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Fertility, Parental Education and Development in India: Evidence from NSS and NFHS in 1992-2006*

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Abstract

This paper empirically investigates the determinants of fertility drawing upon large nationwide household data sets in India constructed by the National Sample Surveys (NSS) and National Family Health Surveys (NFHS) over the period 1992-2006. First, we have found a negative and significant association between the number of children and mother's education even if the latter is instrumented by (the proxy for) the pre-generation access to primary school at village level, or if parental wage equations are incorporated into the fertility equation. Both direct and indirect effects are observed for mother's education which not just directly reduces fertility but also increases mother's potential wages or opportunity costs which would deter her from having a baby. Second, father's education became increasingly important in reducing fertility in the last two rounds. Third, the negative effect of expenditure on fertility is found when it is treated as exogenous, but *not* once instrumented. Fourth, pseudo panel models for three rounds of NSS and NFHS are estimated to confirm the negative effects of parental education. Finally, state-wise regression results show that fertility determinants are different in different states. Our results suggest that national and state governments should improve social infrastructure, such as school at various levels, promote both male and female education, and facilitate female labor market participations to speed down the population growth. These policies would be particularly important in backward states or for socially disadvantaged groups (e.g. Scheduled Castes) which still have higher fertility as well as poverty rates.

Key Words: Fertility, Population, Parental Education, NSS, NFHS, India
JEL Codes: C21, C23, D31, J13

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I. Introduction

The population problem is still one of the important global issues in the 21st century in light of alleviating world poverty and guaranteeing food security. The population increase is also closely related to global warming simply because more people will consume more resources.[2] Based on the UN estimate, the world population is projected to be 6.51 billion in 2005 and 9.19 billion in 2050 (Table 1). More than one third of the current world population is concentrated in India and China: India's population was 1.13 billion, ranked second in the world after China with the population being 1.31 billion in 2005. However, India is likely to be the most populous country in the world by 2050 with 1.66 billion people; almost 18% of the world population, while China's population will be $1.41 billion under certain assumptions on mortality and fertility changes (the United Nations, 2007). No doubt, curbing the population growth in Sub-Saharan African (SSA) countries will remain crucial in providing a solution for the global population problem as their population is expected to increase from 0.77 billion in 2005 to 1.76 billion in 2050. India's population problem, however, would be equally important, at least in terms of its size. Besides, it could be controlled by the governmental policy of a single country, not many as in the SSA region.

(Table 1 to be inserted)

The population problem is one of the crucial domestic issues for India as well, for example, because the fertility decline will have direct and indirect impacts on national

[2] See Vallely, 2008 for the recent debate.

poverty.[3] If the calculation of the poverty rate is based on per capita expenditure or income, the reduction in fertility will decrease it significantly. If the household has fewer children, then the opportunity for education per child will be improved and spending on per child health service will be increased, which has an indirect negative impact on poverty. Economic growth is influenced by population growth and fertility changes, while the former would affect the latter in a complex way, for example, through technical changes (e.g. Rosenzweig, 1990).

Although India was among the first developing countries to implement family planning programs, authoritarian birth control measures corresponding to China's 'one child policy' have never been included in government programs except for a very short period during the mid 1970's. While the population trend has been upwards since the last century as shown by Figure 1, it is conjectured that India is now moving from the second stage to the third stage of the demographic transition.[4] [5] Indeed, the crude birth rate is 25 per thousand in 1999 compared to 43 in 1960, and the total fertility rate (TFR), the average number of children women bear over their lifetime, was 3 in 1999 as against 6 in 1960. Consequently, the annual growth rate of the population went down from 2.3% in 1960-1970 to 1.9% in 1990-1995 and further to 1.7% in 1995-2000 (Mahbub ul Haq Human Development Center 2002: 176).

(Figure 1 to be inserted)

[3] Poverty head count ratio based on the national poverty line in 2004/5 is 28.7% (Himanshu, 2007).
[4] See Lee (2003) for a detailed survey on the demographic transition.
[5] The well-known theory of demographic transition explains the common pattern of transition in population history. While the first stage of transition before economic modernisation sees stable population due to high birth and death rates, the population grows rapidly in the second stage where death rates decline more rapidly than birth rates, for example, through better educational systems and medical and health care facilities only available in modernised society. The population becomes stable again in the third stage when further modernisation and better education cause fertility to go down.

The main objective of the present study is to examine the determinants of population in India, with a particular focus on fertility, drawing upon two different sources of multi-rounds of large national household survey data spanning from 1992 to 2006, namely National Sample Survey (NSS) Data in 1993-4, 1999-2000 and 2004-5 and National Family Health Survey (NFHS) Data in 1992-3, 1998-9 and 2005-6. An individual household's fertility decision which underlies macro-level demographic transition can be directly analyzed by using the household data sets. Our main focus is on the role of parental education in reducing the fertility rates. The impacts of other household socioeconomic characteristics on fertility are also tested.

It is widely known that female education contributes to fertility reduction. For example, according to Subbarao and Raney (1995: 105),

> "Female education increases the value of women's time in economic activities by raising labor productivity and wages, with a consequential rise in household incomes and a reduction in poverty. Female education also produces social gains by improving health (the women's own health and the health of her children), increasing child schooling, and reducing fertility."

Drèze and Sen (2002: 19) extended this line of argument:

> "…women's emancipation (through basic education, economic independence, political organization and related means) tends to have quite a strong impact on fertility rates. This linkage has been widely observed in international comparisons, but it is consistent also with recent experiences of remarkably rapid fertility reduction…. Through this connection with demographic change, the role of women's agency extends well beyond the interest of today's women, and even beyond the interests of all living people today, and has a significant impact on the lives of future generation."

The form of the data (e.g. cross section or panel data) or their level of aggregation (e.g. national, state, district, or household level) varies considerably among different studies to draw these conclusions. Along the lines of Subbarao and Raney (1995), Drèze and Murthi (2001) empirically found that female education is the most important determinant of fertility, using the district-level data, the data which aggregate the census data at district levels in India. However, few studies have examined the determinants of fertility using household

level data despite the fact that fertility decision is actually made at individual or household levels. Drèze and Murthi (2001: 40) recognize the utility of employing household-level data as follows: " ⋯if fertility decisions are, in fact, driven mainly by individual and household characteristics (with social effects playing little role), then household-level analyses are more appropriate, bearing in mind the potential aggregation problems involved in treating the district as the unit of analysis."

While we examine the direct effect of education on fertility by including variables on education as explanatory variables in the fertility equation, the indirect effect of parental education through the change in opportunity costs of parents is also tested by inclusing predicted parental wages which are also estimated by education. This is an extension of Foster and Rosenzweig (2006) who analyzed the fertility decline in India using panel data by incorporating predicted wages into the fertility equation.[6] One would also claim that education is not entirely exogenous determinants of fertility. Another contribution would be made by estimating the instrumental variable (IV) model where parental education is instrumented by the availability of village-level education in grandparent's age.

The rest of the paper is organized as follows. Section 2 briefly sets out the basic analytical framework of the determinants of fertility at household level as a background of empirical sections. The data we use in this paper are described with their basic statistical analysis in Section 3. After the presentation of econometric models in Section 4, we report and discuss the regression results in Section 5. The final section offers concluding remarks with some policy implications.

[6] Drawing upon the household panel data sets in India over the period 1971-1999, Foster and Rosenzweig find evidence on the importance of changes in the implicit cost or shadow price of children and women as sources of fertility change. The main departure of our study is that we use the individual education in estimating male and female wage equations based on much larger nationwide household data sets, while Foster and Rosenzweig use village-level education, which is not significant.

II. Analytical Framework

This section outlines a basic analytical framework focusing on the factors which would influence the number of children a household wishes to bear. The neoclassical approach to understanding a household's fertility decision is based on its utility maximization behavior, which is subject to budget constraints (e.g. Becker 1960, Bardhan and Udry 1999). We follow a version of the 'collective' model of household behavior that explicitly models intra-household resource allocation (e.g. Browning and Chiappori 1998). We consider a two-person household with a wife (or a mother, *m*) and a husband (or a father, *f*). Let x_i be the i^{th} person's consumption ($i = m, f$), n be the number of children, and q be the (average) quality of children. The i^{th} person's utility is $U_i(x_i, n, q; A_i)$ where A_i is a vector consisting of exogenous factors that determine the preferences of the individual *i*. In this setting, the household utility function is defined as $\gamma U_m + (1-\gamma) U_f$ where γ represents the "bargaining power" of a wife in a household ($0 < \gamma < 1$). The household's utility maximization problem is specified as follows:

$$Max\ U = \gamma U_m(x_m, n, q; A_m) + (1-\gamma) U_f(x_f, n, q; A_f)$$

subject to

$$I = p_m x_m + p_f x_f + p_c nq$$

where I is a household's income, p_i is the price of the private goods for i^{th} person (mother or father), and p_c is the shadow price of public goods, that is, children. In general, the optimal n^* will depend on parameters such as γ, p_c, I, p_i, and A_i as follows:

$$n^* = n^*(\gamma, I, p_m, p_f, p_c, A_m, A_f) \qquad (1)$$

This model sheds light on several aspects of the household fertility decision which underlies demographic transition at macro level. For example, "bargaining power" γ may reflect "women's agency" such as female education and female labor participation, as

emphasized in Drèze and Sen (2002, Chapter 7), in improving the quality of life. Given that a female is more likely than a male, to value q, the quality of children (e.g. the nutrition and education level of children) over n, the number of children, the stronger bargaining power of a female reflected in higher γ leads to fewer children. Furthermore, the preferences A_i represent each household member's attitude toward the fertility decision, which may be different in various classes, social groups, religious communities, and regions, and they may move toward "small family value" with social and economic changes.

Economic growth increases a household's income level I with a consequent positive effect on consumption x_i, the number of children n, and the quality of children q. It is most likely that an increase in the income level lowers n and increases q and x_i. The key point is $p_c nq$ in the budget constraints. That a household's marginal utility MU equals its marginal cost is the first order condition with respect to n and q in the maximization problem mentioned above: $MU_n = \lambda p_c q$ and $MU_q = \lambda p_c n$, where λ is the Lagrange multiplier for the budget constraint. If the rise in income increases the demand for q much more than it increases the demand for n, $\lambda p_c q$, which represents n's shadow prices, will increase much more. In the next round, an increase in n's shadow price will first reduce the demand for n. Subsequently, $\lambda p_c n$, which represents q's shadow prices, will decrease, and this will be followed by an increase in the demand for q. Consequently, a higher income level may make n much less and q much more. In this sense, we can suggest that there is a "quantity-quality" trade-off in the fertility behaviors (see Becker and Lewis, 1973 for more details).

In addition, as women attend schools and participate in labor markets more than they did previously and as the wages increase, the opportunity cost of growing children p_c may relatively increase, since women must allocate a greater amount of their time to raising children. As a consequence of the substitution effect, a household may reduce its n.

III. Data

This study draws upon three rounds of employment schedule of National Sample Survey (NSS) Data in 1993-4, 1999-2000 and 2004-5 (or 50th, 55th and 61st round) and National Family Health Survey (NFHS) Data in 1992-3, 1998-9 and 2005-6 (or NFHS-1, NFHS-2 and NFHS-3). There are two reason for using both NSS and NFHS. First, detailed data on fertility behavior are available only in NFHS, while we could construct only the proxy for fertility, namely the number of children in the household from NSS. Potentially important determinants of fertility, such as parental wages, are only available from NSS. Second, comparing the results based on the same econometric model applied to these two different survey data or combining the two data sets, for example by the pseudo panel model, would not only make our conclusion more robust but also provide additional insights into fertility behavior in India.

The NSS, set up by the Government of India in 1950, is a multi-subject integrated sample survey conducted all over the India level in the form of successive rounds relating to various aspects of social, economic, demographic, industrial and agricultural statistics.[7] We use the data in the 'Employment and Unemployment' schedule, called 'the scheduled 10', one of the series of quinquennial surveys in 1993-4, 1999-2000 and 2004-5. These form the repeated cross-section data sets, each of which contains a large number of households across India.[8] The employment and unemployment schedule contains a variety of information related to employment and unemployment situations together with basic socio economic characteristics of the household (e.g. sex, age, religion, caste, and land-holding) and mean per capita

[7] See the website of National Sample Survey Organisation http://mospi.nic.in/nsso_test1.htm for more details of NSS.

[8] After dropping the households with missing observations in one of the explanatory variables, the number of households used for the estimation is 92399, 59869, and 91666 respectively for 50th, 55th and 61st round.

expenditure (MPCE). The comparison across different years is possible only at the aggregated regional unit, such as state or NSS region.

The NFHS is another major nationwide, large multi-round survey conducted in a representative sample of households in India with focus on health and nutrition of household members, especially of women and young children.[9] The survey also contains the detailed data on fertility and mortality. The years for the three rounds of NFHS roughly correspond to those for NSS, which enables us to compare NSS and NFHS for each round.

The dependent variable constructed by NSS is the number of children who are aged under 15 years old and deemed children of the head of the households or his or her spouse (to exclude the grandchildren of the head or maid in a large household). Mother, on the other hand, is defined as a female member of the household aged from 13 to 60 years old who is either the household head's spouse or the household head herself (including the case of single mothers) assuming that a female could give a birth in the age from 13 to 45.[10] We use these indirect ways of identifying children and mothers, as NSS does not have the data by which we track a mother for a particular child. Our proxy for fertility based on NSS thus excludes children who died.

A more direct proxy for the fertility is available from NFHS, which would overcome the above limitation. NFHS has a question to ask mothers aged 15- 49 years old on how many children they have borne, by excluding any miscarriage but including any death of children. We used the number of children based on this question as a dependent variable. While NFHS has an ideal proxy for fertility, it lacks the data of household expenditure, father or mother's

[9] See http://www.nfhsindia.org/index.html for the detailed description of NFHS.
[10] The problem with this procedure, which is inevitable for NSS, is that a representative mother is not necessarily a true mother as she could also be the grandmother in case of extended families. The same problem applies to representative fathers. However, we have confirmed based on NSS 55th round data that the percentage of representative parents not necessarily being true for children is less than 10%. The use of NFHS will overcome this limitation.

wages which are potentially important determinants of fertility and found in only NSS. The joint use of NSS and NFHS is thus necessary because of these limitations.

