Mothers' Work Patterns, Contribution to School Activities and Children's Cognitive Development: Evidence from the India Human Development Survey

Feinian Chen
Kriti Vikram
Sonalde Desai

Department of Sociology
University of Maryland, College Park

Abstract

Using data from the India Human Development Survey (IHDS) of 2004-5, we investigate the link between maternal employment, their contributions to children's school activities and children's cognitive development. Two main contributions of this paper include the development of a work pattern typology that goes beyond standard measures of employment and the use of rich survey data that contain both direct assessment of child outcomes and parental inputs into child rearing. We find that the diverse work patterns of mothers have implications for both their involvement with school activities and their children's cognitive development. We also document mothers' school involvement as an important pathway that links maternal employment and children's learning outcomes.

As increasing female labor force participation becomes a global trend, a great deal of public and scholarly attention has been paid to the effects of maternal employment on children's development around the world. However, despite the vast number of studies on the topic, the direction and the strength of the relationship between maternal employment and children's development prospects, remains a topic of open debate. Three aspects of this relationship add to this debate: (1) In the context of developing countries, women's employment takes many forms including work in informal sector and combination of a range of income-generating activities, some that are compatible with child care and others that are not (Lloyd 1991; Mason and Palan 1981); (2) Maternal employment has both positive and negative consequences for investments in children. Employment may pose demands on women's time that compete with child care, but at the same time, it may result in income, reduce fertility and create a sense of self-efficacy that may increase overall investments in children. It has been suggested that income in hands of women is more likely to result in child focused investments that income in hands of men (Dwyer and Bruce 1988); (3) While maternal employment may shape direct investments in children, the role of these investments in shaping children's education and learning outcomes depends on a variety of contexts including inputs from school. How these various positive and negative influences are balanced remains an empirical question. For example, maternal employment may well reduce the amount of time a mother is able to devote to supervising children's homework, but if the added income increases the likelihood of private school enrollment or ability to obtain private tutoring, this may well make up for her own reduced input.

Tracing these diverse influences is particularly important in rapidly developing economies such as India. Hence, using data from the India Human Development Survey (IHDS) of 2004-5, we investigate the link between maternal employment, their contributions to children's school activities and children's cognitive development. Two main contributions of this paper include development of a work pattern typology that goes beyond standard measures of employment (e.g. working vs. not working or occupational classification) to highlight diversity of women's work experiences in a changing economy, particularly within the agricultural sector, and use of rich survey data that contain both direct assessment of child outcomes and parental inputs into child rearing to trace the mechanisms that link maternal employment with child outcomes.

Specifically, we ask the following research questions: 1) Does maternal employment reduce investments in children in terms of time devoted to children's education? 2) Does this reduction depend on the type of work mothers do? Is some type of work far less compatible with child specific investments than other? 3) To what extent does this reduction (if any), translate into child outcomes? Our research sheds light on the intricate process of how maternal employment may influence the process of childhood development.

Maternal Employment and Child Outcomes

Does maternal employment compromise or enhance her child's development? Theoretically both directions of the relationship are plausible. From a time constraint perspective, since hours spent on work cannot be devoted to other activities, it is assumed that working leads to some reduction in women's time with children, reflecting a role incompatibility between the role of a worker and a nurturer. In terms of psychological mechanisms, it is possible

that stress or fatigue associated with employment may affect women's interactions with children, resulting in an unfavorable change in the home environment. Others are concerned that maternal employment outside the home weakens the parent-child relationship and so called family social capital, which could negatively affect children's well-being (Coleman 1988). On the other hand, it is easy to perceive many benefits of maternal employment. Maternal employment could bring additional resources to the family, enhance her autonomy and sense of well-being, and consequently benefit the children as a result.

Empirical literature on the topic of maternal employment and child well- being is extensive but generally inconclusive. Whether maternal employment has any detrimental, beneficial or no effect seems to hinge on a range of factors. Just to name a few: the developmental context, children's life stage of and measurement of child outcomes, the definition and timing of maternal employment, family economic well-being as well as other family/household characteristics.

