's own health-promoting behaviors, such as contraceptive use, as well as on other maternal and child health issues. They also concluded that empowered mothers and mothers-in-law are more likely to promote better reproductive health and positive gender norms (such as

delayed age at marriage, postponement of childbearing, and improved economic opportunities) among married daughters and daughters-in-law in the next generation.

Chakraborty (2011) constructed a new, direct measure of female empowerment (autonomy) in household decision-making by creating an index from the principal components of a variety of household decision variables using Mexican household surveys. He used the geographic proximity of spousal parents as an instrumental variable to control for the potential endogeneity of women's empowerment. He found that greater mothers' empowerment is associated with better secondary education for boys, but not girls.

Desai and Johnson (2005) examined the impact of women's empowerment on health outcomes in a number of countries. Their results suggest that while women's decision-making authority does not affect health outcomes in all settings, it has a positive impact on health outcomes in a large number of the countries considered. They found that in Nepal and India, women's decision-making authority improves particularly child height-for-age, a measure of long-run nutritional status, and reduces child mortality, even after controlling for schooling and wealth. Their results are consistent with women's decision-making authority most directly translating into day-to-day behaviors of households that are likely to be reflected in nutritional intakes and care of infectious diseases that determine child long-run nutritional status. The effects are the weakest in sub-Saharan Africa, with Latin America and the Caribbean falling in between. This pattern suggests that more nuanced research on gender inequalities needs to incorporate historical and cultural factors that influence gender systems in different settings.

4. Data and Variable Construction

The data that we use for this study are from the Pakistan Integrated Household Survey for 1998-99 (16,305 households) and the Pakistan Social Living Standard and Measurement Survey for 2007-08 (15,512 households), both published by the Federal Bureau of Statistics, Islamabad, Pakistan. Both surveys contain detailed information on a wide range of individual and household characteristics including demographic characteristics, dwelling characteristics, financial, educational and health status, location, and household durables (that we use to construct a wealth index, see below). In both surveys seven questions are asked of women to determine their

decision-making power, which we use to construct the empowerment index for our study (see below).[3] Table 1 gives basic characteristics of the data and Table 2 gives variable definitions both grouped by (1) the mothers' empowerment index, (2) the child human capital investments that we consider, and (3) control variables.

Tables 1 and 2 about here

(1) Mothers' Empowerment Index:

Both surveys conducted interviews independently for each female aged 15-49 years in the family in which she responded for seven topics on whether she made decisions on her own (full empowerment), jointly with her husband (partial empowerment), or the decisions were made completely by someone else (no empowerment). If full empowerment is given a score of 3, partial empowerment a value of 2 and no empowerment a value of 1, the mean value of these responses is 1.49 for 1998-99 and 1.52 for 2008-08, suggesting limited empowerment in both years and no significant change in empowerment between the two years. For both years there was substantial variance of about 0.5 in these responses.

The decision-making questions include seven categories:

Q1. Who in your household decides whether you can start or continue to get education?

Q2. Who in your household decides whether you can seek or remain in paid employment?

Q3. Why are you not actively seeking paid work?

Q4. Who in your HH decides where and when you should be married?

Q5.Who in your family decides whether you can use birth control methods?

Q6. Who in your family decides whether you should have more children?

Q7.Who in your household usually makes decisions about purchase of following consumption items?

(a) food, (b) clothing and footwear, (c) medical treatment and care and (d) travel and recreation.

[3] More recent surveys do not include this information so we are not able to use them in this study.

We make a composite index for mothers' empowerment from the subset of the responses to these questions that are included in Table 3. This subset excludes Q3 and Q4 because there are substantially fewer observations for these two questions than for the others and because Q4 is for unmarried women. The responses to these questions on average fall into two groups for both survey rounds, with much less empowerment on average for Q1 (woman more schooling), Q2 (woman seeks employment), Q7c (provision of medical treatment), and Q7d (purchase travel and recreation) than for Q5 (birth control), Q6 (more children), Q7a (purchase food) and Q7b (purchase travel and recreation). Thus women seem relatively more empowered for decisions about fertility (Q5, Q6) and routine purchases (Q7a, Q7b).

Table 4 summarizes the distributions of the composite index for the two survey years. Strikingly, 25.2% of the mothers in 1998-99 and 22.3% in 2007-08 reported that they had no decision-making power for any of the eight items in the index. Only 38.3% in 1998-99 and 40.6% of the mothers in 2007-08 reported at least an average of being partially empowered on these eight items. Only about 12% in both years reported being fully empowered.

Tables 3 and 4 about here

(2) Human Capital Investments in Children: We consider three indicators of human capital investments in children:

Inoculations: About 51% of children under 4 years of age had a complete set of inoculations in the 1998-99 survey, which rose to 62% in the 2007-08 survey.

Age of starting school: Children who started school at younger ages are thought to be more mature or developed for their age (Glewwe and Jacoby 1995; Alderman et al. 2001). The mean age at which children aged 4-14 years at the time of the survey started schooling in the 1998-99 survey was 5.6 years with a slight drop to 5.4 years for the 2007-08 survey.