Table 2 summarizes the recent trend of total fertility rate (TFR)[11] by region in India. Overall, TFR declined from 1992 to 2005 across different areas and regions in India. However, there remains a significant disparity between rural and urban areas. Also noted is a disparity among different regions, reflecting disparity among different states. TFRs are much lower in South (Andhra Pradesh, Karnataka, Kerala and Tamil Nadu) and West (Goa, Gujarat and Maharashtra) than in Central (Madhya Pradesh and Uttar Pradesh), East (Bihar, Orissa and West Bengal) or Northeast (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura). North is roughly at the national average, while TFR is varied within North raging from 1.94 in Himachal Pradesh and 1.99 in Punjab to 3.21 in Rajasthan in 2005.[12]

(Table 2 to be inserted)

IV. Econometric Models

The main objective of our econometric model is to identify the key determinants of fertility proxied by the number of children based on the analytical framework of household model of fertility summarized in Section II. The basic idea of specifying the econometric model of fertility behavior draws upon Drèze and Sen (2001) and Foster and Rosenzweig (2006).

In the equation (1), we do not have any data for p_i, the price of the private goods for mother or father. While we do not have the direct data for γ on the bargaining power, we include education for mother or father which is likely to affect γ. In some specifications

[11] TFR is the average number of children that would be born to a woman over her lifetime if she were to experience the exact current age-specific fertility rates through her lifetime, and she were to survive from birth through the end of her reproductive life.
[12] See Appendix 1 for the fertility trends at state level.

wages of mother or father, which would also determine their relative bargaining power, are used as explanatory variables. Besides, exogenous household specific variables common for a father and a mother (e.g. religion, social class or caste) can be included together with regionally specific environment or infrastructure in this framework.

(1) Tobit Model

Using the cross sectional household data constructed by three rounds of NSS and NFHS, we estimate the following reduced form as a baseline model. In this version we do not insert wages of father or mother, assuming that the coefficients related to parental education capture both direct and indirect effects.

$$n_i = n_i\left(E_i^m, E_i^f, I_i, A_i^m, B_i, O_i, M_i, L_i, S_i, R, D\right) \qquad (2)\ ^{13}$$

i denotes household and the dependent variable is n_i the number of children defined separately for NSS and NFHS as discussed in the previous section. n_i is estimated by the following explanatory variables.

E_i^m: A vector of the mother's education (Case i: whether literate; Case ii: whether literate, but has not completed primary school, whether completed primary school, whether completed middle school, whether completed secondary or higher secondary school, and whether completed higher education). Each dummy variable takes either 1 or 0.

In general, female education may be considered as a proxy for the opportunity cost of raising children. Furthermore, an increase in female education will empower women and increase their bargaining capability in households, which results in a decline in the number of

[13] There is a high correlation between neo-natal mortality and fertility as a mother who has lost her baby is more likely to have another baby, analytically and empirically shown by Bhalotra and van Soest (2008) in the Indian context. In case where we use NSS, we may underestimate the fertility as our proxy of fertility excludes children who died. They are counted in case of NFHS.

children born, and thus avoids the physical risks of childbirth for mothers, or improves health and education of children.

E_i^f: A vector of the father's education (defined same as above).

Higher level of the father's education might lead him to cooperate with mother in developing the family plan and using contraceptives. This has been relatively neglected in the literature with a few exceptions, for example Bhat (2002).[14]

I_i: A vector of household income (proxied by mean per capita expenditure or MPCE at household level).[15]

A_i^m: Mother's age and its square, which take account of the life cycle effect of mother.

B_i: Social backwardness of the household in terms of (i) whether a household belongs to scheduled caste and (ii) whether it belongs to scheduled tribe.

O_i: Occupation of parents in terms of (i) whether the household is classified as non-agricultural self-employment and (ii) whether as agricultural self-employment.

M_i: Religion of the household. We use the Muslim dummy only in consideration of the unique fertility behavior among Muslims.

L_i: Owned land as a measure of wealth.

S_i: Son-preference index (defined as [the number of female children]/[the total number of children]) following Arnold, Choe, and Roy (1998) and Drèze and Murthi (2001). In India, the fact that sons are preferred over daughters is well known and thus the expected sign of this index is positive.

R: The degree of urbanisation proxied by the rural sector dummy (whether in rural areas).

[14] According to the bargaining model in the previous section, education can be regarded as a proxy of bargaining power, but it may be also regarded as a proxy of the preference and the opportunity cost of raising children.

[15] One of the fundamental factors underling income growth is technical change. See Rosenzweig (1990) who showed analytically and empirically that changes in returns to exogenous technical change induce human capital investments and reduce fertility.

$\boldsymbol{D}$: A vector of state dummy variables.

Tobit model is used to take account of the censoring at 0 as some households do not have any children.[16]

$$n_i^* = \alpha + \sum_{l=1}^{q} \beta^l x_i^l + \epsilon_i \qquad (3)$$

$$n_i = n_i^* \quad , if\ n_i^* > 0$$

$$n_i = 0 \quad , if\ n_i^* <= 0$$

where n_i^* is the latent variable, whose actual value we cannot directly observe from the data set. x_i^l is a vector of a set of explanatory variables, such as mother's education, E_i^m or Land, L, while $\beta^l$is a corresponding vector of coefficient. ϵ_i is an error term.

Tobit has the advantage of providing an unbiased and consistent estimator when the variance of the error term is homoscedastic, while the OLS estimator given in the first model is still biased and inconsistent. However, the Tobit estimator is neither unbiased nor consistent and the estimator is unreliable when the variance of the error term is heteroscedastic, while heteroscedasticity plays no role in the determination of the unbiasedness in the case of OLS. We have thus employed Tobit model based on the White-Huber robust variance-covariance estimator.[17]

[16] We have tried both OLS and Tobit for all the cases and obtained broadly similar results. Due to the space limitation, we report the results based on 'robust' Tobit.

[17] Two other interpretations can be made of this index. First, it reflects higher expected wages of sons and higher expected expenses related to daughters (e.g. dowry), leading to higher expected household net income in the future by having more sons. Second, the index may be correlated to the opportunity cost of raising children, since young girls, whose opportunity costs are negligible, are usually involved in raising younger brothers and sisters.

(2) IV Estimation

IV for Education

There are two issues regarding the endogeneity of explanatory variables. First, education is deemed not exogenous due to the simultaneity in determining the number of children, the dependent variable, and the general level of education at household level. This will cause the correlation of education and the error term, which may bias the coefficient estimate. We use two stage least squares (2SLS) to address this issue in estimating the fertility equstion.

For example, if a household has fewer or no children, then young parents or couples could have time to go to school. A household with fewer children could spend more in their education per child and in the next generation, they will have fewer children when they are grown up. IV (instrumental variable) estimation would at least partly take account of this problem, but it is not generally easy to find the variable which affects parental education, but not the dependent variable, the number of their children. We use the ratio of those who attended primary school in the total in the age group 50 or above for men and women separately at the village level (or the FSU (first sampling unit) village level). This is a proxy for general education levels or the availability of primary education for grandparents, which would affect parental education, but not fertility. We use two stage least squares (2SLS) to address this issue.

IV for Mean Per Capita Expenditure (MPCE)

Another key variable, MPCE, our proxy for household income, is not entirely exogenous. For example, having more children would cause a mother to spend more time in childcare, which may reduce her current and expected future earnings, for example, due to the increased difficulty in finding a new job. Because we use MPCE based on the question asking

household expenditure in the last 30 days, we instrument it by the seasonal unemployment rate at village level, assuming that a seasonal shock reduces MPCE, but not fertility which is more likely to be influenced by the long-term conditions.

(3) Incorporation of Wage Equation into the Fertility Model

While the higher level of parental education is likely to reduce fertility, it is not clear whether it is due to the increase in bargaining power or in opportunity costs for a mother. Educated women are more likely to earn higher wages and have a less incentive to have children. As NSS provides us with individual data of earnings during the previous week of the survey date, these could be used as proxies for wages of mothers and fathers. So in the first step, we estimate the parental wage equation by Tobit model.

$$w_j^{Female} = w_j^{Female}\left(E_j, A_j, B_i, O_i, M_i, L_i, S_i, D\right) \quad (4)$$

$$w_j^{Male} = w_j^{Male}\left(E_j, A_j, B_i, O_i, M_i, L_i, D\right) \quad (4)'$$

Here wage for female workers (or for male workers) is estimated by a set of variables at individual levels for the individual *j*, such as a set of education dummies, E_j, age or its square, denoted as a vector, A_j. These variables serve as identifying wage equations. Reflecting the difference in the labour market structure for rural and urban areas, the wage equation is estimated for rural and urban areas separately, and separately for w_j^{Female} and w_j^{Male}. This will give us predicted wages for female and male workers (including fathers and mothers), $\hat{w}_j^{Female}$ and $\hat{w}_j^{Male}$, which will be directly used as predicted wages for mother and father for each household i, $\hat{w}_i^M$ and $\hat{w}_i^F$. These predicted wages will be used as explanatory variables for the estimation of fertility together with the variables at household level, such as O_i, M_i, and L_i in the second step.

$$n_i = n_i\left(\hat{w}_i^M(E_j, A_j, B_i, O_i, M_i, L_i, S_i, D), \hat{w}_i^F(E_j, A_j, B_i, O_i, M_i, L_i, S_i, D), E_i^m, E_i^f, I_i, A_i^m, B_i, O_i, M_i, L_i, S_i, R, D\right) \quad (5)$$

The equation (5) will enable us to identify the direct and indirect effects of education of parents on fertility, the latter of which will be related to the effects of education on wages. This is an extension of Foster and Rosenzweig (2006) by taking account of the effects of individual education on wages.

(4) Pseudo Panel Model

One of the limitations in the above models is that each round of NSS or NFHS is used separately for the cross-sectional estimations. To overcome this, we apply the pseudo panel model which aggregates micro-level household data by any meaningful unit or cohort (e.g. geographical areas or categorization by household characteristics) that is common across cross-sectional data sets in different years. We apply the pseudo panel model for the cohort *k* based on the combination of states and rural-urban classifications, which is common for both NSS and NFHS. The cohort is denoted as *k* in the equation (6) below.

$$\bar{n}_{ikt} = \bar{n}_{ikt}\left(\overline{E_i^m}_{kt}, \bar{I}_{ikt}, \overline{A_i^m}_{kt}, \bar{B}_{ikt}, \bar{O}_{ikt}, \bar{M}_{ikt}, \bar{L}_{ikt}, \bar{S}_{ikt}\right) \quad (6)$$

where *k* denotes cohort (i.e., state × rural-urban classification) and *t* stands for survey years for three rounds of NSS and NFHS, 1992 or 1993, 1998 or 1999 and 2004 or 2005. The upper bar means that the average of each variable is taken for each cohort, *k* for each round *t*. As mother's education is highly correlated with father's at the aggregate level, we insert either $\overline{E_i^m}_{kt}$ or $\overline{E_i^f}_{kt}$ at one time.

The equation (6) can be estimated by the standard static panel mode, such as fixed effects or random effects model.

$$\bar{n}_{ikt} - \alpha + \sum_{l=1}^{q} \beta^{l} \bar{x}^{l}_{ikt} + \gamma D_t + \bar{\mu}_{kt} + \bar{e}_{kt} \qquad (7)$$

where $\bar{x}^{l}_{ikt}$ is a dependent variable, $\bar{x}^{l}_{ikt}$ is an explanatory variable such as $\overline{E^{m}_{i}}_{kt}$, D_t is the vector of year dummies, $\bar{\mu}_{kt}$ is the unobservable individual effect specific to the cohort *k* (e.g. the infrastructure, the cultural effects which are not captured by explanatory variables), and $\bar{e}_{kt}$ is an error term. The issue is whether the equation (7) is a good approximation of the underlying household panel models for household *i* in the equation (7)' below. It is not straightforward to check this as we do not have 'real' panel data.

$$n_{it} = \alpha' + \sum_{l=1}^{q} \beta'^{l} x^{l}_{it} + \gamma' D_t + \mu_i + e_{it} \qquad (7)'$$

However, as shown by Verbeek and Nijman (1992) and Verbeek (1996), if the number of observations in cohort *k* tends to infinity, $\bar{\mu}_{kt} \rightarrow \mu_k^{*}$ and the estimator is consistent. In our case, *k* is very large and thus the estimator is likely to be almost consistent. Once we take account of the cohort population, the equation (7) will become the model developed by Deaton (1985) whereby $\bar{n}_{ikt}$ and $\bar{x}_{ikt}$ are considered to be error-ridden measurements of unobservable cohort means, which leads to so-called 'error-in-variables estimator' (see Fuller, 1987 for more details).

V. Main Results

In this section we will report and discuss econometric results for the models described in the previous section. The results of cross-sectional estimations for the first, second and third rounds of NSS and NFHS are compared in Tables 3, 4, and 5. The results for wage equations are shown in Appendix 2. Table 6 reports the results of the pseudo panel models. Selected

state-wise regression results are found in Appendix 3. Below, only key results are summarized for each case.

Cross-sectional Regression Results for Households across all India

For each round of NSS and NFHS, we show only seven representative cases, four for NSS and three for NFHS in Tables 3, 4, and 5. In Case (1) for NSS and in Case (5) for NFHS, we estimate the equation (2) using the literacy dummies for mother and father by Tobit model. Note, however, that MPCE is available only for NSS, not for NFHS. In Case (2) for NSS and in Case (6) for NFHS, 2SLS is applied to take account of the endogeneity of education variables for mother and father (or their literacy) which are instrumented by the pre-generation access to primary school at the village level. Case (3) for NSS is the case where MPCE is instrumented by seasonal unemployment rate at the village level. In Case (4) for NSS, predicted wages of mother and father are used for Tobit model where dummy variables of mother and father's educational levels are used. The corresponding case for NFHS is Case (7) which uses similar education dummies without wages because wage data are not available from NFHS.