Among these constellations of factors and mechanisms, how mothers' work is characterized is of tremendous importance in developing country settings. Although much research has been conducted on maternal employment and its impact on cognitive outcomes, less attention has been paid to how maternal employment is measured. Standard measures of work, e.g., working versus not working, full time versus part time work, formal versus informal work, or standard occupational classification, often fail to give an accurate assessment of mothers' work load. In rural, less industrialized settings, a large majority of women are engaged in income earning activities outside of the formal sector and often combine them together. Without taking into account of these multiple activities, it is difficult to gauge their time demands on mothers and the subsequent implications for children's development.

Previous work has either treated maternal employment as a dichotomous variable or has captured intensity of work as hours spent on the job, the common distinctions being between working full time and part time (Brooks-Gunn, Han and Waldfogel 2002; Waldfogel, Han and Brooks-Gunn 2002; Cooksey, Joshi and Verropoulou, 2009). Certain researchers have looked beyond these categories of maternal employment and have focused on the nature of employment such as its complexity using complexity scores (Parcel and Menaghan 1994; Joshi, Cooksey and Verropoulou, 2009). In the developing regions of the world, there is also an increased emphasis on capturing the complexity of women's employment by distinguishing between multiple work activities (Lloyd 1991; Desai and Jain 1994; and Donahoe 1999). More recently, Short, Chen, Entwisle and Fengying (2002) have nuanced the understanding of how maternal employment influences child outcomes by demonstrating how wage as well as non-wage work influence time spent on child care. Few researchers have made distinctions among nonwage workers, but Short (2002) et al. demonstrate the importance of recognizing multiple economic activities and its consequences for both work-child care compatibility and work intensity in China. In India, like in China, a vast majority of women continue to live in rural areas and engage in economic activities outside of the wage and salary sector such as agricultural work on family owned farms and sideline activities such as animal care or running a family business.

Research Significance and Hypotheses

We make significant contributions to the study of maternal employment and child development on several fronts. First, we begin with a new typology of work patterns that highlights a range of income earning activities and a combination of these activities. Second, instead of testing all the possible relevant mechanisms that maternal employment can affect child development, we focus a dimension that is often overlooked in the literature (mostly due to data unavailability), that is, mother's actual involvement with school related work, in terms of supervision of homework and involvement in parent-teacher-associations (PTAs). We hypothesize that it is an important pathway for mothers to influence the child development process.

We hypothesize that the nature of different types of work means that they have different claims on a woman's time. For example, for someone who has a salaried job, she is most likely to work away from home and has little flexibility in scheduling. At the same time, the schedule is often fixed and predictable and makes it easy to plan activities around work. For someone who engages in agricultural wage work, or animal husbandry, the location of work is typically close to home and probably offers flexibility in scheduling. However, work hours can be long and physically demanding. For those women who combine some of these activities together, work hours can be extended, and the fatigue and stress induced by juggling these multiple activities can take a toll on their time and energy, and leave little room to be involved in homework supervision and PTA activities.

Apart from the time constraint that maternal employment imposes, we expect that the resource it brings to the family has a positive influence on children development. Thus, we hypothesize that the effect of mothers' work typology on children's learning outcome (reading, writing, math) is attenuated once the pathway (via involvement in school work), maternal characteristics and family SES are controlled.

Data and sample

The IHDS is a nationally representative survey of 41,554 urban and rural households. It covers all states and union territories of India – with the exception of Andaman/Nicobar and Lakshadweep. These households are spread across 33 states and union territories, 384 districts, 1503 villages and 971 urban blocks located in 276 towns and cities. This survey was jointly organized by researchers from University of Maryland and National Council of Applied Economic Research, New Delhi and funded by the National Institute of Child Health and Human Development. The survey was translated into 13 Indian languages and administered by pairs of local interviewers; women respondents were interviewed by women interviewers whenever possible. This survey was specially designed to capture diversity of women's work patterns and interviewers were trained to ensure that women's work in household enterprises and family farms is appropriately captured along with their market work. Most importantly, the IHDS incorporates the direct measurement of reading, writing, and arithmetic skills of children aged 8–11 along with parental inputs into children's education. The test data we have available to us are quite unique, particularly since they are combined with a wealth of household and contextual characteristics.