Schooling progression gap: We have created a schooling progression gap variable for children 4-14 years of age at the time of the surveys. We define this variable as the

highest schooling grade completed at the time of the survey minus the child's current age plus four (the earliest age for starting school). The average progression gap in the 1998-99 survey is -2.2 grades, while that for the 2007-08 survey is -1.3 grades. Thus for both survey years on average children lagged behind the schooling grades that they would have attained if they had started at age 4 years and progressed one grade each year, but on average the gaps were a fair amount smaller for 2007-08 in comparison to 1998-99.

(3) Control Variables:

Parental education: We use a dichotomous variable for each of the parents' education with a value of one if they can read, write and solve simple mathematics problem and zero otherwise. These are the equally-weighted self-reported dichotomous responses to three separate questions on whether they can read, write and do simple sums. The means for mothers increased from 0.19 in 1998-99 to 0.26 in 2008-09. The means for fathers were much higher with 0.58 in 1998-99 and 0.53 in 2008-09. Though the gender gap in this measure of education fell from 0.39 to 0.27 between the two surveys, it remained very high.

Parental ages: The mothers in the sample that we used are limited to the 15-49 years age range. The mean mothers' age is 23.1 years for 1998-99 but increases to 27.5 years for 2008-09. The fathers (husbands of the mothers) are in the 14-60 years age range, with a mean of 26.2 years for 1998-99 and of 31.0 years for 2008-09. For both mothers and fathers the average age increases between the surveys (by 4.4 and 4.8 years, respectively), apparently reflecting steady shifts of the age distributions to the right over the intervening nine years because Pakistan is in the aging phase of the demographic transition. In both surveys on average the fathers are older than the mothers by over 3 years, but the average age gap between fathers and mothers increased from 3.1 to 3.5 years. The age at the time of marriage averaged 18.1 years for the mothers in the 1998-09 survey and 19.5 years for the mothers in the 2008-09 survey.

Wealth index: The surveys do not include the value of household wealth. But they do include whether or not the household had a number of durable assets and some housing characteristics pertaining to ownership and utilities. In the absence of prices with which to aggregate the value of these items and characteristics to obtain the monetary value of household wealth, we use principal components to represent the commonality of whether households have these items and characteristics as in Pollitt et al. (1993), Filmer and Pritchett (2001) and many other studies. Appendix Tables A and B give summary statistics and scoring factors for the first principal components that we use for our wealth indices for 1998-09 and 2008-09 respectively. The factor scores vary a fair amount, with relatively large absolute magnitudes, for example, for having piped drinking water, good drainage, gas, own property, and flush toilets in 1998-09. The wealth indices are standardized to have mean zero and standard deviation one.

5. Estimates

We are interested in obtaining estimates of the impact of mothers' empowerment on investments in child human capital – namely inoculations, age of starting school and schooling progression gaps – and of whether the impact of mothers' empowerment differs by (1) urban-rural context given the emphasis in the literature regarding the importance of context for the expression of empowerment, (2) whether the child is a daughter or son given socio-biological and cultural conjectures about intergenerational gender transmissions, and (3) the survey round given the many changes that occurred in Pakistan between 1998-99 and 2008-09, including increased advocacy for women's empowerment. We explore these possibilities through expressing the three indicators of investments in children that we consider (inoculations, age of starting school, schooling progression gaps) as functions of the mothers' empowerment index (MEI) and of interactions between that index and three dummy variables with values of 1 for urban (*Durban*), for daughter (*Ddaughter*) and for the 2007-08 survey (*D2007*).

We also control for the parental age, parental education, and household wealth variables discussed above so that MEI will not proxy for these characteristics. We allow for the possibility that the coefficient estimates for these variables vary by urban, daughter and 2007-08 survey

round by including interactions parallel to those for MEI. Thus for the two continuous child investment variables --- ages of starting school and schooling progression gaps – we estimate:

$$C = (\alpha + D2007*\alpha^{/} + Durban*a^{//} + Ddaughter*\alpha^{///})MEI + (\beta + D2007*\beta^{/} + Durban*\beta^{//} + Ddaughter*\beta^{///})ME +$$
$$(\gamma + D2007*\gamma^{/} + Durban*\gamma^{//} + Ddaughter*\gamma^{///})FE + (\delta + D2007*\delta^{/} + Durban*\delta^{//} + Ddaughter*\delta^{///})MA +$$
$$(\eta + D2007*\eta^{/} + Durban*\eta^{//} + Ddaughter*\eta^{///})FA + (\varpi + D2007*\varpi^{/} + Durban*\varpi^{//} + Ddaughter*\varpi^{///})WI +$$
$$(\theta + D2007*\theta^{/} + Durban*\theta^{//} + Ddaughter*\theta^{///})CA + u$$

(Because our inoculation variable is a dichotomous variable, we use logistic regressions in this case.)

C = investment in children's human capital,

MEI = mothers' empowerment index,

ME = mothers' education,

FE = fathers' education,

MA = mothers' age,

FA = fathers' age,

CA= children's age,

WI = household wealth index,

u = stochastic term.