(Tables 3, 4 and 5 to be inserted)

Although NSS and NFHS are carried out different purposes and the dependent variables are defined differently as we discussed in the precious section, we find very similar patterns of the results for the two surveys. This is important in two ways. First, this will justify our use of proxy for fertility constructed by NSS, or child number.[18] Second, the robustness of

[18] Appendix 4 shows the graphs of the dependent variable for NSS (the number of children under 15 of the household head and spouse) and that for NFHS (the number of children a mother bears) aggregated at state

our general conclusions is strengthened as a set of the results based on one survey serves as sensitivity tests for the other.

All the cases for three rounds show that the coefficient estimate of age is positive and significant and its square is negative and significant except a few cases (e.g. Case 1 of Table 5 where age is not significant; Case 2 of Tables 4 and 5 where both age and its square is positive). This reflects the non-linearity in the age-fertility relationship, i.e., the fertility rate first increases and then falls as the mother's age increases, which is consistent with the life cycle of a typical household.

The non-agricultural self-employment dummies have a significant and positive sign in most of the cases. These results suggest that children work for household enterprises as family laborers, more so than in other types of households. The coefficients of the agricultural self-employment household dummy are also positive and significant in most of the cases. The results suggest that children, as agricultural labor input, are more valuable in agricultural households than in other types of households.

The coefficients of scheduled caste dummies are positive and significant in most of the cases for NSS and NFHS, whilst the results on scheduled tribe dummies are more mixed. It appears that the negative coefficients in the first round (significant in Cases (1) and (2)) turned into positive in the last round (significant in Cases (3), (4), (5) and (7)). Drèze and Sen (2002) and Murthi, Guio, and Drèze (1995) found a negative coefficient on the scheduled tribes variable, while Drèze and Murthi (2001) found no relation between the scheduled tribes variable and fertility after controlling son-preference index. Maharatna (2000) finds a relatively low fertility rate in tribal communities by investigating historical material in British colonial India. Our results suggest that after controlling son-preference index the

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level for rural and urban areas. They are positively correlated with high correlation coefficients, 0.74, 0.80, and 0.75 for each round.

fertility level of tribal communities was relatively lower than the rest in the early 1990s, but it became relatively higher in 2004-6. The positive effect of scheduled caste and Muslim dummies on fertility found in all the cases is consistent with the earlier literature, for example, Mouhasha and Rama Rao (1999) and Bhat and Zavier (2005).[19] [20]

The coefficient estimates of MPCE, our proxy for household income, which is available only for NSS, are negative and significant in Cases (1) and (2) in Tables 3, 4, and 5 when it is not instrumented. This is consistent with the analytical framework of bargaining model which implies that higher income reduces fertility. However, once it is instrumented by the village-level seasonal unemployment in Case (3) (which is significant in the first stage), MPCE becomes non-significant with its sign negative only for 1999. Given that MPCE is likely to be an endogenous variable, whether the income or MPCE reduces fertility is not clear. Regarding the estimates of owned land, they are mostly negative and significant for NSS whereby it is defined as all the land possessed by the household. The signs are expected. However, due to the data limitation, NFHS has the variable of the area of agricultural land (which may be larger for rural households –which tend to have more children in a household in general- but some rich agricultural households may have fewer children) and thus we get mixed results. In 1992 and 1998, the effects of agricultural lands on fertility were by and large negative and significant as expected by the theory, but they became positive in 2005. While the economic growth will contribute to a lower fertility rate as implied by the theory of demographic transition, this is not clearly supported by the micro-level household data.

The son preference index is significantly positive in all equations irrespective of the

[19] Note that we excluded Muslim households with more than one female spouse of a male household head.
[20] However, it should be noted that fertility declined among Hindus as well as Muslims in India as suggested, for example, by James and Nair (2005) and Kulkarni and Alagrajan (2005). We do not investigate this issue directly, but the results of state-wise fertility regressions show that Muslim dummy ceased to be significant in 2004-5 in a few states, such as Tamil Nadu, West Bengal, and Bihar, which suggests some recent changes in reproductive behavior among Indian Muslims.

model specification. This result confirms that son preference increases fertility, as observed by Drèze and Murthi (2001).

Let us turn to the effects of education on fertility. Tables 3, 4 and 5 conform that mother's education is negative and significant irrespective of the specifications (e.g. whether education is instrumented or not; literacy dummy or dummies on educational levels are used) over the period of 1992-2006 for both NSS and NFHS. The role of father's education appears to have changed over time from positive and significant (or non-significant) effects in 1992-4 to negative and significant effects in 1998-2000 to 2004-2006 for NSS and NFHS with a few exceptions. This implies that the role of father's education in reducing fertility became increasingly important over the years.

For example, in Case (1) for NSS and Case (4) for NFHS in Tables 3, 4 and 5, we used the dummy variables on mother and father's literacy in the baseline specification without instrumenting them. In all the cases, mother's literacy dummy is negative and significant, while father's literacy dummy is negative and significant in Case (4) for NFHS-2 and 3 and Case (1) for the NSS 61st round. Negative and significant results for mother's literacy dummy are unchanged in Case (2) for NSS and Case (5) for NFHS where dummy variables for mother and father's education are instrumented by pre-generation access to primary school for males and females using 2SLS. On the estimate of father's literacy dummy, it is negative and non-significant in 1993-4 and becomes negative and significant in 1999-2000 and in 2004-5 for NSS. However, it was positive throughout three rounds of NFHS.

In Case (4) for NSS and in Case (7) for NFHS, the predicted wages for father and mother as well as the dummy variables on their educational attainment are used to estimate fertility. Wages are predicted by the wage equations for males and females at individual levels for rural and urban areas separately as shown in Appendix 3. Appendix 3 shows that education

level dummies (for which the baseline case is 'illiterate') are all positive and significant and the significance level is higher with higher levels of education in Tobit estimations. Predicted wages of mothers, defined for both the actual labor market participants and non-participants (for the latter of which implied wages are derived by the individual characteristics) are negative and significant for all three rounds of NSS, which implies that higher wages would decrease the fertility through higher opportunity costs (Case (4) in Tables 3, 4, and 5). The negative and significant results are unchanged for all three rounds if actual wages are used only for households with small samples of labor market participants.[21] The predicted wages of father are negative and significant in 1993-4, positive and significant in 1999-2000 and 2004-5. It is important to note in these cases that the coefficient estimates of education-level dummies in fertility equations are negative and significant for mother for all three rounds. Those of father are positive in the first round and negative and significant in the second and the third rounds. It can be concluded that mother' education has direct and indirect negative effects on fertility. Father's education has either direct (in 1999-2000 or 2004-5) or indirect (in 1993-4) negative effects on fertility.

Our result, therefore, justifies the greater role of female education in fertility reduction as emphasized by earlier studies, for example, Brookins and Brookins (2002), Drèze and Sen (2002: Chapter 7), Drèze and Murthi (2001), Subbarao and Raney (1985), and Jain and Nag (1986).[22] While Drèze and Murthi (2001) and Drèze and Sen (2002: Chapter 7) claim that male literacy makes no contribution to reduction in fertility when controlled by female

[21] The results will be furnished on request.
[22] We are not excluding the possibility that the fertility among illiterate parents have recently declined in India as argued by Bhat (2002). It must be noted, however, that fertility declined among illiterate parents, but more so among educated parents, implying the importance of parental education. For example, if we estimate the pseudo panel for the first difference of the number of children, education dummies are negative and significant in some cases. The results will be furnished on request.

education, our study confirms that both male literacy and education attainments are closely associated with fertility reduction particularly in more recent years.

These differences from earlier studies are related to our contributions, that is, the consideration of heterogeneity within districts and the extensive use of survey data covering more recent periods. The robustness of our results is further strengthened by using IV to take account of the endogeneity of education. Overall, our results provide a picture broadly consistent with the analytical framework of the relationship between the fertility decision and household-specific socioeconomic factors.

Pseudo Panel Model Results

Table 6 presents the results based on pseudo panel model for state levels classified rural and urban areas for NSS and NFHS. A few points are noted on the selection of explanatory variables. First, we put education variables (literacy or a set of educational levels) separately for a father and a mother as they are correlated at the aggregate level. Second, in case where NFHS is used, MPCE is added by the cohort data constructed from the aggregation of NSS. Third, the results based on both fixed-effects and random-effects models are presented. Eight cases are shown according to whether NSS or NFHS is used, whether education is for mother or father, and how education is defined, i.e. the literacy rate or the educational attainments.

(Table 6 to be inserted)

The results are broadly consistent with those in Tables 3, 4 and 5 with a few notable changes. The following explanation is based on either fixed or random-effects model chosen by Hausman test for each case (shown in bold in the table). We obtain the coefficient estimates with same signs and significance as obtained by household data for mother's age

(positive) and its square (negative), non-agricultural self-employed dummies (positive), agricultural self-employed dummies (positive for NSS) and son preference index (positive, significant only for NSS). The variables on Schedule Castes and Muslim have become non-significant in most cases. MPCE are also non-significant, contrary to the household-level results which show negative and significant coefficient estimates for MPCE in case it is not instrumented.

Mother's literacy is negative and significant in Case (1) and so is father's literacy in Case (2) for NSS. They are not significant in Case (5) for NFHS in fixed-effects models chosen by Hausman tests, but negative and significant in random-effects models. In Case (3) (or Case (4)) for NSS with mother's (or father's) educational attainment variables, 'primary school under', reflecting the low level of educational attainment, is positive and significant at 1% level (or at 10% level). In the corresponding cases for NFHS (Cases (7) and (8)), they are negative though not significant. These results should be interpreted with caution because of the possible aggregation bias, but they confirm the importance of parental education in reducing fertility.

State-wise Results

Appendix 3 provides cross-sectional regressions applied to household-level data constructed from NSS for selected states. Andhra Pradesh and Tamil Nadu experienced remarkable reduction of TFR from 1992-3 to 2005-6, 2.59 to 1.79 and 2.48 to 1.80 respectively (Appendix 1). Kerala is the state of which the fertility rate was already low (2.00) in 1992-3 and experienced the small degree of reduction to 1.93 in 2005-6. West Bengal and Orissa experienced the similar decline in TFR from 2.92 to 2.27 or 2.37 in the same period. Bihar

remained one of the states with the highest TFR in India (from 4.00 to 3.83). The specification same as Case (4) in Tables 3, 4, and 5 is used.

Four observations are made to summarize the results on key variables, land, wage and parental education. First, land is negative and significant in all the states. Second, in the states which experienced the remarkable decline in TFR (e.g. Andhra Pradesh, Tamil Nadu, West Bengal and Orissa), (i) mother's education is generally important and the negative and significant effects of mother's educational attainment, particularly at middle school, secondary school and higher education became increasingly pronounced in 1999-2000 and 2004-5, (ii) father's education became important in the last two or in the last survey, reflected in the negative and significant coefficient estimates, and (iii) mother's wage is negative and significant, while father's wage is positive in the last round. Third, in Kerala education attainments at higher levels are not significant and mother's wage is not significant either, in contrast with results for Andhra Pradesh or Tamil Nadu. This may be because Kerala has already reached the stage where the relative importance of higher levels of education or higher mother's wage is low. Finally, even in Bihar with high TFR, mother's wage is negative and significant and mother's educational attainments as well as higher education of father are associated with lower fertility in 2004-5.

VI. Concluding Observations

This paper examines the determinants of population in India, with a particular focus on fertility, drawing upon three rounds of NSS and NFHS data over the period 1992-2006. That fertility declined dramatically in many parts of India during the period is consistent with the view that India is seen to be moving through the second stage toward the third stage of demographic transition. The investigation of fertility in India is important not only for

providing an insight into the population problem for the second populous country in the world. It also serves as a background for the debate on poverty in India which would be influenced by the geographical pattern of population growth.

This paper sheds an empirical light on the determinants of fertility by applying several econometric models (namely Tobit, IV for parental education, and the two step estimation where parental wages are estimated in the first stage and fertility is estimated by Tobit) to the large household data sets constructed by NSS and NFHS. Then, we estimate pseudo panel data models using the cohort defined by state and rural-urban classifications. Finally, state-wise regressions are estimated for selected states. We have found broadly similar and consistent results between the two different surveys, across years and for different models. Our main findings are summarized below.

First, consistent with the literature, mother's education is related to reduction in fertility. We have confirmed by Tobit model a negative and significant association of the number of children (the number of children under 15 in a household who are deemed children of household heads or spouse for NSS and the number of children a mother bears for NFHS) and mother's education. This negative and significant relationship is unchanged over the different years (i) when mother's literacy is instrumented by pre-generation access to primary education of mother, (ii) when parental wages estimated by individual education are inserted, and (iii) when the pseudo panel model is applied.

Second, we have found significant and negative estimates for father's education, particularly relatively higher levels of education in the second round in 1998-2000 and the third round in 2004-6 of NSS and NFHS.[23]

[23] For example, paragraph 27 in India's National Population Policy 2000 correctly states,
"In the past, population programmes have tended to exclude menfolk …The special needs of men include re-popularising vasectomies, in particular no-scalpel vasectomy as a safe and simple procedure, and focusing on

Third, while the significant negative relation between fertility and mean per capita expenditure at household level is observed when the former is exogenous, it is no longer significant once it is instrumented by the village-level seasonal unemployment rate. Owned land is negative and significant in the cases where NSS is used.

Finally, some diversity is observed on the determinants of fertility in different states.

Our results suggest that policies of national and state governments to support social infrastructure, such as school at various levels and to promote both male and female education, together with facilitating female labor market participations, would be very important to reduce fertility and to speed down the population growth. These policies would play particularly important roles in backward states or for socially disadvantaged groups (e.g. Scheduled Castes) which have higher fertility as well as poverty rates.

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men in the information and education campaigns to promote the small family norm." Our results empirically support this statement.