In all 12,345 children were administered the arithmetic test; 12,394 children were administered the reading test and 12,249 were administered the writing test. The sample includes children between the ages of 8 to 11 who were administered the cognitive tests and includes information about their parents as well as the household. Excluding children who are not currently enrolled in schools or any other academic institution and who have missing data on independent and control variables, the final analytic sample for consists of 8,360 children.

Mother's Involvement with School-related Activities

We begin with two dependent variables, which represent the pathways that potentially link maternal employment with children's cognitive outcomes. We first use a dichotomous variable that indicate whether women supervised their children's homework. The second measure is whether the woman has participated in school committees like parent teacher associations.

Cognitive Ability Skills

A major innovation of this survey was to conduct short assessments of reading, writing and arithmetic skills for children aged 8-11. Conducting educational assessment in developing countries – particularly India -- is difficult for a variety of reasons: children's abilities vary tremendously and an instrument must capture children at both ends of the distribution; tests must be translated in many different languages with similar difficulty levels; the instrument must be simple and intuitive so that interviewers can administer it easily and it would not frighten children who are not used to standardized tests. Luckily, the IHDS research team was able to work with Pratham, a non-governmental organization that has worked in the field of elementary education for many years. They have developed simple assessment tools to measure the effectiveness of their training programs and administered these tools to over 250,000 children in their nationwide survey reported in Annual Status of Education Report 2005 (Pratham 2005). These tests were included in the IHDS and allow us to measure whether a child is not able to read at all, or is able to read letters, words, sentences, paragraphs or stories. Simple addition, subtraction, multiplication and division problems were also developed.

Interviewers were trained extensively by Pratham volunteers using specially developed films so that they could differentiate between a child's shyness and inability to read. They were also taught how to develop rapport with children. Tests were developed in 12 Indian languages as well as English and children were asked to take the test in whichever language they were most the comfortable.

In all the IHDS sample consists of 17,117 children aged 8-11. Reading and arithmetic tests were administered to 72% of the children aged 8-11. Children may not be tested for two reasons: (1) Interviewers were explicitly instructed to obtain parental consent as well as assent from children for testing and were asked not to pressurize children who were reluctant; and, (2) Since the household survey was the main focus of this study, the administration of the reading and arithmetic skills was left to the end. We suspect that household fatigue as well as interviewer fatigue may have played a role in missing skill testing. Results not shown here also suggest that children who are currently not enrolled are the least likely to be tested (Desai et al. 2010).

The reading skills are divided into five categories: cannot read at all, can read letters, can

read words, can read a short paragraph, and can read a short story. The results presented in Figure 1(a) show that 9.26 per cent of the children in our sample cannot recognize letters, 13.45 per cent recognize letters but cannot read words, 21.6 per cent can read words but not connect them into sentences, 22.4 per cent can read simple two to three sentence paragraphs but not a one-page story, and 34.1 per cent can read a one-page story. Because 95 per cent of the children tested completed at least Standard 1 and 65 per cent completed Standard 2, they are generally expected to be able read at least a simple paragraph with three sentences.

The arithmetic skills are divided into four categories: no recognition of written numbers, can read numbers, can subtract a two-digit number from another two-digit number, and can divide a three-digit number with a one digit number. The results presented in Figure 1(b) show that in our sample of eight to eleven year old children, 16.52 per cent cannot identify numbers between 10 and 99, 32.9 per cent can identify numbers only, a further 27.4 per cent can subtract two-digit numbers with borrowing but cannot divide numbers, and 23.2 per cent can divide as well as subtract. Again, two-digit subtraction is considered to be a basic numerical skill that eight to eleven year olds should have. Thus, in all subsequent discussion, we focus on this skill as the basic arithmetic skill.

In terms of writing, eight to eleven year olds are expected to be able to write a simple sentence—such as, 'My mother's name is Madhuben'—with two or fewer mistakes. About 70 per cent of the kids were able to do this (See Fig. 1c) in this sample.