One final question about the specification is whether MEI should be treated as endogenously determined together with the investments in children's human capital. We have explored this possibility using mothers' age at marriage on its own and in interaction with the three dummy variables (*Durban, Ddaughter, D2007*) as identifying instruments. The diagnostics (summarized in Appendix Tables C-E) indicate that: (1) the instruments are not weak and (2) the null hypotheses that the instruments are uncorrelated with the second-stage disturbance term is not rejected. However they also indicate that the null hypothesis that MEI is exogenous is not rejected. Therefore we present below ordinary least squares estimates for the two continuous schooling variables and logistic regressions for the dichotomous variable for inoculations.

Table 5 summarizes multivariate estimates for the three indicators of investments in children's human capital. They are consistent with a substantial portion of the variance in the dependent

variables, with R-squared (or pseudo R squared) equal to 0.79 for inoculations, 0.56 for ages of starting school, and 0.68 for schooling progression gaps.

Of primary interest, of course is the significance and magnitude of the coefficient estimates for MEI. The first row in Table 5 gives the estimates for sons in rural areas in the 1998-99 survey. The point estimates are significant for all three indicators of investments in children's human capital. They also are fairly substantial, despite the controls for other probable important determinants of investments in children's human capital including parental education, parental ages and household wealth. In particular they imply that a one standard deviation increase in MEI[4] would result on average for rural sons in 1998-99 in a 0.17 increase in the probability of complete inoculations, starting school when 0.36 years younger and improving the schooling progression rate by 0.32 grades.

The second row in Table 5 gives the additional changes for being in an urban area. The additional change for inoculations is significant at the 5% level and those for ages of starting school and for the schooling progression gaps are significant at the 10% level. All three point estimates imply substantial improvements beyond those in rural areas. For sons in urban areas in the 1998-99 survey they imply that a one standard deviation increase in MEI would result on average in a 0.16 increase in the probability of complete inoculations, starting school when 0. 26 years younger and improving the schooling progression rate by 0.32 grades. Holding all else equal, thus, any given level of MEI or any given increase in MEI is estimated to have much greater impact – almost twice as large – in urban as in rural areas. Apparently some combination of the culture, knowledge, and market and policy options make mothers' empowerment much more effective in urban than in rural areas.

The third row in Table 5 gives the additional changes for the child being a daughter rather than a son. The additional changes are significant at the 10% level for ages of starting school and at the 5% level for the schooling progression gaps. All three point estimates imply improvements beyond those experienced by sons. For girls in rural areas in the 1998-99 survey they imply that a one standard deviation increase in MEI would result on average in 0.07 increase in the

[4] For these illustrations we use the mean of the standard deviations for MEI in the two survey rounds (0.47).

probability of complete inoculations, starting school when 0.36 years younger and improving the schooling progression rate by 0.21 grades. Holding all else equal, thus, any given level or MEI or any given increase in MEI is estimated to have greater impact for daughters than for sons, particularly for schooling.

The fourth row in Table 5 gives the additional changes for a son in rural areas being in the 2007-08 survey rather than in the 1998-99 survey. The additional changes for the coefficient estimates for all three of the children human capital investment indicators are significant at the 5% level and imply substantial improvements beyond those observed in the 1998-99 survey. For boys in rural areas in the 2007-08 survey they imply that a one standard deviation increase in MEI would result on average in a 0.15 increase in the probability of complete inoculations, starting school when 0.31 years younger and improving the schooling progression rate by 0.25 grades. Thus, even though the measured mothers' empowerment index did not change on average between 1998-99 and 2007-08, the effectiveness of MEI on investments in indicators of children's human capital investments increased significantly and substantially. This suggests that in the first decade of the 21st century in Pakistan the context became considerably more supportive of expressions of mothers' empowerment.

The rest of Table 5 includes the estimated coefficients for the controls, including interactions with the same three dummy variables. On a general level these are not central for the purpose of this paper other than to note than many of these controls have significant coefficient estimates so that if they were not included, the coefficient estimates for MEI would change to represent these controls to the extent that MEI is correlated with the controls.

However one control is of particular interest –mothers' education – because it often is posited to be a cause and an indicator of mothers' empowerment. The sign patterns of the coefficient estimates for mothers' education generally are similar to those for MEI with the two exceptions for the impacts on ages of starting schools. The first exception is that mothers' education has a significantly positive impact on the ages for starting school of sons in rural areas in 1998-99. The second exception is for daughters versus sons – more education for mothers is associated with younger ages for starting school for sons while a higher MEI results in younger ages for

starting school for daughters. But generally the patterns in the coefficient estimates appear quite similar between MEI and mothers' education, suggesting that each has generally significantly positive impacts on investments in children's human capital even when controlling for the other and suggesting that they represent complementary but not identical constructs.

6. Conclusions

Mothers generally are thought to tend to have more interest than fathers in improving the "quality" of their children through human capital investments, but the evidence is limited, particularly for countries in which gender inequalities are thought to be considerable. We investigate the associations of maternal empowerment and three indicators of investments in children's human capital in Pakistan, a country that is usually characterized as having considerable gender inequality. We find significant and substantial associations of mothers' empowerment with investments in children's human capital even when we control for other factors such as parental education, parental ages and household wealth. We find that such effects tend to be larger for urban than for rural areas suggesting that the context matters, for daughters than for sons implying stronger intergenerational relations within than across genders, and in 2007-08 than nine years earlier suggesting that the context has been changing in ways that make women's empowerment in household decision making more effective in terms of impacts on investments in children's human capital.