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Table 1 Population Projection for India, China, Sub-Saharan Africa and World in 2005

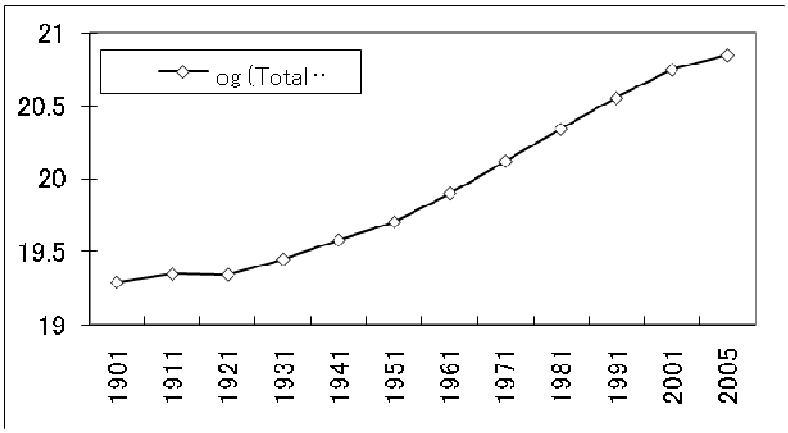
	India	China	SSA[*2.]	World
1980	689	989	388	4451
	(15.5%)	(22.2%)	(8.7%)	(100%)
2005	1134	1312	769	6514
	(17.4%)	(20.1%)	(11.8%)	(100%)
2050	1658	1408	1760	9191
	(18.0%)	(15.3%)	(19.1%)	(100%)

[*1]. Unit: million. The number in the brackets: share in the world.

[*2]. Sub-Saharan Countries total.

[*3]. Source: UN (2007)

Figure 1 Long Term Trend of India's Population



Source: Government of India, Statistical Abstract of India 1999, pp. 4-5;

Table 2 Total Fertility Rate for 15-49 in India based on NFHS-1, 2 and 3 (1992-3, 1998-9 and 2005-6)

	URBAN			RURAL			Total		
	1992	1998	2005	1992	1998	2005	1992	1998	2005
North	2.69	2.15	1.95	3.60	2.98	2.68	3.32	2.71	2.43
Central	3.43	2.75	2.66	4.65	3.94	3.64	4.36	3.65	3.37
East	2.64	2.21	2.04	3.46	2.86	3.04	3.28	2.75	2.82
Northeast	2.53	2.08	2.09	2.70	3.43	3.17	3.31	3.12	2.87
West	2.33	2.09	1.87	2.76	2.53	2.31	2.58	2.34	2.11
South	2.22	1.90	1.76	2.60	2.22	1.99	2.48	2.13	1.90
All India	2.70	2.27	2.06	3.67	3.07	2.98	3.39	2.85	2.68

Source: Based on National Familiy Health Survey in 1998-99 and 2005-6 (Table 4.3)

Table 3 Determinants of Fertility (based on NSS 50th round in 1993/4 and NFHS-1 in 1992/3) Dependent Variable: Number of Children

	Based on NSS 50 (1993/4)				Based on NFHS-1 (1992/3)		
	Case (1)	Case (2)	Case (3)	Case (4)	Case (1)	Case (2)	Case (3)
	Tobit	IV for Education	IV for Expenditure	With education dummies & wages	Tobit	IV for Education	Tobit with education dummies
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Explanatory Variables	(t value)	(t value)	(t value)	(t value)	(t value)	(t value)	(t value)
Mother`s Age	0.494	0.216	0.207	0.589	0.307	0.15	0.316
	(89.38)**	(62.86)**	(13.42)**	(91.99)**	(20.20)**	(10.77)**	(20.76)**
(Mother`s Age)^2	-0.008	-0.003	-0.004	-0.009	-0.002	0.00	-0.002
	(96.13)**	(63.28)**	(35.15)**	(95.72)**	(7.06)**	(0.17)	(7.77)**
Scheduled Tribe (ST) dummy (ST=1, otherwise=0)	-0.077	-0.137	(0.341)	0.007	-0.084	-0.089	-0.091
	(3.35)**	(5.80)**	(1.12)	(0.29)	(1.30)	(0.64)	(1.40)
Scheduled Caste (SC) dummy (SC=1, otherwise=0)	0.038	-0.054	0.456	0.035	0.263	0.164	0.235
	(2.15)*	(3.05)**	(1.35)	(1.83)	(4.17)**	(2.10)*	(3.72)**
non-agricultural self employment dummy (non-agricultural self employment=1 otherwise)	0.186	0.156	0.229	0.352	0.147	0.055	-0.008
	(12.39)**	(13.21)**	(3.14)**	(13.41)**	(2.75)**	(0.70)	(0.15)
agricultural self employment dummy (agricultural self employment=1 otherwise=0)	0.214	0.124	-0.004	0.287	0.199	0.077	0.029
	(8.61)**	(6.57)**	(0.03)	(9.43)**	(3.65)**	(0.55)	(0.50)
monthly per capita expenditure (MPCE) (Rs.) (/10^6)	**-13.20**	**-2.80**	**54.20**	**-**	-	-	-
	(21.58)**	**(2.86)****	**(1.01)**	**-**	-	-	-
Land Owned	**-0.001**	**-0.001**	**-0.002**	**-0.001**	**-0.001**	**0.00**	**-0.001**
	(1.49)	**(1.64)**	**(1.22)**	**(1.33)**	**(2.44)***	**(0.95)**	**(2.24)***
Muslim dummy(Muslim=1, otherwise=0)	**0.585**	**0.391**	**0.814**	**0.606**	**0.32**	**0.309**	**0.281**
	(27.51)**	**(20.49)****	**(2.82)****	**(26.75)****	**(3.88)****	**(2.78)****	**(3.39)****
Mother`s Literacy	**-0.052**	**-0.497**	**-1.091**	**-**	**-0.354**	**-2.389**	**-**
(whether mother literate)	**(3.08)****	**(4.23)****	**(1.31)**	**-**	**(8.11)****	**(2.46)***	**-**
Father`s Literacy	**0.033**	**-0.164**	**-**	**-**	**-0.053**	**1.658**	**-**
	(2.12)*	**(1.27)**	**-**	**-**	**(1.18)**	**(1.33)**	**-**
Mother`s Wage	**-**	**-**	**-**	**-9.16**	-	-	-
	-	**-**	**-**	**(2.76)****	-	-	-
Father`s Wage	**-**	**-**	**-**	**-11.9**	-	-	-
	-	**-**	**-**	**(6.66)****	-	-	-
Whether mother is literate, but has not completed primary school	**-**	**-**	**-**	**-0.086**	-	-	**-0.147**
	-	**-**	**-**	**(3.46)****	-	-	**(2.92)****
Whether mother completed primary school	**-**	**-**	**-**	**-0.08**	-	-	**-0.484**
	-	**-**	**-**	**(3.21)****	-	-	**(8.83)****
Whether mother completed middle school	**-**	**-**	**-**	**-0.116**	-	-	**-1.146**
	-	**-**	**-**	**(2.48)***	-	-	**(10.28)****
Whether mother completed secondary or higher secondary school	**-**	**-**	**-**	**-0.132**	-	-	-

	-	-	-	**(1.06)**	-	-	-
Whether mother completed higher education	-	-	-	**-0.29**	-	-	-
	-	-	-	**(1.54)**	-	-	-
Whether father is literate, but has not completed primary school	-	-	-	**0.076**	-	-	-
	-	-	-	**(3.38)****	-	-	-
Whether father completed primary school	-	-	-	**0.122**	-	-	**-0.01**
	-	-	-	**(4.90)****	-	-	**(0.20)**
Whether father completed middle school	-	-	-	**0.21**	-	-	**-0.123**
	-	-	-	**(6.34)****	-	-	**(2.30)***
Whether father completed secondary or higher secondary school	-	-	-	**0.349**	-	-	**-0.306**
	-	-	-	**(5.50)****	-	-	**(3.66)****
Whether father completed higher education	-	-	-	**0.619**	-	-	-
	-	-	-	**(5.37)****	-	-	-
rural sector dummy (rural=1 urban=0)	0.016	-0.062	0.852	-0.162	0.163	-0.07	0.053
	(0.94)	(3.71)**	(1.28)	(6.06)**	(2.99)**	(0.77)	(0.96)
Son`s Preference Index	0.28	0.226	0.298	0.273	1.971	1.255	1.963
	(48.91)**	(41.34)**	(4.38)**	(47.27)**	(48.45)**	(35.32)**	(48.36)**
Number of Adults	-0.153	-0.089	0.009	-0.163	0.051	0.062	0.056
	(32.67)**	(27.66)**	(0.10)	(30.47)**	(5.41)**	(4.29)**	(5.90)**
Constant	-5.897	-1.366	-3.876	-7.355	-7.58	-3.53	-7.43
	(60.05)	(12.94)	(2.24)	(69.33)	(29.29)	(8.04)	(28.78)
Observations	92399	83789	92399	79112	11726	11585	11663
R-squared	-	0.31	-	-	-	0.38	-
Joint Significant Test	Wald $Chi^2(45)$ =26569**	F(45,83743) =1068.8**	F(45,92353) =309.54**	Wald $Chi^2(54)$ =22362**	Wald $Chi^2(37)$ =11670**	F(37,11547) =227.47**	Wald $Chi^2(41)$ =11768**

Notes 1. Robust z t statistics in parentheses. * significant at 5%; ** significant at 1%

2. State dummies are included in the regressions, but are omitted to save the space.

Table 4 Determinants of Fertility (based on NSS 55th round in 1999/2000 and NFHS-2 in 1998/9) Dependent Variable: Number of Children

	Based on NSS 55 (1999/2000)				Based on NFHS-2 (1998/9)		
	Case (1)	Case (2)	Case (3)	Case (4)	Case (1)	Case (2)	Case (3)
	Tobit	IV for Education	IV for Expenditure	With education dummies & wages	Tobit	IV for Education	Tobit with education dummies
Explanatory Variables	Coef. (t value)	Coef. (t value)	Coef. (t value)	Coef. (t value)	Coef. (t value)	Coef. (t value)	Coef. (t value)
Mother`s Age	0.522 (69.14)**	0.202 (56.95)**	0.211 (34.81)**	0.231 (56.07)**	0.263 (28.27)**	0.089 (4.45)**	0.273 (29.78)**
(Mother`s Age)^2	-0.008 (76.07)**	-0.003 (74.02)**	-0.003 (66.67)**	-0.004 (68.82)**	-0.001 (8.87)**	0.001 (2.07)*	-0.001 (10.29)**
Scheduled Tribe (ST) dummy (ST=1, otherwise=0)	-0.006 (0.18)	-0.074 (2.92)**	0.005 (0.11)	0.137 (5.47)**	0.067 (1.57)	0.218 (1.00)	0.028 (0.66)
Scheduled Caste (SC) dummy (SC=1, otherwise=0)	0.051 (2.21)*	-0.039 (1.92)	0.021 (0.32)	0.143 (7.69)**	0.289 (9.52)**	0.288 (1.70)	0.207 (6.85)**
non-agricultural self employment dummy (non-agricultural self employment=1 otherwise)	0.177 (9.59)**	0.133 (9.72)**	0.133 (4.85)**	0.076 (1.93)	0.018 (0.63)	-0.047 (0.58)	0.003 (0.12)
agricultural self employment dummy (agricultural self employment=1 otherwise=0)	0.18 (6.01)**	0.069 (3.50)**	0.089 (4.96)**	0.015 (0.48)	0.093 (3.47)**	0.309 (1.67)	0.024 (0.88)
monthly per capita expenditure (MPCE) (Rs.) (/10^5)	-1,263.80 (24.18)**	-466.85 (10.63)**	-732.91 (1.48)	- -	- -	- -	- -
Land Owned	**-0.002 (3.23)****	**-0.001 (5.15)****	**-0.001 (1.83)**	**-0.002 (7.01)****	**-0.005 (2.05)***	**-0.004 (1.14)**	**-0.004 (1.91)**
Muslim dummy(Muslim=1, otherwise=0)	**0.699 (26.55)****	**0.452 (20.83)****	**0.501 (8.35)****	**0.495 (20.98)****	**0.482 (11.48)****	**0.638 (2.85)****	**0.355 (8.47)****
Mother`s Literacy (whether mother literate)	**-0.247 (11.46)****	**-0.384 (2.65)****	**-0.189 (2.03)***	**- -**	**-0.452 (17.18)****	**-4.746 (3.15)****	**- -**
Father`s Literacy (whether father literate)	**-0.007 (0.31)**	**-0.317 (2.07)***	**0.002 (0.06)**	**- -**	**-0.077 (2.50)***	**5.952 (2.24)***	**- -**
Mother`s Wage	**- -**	**- -**	**- -**	**-6.63 (7.77)****	- -	- -	- -
Father`s Wage	**- -**	**- -**	**- -**	**4.28 (3.83)****	- -	- -	- -
Whether mother is literate, but has not completed primary school	**- -**	**- -**	**- -**	**-0.162 (7.19)****	- -	- -	**-0.121 (3.82)****
Whether mother completed primary school	**- -**	**- -**	**- -**	**-0.246 (10.30)****	- -	- -	**-0.428 (13.75)****
Whether mother completed middle school	**- -**	**- -**	**- -**	**-0.351 (14.05)****	- -	- -	**-1.088 (26.72)****
Whether mother completed secondary or higher secondary school	**- -**	**- -**	**- -**	**-0.283 (11.54)****	- -	- -	- -
Whether mother completed higher education	**- -**	**- -**	**- -**	**-0.229 (4.63)****	- -	- -	- -
Whether father is literate, but has not completed primary school	**- -**	**- -**	**- -**	**0.016 (0.73)**	- -	- -	**0.043 (1.21)**
Whether father completed primary school	**- -**	**- -**	**- -**	**-0.036 (1.70)**	- -	- -	**-0.094 (2.83)****
Whether father completed middle school	**- -**	**- -**	**- -**	**-0.074 (3.51)****	- -	- -	**-0.252 (6.24)****
Whether father completed secondary or higher	**- -**	**- -**	**- -**	**-0.16**	- -	- -	-

secondary school							
	-	**-**	**-**	**(6.82)****	-	-	-
Whether father completed higher education	**-**	**-**	**-**	**-0.253**	-	-	-
	-	-	-	**(7.42)****	-	-	-
rural sector dummy (rural=1 urban=0)	-0.043	-0.053	-0.023	0.477	0.31	-0.001	0.154
	(2.01)*	(2.97)**	(0.18)	(9.28)**	(11.94)**	0.00	(5.85)**
Son`s Preference Index	0.314	0.248	0.241	0.248	1.669	1.013	1.671
	(36.07)**	(31.66)**	(19.26)**	(31.36)**	(68.12)**	(23.71)**	(68.91)**
Number of Adults	-0.158	-0.111	-0.118	-0.111	0.086	0.049	0.089
	(27.06)**	(31.21)**	(8.19)**	(32.38)**	(13.91)**	(1.43)	(14.56)**
Constant	-5.87	-0.747	-1.118	-2.409	-6.44	-3.80	-6.41
	(43.50)	(9.28)	(4.24)	(21.15)	(40.70)	(4.29)	(41.27)
Observations	59869	56927	59869	52971	26955	26955	26872
R-squared		0.36	0.36	0.34	-	-	-
Joint Significant Test	Wald $Chi^2(45)$ =20576**	F(45,56881) =789.01**	F(45,59823) =818.51**	Wald $Chi^2(54)$ =17354**	Wald $Chi^2(38)$ =22646**	F(38,26916) =182.40**	Wald $Chi^2(42)$ =23806**

Notes 1. Robust z t statistics in parentheses. * significant at 5%; ** significant at 1%.
2. State dummies are included in the regressions, but are omitted to save the space.