Typology of Work Patterns

The IHDS is one of the rare surveys in India to collect information on income as well as employment. The survey began by asking about different sources of household income. The respondents were then questioned about which household members participated in each of those activities and what their level of their participation was. For example, the IHDS asked whether the household owned any animals and, if so, who took care of these animals. Whether the household engaged in farming or gardening in the past year and, if so, who worked on these farms, and how many days and hours they worked.

Using this information, we broadly create six categories of types of employment (See Fig. 2b). These categories are not mutually exclusive and include: work on own farm (32.5%), farm wage (17%), non-farm wage (5%), salaried workers (4.4%), animal care (39.5%) and business (5.8%). Overall, 65 % of the women are categorized as working for this sample (see Fig. 2a). This is higher than other Indian estimates because it has explicitly measured and included "animal care" which yields higher work participation rates. This combination of information from different streams of activity draws a holistic picture of the work undertaken by all individuals in the household in the preceding year.

We take these categories and create a typology for female employment that encompasses not only the type of work but also its intensity. Since how maternal employment is categorized is hypothesized to influence involvement in children's school activities and subsequently cognitive outcomes, we create categories that go beyond simplistic conventional measures. We develop a work pattern typology that highlights key aspects of women's work in India (see Fig. 2c). The employment pattern distinguishes between those with a single job and those with multiple jobs.

Within those with one job, the nature of work is an important aspect and is captured by these mutually exclusive categories - work on own farms (6.1%), earning a farm wage (5.8%), earning a non-farm wage (2.9%), engaging in sideline work (14.74%) that includes work with animals and on household non-farm businesses and are usually non-wage activities and lastly salaried work (3.3%). We expect that those workers who exclusively work on family farms have greater freedom with respect to time spent on childcare as compared to those that earn a farm wage or engage in other wage work. Those who exclusively earn a non-farm wage work engage in a variety of jobs such as construction work and work in the tobacco industry. It also includes skilled work such as tailoring, carpentry and nursing. Sideline work includes those who either exclusively engaged in household businesses and those who exclusively tend to animals. Sidelines, which may include gardening, tending chickens, or running a small shop, tend to be more compatible with childcare than fieldwork because they are more often home-based. Exclusively salaried work includes people who are paid a salary (i.e. paid monthly) and includes a wide spectrum of work such as professional work as well as service sector employees such as cooks. Salaried workers are the most highly educated and are the best off economically (See Table. 3).

The second set of categories includes those who have combined two or more jobs. We include those categories with a substantial number of cases. One category contains those women who combine own farm work and other jobs (excluding farm wage) and contain 16.5% of the sample. This category includes those who work on their own farms and combine it with one another job – own farm and non-farm wage, own farm and salaried work, own farm and business and own farm and animal work. Another category includes those who combine work on their farm with agricultural wage work –own farm and farm wage (7.1%). A third job category includes those who combine farm wage with sideline work -- farm wage and animal work and farm wage and business. A last category includes all those who combine two and three jobs but are not included in the earlier classifications (6%).

We expect that among women who engage in certain jobs such as wage work and those that combine jobs together, particularly for those who work in the agricultural sector will have less time to invest in school related activities and hence their children are more likely to have poorer cognitive outcomes. We think the work pattern variables are useful, because it goes beyond the usual socioeconomic status or maternal education measures, in that it also captures the intensity of the mother's work, which may limit their time and investment on children.

Control Variables

Maternal Education The education of the mother is measured as the highest number of years of education completed as reported by the head of the household. The education of the mother is of interest, since they are in a position to influence the learning of children by way of revision, preparation for exams, interest in and interaction with school activities and participation in parent-teacher meetings among others. Education is also associated with maternal employment (see table 3) and is thus a confounding variable.

Housing We include an index of housing amenities ranging from 0 to 7, which includes piped indoor water, separate kitchen, flush toilet, LPG, electricity, wall type, floor type and roof type that reflect a household's long term economic well-being. This indicator was chosen since it is less likely to be associated with a women's earning since a women was most likely married into

this household. A more detailed household asset score might be associated with maternal employment as she is likely to contribute to other aspects of the standard of living.