References

Alderman, Harold, Jere R. Behrman, et al. (2001). "Child Health and School Enrollment: A Longitudinal Analysis." *Journal of Human Resources* **36**(1): 185-205.

Alesina, Alberto, Paola Giuliano and Nathan Nunn. (2013). "On the Origins of Gender Roles: Women and the Plough," *Quarterly Journal of Economics* 128(2): 469-530.

Alsop, Ruth, Mette Frost Bertelsen, Jeremy Holland, (2006), Empowerment in Practice, From Analysis to Implementation: Directions in Development, *World Bank.*

Bartholomew DJ, Steele F, Moustaki I, Galbraith JI. The Analysis and Interpretation of Multivariate Data for Social Scientists. Chapman & Hall/CRC; 2002. Chapter 5: *Principal Components Analysis*; pp. 115–142.

Chakraborty, Tanika (2011), "Mother's Autonomy and Child Welfare: A New Measure and Some New Evidence". German Institute of Economic Research (DIW Berlin), and IZA, Bonn, Prabal K. De City College, City University of New York, February, 2011

Dasgupta, P., and M. Weale (1992), "On Measuring the Quality of Life". *World Development*: 20(1).

Desai, Sonalde and Kiersten Johnson (2005), "Women's Decision making and Child Health: Familial And Social Hierarchies", Published By USAID, Edited By Sunita Kishor August 2005, A Focus On Gender: Collected Papers On Gender Using DHS ORC Macro, Calverton, Maryland, USA.

Dyson, Tim and Mick Moore. 1983. "On Kinship Structure, Female Autonomy, and Demographic Behavior in India". *Population and Development Review* 9(1):35-60.

Duflo, Esther (2011), "Women's Empowerment and Economic Development" NBER Working Paper Series; 17702, Cambridge, Massachusetts Institute of Technology, Boston, USA.

Esfahani, Hadi Salehi (2010), "Gender, Education, Family Structure, and the Allocation of Labor in Iran" *Middle East Development Journal,* A Publication of the Economic Research Forum: 4(02), December 2012.

Fernandez, Leticia Esther (1997), "Paternal Migration, Maternal Autonomy and Child Health in Mexico" (January 1, 1997). *Dissertations Available from ProQuest.* Paper AAI9814841. http://repository.upenn.edu/dissertations/AAI9814841

Filmer, Dean and Lant H. Pritchett (2001), "Estimating Wealth Effects Without Expenditure Data - Or Tears: An Application to Educational Enrollments in States of India." *Demography* 38:115–132.

Gage, Anastasia J. 1995. "Women's Socioeconomic Position and Contraceptive Behavior in Togo." *Studies in Family Planning*. 26(5):264-277.

Glewwe, Paul and Hanan Jacoby (1995). "An Economic Analysis of Delayed Primary School Enrollment and Childhood Malnutrition in a Low Income Country." *Review of Economics and Statistics* 77:1(February): 156-169.

Hindin, Michelle J. 2000. "Women's Power and Anthropometric Status in Zimbabwe." *Social Science and Medicine* 51:1517-1528.

Jejeebhoy, S.J. and Z.A. Sathar. 2001. Women's autonomy in India and Pakistan: The Influence of Religion and Region. *Population and Development Review* 27(4): 687-712.

Kabeer, N. 2001. Reflections on the measurement of women's empowerment. In Discussing women's empowerment-theory and practice. *SIDA Studies* No. 3. Stockholm: Novum Grafiska AB.

Kabeer, Naila (2012) Women's economic empowerment and inclusive growth: labour markets and enterprise development, School of Oriental and African Studies, UK , *Sig Working Paper* 2012/1

MacQuarrie, Kerry (2009), "Women's Empowerment and Family Formation across the Life Course in Madhya Pradesh, India: The Influence of Time-varying and Fixed Empowerment Resources", Paper presented at XXVI IUSSP International Population Conference, Marrakech, Morocco, 27 September – 2 October, 2009.

Mahmud, Simeen, Nirali M. Shah, and Stan Becker (2012), "Measurement of Women's Empowerment in Rural Bangladesh," *World Development* 40 (3): 437-656 (March).

Malhotra, A., S.R. Schuler, and C. Boender. 2002. Measuring women's empowerment as a variable in development. World Bank Working Paper. Washington, D.C.: The World Bank.

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

Mason, Karen O. and Herbert L. Smith. 2003. Women's empowerment and social context: Results from five Asian countries. Washington, D.C.: The World Bank.

Mukhopadhyay, C.C. and P.J. Higgins. 1988. Anthropological Studies of Women's Status Revisited: 1977-1987.*Annual Review of Anthropology*. (17): 461-495 .

Narayan, Deepa (ed). 2002. Empowerment and Poverty Reduction: A Sourcebook. Washington DC: World Bank.