Table 5 Determinants of Fertility (based on NSS 61st round in 2004/5 and NFHS-3 in 2005/6) Dependent Variable: Number of Children

	Based on NSS 61 (2004/2005)				Based on NFHS-3 (2005/2006)		
	Case (1)	Case (2)	Case (3)	Case (4)	Case (1)	Case (2)	Case (3)
	Tobit	IV for Education	IV for Expenditure	With education dummies & wages	Tobit	IV for Education	Tobit with education dummies
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Explanatory Variables	(t value)	(t value)	(t value)	(t value)	(t value)	(t value)	(t value)
Mother`s Age	-0.006	0.121	0.189	0.15	0.55	0.068	0.362
	(1.23)	(47.16)**	(11.74)**	(50.13)**	(78.52)**	(4.81)**	(50.72)**
(Mother`s Age)^2	0.00	-0.002	-0.003	-0.002	-0.006	0.001	-0.003
	(4.75)**	(66.34)**	(16.52)**	(64.63)**	(56.50)**	(3.00)**	(31.42)**
Scheduled Tribe (ST) dummy (ST=1, otherwise=0)	0.023	0.00	0.998	0.106	0.114	0.09	0.22
	(1.00)	(0.02)	(5.70)**	(7.07)**	(2.93)**	(1.74)	(5.72)**
Scheduled Caste (SC) dummy (SC=1, otherwise=0)	0.111	0.054	-0.689	0.051	0.241	0.077	0.204
	(4.28)**	(3.31)**	(4.68)**	(2.99)**	(8.70)**	(1.95)	(7.49)**
non-agricultural self employment dummy (non-agricultural self employment=1 otherwise)	0.185	0.087	0.29	0.037	0.193	0.173	-0.027
	(12.91)**	(9.44)**	(6.95)**	(1.64)	(9.74)**	(4.71)**	(1.45)
agricultural self employment dummy (agricultural self employment=1 otherwise=0)	0.145	0.026	0.107	-0.044	-	-	-
	(8.51)**	(2.49)*	(5.49)**	(2.00)*	-	-	-
monthly per capita expenditure (MPCE) (Rs.) (/10^6)	**-0.033**	**-0.011**	**59.158**	**-**	-	-	-
	(2.63)**	**(4.80)****	**(1.04)**	**-**	-	-	-
Land Owned	**0.00**	**0.00**	**0.00**	**0.00**	0.019	0	0.024
	(0.90)	**(0.83)**	**(0.86)**	**(14.07)****	(10.11)**	(0.02)	(9.03)**
Muslim dummy(Muslim=1, otherwise=0)	**0.595**	**0.378**	**0.57**	**0.336**	0.479	0.159	0.476
	(27.73)**	**(24.08)****	**(18.87)****	**(20.50)****	(13.63)**	(3.45)**	(13.54)**
Mother`s Literacy	**-0.383**	**-0.344**	**-0.159**	**-**	**-0.902**	**-5.31**	-
(whether mother literate)	**(24.65)****	**(3.90)****	**(3.25)****	**-**	**(46.14)****	**(7.91)****	-
Father`s Literacy	**-0.133**	**-0.296**	**-0.067**	**-**	**-0.288**	**5.764**	-
(whether father literate)	**(7.60)****	**(2.85)****	**(2.23)***	**-**	**(9.16)****	**(5.44)****	-
Mother`s Wage	**-**	**-**	**-**	**-2.36**	-	-	-
	-	**-**	**-**	**(16.28)****	-	-	-
Father`s Wage	**-**	**-**	**-**	**0.74**	-	-	-
	-	**-**	**-**	**(8.13)****	-	-	-
Whether mother is literate, but has not completed primary school	**-**	**-**	**-**	**-0.094**	-	-	**-0.217**
	-	**-**	**-**	**(6.74)****	-	-	**(7.37)****
Whether mother completed primary school	**-**	**-**	**-**	**-0.079**	-	-	**-0.656**
	-	**-**	**-**	**(5.91)****	-	-	**(29.12)****
Whether mother completed middle school	**-**	**-**	**-**	**-0.145**	-	-	**-1.171**
	-	**-**	**-**	**(8.83)****	-	-	**(42.26)****
Whether mother completed secondary or higher secondary school	**-**	**-**	**-**	**-0.037**	-	-	-
	-	**-**	**-**	**(2.50)***	-	-	-
Whether mother completed	**-**	**-**	**-**	**-0.233**	-	-	-

higher education							
	-	**-**	**-**	**(11.02)****	-	-	-
Whether father is literate, but has not completed primary school	**-**	**-**	**-**	**-0.253**	-	-	**-0.013**
	-	**-**	**-**	**(16.79)****	-	-	**(0.40)**
Whether father completed primary school	**-**	**-**	**-**	**-0.188**	-	-	**-0.056**
	-	**-**	**-**	**(13.82)****	-	-	**(1.86)**
Whether father completed middle school	**-**	**-**	**-**	**-0.202**	-	-	**-0.355**
	-	**-**	**-**	**(11.97)****	-	-	**(9.24)****
Whether father completed secondary or higher secondary school	**-**	**-**	**-**	**-0.163**	-	-	**-**
	-	**-**	**-**	**(10.98)****	-	-	**-**
Whether father completed higher education	**-**	**-**	**-**	**-0.003**	-	-	-
	-	**-**	**-**	**(0.10)**	-	-	-
rural sector dummy (rural=1 urban=0)	0.172	0.004	0.267	0.496	0.301	-0.035	0.11
	(11.49)**	(0.32)	(4.11)**	(16.42)**	(14.17)**	(0.98)	(5.24)**
Son`s Preference Index	1.961	1.397	1.647	1.385	1.222	0.687	1.096
	(114.54)**	(116.29)**	(29.98)**	(111.21)**	(73.40)**	(24.37)**	(64.02)**
Number of Adults	0.07	-0.114	-0.134	-0.124	0.08	0.137	0.153
	(14.78)**	(37.25)**	(4.07)**	(44.79)**	(13.70)**	(15.45)**	(24.08)**
Constant	0.701	-0.149	-2.504	-1.585	-11.05	-3.08	-7.73
	(7.65)	(2.43)	(6.00)	(20.04)	(-79.21)	(-8.07)	(-57.07)
Observations	91666	91666	91666	82390	47441	47341	35376
R-squared	-	0.45	-	0.45	-	-	-
Joint Significant Test	Wald $Chi^2(45)$ =25961**	F(45,91626) =303.21**	F(45,91620) =1375.30**	Wald $Chi^2(54)$ =23413**	Wald $Chi^2(32)$ =39504**	F(32,47308) =433.08**	Wald $Chi^2(36)$ =26222**

Notes 1. Robust z t statistics in parentheses. * significant at 5%; ** significant at 1%.

2. State dummies are included in the regressions, but are omitted to save the space.

Table 6 Determinants of Fertility based on Pseudo Panel Data Model for NSS and NFHS, 1992-2006 (Dep. Var: Number of Children)

	NSS (Dependent Variable: Number of Children)								NFHS (Dependent Variable: Number of Children Born)							
	Case 1 With mother's literacy		Case 2 With father's literacy		Case 3 With mother's education levels		Case 4 With father's education levels		Case 5 With mother's literacy		Case 6 With father's literacy		Case 7 With mother's education levels		Case 8 With father's education levels	
	Fixed-effects Coef. (t value)	**Random-effects Coef. (t value)**	Fixed-effects Coef. (t value)	**Random-effects Coef. (t value)**	Fixed-effects Coef. (t value)	Random-effects Coef. (t value)	Fixed-effects Coef. (t value)	Random-effects Coef. (t value)	Fixed-effects Coef. (t value)	Random-effects Coef. (t value)	Fixed-effects Coef. (t value)	Random-effects Coef. (t value)	Case 13 Fixed Coef. (t value)	Case 14 Fixed Coef. (t value)	Case 15 Fixed Coef. (t value)	Case 15 Fixed Coef. (t value)
Mother`s Age	0.28	**0.295**	0.3	**0.312**	**0.282**	0.328	0.219	**0.198**	**0.532**	0.166	**0.576**	-0.065	0.488	**0.277**	**0.545**	-0.138
	(2.93)**	**(3.69)****	(3.10)**	**(3.66)****	**(3.11)****	(3.68)**	(2.15)*	**(2.14)***	**(1.81)**	(0.68)	**(1.92)**	(0.23)	(1.86)	**(1.19)**	**(1.93)**	(0.46)
(Mother`s Age)^2	-0.004	**-0.004**	-0.004	**-0.005**	**-0.004**	-0.005	-0.003	**-0.003**	**-0.007**	-0.002	**-0.007**	0.001	-0.006	**-0.003**	**-0.007**	0.002
	(3.37)**	**(4.38)****	(3.49)**	**(4.35)****	**(3.60)****	(4.32)**	(2.41)*	**(2.70)****	**(1.48)**	(0.42)	**(1.58)**	(0.33)	(1.56)	**(0.93)**	**(1.62)**	(0.53)
Scheduled Tribe (ST) dummy (ST=1, otherwise=0)	0.209	**0.37**	0.147	**0.299**	**0.075**	0.26	0.25	**0.262**	**0.401**	0.743	**0.403**	0.533	0.202	**0.568**	**0.194**	0.447
	(1.32)	**(5.33)****	(0.91)	**(4.03)****	**(0.51)**	(3.31)**	(1.49)	**(3.35)****	**(0.75)**	(5.56)**	**(0.74)**	(3.22)**	(0.42)	**(4.21)****	**(0.37)**	(2.63)**
Scheduled Caste (SC) dummy (SC=1, otherwise=0)	-0.243	**-0.231**	0.044	**-0.101**	**0.686**	0.156	0.109	**0.134**	**-0.891**	-0.191	**-0.869**	-0.228	-1.373	**-0.504**	**-1.422**	-0.272
	(0.59)	**(1.17)**	(0.11)	**(0.47)**	**(1.98)***	(0.70)	(0.29)	**(0.60)**	**(1.80)**	(0.50)	**(1.72)**	(0.49)	(3.06)**	**(1.38)**	**(2.71)****	(0.57)
non-agricultural self employment dummy (non-agricultural self employment=1 otherwise)	0.772	**1.028**	0.653	**0.991**	**0.677**	1.058	0.69	**1.098**	**1.253**	1.086	**1.292**	0.926	0.812	**1.179**	**0.831**	0.876
	(2.71)**	**(5.52)****	(2.29)*	**(4.95)****	**(2.37)***	(5.13)**	(2.30)*	**(5.11)****	**(3.00)****	(3.02)**	**(3.07)****	(2.19)*	(2.14)*	**(3.50)****	**(1.93)**	(1.99)*
agricultural self employment dummy (agricultural self employment=1 otherwise=0)	0.518	**0.605**	0.66	**0.7**	**0.614**	0.851	0.679	**1.05**	**0.095**	-0.105	**0.235**	-0.162	0.007	**-0.152**	**-0.028**	-0.144
	(1.96)	**(4.52)****	(2.48)*	**(4.55)****	**(2.74)****	(5.51)**	(2.66)**	**(6.95)****	**(0.44)**	(0.54)	**(1.05)**	(0.72)	(0.04)	**(0.84)**	**(0.13)**	(0.59)
monthly per capita expenditure (MPCE) (Rs.) (/10^6)	0.191	**0.265**	-0.151	**-0.549**	**-**	-	-	**-**	**-2.004**	-1.866	**-2.072**	-1.885	-3.2	**-2.253**	**-1.916**	-2.396
	(0.17)	**(0.25)**	(0.13)	**(0.51)**	**-**	-	-	**-**	**(1.00)**	(0.99)	**(1.02)**	(0.87)	(1.72)	**(1.24)**	**(0.97)**	(1.05)
Land Owned	0	**0**	0	**0**	**0**	0	0	**0**	**-0.003**	-0.003	**-0.005**	0.001	0	**0**	**-0.004**	0.002
	(1.23)	**(0.89)**	(1.26)	**(0.61)**	**(1.46)**	(0.93)	(1.12)	**(0.44)**	**(0.43)**	(0.49)	**(0.70)**	(0.17)	(0.05)	**(0.06)**	**(0.54)**	(0.28)
Share of Muslim	-0.218	**-0.073**	-0.036	**-0.082**	**0.152**	-0.121	-0.04	**-0.049**	**0.06**	0.041	**0.401**	-0.037	-0.868	**-0.052**	**-0.155**	-0.097
	(0.89)	**(0.75)**	(0.15)	**(0.77)**	**(0.74)**	(1.06)	(0.18)	**(0.43)**	**(0.14)**	(0.18)	**(0.97)**	(0.13)	(2.09)*	**(0.24)**	**(0.32)**	(0.35)
Mother`s Literacy	-0.522	**-0.719**	-	**-**	**-**	-	-	**-**	**-0.73**	-1.851	**-**	-	-	**-**	**-**	-
(whether mother literate)	(2.04)*	**(5.66)****	-	**-**	**-**	-	-	**-**	**(1.42)**	(9.36)**	**-**	-	-	**-**	**-**	-
Father`s Literacy	-	**-**	-0.005	**-0.556**	**-**	-	-	**-**	**-**	-	**0.316**	-1.93	-	**-**	**-**	-
(whether father literate)	-	**-**	(0.02)	**(2.95)****	**-**	-	-	**-**	**-**	-	**(0.44)**	(4.86)**	-	**-**	**-**	-
Son`s Preference Index	0.635	**0.793**	0.655	**0.945**	**0.831**	0.983	0.703	**0.969**	**0.69**	0.535	**0.819**	0.674	-0.244	**-0.008**	**0.102**	0.638