Caste and Religion The caste and religion of the family is included in the model. It is well-established that educational access and opportunities in India are stratified by social caste and religion. Children from socially disadvantaged groups such as lower-castes and tribes are less likely to complete schooling and perform worse-off compared to higher-caste children in learning achievement tests (Desai and Kulkarni 2008). Forward caste (22.3 %) have been treated as the reference category for caste. The caste categories include Brahmin (5.7%), other backward castes (42.1%), scheduled castes (23.7%) and scheduled tribes (6.3%). Hindus have been treated as the reference category (81%) for religious groups. Muslims (13 %), Christians (1.7%) are the other categories included.

Family demographic variables include the number of children and the number of people in the household. More children (sibling or cousins) may mean competition for parents' attention. The presence of grandparents has been included as a control and indicates the presence of additional caregivers. We also include the child's age and sex as control variables. We expect child's age to be positively associated with cognitive scores and since girls are disadvantaged in India, we expect that they would have lower scores.

Methods

For the dichotomous dependent variables (supervision of homework, participation in school committees, and writing skills), we use logit regression models. Since two of our outcome variables are ordinal (math and reading skills), they are modeled using ordinal logit regression, which takes the following form:

$yi^* = xi\ \beta + \varepsilon i$

$yi = m$ if $\tau m\text{-}1 \leq yi^* < \tau m$ for $m = 1$ to J

Ordinal logit models are particularly suited to phenomena that contain measurement errors. In this case, the interviewers were specifically trained to distinguish between students at varying levels of reading and mathematical ability but nonetheless, the same student may well be classified by one interviewer as being able read letters and not words and by another interviewer as being able to put the letters together in words. So the outcome variable is better classified as a propensity to read rather than a specific skill level.

In the first step, we look at mother's involvement with school related work, in terms of supervision of homework and involvement in school committees like parent-teacher-associations (PTAs). We hypothesize that it is an important pathway through which mothers influence the child development process.

We use two dependent variables indicating supervision of homework and participation in school committees. With respect to the independent variable, we start with a simple dichotomy indicating the work status of women. In the second model, detailed work typologies are introduced. In the third step, socioeconomic controls i.e. maternal education and housing quality are added to the equation. The final model includes controls for age and sex of the child, caste and religious group variables, state dummies and family demographic controls.

In the second step, we use multivariate ordinal logistic or logistic regression in our analysis, separately for each of the three dependent variables (cognitive scores). Our base models consist of regressing employment status on the dependent variables, followed by a model that includes detailed employment typologies instead. In the third model, pathway variables -- supervision of homework and participation in school committees are added to the second model with work typologies. We then add socioeconomic controls to the equation in Model 4 and in the final model we include the remaining background and demographic controls.

Results

Involvement with School Committees Maternal employment is negatively associated with participation in school committees like PTA. Bivariate relationship shows that maternal employment reduces the log odds of participation in school committees by 0.758 (see Table 4a) as compared to unemployed women. In the second step we use a more detailed employment typology instead of a dichotomous variable for maternal employment. The log odds of participation in PTA decreases by .393 for women who work only on their own farms as compared to women who are not employed holding all the other variables constant. Similarly, the log odds of PTA participation decreases by 1.096 for women who earn only farm wage, by .639 for women who engage only in sideline work (animal and non-farm business), by .412 for non-farm wage earners as compared to women who are not employed holding all the other variables constant. The log odds of participation in school committees decreases by .656 for women who combine work on own farm with other work (excluding a farm wage) as compared to women who are not employed holding all the other variables constant. The log odds of participation decreases by .576 for women who combine only own farm and farm wage, by .914 for those who combine farm wage with other activities such as sideline work and by .825 for women who engaged in two or three jobs not included in the other categories as compared to women who are not employed holding all the other variables constant.