Pitt, Mark M., Mark R. Rosenzweig, and M.N. Hassan. (1990). "Productivity, Health and Inequality in the Intrahousehold Distribution of Food in Low-Income Countries." *American Economic Review* **80:5** (December): 1139-1156.

Pollitt, E., K. S. Gorman, et al. (1993). "Early Supplementary Feeding and Cognition: Effects over Two Decades." *Monographs of the Society for Research in Child Development* **58**(7): i-118.

Santhya, K.G. Usha Ram, Rajib Acharya, Shireen J. Jejeebhoy, Faujdar Ram and Abhishek Singh (2010) Associations Between Early Marriage and Young Women's Marital and Reproductive Health Outcomes: Evidence from India, *International Perspectives on Sexual and Reproductive Health,* Volume 36, Number 3, September 2010

Sen, Amartya. 1999. *Development as Freedom*. Oxford: Oxford University Press.

Sidney, Ruth Schuler and Elisabeth Rottach (2010), "Women's Empowerment across Generations in Bangladesh", *Journal of Development Studies*, 46(3): 379–396.

Smetana ,Judith G., Nicole Campione-Barr, and Christopher Daddis(2004), " Longitudinal Development of Family Decision Making: Defining Healthy Behavioral Autonomy for Middle-Class African American Adolescents" *Child Development*, September/October 2004, Volume 75, Number 5, Pages 1418 – 143.

Standing, H. (1991) *Dependence and Autonomy*, London: Routledge

Tiwari , Mukesh and Kaushlendra Kumar (2010), " Women's Autonomy and Utilization of Maternal and Child Health Care Services in India" Population Association of America, 2010 Annual Meeting, Dallas, Texas April 15-17, 2010

Vyas S and L. Kumaranayake (2006). "Constructing socio-economic status indices: how to use principal components analysis" *Health Policy Plan*. 21: 459–468.

TABLES

Table 1: Summary Statistics

	1998-99			2007-08		
Variables	**Obs**	**Mean**	**S.D**	**Obs**	**Mean**	**S.D**
MEI	13546	1.7658	0.4987	12987	1.7564	0.4443
Inoculations of a Child	12927	0.5101	0.4121	11533	0.6222	0.2341
Ages at Started School	24760	5.57	0.9180	25823	5.38	1.2840
Schooling Progression Gaps	17135	-2.2152	0.4143	31002	-1.3245	0.6723
Mothers' Education	16915	0.1942	0.3956	19541	0.2597	0.4385
Mothers' Ages at Time of Marriage	18764	18.1006	4.6003	18623	19.4636	3.6695
Mothers' Ages	17254	23.1456	12.5413	18581	27.5433	13.3247
Fathers' Education	17125	0.5771	0.3817	18432	0.5300	0.4993
Fathers' Ages	18069	26.2354	15.0432	17587	31.0314	15.5123
Wealth Index	15765	0	1	13012	0	1
No of Observations	115172			107207		
No of households	16305			15512		

Table2: Variable Definitions

Variables	Definition	Dependent/ Independent Variable	Continuous/ Categorical	Source
MEI	3= decision taken by mother (fully empowered) 2= decision taken jointly with her husband(partially empowered) 1= decision completely out of her control and taken by other relatives (no empowerment)	Independent variable	Continuous	Section 4-F(E)
Inoculations of Children	A child (0-4 years) is considered completely inoculated if he/she is immunized for DPT, polio, diarrhea, Tetanus measles, TB, malaria and Hepatitis.	Dependent variable	Categorical	Section 3-F(A, B,C)
Ages at which Children Started School	Ages at which children start school	Dependent variable	Continuous	Section 2-F(B)
Schooling Progression Gaps[5]	Highest Grade Passed – Age + 4 for children 4-14 years old	Dependent variable	Continuous	Section 2-F(B)
Mothers' Education	If they can read, write and solve maths sum, they are characterized as educated	Independent variable	Categorical	Section 2-F(A)
Mothers' Ages	Ages of mothers vary from 15- 49 years	Independent variable	Continuous	Section 1-F(A)
Mothers' Ages at Marriage	Mothers' Ages at Times of First Marriages	Instrumental Variable	Continuous	Section 4-F(A)
Fathers' Education	If they can read, write and solve maths sum, they are characterized as educated	Independent variable	Categorical	Section 2-M(A)
Fathers' Ages	Ages of fathers vary from 14- 60 years	Independent variable	Continuous	Section 1-M(A)
Wealth Index (WI)	WI developed by Principal Component Analysis (PCA) using consumer durables and housing characteristics	Independent variable	Continuous	Section 5-M, 9-M(A), 7-M

Note: Pakistan integrated household survey (PIHS) 1998-99 and Pakistan Social Living and Measurement Survey (PSLM) 2007-08 (same sections for both surveys).