	(1.66)	**(2.64)****	(1.67)	**(3.00)****	**(2.46)***	(3.20)**	(1.86)	**(3.02)****	**(0.87)**	(0.82)	**(1.03)**	(0.87)	(0.34)	**(0.01)**	**(0.13)**	(0.78)
Number of Adults	0.038	**0.062**	0.063	**0.106**	**0.031**	0.061	0.043	**0.102**	**-0.008**	0.142	**0.032**	0.217	0.005	**0.132**	**0.078**	0.194
	(0.61)	**(1.34)**	(1.00)	**(2.18)***	**(0.57)**	(1.24)	(0.67)	**(2.00)***	**(0.06)**	(1.89)	**(0.25)**	(2.35)*	(0.04)	**(1.83)**	**(0.61)**	(2.06)*
Whether mother (or father) is literate, but has not completed primary school	-	**-**	-	**-**	**2.601**	1.241	1.365	**0.756**	**-**	-	**-**	-	-	**-2.234**	**-1.801**	-0.894
	-	**-**	-	**-**	**(6.58)****	(3.55)**	(2.95)**	**(1.89)**	**-**	-	**-**	-	-	**(0.67)**	**(0.28)**	(0.13)
Whether mother (or father) completed primary school	-	**-**	-	**-**	**-0.034**	-0.824	0.463	**-0.059**	**-**	-	**-**	-	-0.26	**-3.005**	**-0.96**	-2.561
	-	**-**	-	**-**	**(0.09)**	(2.40)*	(1.31)	**(0.19)**	**-**	-	**-**	-	(0.50)	**(0.89)**	**(0.15)**	(0.36)
Whether mother (or father) completed middle school	-	**-**	-	**-**	**0.662**	0.017	0.721	**0.189**	**-**	-	**-**	-	-1.872	**-4.268**	**-1.542**	-2.289
	-	**-**	-	**-**	**(1.31)**	(0.05)	(1.29)	**(0.50)**	**-**	-	**-**	-	(3.11)**	**(1.24)**	**(0.24)**	(0.32)
Whether mother (or father) completed secondary or higher secondary school	-	**-**	-	**-**	**-0.246**	-0.435	0.129	**0.305**	**-**	-	**-**	-	-3.707	**-4.701**	**-3.616**	-3.087
	-	**-**	-	**-**	**(0.62)**	(1.26)	(0.41)	**(1.19)**	**-**	-	**-**	-	(4.40)**	**(1.39)**	**(0.55)**	(0.44)
Whether mother (or father) completed higher education	-	**-**	-	**-**	**0.316**	0.056	0.271	**0.278**	**-**	-	**-**	-	-	**-**	**-**	-
	-	**-**	-	**-**	**(1.09)**	(0.23)	(0.94)	**(1.11)**	**-**	-	**-**	-	-	**-**	**-**	-
Whether in 1993	-0.461	**-0.599**	-0.413	**-0.64**	**-0.481**	-0.672	-0.364	**-0.645**	**-0.481**	-0.231	**-0.492**	-0.07	0.156	**0.039**	**0.234**	0.174
	(1.31)	**(2.18)***	(1.15)	**(2.21)***	**(1.51)**	(2.38)*	(1.02)	**(2.18)***	**(0.68)**	(0.38)	**(0.68)**	(0.10)	(0.24)	**(0.07)**	**(0.32)**	(0.23)
Whether in 1998	-0.476	**-0.581**	-0.507	**-0.743**	**-0.558**	-0.74	-0.482	**-0.729**	**-0.304**	-0.018	**-0.403**	0.104	0.453	**0.355**	**0.487**	0.356
	(1.37)	**(2.15)***	(1.43)	**(2.63)****	**(1.79)**	(2.64)**	(1.37)	**(2.47)***	**(0.43)**	(0.03)	**(0.57)**	(0.15)	(0.71)	**(0.63)**	**(0.65)**	(0.48)
Constant	-3.495	**-3.596**	-4.415	**-4.07**	**-4.332**	-4.804	-3.491	**-2.835**	**-7.058**	-0.9	**-8.796**	3.06	-4.81	**0**	**-5.75**	4.876
	(1.91)	**(2.44)***	(2.43)*	**(2.61)****	**(2.65)****	(2.99)**	(1.90)	**(1.72)**	**(1.56)**	(0.25)	**(1.87)**	(0.75)	(1.19)	**(.)**	**(0.77)**	(0.58)
Observations	185	**185**	185	**185**	**185**	185	185	**185**	**143**	143	**143**	143	143	**143**	143	143
Number of StRegion	64	**64**	64	**64**	**64**	64	64	**64**	**52**	52	**52**	52	52	**52**	52	52
R-squared	0.51	**-**	0.49	-	**0.64**	-	0.54	**-**	**0.91**	-	**0.9**	-	0.93	**-**	0.92	-
Hausman Test for Fixed or Random Effects*2	$Chi^2(12)$ = 11.30 Prob>chi2 = 0.5038 Random-effects		$Chi^2(12)$ = 17.95 Prob>chi2 = 0.1172 Random-effects		$Chi^2(16)$ = 80.36** Prob>chi2 = 0.0000 Fixed-effects		$Chi^2(16)$ = 23.42 Prob>chi2 = 0.1031 Random-effects		$Chi^2(13)$ = 29.94** Prob>chi2 = 0.0048 Fixed-effects		$Chi^2(14)$ = 359.83** Prob>chi2 = 0.0000 Fixed-effects		$Chi^2(15)$ = 7.69 Prob>chi2 = 0.9357 Random-effects		$Chi^2(16)$ = 31.59* Prob>chi2 = 0.01313 Fixed-effects	

Notes 1. Robust t statistics in parentheses. * significant at 5%; ** significant at 1%.

2. The choice of fixed or random effects model is based on 10 % significance of Hausman Test results. The econometric results for chosen model are shown in bold. Those not chosen by Hausman model are shown as references as a few cases are at borderlines.

Appendix 1 Estimates of Total Fertility Rate for women aged 15-49 by state and regions in India in 1992, 1998 and 2005

		URBAN			RURAL			Total		
		NFHS-1(1992)	NFHS-2(1998)	NFHS-3(2005)	NFHS-1(1992)	NFHS-2(1998)	NFHS-3(2005)	NFHS-1(1992)	NFHS-2(1998)	NFHS-3(2005)
	India	2.70	2.27	2.06	3.67	3.07	2.98	3.39	2.85	2.68
North	Delhi	3.00	2.37	2.10	NA	NA	2.50	3.02	2.40	2.13
	Haryana	3.14	2.24	2.17	4.32	3.13	2.92	3.99	2.88	2.69
	Himachal Pradesh	2.03	1.74	1.57	3.07	2.18	1.98	2.97	2.14	1.94
	Jammu & Kashmir	NA	1.66	1.63	NA	3.00	2.69	NA	2.71	2.38
	Punjab	2.48	1.79	1.88	3.09	2.42	2.06	2.92	2.21	1.99
	Rajasthan	2.77	2.98	2.21	3.87	4.06	3.62	3.63	3.78	3.21
Central	Madhya Pradesh	3.27	2.61	2.41	4.11	3.56	3.21	3.90	3.31	2.99
	Uttar Pradesh	3.58	2.88	2.91	5.19	4.31	4.06	4.82	3.99	3.76
East	Bihar	3.25	2.75	2.65	4.14	3.59	4.10	4.00	3.49	3.83
	Orissa	2.53	2.19	1.89	3.00	2.50	2.48	2.92	2.46	2.37
	West Bengal	2.14	1.69	1.59	3.25	2.49	2.54	2.92	2.29	2.27
Northeast	Arunachal Pradesh	NA	NA	2.51	4.38	2.68	3.21	4.25	2.52	3.03
	Assam	2.53	1.50	1.43	3.68	2.39	2.65	3.53	2.31	2.42
	Manipur	NA	2.36	2.35	3.03	3.41	3.07	2.76	3.04	2.83
	Meghalaya	NA	NA	2.28	3.80	5.16	4.38	3.73	4.57	3.80
	Mizoram	NA	2.37	2.50		3.47	3.33	2.30	2.89	2.86
	Nagaland	NA	NA	2.68	3.60	4.06	4.15	3.26	3.77	3.74
	Sikkim	NA	NA	1.29	NA	2.87	2.22	NA	2.75	2.02
	Tripura	NA	NA	1.66	NA	NA	2.34	NA	NA	2.22
West	Goa	1.80	1.69	1.77	1.99	1.83	1.81	1.90	1.77	1.79
	Gujarat	2.65	2.33	1.92	3.17	3.03	2.80	2.99	2.72	2.42
	Maharashtra	2.54	2.24	1.91	3.12	2.74	2.31	2.86	2.52	2.11
South	Andhra Pradesh	2.35	2.07	1.73	2.67	2.32	1.82	2.59	2.25	1.79
	Karnataka	2.38	1.89	1.89	3.08	2.25	2.19	2.85	2.13	2.07
	Kerala	1.78	1.51	1.73	2.09	2.07	2.03	2.00	1.96	1.93
	Tamil Nadu	2.36	2.11	1.70	2.54	2.23	1.90	2.48	2.19	1.80

Source: National Family Health Survey 2005-06, table 4.3, National Family Health Survey 1998-99, table 4.3.

Notes: Population figures for rural and areas are used to calculate TFR for old Bihar, Madhya Pradesh, and Uttar Pradesh. NA indicates that the data are not available.

Appendix 2 Wage Equations for male and female workers based on NSS data in 1993, 1998, and 2004 (Rural Areas)

	1993 Male wage Coef. (t value)	Female Wage Coef. (t value)	1998 Male Wage Coef. (t value)	Female wage Coef. (t value)	2004 Male Wage Coef. (t value)	Female Wage Coef. (t value)
Land Owned	0.349	-0.324	-0.452	-0.386	0.00	-0.082
	(0.98)	(4.86)**	(5.89)**	(2.75)**	(2.39)*	(8.35)**
Scheduled Tribe (ST) dummy (ST=1, otherwise=0)	-322.569	1,018.14	27.535	148.539	121.41	108.96
	(0.87)	(4.08)**	(2.32)*	(13.75)**	(9.13)**	(7.53)**
Scheduled Caste (SC) dummy (SC=1, otherwise=0)	-2,177.57	-381.166	18.872	77.975	-	-
	(7.95)**	(1.89)	(2.03)*	(8.45)**		
non-agricultural self employment dummy (non-agricultural self employment=1 otherwise)	7,216.57	2,324.92	-1,306.23	-460.104	-1,859.26	-566.23
	(10.27)**	(5.49)**	(52.30)**	(25.18)**	(68.44)**	(21.97)**
agricultural self employment dummy (agricultural self employment=1 otherwise=0)	7,899.48	5,204.41	-1,181.15	-579.812	-2,196.08	-880.79
	(15.13)**	(14.37)**	(53.85)**	(23.35)**	(69.07)**	(22.83)**
Muslim dummy(Muslim=1, otherwise=0)	746.744	185.894	29.163	-210.77	113.494	-330.9
	(1.61)	(0.46)	(2.18)*	(12.87)**	(5.59)**	(10.79)**
Age	662.822	204.695	69.715	28.053	139.625	49.933
	(8.65)**	(3.65)**	(30.66)**	(10.97)**	(37.08)**	(10.15)**
Age^2	-4.072	-1.257	-0.86	-0.359	-1.638	-0.637
	(4.17)**	(1.69)	(32.63)**	(11.03)**	(39.07)**	(10.24)**
Whether mother (or father) is literate, but has not completed primary school	**3,542.99**	**2,126.39**	**20.675**	**-98.23**	**92.081**	**-205.98**
	(12.71)**	**(7.36)****	**(1.89)**	**(7.56)****	**(5.10)****	**(8.72)****
Whether mother (or father) completed primary school	**7,518.66**	**3,208.70**	**70.519**	**-234.546**	**175.043**	**-227.04**
	(23.01)**	**(7.49)****	**(5.94)****	**(13.56)****	**(9.45)****	**(9.53)****
Whether mother (or father) completed middle school	**14,163.75**	**10,200.92**	**155.273**	**-197.743**	**360.514**	**-192.21**
	(29.57)**	**(8.09)****	**(12.13)****	**(10.15)****	**(19.49)****	**(7.37)****
Whether mother (or father) completed secondary or higher secondary school	**35,055.00**	**38,201.86**	**532.061**	**284.545**	**810.913**	**201.04**
	(56.87)**	**(26.88)****	**(36.19)****	**(12.11)****	**(33.86)****	**(5.63)****
Whether mother (or father) completed higher education	**57,151.06**	**53,253.26**	**1,091.99**	**736.177**	**1,473.09**	**1,004.51**
	(47.65)**	**(17.32)****	**(38.63)****	**(14.63)****	**(64.15)****	**(20.43)****
Constant	-2,171.00	4,216.78	-1,366.54	-954.455	-2,940.20	-1,749.97
	(1.50)	(4.18)**	(27.84)**	(17.48)**	(34.97)**	(16.65)**
Observations	33720	15849	64631	62488	67168	59221