Controlling for housing quality and maternal education makes five employment categories non-significant - only own farm work, only non-farm wage, only own farm and others, only own farm and farm wage, and only farm wage and others. Only farm wage and sideline work are associated with reduced log odds of participation in single job categories. Only the residual category of two or three jobs is negatively associated with participation among the multiple job categories. The coefficients for these two categories are reduced in this model as compared to those in model 2. The two socioeconomic controls, housing quality and maternal education are significantly and positively associated with supervision.

This perhaps indicates that the low participation of two and three jobholders in school committees is a reflection of their low socio-economic status. Farm wage earners and sideline workers continue to be disadvantaged probably because of their time constraints. In the last model where all the controls are introduced, four employment categories remain significant. Work on own farms is negatively associated with PTA participation and so is only farm wage work. Among multiple jobs categories, own farm and others as well as residual category are negatively associated with the dependent variables. The socio-economic controls, sex of the child, belonging to scheduled castes and tribes as compared to forward caste categories and eleven state dummies (of twenty one) continue to be significant in the last model.

Supervision of Homework Maternal employment is negatively associated with supervision of homework. Bivariate relationship shows that maternal employment reduces the log odds of supervision by 0.774 (see Table 4b) as compared to unemployed women. Using the more detailed employment typologies instead of a dichotomous variable for maternal employment shows some interesting results. The log odds of supervising homework decreases by .675 for women who work only on their own farms as compared to women who are not employed holding all the other variables constant. Similarly, the log odds of supervising homework decreases by .574 for women who earn only farm wage, by .666 for women who engage only in sideline work (animal and non-farm business), by .699 for non-farm wage as compared to women who are not employed holding all the other variables constant. The women who combine work on own farm with other work (excluding a farm wage) seem especially disadvantaged as the log odds of supervising homework decreases by 1.172 for these women as compared to women who are not employed holding all the other variables constant. The log odds supervising homework decreases by .756 for women who combine farm wage with other activities such as sideline work and by .678 for women who engaged in two or three activities not included in the other categories as compared to women who are not employed holding all the other variables constant.

Controlling for housing quality and maternal education explains to a large extent the association of maternal employment with supervision of homework, as four employment categories are no longer significant. The variables indicating only own farm work, only non-farm wage, only farm wage and others and rest of two or three job categories are no longer significant. Sideline work and combining work on own farm with other jobs except farm wage is associated with reduced log odds of homework supervision. The coefficients for these two categories are reduced in this model as compared to those in model 2.

Two employment categories i.e. farm wage and combining own farm work with farm wage are positively associated with homework supervision once socio-economic status and her education are controlled for. This could be indicative of mother's initiative and that mothers engage in farm wage to facilitate resources for children but not at the cost of supervision at home. The two socioeconomic controls, housing quality and maternal education are significantly and positively associated with supervision.

Only one employment category, sideline work continues to be significant and negatively associated with supervision in the last model with all the controls. Animal care is common across all socioeconomic classes and all regions of the country and hence controlling for all the background factors does not influence the negative impact of sideline work.

The socio-economic controls, presence of grandparents and ten state dummies (of twenty one) continue to be significant in the last model. The last model highlights the significance of regional effects in how maternal employment is associated with parental involvement with respect to homework.

Reading Skills Maternal employment is negatively associated with reading ability. The basic model shows that maternal employment reduces the ordered log odds of reading ability by 0.553 (see Table 5a) as compared to unemployed women. Using the more detailed employment typologies instead of a dichotomous variable for maternal employment shows that the employment categories are associated differently with reading ability. The ordered log odds of

reading ability decreases by .424 for women who work only on their own farms, by .789 for women who earn only farm wage, by .432 for women who engage only in sideline work (animal and non-farm business), by .644 for non-farm wage earners as compared to women who are not employed holding all the other variables constant.