[5] Progression <0 if child starts when overage or repeats grades, and zero if right on track and positive if the child starts young or skips grades)

Table 3: Summary Statistics for mothers' empowerment Index (MEI) for mothers 15-49 years old

Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
	(1998-99)			(2007-08)		
MEI	13546	1.7658	0.4987	12987	1.7564	0.4443
Q1. Who in your household decides whether you can start or continue to get education?	13445	1.3931	0.6639	12342	1.2562	0.6124
Q2. Who in your household decides whether you can seek or remain in paid employment?	10233	1.2002	0.5729	10207	1.3357	0.6832
Q5. Who in your family decides whether you can use birth control methods?	9897	1.2304	0.3034	9910	1.3486	0.4683
Q6. Who in your family decides whether you should have more children?	11345	1.4987	0.6137	7865	1.4714	0.4833
Q7a. Who in your household usually makes decisions about purchase of food?	13546	1.6653	0.9619	12756	1.6613	0.8903
Q7b. Who in your household usually makes decisions about purchase of clothing and footwear?	13546	1.3376	0.9069	12765	1.5387	0.8109
Q7c. Who in your household usually makes decisions about provision of medical treatment?	13546	1.2592	0.7767	12546	1.4036	0.6554
Q7d. Who in your household usually makes decisions about purchase travel and recreation?	13546	1.2806	0.6234	12857	1.3068	0.5974

Note: Different numbers of observation are shown for different questions as all the mothers did not reply to all questions.

Table 4 : Percentage Distributions of Mothers' Empowerment Index (MEI)

	(1998-99)	(2007-08)
Index range	**%age**	**%age**
1	25.21	22.34
1.125-1.875	36.54	37.03
2	9.65	10.85
2.125-2.875	16.63	17.34
3	11.97	12.44
Total	100	100

Note: 3= decision taken by mother (fully empowered)
2= decision taken jointly with her husband (partially empowered)
1= decision completely out of her control and taken by other relatives (No empowerment).

Table 5. Multivariate Logistic Estimates (for Inoculations) and Ordinary Least Squares Estimates (for Ages of Starting School and Schooling Progression Gaps)

		Inoculations (Marginal Effects)		Ages Starting School		Schooling Progression Gaps	
		Children 0-4 y		Children 4-14 y		Children 4-14 y	
Variables	***Interactions***	Coeff	Z-test	**Coeff**	**t-test**	**Coeff**	**t-test**
MEI	*None*	0.3112	2.21	-0.7654	-2.88	0.6713	2.57
	Durban	0.3304	2.02	-0.5432	-1.9	0.6655	1.68
	Ddaughter	0.1543	1.56	-0.7654	-1.9	0.4536	1.98
	D2007	0.3141	2.11	-0.6653	-1.99	0.5265	2.88
Fathers' Education	*None*	0.0214	1.63	0.5643	2.99	0.0675	1.99
	Durban	0.3654	2.41	-0.5678	-1.88	-0.5674	-1.28
	Ddaughter	0.0142	2.55	0.0276	1.9	0.0348	2.78
	D2007	0.1222	1.56	-0.7889	-1.88	-0.5566	-3.85
Mothers' Education	*None*	0.0343	1.66	0.2145	2.12	0.0655	2.48
	Durban	0.0564	1.75	-0.6179	-4.27	0.2549	4
	Ddaughter	0.0235	3.34	0.0298	1.92	0.0234	2.29
	D2007	0.4234	1.34	-0.7365	-2.15	0.7543	2.44
Fathers' Ages	*None*	0.0242	2.41	0.0334	2.59	-0.0458	-2.38
	Durban	0.0231	1.97	-0.0478	-1.65	0.0521	1.48
	Ddaughter	0.0156	2.13	0.0687	1.85	0.0512	1.63
	D2007	0.0023	2.61	0.0398	2.78	-0.0345	-2.64
Mothers' Ages	*None*	0.0143	2.09	0.0129	2.79	-0.0043	-1.67
	Durban	0.0121	1.76	0.0786	1.24	-0.0111	-1.49
	Ddaughter	0.0312	1.91	0.0989	2.57	0.0658	2.48
	D2007	0.0087	2.36	0.0169	2.24	-0.0568	-1.69
Children's Ages	*None*	0.0032	1.86	0.0124	1.23	-0.0013	-2.32
	Durban	0.0324	1.64	0.0556	1.65	-0.0121	-1.21
	Ddaughter	0.0657	1.81	0.0439	1.98	0.0128	2.17
	D2007	0.4428	2.96	0.0119	2.34	-0.2268	-1.18
Weath Index	*None*	0.1423	2.49	-0.4224	-2.43	0.0239	1.55
	Durban	0.0056	1.99	-0.0687	-1.92	0.0297	4.83
	Ddaughter	0.0076	1.61	0.0576	3.82	0.0238	3.09

	D2007	0.3126	1.65	0.0314	1.69	0.5863	1.99
Constant	*None*	-3.7554	-1.96	-2.5234	-1.55	3.5043	1.49
	Durban	-1.2342	-2.17	-3.2432	1.84	2.4321	1.88
	Ddaughter	1.2832	1.47	2.3421	1.39	1.8432	1.35
	D2007	2.4837	1.88	1.4832	2.48	2.9483	1.94
Number of Observations		13767 LR chi2(25) = 367.45 prob>chi2 = 0.0000 Pseudo R2 = 0.7865 Log likelihood = -4265.87		18548 F(25, 18523) = 123.45 prob>F = 0.0000 R-Squared = 0.5576 Root MSE = 0.6897		12567 F(25, 12542) = 131.76 prob>F = 0.0000 R-Squared = 0.6787 Root MSE = 0.6954	