Robust z-statistics in parentheses
* significant at 5% level; ** significant at 1% level

(Urban Areas)

	1993 Male wage Coef. (t value)	Female Wage Coef. (t value)	1998 Male Wage Coef. (t value)	Female wage Coef. (t value)	2004 Male Wage Coef. (t value)	Female Wage Coef. (t value)
Land Owned	-3.614	15.997	0.075	-0.653	0.001	-0.077
	(1.21).	(1.94).	(0.48).	(2.90)**	(1.32).	(2.36)*
Scheduled Tribe (ST) dummy (ST=1, otherwise=0)	-2,611.33	4,112.63	78.439	703.703	55.486	634.305
	(2.53)*	(3.59)**	(3.09)**	(14.20)**	(2.08)*	(11.26)**
Scheduled Caste (SC) dummy (SC=1, otherwise=0)	-4,698.31	-561.604	17.674	439.395		
	(8.11)**	(0.83).	(1.02).	(11.33)**		
non-agricultural self employment dummy (non-agricultural self employment=1 otherwise)	21,496.64	6,469.18	-2,584.54	-1,122.31	-3,658.11	-1,401.75
	(9.98)**	(5.82)**	(62.16)**	(23.35)**	(44.47)**	(22.58)**
Muslim dummy(Muslim=1, otherwise=0)	-4,223.52	149.138	-85.447	-420.463	-37.205	-523.604
	(6.55)**	(0.14).	(4.56)**	(8.31)**	(0.99).	(5.76)**
Age	1,324.95	1,030.76	189.38	113.16	315.387	212.348
	(6.99)**	(4.52)**	(49.12)**	(10.95)**	(28.86)**	(10.41)**
Age^2	-4.568	-6.226	-2.267	-1.262	-3.74	-2.49
	(1.80).	(2.10)*	(49.03)**	(10.03)**	(29.58)**	(10.00)**
Whether mother (or father) is literate, but has not completed primary school	**4,798.27**	**5,090.88**	**110.174**	**-218.989**	**173.623**	**-430.541**
	(7.49)**	**(3.58)****	**(4.77)****	**(4.49)****	**(3.81)****	**(4.71)****
Whether mother (or father) completed primary school	**6,855.26**	**6,064.43**	**115.636**	**-530.84**	**243.726**	**-595.215**
	(10.65)**	**(7.23)****	**(5.36)****	**(9.73)****	**(5.86)****	**(7.01)****
Whether mother (or father) completed middle school	**12,945.26**	**15,461.91**	**267.889**	**-574.963**	**429.975**	**-854.305**
	(20.70)**	**(10.05)****	**(13.16)****	**(10.59)****	**(11.35)****	**(9.67)****
Whether mother (or father) completed secondary or higher secondary school	**29,461.08**	**37,408.31**	**497.771**	**295.871**	**737.639**	**-231.205**
	(46.56)**	**(35.46)****	**(25.91)****	**(8.10)****	**(18.08)****	**(2.51)***
Whether mother (or father) completed higher education	**61,317.93**	**56,576.27**	**1,091.78**	**1,300.66**	**1,644.48**	**1,539.72**
	(63.86)**	**(39.31)****	**(45.37)****	**(21.14)****	**(41.56)****	**(21.16)****
Constant	-14,176.68	-13,738.35	-3,524.42	-4,121.62	-6,186.53	-6,791.28
	(4.21)**	(3.25)**	(43.42)**	(16.21)**	(26.69)**	(15.95)**
Observations	23968	5934	44205	39700	28367	24174

Robust z-statistics in parentheses
* significant at 5% level; ** significant at 1% level

Appendix 3 State-wise estimates of determinants of Fertility (based on NSS in 1993/4, 1999/2000, and 2004/5)
Dependent Variable: Proxied Fertility (Number of Unmarried Children under 15 years old of household head (Based on Robust Standard Errors)

	Andhra Pradesh			Tamil Nadu			Kerala		
	1993 Coef. (t value)	1998 Coef. (t value)	2004 Coef. (t value)	1993 Coef. (t value)	1998 Coef. (t value)	2004 Coef. (t value)	1993 Coef. (t value)	1999 Coef. (t value)	2004 Coef. (t value)
Mother`s Age	0.539	0.542	-0.08	0.588	0.447	-0.047	0.451	0.3	-0.31
	(22.43)**	(14.90)**	(3.99)**	(21.91)**	(8.99)**	(2.19)*	(10.82)**	(4.36)**	(9.81)**
(Mother`s Age)^2	-0.009	-0.009	0.001	-0.009	-0.008	0	-0.007	-0.005	0.003
	(24.07)**	(16.33)**	(2.26)*	(23.14)**	(10.33)**	(0.02)	(12.38)**	(5.89)**	(8.38)**
Scheduled Tribe (ST) dummy (ST=1, otherwise=0)	0.097	0.342	0.191	-0.06	-0.645	0.21	-0.361	0.11	-0.416
	(0.94)	(2.17)*	(2.01)*	(0.31)	(1.64)	(0.58)	(0.95)	(0.39)	(1.38)
Scheduled Caste (SC) dummy (SC=1, otherwise=0)	-0.03	0.186	0.053	0.03	0.217	-0.042	-0.012	0.694	0.482
	(0.49)	(1.97)*	(0.51)	(0.50)	(1.77)	(0.12)	(0.12)	(3.03)**	(1.55)
non-agricultural self employment dummy (non-agricultural self employment=1 otherwise)	0.193	0.008	0.5	0.188	0.228	-0.091	0.037	0.616	-0.372
	(2.09)*	(0.03)	(3.37)**	(2.15)*	(0.90)	(0.62)	(0.34)	(1.90)	(2.22)*
agricultural self employment dummy (agricultural self employment=1 otherwise=0)	0.141	0.2	0.575	0.343	0.267	0.035	-0.067	0.615	-0.236
	(1.57)	(1.11)	(3.76)**	(3.61)**	(1.25)	(0.24)	(0.53)	(2.25)*	(1.31)
Mother`s Wage	**0.00001**	**-0.00025**	**-0.001**	**0.000025**	**-0.0001**	**-0.0003**	**0.0002**	**-0.0004**	**0.0001**
	(1.12)	**(1.33)**	**(4.38)****	**(3.07)****	**(0.53)**	**(2.90)****	**(1.39)**	**(1.35)**	**(0.87)**
Father`s Wage	**-0.00001**	**0.00001**	**0.0003**	**0.00001**	**0.00008**	**0.00003**	**-0.00001**	**0.003**	**-0.0002**
	(1.30)	**(0.58)**	**(3.61)****	**(2.88)****	**(0.53)**	**(0.47)**	**(1.23)**	**(2.56)***	**(2.44)***
Land Owned	**-0.004**	**-0.008**	**-0.001**	**-0.006**	**-0.006**	**-0.001**	**-0.006**	**-0.006**	**-0.002**
	(4.38)**	**(7.10)****	**(9.83)****	**(5.62)****	**(3.86)****	**(5.37)****	**(2.45)***	**(1.90)**	**(3.88)****
Muslim dummy(Muslim=1, otherwise=0)	0.391	0.811	0.329	0.514	0.573	0.098	0.745	0.677	0.837
	(4.85)**	(7.07)**	(3.18)**	(5.44)**	(3.76)**	(0.71)	(8.80)**	(4.37)**	(8.74)**
Whether mother is literate, but has not completed primary school	**-0.326**	**-0.501**	**-0.338**	**-0.123**	**-0.066**	**-0.138**	**-0.136**	**-0.159**	**-0.129**
	(3.76)**	**(4.42)****	**(3.57)****	**(1.57)**	**(0.46)**	**(1.55)**	**(0.89)**	**(0.55)**	**(0.76)**
Whether mother completed primary school	**-0.261**	**-0.337**	**-0.424**	**-0.118**	**-0.04**	**-0.126**	**-0.313**	**-0.724**	**-0.314**
	(2.88)**	**(2.71)****	**(4.73)****	**(1.59)**	**(0.28)**	**(1.60)**	**(2.11)***	**(2.63)****	**(2.08)***
Whether mother completed middle school	**-0.338**	**-0.405**	**-0.459**	**-0.404**	**-0.097**	**-0.359**	**-0.322**	**-0.427**	**-0.274**
	(1.95)	**(3.02)****	**(4.42)****	**(3.10)****	**(0.64)**	**(3.89)****	**(1.40)**	**(1.61)**	**(1.80)**
Whether mother completed secondary or higher secondary school	**-0.695**	**-0.124**	**-0.226**	**-1.216**	**-0.075**	**-0.212**	**-0.842**	**0.082**	**-0.144**
	(1.59)	**(0.96)**	**(2.18)***	**(3.92)****	**(0.50)**	**(2.04)***	**(1.37)**	**(0.30)**	**(0.88)**
Whether mother completed higher education	**-1.205**	**0.143**	**0.411**	**-1.883**	**-0.076**	**0.155**	**-1.171**	**0.458**	**-0.286**
	(1.85)	**(0.49)**	**(1.97)***	**(3.99)****	**(0.23)**	**(0.92)**	**(1.29)**	**(1.09)**	**(1.25)**
Whether father is literate, but has not completed primary	**-0.13**	**0.185**	**-0.125**	**0.199**	**-0.098**	**0.014**	**0.038**	**-0.259**	**-0.179**

school									
	(1.83)	**(1.70)**	**(1.54)**	**(2.60)****	**(0.65)**	**(0.16)**	**(0.24)**	**(0.87)**	**(1.13)**
Whether father completed primary school	**-0.11**	**-0.196**	**-0.126**	**0.245**	**-0.074**	**-0.004**	**-0.147**	**-0.159**	**-0.224**
	(1.27)	**(1.94)**	**(1.70)**	**(3.30)****	**(0.53)**	**(0.05)**	**(0.96)**	**(0.57)**	**(1.50)**
Whether father completed middle school	**-0.098**	**-0.056**	**-0.388**	**0.301**	**0.003**	**0.062**	**-0.249**	**-0.347**	**-0.186**
	(0.86)	**(0.50)**	**(4.58)****	**(3.15)****	**(0.02)**	**(0.70)**	**(1.40)**	**(1.24)**	**(1.25)**
Whether father completed secondary or higher secondary school	**-0.089**	**-0.363**	**-0.414**	**0.532**	**-0.131**	**-0.025**	**-0.115**	**-0.704**	**-0.34**
	(0.43)	**(2.84)****	**(3.84)****	**(3.21)****	**(0.78)**	**(0.24)**	**(0.38)**	**(2.30)***	**(1.91)**
Whether father completed higher education	**-0.039**	**-0.622**	**-0.702**	**0.728**	**-0.193**	**-0.089**	**0.179**	**-1.271z**	**-0.004**
	(0.10)	**(2.94)****	**(4.72)****	**(2.37)***	**(0.78)**	**(0.64)**	**(0.35)**	**(3.02)****	**(0.02)**
rural sector dummy (rural=1 urban=0)	-0.117	0.452	0.942	0.05	0.282	0.604	0.206	0.673	0.042
	(1.43)	(1.43)	(3.71)**	(0.65)	(0.78)	(3.09)**	(1.78)	(1.45)	(0.17)
Son`s Preference Index	0.3	0.312	1.819	0.271	0.332	1.732	0.203	0.344	1.769
	(15.84)**	(8.70)**	(29.71)**	(12.68)**	(8.20)**	(27.88)**	(7.34)**	(5.94)**	(21.15)**
Number of Adults	-0.136	-0.075	0.131	-0.153	-0.21	-0.003	-0.234	-0.204	0.097
	(6.36)**	(2.72)**	(5.50)**	(7.63)**	(6.14)**	(0.14)	(7.62)**	(5.06)**	(3.46)**
Constant	-6.191	-6.789	0.761	-7.329	-4.962	1.36	-4.453	-2.783	7.443
	(16.79)**	(9.64)**	(1.52)	(17.44)**	(5.17)**	(2.72)**	(6.25)**	(1.86)	(9.72)**
Observations	6507	4598	5315	5527	2498	4514	2528	1185	3019

Robust z statistics in parentheses
* significant at 5%; ** significant at 1%

	West Bengal			Orissa			Bihar		
	1993 Coef. (t value)	1998 Coef. (t value)	2004 Coef. (t value)	1993 Coef. (t value)	1998 Coef. (t value)	2004 Coef. (t value)	1993 Coef. (t value)	1998 Coef. (t value)	2004 Coef. (t value)
Mother`s Age	0.666	0.654	0.161	0.61	0.543	0.022	0.617	0.633	0.146
	(39.09)**	(27.99)**	(8.47)**	(18.29)**	(13.47)**	(0.92)	(30.36)**	(23.66)**	(7.24)**
(Mother`s Age)^2	-0.01	-0.009	-0.002	-0.009	-0.008	0	-0.009	-0.009	-0.002
	(40.62)**	(29.77)**	(8.79)**	(19.27)**	(14.55)**	(1.58)	(31.09)**	(24.71)**	(7.18)**
Scheduled Tribe (ST) dummy (ST=1, otherwise=0)	0.271	0.086	-0.443	0.002	0.373	0.277	0.138	0.175	-0.279
	(1.33)	(0.35)	(2.01)*	(0.02)	(3.05)**	(3.52)**	(1.45)	(1.38)	(3.18)**
Scheduled Caste (SC) dummy (SC=1, otherwise=0)	-0.123	0.25	0.612	-0.1	0.361	-0.172	0.088	0.18	0.367
	(2.29)*	(3.25)**	(2.75)**	(1.09)	(3.36)**	(1.94)	(1.34)	(1.99)*	(3.75)**
non-agricultural self employment dummy (non-agricultural self employment=1 otherwise)	0.525	0.483	0.559	0.219	0.339	(0.85)	0.445	0.469	0.753
	(6.27)**	(2.35)*	(3.64)**	(1.82)	(1.33)	0.181	(4.41)**	(2.20)*	(4.60)**
agricultural self employment dummy (agricultural self	0.5	0.318	0.588	0.343	0.27	0.135	0.422	0.161	0.581