APPENDIX

Table A: Scoring factors and summary statistics for variables entering the computation of the first principal component for the wealth index (1998-99)

Variable	Mean	Std. Dev.	Factor	Factor/Sd=Weights
Refrigerator	0.0424	0.2016	0.1537	0.7624
Freezer	0.009	0.0544	0.0567	1.0423
Air conditioner	0.0062	0.0788	0.0893	1.1332
Room cooler	0.0129	0.1128	0.0714	0.6330
Fan(ceiling/pedestal)	0.2430	0.4289	-0.1519	-0.3542
Geyser	0.0128	0.1126	0.1042	0.9254
Washing machine	0.0622	0.2416	0.1735	0.7181
Camera	0.0033	0.057	0.0558	0.9789
Stove	0.0743	0.2622	0.1695	0.6465
Microwave	0.0057	0.0754	0.0469	0.6220
Heater	0.0202	0.1406	0.0783	0.5569
Bicycle	0.0834	0.2764	0.1218	0.4407
Car	0.0098	0.0587	0.0608	1.0358
Motorbike/scooter	0.0186	0.135	0.0371	0.2748
Television	0.0896	0.2856	0.1107	0.3876
VCR	0.0151	0.1218	0.104	0.8539
Radio	0.1278	0.3338	-0.2027	-0.6072
Disc player	0.0019	0.0641	0.0886	1.3822
Vacuum cleaner	0.0122	0.1096	0.1692	1.5438
Sewing machine	0.1456	0.3527	-0.1152	-0.3266
Personal computer	0.0016	0.0496	0.0456	0.9194
full house	0.8694	0.3369	-0.1378	-0.4090
Apartment	0.0274	0.1633	0.3534	2.1641
Rented house	0.0867	0.2814	0.5486	1.9495
Having gas	0.2894	0.4535	0.654	1.4421
Having telephone	0.2624	0.4400	0.3989	0.9066
Having Electricity	0.7862	0.5001	0.4139	0.8276
Drinking water from Pipe	0.4112	0.4921	0.6355	1.2914
Drinking water from Pump	0.2601	0.4387	-0.232	-0.5288
Drinking water from tube well	0.1438	0.3509	0.1307	0.3725
Drinking water from well	0.0806	0.2722	-0.4525	-1.6624
Flush	0.7740	0.4182	0.5577	1.3336
Latrine	0.0871	0.2819	-0.4563	-1.6187
Drainage	0.4741	0.4993	0.6304	1.2626
Open drainage	0.0822	0.2747	0.1345	0.4896
Property	0.3211	0.4669	0.5992	1.2834

Notes: Each variable takes the value 1 if true, 0 otherwise. Scoring factor is the "weight" assigned to each variable (normalized by its mean and standard deviation) in the linear combination of the variables that constitute the first principal component. The first eigenvalue is 4.41; the second eigenvalue is 1.95.
Source: Authors' calculation from PIHS 1998-99

Table B: Scoring factors and summary statistics for variables entering the computation of the first principal component for the wealth index (2007-08)

Variable	Mean	S. D	Factor	Factor/S.D
Own personal computer	0.0130	0.1187	0.1145	0.9644
Own sewing machine	0.0994	0.2992	-0.0128	-0.0428
Own vacuum cleaner	0.0019	0.0433	0.0071	0.1647
Own radio set	0.0427	0.2022	-0.0422	-0.2085
Own VCR	0.0034	0.0584	0.0034	0.0575
Own television	0.1298	0.3361	-0.0055	-0.0165
Own disc player	0.0081	0.0899	0.0890	0.9897
Own motor cycle/scooter	0.0328	0.1780	-0.0009	-0.0052
Own car	0.0099	0.0987	0.0944	0.9558
Own bicycle	0.0536	0.2253	-0.0039	-0.0171
Own heater	0.0160	0.1255	-0.0126	-0.1006
Own microwave	0.0035	0.0588	0.0692	1.1754
Own stove	0.0651	0.6467	0.0272	0.0421
Own camera	0.0054	0.0733	0.0805	1.0978
Own washing machine	0.0804	0.2720	0.0082	0.0303
Own geyser	0.0127	0.1120	0.1134	1.0131
Own fan(ceiling/pedestal)	0.1529	0.3599	-0.0053	-0.0148
Own room cooler	0.0154	0.1232	0.0156	0.1268
Own air conditioner	0.0084	0.1912	0.0845	0.4422
Own freezer	0.0059	0.0765	0.0063	0.0821
Own refrigerator	0.0667	0.2495	0.0109	0.0435
Drainage	0.3043	0.4601	0.0984	0.2138
open drainage	0.2847	0.4513	-0.1864	-0.4131
Latrine	0.0836	0.2768	-0.0912	-0.3295
Flush	0.7524	0.4316	0.2919	0.6763
Drinking water from well	0.0095	0.0970	-0.0454	-0.4677
Drinking water from tube well	0.2554	0.4361	-0.0414	-0.0948
Drinking water from water pump	0.2350	0.4240	-0.1029	-0.2427
Drinking water from water pipe	0.4290	0.4949	0.0000	0.0000
Owning electricity	0.2521	0.4342	0.1131	0.2606
Owning telephone	0.9104	0.2856	0.1653	0.5789
Owning gas connection	0.5371	0.4986	0.1610	0.3230
Rented house	0.0872	0.4987	0.3546	0.7110
Owned house	0.9128	0.2821	-0.0828	-0.2934
Apartment	0.0038	0.0613	0.0096	0.1561
Property	0.9243	0.6432	0.5331	0.8288