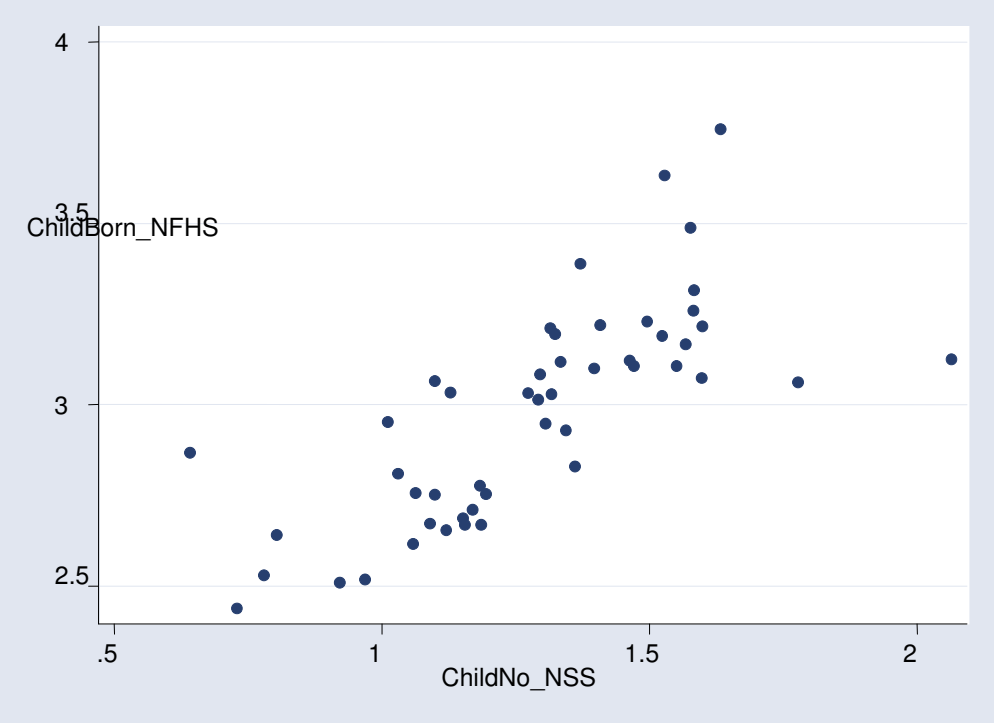
employment=1 otherwise=0)									
	(6.70)**	(1.68)	(3.80)**	(2.86)**	(1.35)	(0.63)	(4.77)**	(0.96)	(3.44)**
Mother`s Wage	**0.000016**	**-0.00004**	**-0.008**	**-0.0001**	**-0.0006**	**-0.0005**	**-0.00001**	**-0.001**	**-0.0008**
	(1.31)	**(2.18)***	**(7.16)****	**(0.09)**	**(2.70)****	**(3.37)****	**(0.39)**	**(4.71)****	**(6.32)****
Father`s Wage	**0.00002**	**0.0003**	**0.0004**	**-0.0001**	**0.0003**	**0.0002**	**-0.00001**	**0.0005**	**0.0004**
	(3.90)**	**(1.66)**	**(5.19)****	**(1.07)**	**(1.76)**	**(1.41)**	**(1.82)**	**(3.18)****	**(5.10)****
Land Owned	**-0.01**	**-0.01**	**-0.002**	**-0.007**	**-0.006**	**-0.001**	**-0.006**	**-0.011**	**-0.001**
	(9.04)**	**(2.46)***	**(9.25)****	**(4.01)****	**(3.18)****	**(7.96)****	**(5.34)****	**(6.58)****	**(10.46)****
Muslim dummy(Muslim=1, otherwise=0)	0.589	0.723	0.135	0.981	1.067	0.837	0.751	0.601	-0.009
	(10.25)**	(7.78)**	(1.66)	(3.85)**	(4.04)**	(2.58)**	(10.66)**	(5.35)**	(0.10)
Whether mother is literate, but has not completed primary school	**-0.156**	**-0.372**	**-0.537**	**0.061**	**-0.221**	**-0.319**	**-0.011**	**-0.121**	**-0.459**
	(1.60)	**(2.94)****	**(4.62)****	**(0.54)**	**(1.89)**	**(3.44)****	**(0.10)**	**(0.94)**	**(4.51)****
Whether mother completed primary school	**-0.101**	**-0.531**	**-0.581**	**-0.073**	**-0.069**	**-0.293**	**0.124**	**-0.313**	**-0.589**
	(1.06)	**(4.44)****	**(6.77)****	**(0.48)**	**(0.44)**	**(2.54)***	**(0.87)**	**(1.90)**	**(5.32)****
Whether mother completed middle school	**-0.356**	**-0.668**	**-0.807**	**-0.004**	**-0.434**	**-0.42**	**0.013**	**-0.464**	**-0.707**
	(1.95)	**(5.19)****	**(8.34)****	**(0.02)**	**(2.73)****	**(3.67)****	**(0.07)**	**(2.78)****	**(6.33)****
Whether mother completed secondary or higher secondary school	**-1.182**	**-0.532**	**-0.863**	**-0.204**	**-0.072**	**-0.225**	**0.018**	**-0.162**	**-0.512**
	(2.56)*	**(4.44)****	**(7.69)****	**(0.28)**	**(0.42)**	**(1.49)**	**(0.04)**	**(1.06)**	**(4.30)****
Whether mother completed higher education	**-1.96**	**-0.531**	**0.246**	**-0.341**	**-0.141**	**0.853**	**-0.664**	**0.35**	**0.119**
	(2.89)**	**(1.94)**	**(1.40)**	**(0.32)**	**(0.41)**	**(3.23)****	**(0.91)**	**(1.13)**	**(0.54)**
Whether father is literate, but has not completed primary school	**0.173**	**-0.051**	**-0.246**	**0.186**	**0.136**	**0.131**	**0.277**	**0.116**	**0.091**
	(2.35)*	**(0.51)**	**(2.54)***	**(1.96)**	**(1.20)**	**(1.46)**	**(3.24)****	**(1.21)**	**(1.04)**
Whether father completed primary school	**0.245**	**0.012**	**-0.253**	**0.266**	**-0.14**	**0.04**	**0.364**	**-0.076**	**-0.164**
	(3.03)**	**(0.13)**	**(3.53)****	**(1.93)**	**(0.90)**	**(0.41)**	**(3.47)****	**(0.63)**	**(1.85)**
Whether father completed middle school	**0.515**	**0.021**	**-0.339**	**0.46**	**-0.096**	**-0.236**	**0.488**	**-0.108**	**-0.108**
	(4.71)**	**(0.24)**	**(4.70)****	**(2.75)****	**(0.73)**	**(2.33)***	**(3.94)****	**(1.03)**	**(1.26)**
Whether father completed secondary or higher secondary school	**0.867**	**-0.234**	**-0.61**	**0.416**	**-0.213**	**-0.324**	**0.684**	**-0.338**	**-0.123**
	(3.86)**	**(2.11)***	**(6.09)****	**(1.24)**	**(1.29)**	**(2.04)***	**(2.69)****	**(2.55)***	**(1.12)**
Whether father completed higher education	**1.534**	**-0.535**	**-0.992**	**0.365**	**-0.266**	**-0.64**	**1.083**	**-0.905**	**-0.622**
	(3.75)**	**(2.84)****	**(7.20)****	**(0.61)**	**(0.98)**	**(2.77)****	**(2.37)***	**(3.95)****	**(3.79)****
rural sector dummy (rural=1 urban=0)	-0.214	0.894	1.71	0.039	1.035	1.047	-0.187	1.592	1.6
	(2.54)*	(3.08)**	(8.01)**	(0.26)	(2.85)**	(3.50)**	(1.65)	(4.98)**	(6.59)**
Son`s Preference Index	0.226	0.326	1.904	0.284	0.39	1.856	0.239	0.273	1.956
	(13.11)**	(11.00)**	(29.57)**	(10.48)**	(11.75)**	(24.89)**	(11.47)**	(9.79)**	(28.08)**
Number of Adults	-0.125	-0.124	0.104	-0.129	-0.139	0.041	-0.171	-0.161	0.115
	(10.90)**	(8.34)**	(6.74)**	(5.56)**	(5.46)**	(2.04)*	(10.08)**	(7.97)**	(6.35)**

Constant	-8.343	-9.551	-3.668	-7.63	-8.148	-0.814	-7.863	-10.212	-3.743
	(28.61)**	(16.35)**	(7.65)**	(13.56)**	(9.77)**	(1.32)	(22.21)**	(16.31)**	(7.31)**
Observations	9337	6685	9157	3055	2088	3574	6705	4837	6809

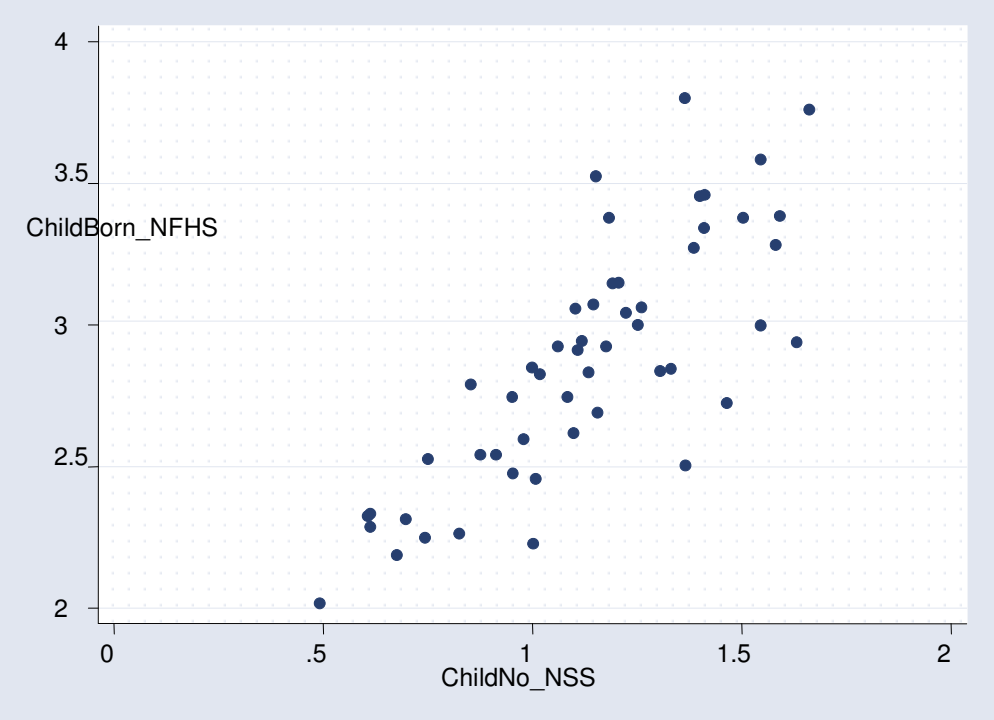
Robust z statistics in parentheses. * significant at 5%; ** significant at 1%

Appendix 4 Relationship of the number of children (of the household head and spouse under 15) in NSS and the number of children (a mother bears) in NFHS aggregated at state level for rural and urban areas

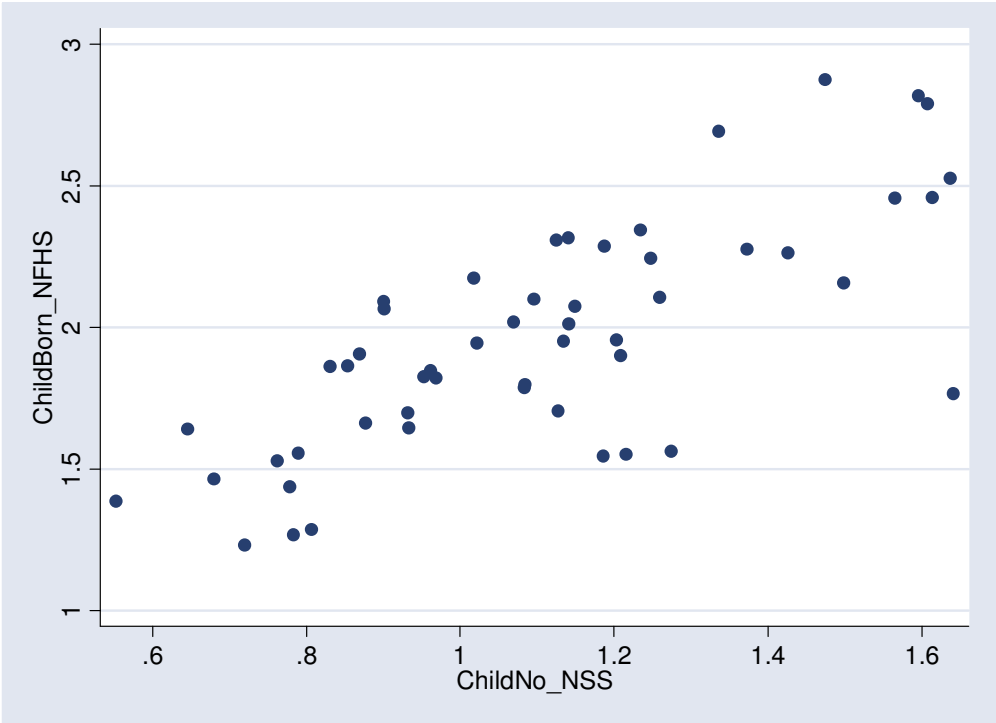
(1) NSS 50th round in 1993/4 and NFHS-1 in 1992/3



(2) NSS 55th round in 1999/2000 and NFHS-1 in 1998/9



(3) NSS 61st round in 2004/5 and NFHS-1 in 2005/6



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