Notes: Each variable takes the value 1 if true, 0 otherwise. Scoring factor is the "weight" assigned to each variable (normalized by its mean and standard deviation) in the linear combination of the variables that constitute the first principal component. The first eigenvalue is 3.19; the second eigenvalue is 1.76
Source: Authors' calculation from PSLM2007-08

Table C: Inoculations of Children: First-Stage Diagnostic Statistics

Variables	R-sq.	Adjusted R-sq.	Partial R-sq.	F(28, 11690)	Prob > F
MEI	0.8017	0.7841	0.7121	289.46	0.0000
MEI*D2007	0.6856	0.6512	0.5532	223.43	0.0000
MEI*Ddaughter	0.5811	0.5331	0.4764	138.43	0.0000
MEI*Durban	0.4897	0.4319	0.3812	175.21	0.0000

Minimum eigenvalue statistics = 14.18

Critical Values H0: Instruments are weak	# of endogenous regressors:4 # of excluded instruments: 26			
	5%	10%	20%	30%
2SLS relative bias	19.12	14.28	8.01	6.17
	10%	15%	20%	25%
2SLS Size of nominal 5% Wald test	25.18	15.68	9.78	8.11
LIML Size of nominal 5% Wald test	6.88	5.73	5.05	4.51

Test of endogenous
Ho: Variables are exogenous

Durbain(Score) chi(4) = 2..8765 (p = 0.6534)
Wu-Hausman F(3, 11694) = 1.1765 (p = 0.5875)

Tests of overidentifying restrictions:

Anderson-Rubin chi2 (4) = 0.5143 (p = 0.8865)
Basmann F(4, 12537) = 0.5432 (p = 0.7123)

Table D: Starting School Ages: First-Stage Diagnostic Statistics

Variables	R-sq.	Adjusted R-sq.	Partial R-sq.	F(28, 18518)	Prob > F
MEI	0.5198	0.4762	0.4138	289.16	0.0000
MEI*D2007	0.6238	0.5782	0.4943	256.12	0.0000
MEI*Ddaughter	0.5912	0.5671	0.4717	207.12	0.0000
MEI*Durban	0.5261	0.4711	0.4210	187.04	0.0000

Minimum eigenvalue statistics = 10.6252

Critical Values H0: Instruments are weak	# of endogenous regressors:4 # of excluded instruments: 26			
	5%	10%	20%	30%
2SLS relative bias	14.14	9.75	7.01	4.21
	10%	15%	20%	25%
2SLS Size of nominal 5% Wald test	26.12	15.12	11.76	9.58
LIML Size of nominal 5% Wald test	5.05	4.87	4.02	3.23

Test of endogenous
Ho: Variables are exogenous

Durbain(Score) chi(4) = 2.2147 (p = 0.8712)
Wu-Hausman F(3, 12541) = 1.6815 (p = 0.7712)

Tests of overidentifying restrictions:

Anderson-Rubin chi2 (4) = 0.4991 (p = 0.8156)
Basmann F(4, 18522) = 0.2018 (p = 0.5418)

Table E: Schooling Progression Gap: First-Stage Diagnostic Statistics

Variables	R-sq.	Adjusted R-sq.	Partial R-sq.	F(28, 12537)	Prob > F
MEI	0.7608	0.7157	0.6437	365.3432	0.0000
MEI*D2007	0.6338	0.5302	0.3451	225.3211	0.0000
MEI*Ddaughter	0.5332	0.4671	0.3787	111.1374	0.0000
MEI*Durban	0.5609	0.4676	0.4010	168.2383	0.0000

Minimum eigenvalue statistics = 16.8766

Critical Values H0: Instruments are weak	# of endogenous regressors:4 # of excluded instruments: 26			
	5%	10%	20%	30%
2SLS relative bias	15.87	10.56	5.87	4.87
	10%	15%	20%	25%
2SLS Size of nominal 5% Wald test	24.89	13.99	10.91	8.76
LIML Size of nominal 5% Wald test	7.56	5.29	4.61	4.09

Test of endogenous
Ho: Variables are exogenous

Durbin (Score) chi(4) = 1.8765 (p = 0.7532)
Wu-Hausman F(3, 12541) = 0.5876 (p = 0.4952)

Tests of overidentifying restrictions:

Anderson-Rubin chi2 (4) = 0.1675 (p = 0.5643)
Basmann F(4, 12537) = 0.7654 (p = 0.8756)