The ordered log odds of reading skills reduces by .546 for women who combine work on own farm with other work (excluding a farm wage), by .329 for those who combine work on own farm with farm wage, by 1.329 for women who combine farm wage with other activities such as sideline work and .329 for those who engaged in two or three activities not included in the other categories as compared to women who are not employed holding all the other variables constant

Controlling for the pathways i.e. participation in PTA and supervision of homework reduces the magnitude of coefficients but a majority of them continue to remain significant. Work on own farm, work on own farm and farm wage and the residual category for employment are no longer significant and the two pathways are significantly associated with reading skills. This suggests that these pathways mediate the impact of maternal employment on reading ability but that other factors not included in this model continue to play an important role. In the next model with controls for housing quality and maternal education, none of the maternal employment variables remain significant. Maternal education and quality of housing are positively associated with reading skills.

In the last model with demographic and background controls, none of the employment variables are significant factors associated with reading ability. However, the parental involvement and SES variables continue to be significant factors. Of the child level variables, age has a significant association with reading skills as an older child is expected to be in a higher grade. Moreover, an increase of one child in the household decreases the log odds of reading by .086 while the other variables in the model are held constant. Being Brahmin is associated with greater reading skills as compared to forward castes and being Muslim is negatively associated with the dependent variable as compared to Hindus, the majority religion. Certain state dummies are also significant in the final model.

Arithmetic Skills Maternal employment is negatively associated with arithmetic skills. The basic model shows that maternal employment reduces the ordered log odds of math proficiency by 0.678 (see Table 5b) as compared to unemployed women. In the second model with more detailed employment typologies for maternal employment all but one of the categories are negatively associated with math skills. The ordered log odds of math skills decreases by .433 for women who work only on their own farms, by .863 for women who earn only farm wage, by .396 for women who engage only in sideline work (animal and non-farm business), by .640 for non-farm wage earners as compared to women who are not employed holding all the other variables constant. The ordered log odds of math skills reduces by .603 for women who combine work on own farm with other work (excluding a farm wage), by .677 for those who combine work on own farm with farm wage, by 1.013 for women who combine farm wage with other work and .456 for women who engage in two or three activities not included in the other categories as compared to women who are not employed holding all the other variables constant. These results are quite similar to those for reading skills in terms of magnitude and significance.

Controlling for the pathways i.e. participation in PTA and supervision of homework reduces the magnitude of coefficients but unlike in the analysis of reading skills all of them continue to remain significant. The pathway variables are significant and positively associated with arithmetic skills. However, as we see in the analysis of reading skills, the introduction of the maternal involvement variables reduces the magnitude of the employment variables. This suggests that these pathways mediate the impact of maternal employment on cognitive skills. In the model with SES controls, none of the maternal employment variables remain significant but the SES variables are positively associated with the dependent variable. These results again replicate those seen for reading skills.

In the last model with demographic and background controls, none of the employment variables are significant factors associated with arithmetic ability. However, the parental involvement and SES variables continue to be significant factors. Of the child level variables, sex and age are significantly associated with math skills. Older children and boys (as compared to girls) have higher mathematical abilities. Being Brahmin is associated with greater math skills as compared to forward castes and being Muslim is negatively associated with the dependent variable as compared to Hindus. Certain state dummies are also significant in the final model.

Writing Ability The first model with a dichotomous indicator for maternal employment shows that maternal employment is negatively associated with writing skills (see Table 5c) as compared to unemployed women. Using the more detailed employment typologies shows that five employment categories are negatively associated with writing scores. The log odds of writing decrease by .586 for women who earn only a farm wage, by .440 for those who combine work on own farm with other work (excluding a farm wage), by .473 for those who combine work on own farm with farm wage and by .972 for women who combine farm wage with other activities such as sideline work as compared to women who are not employed holding all the other variables constant. This is different from the results for reading and arithmetic where all but one category is associated with the respective dependent variables in the second model with typologies.

Controlling for the pathways i.e. participation in PTA and supervision of homework reduces the magnitude of two coefficients moderately and one employment category, non-farm wage is no longer significant. These results prove that parental involvement is a pathway that mediates the impact of maternal employment on cognitive scores. As seen for the other dependent variables, supervision of homework and participation in school committees is positively associated with writing skills. In the SES model, none of the maternal employment variables remain significant. Maternal education and quality of housing are positively associated with writing skills.

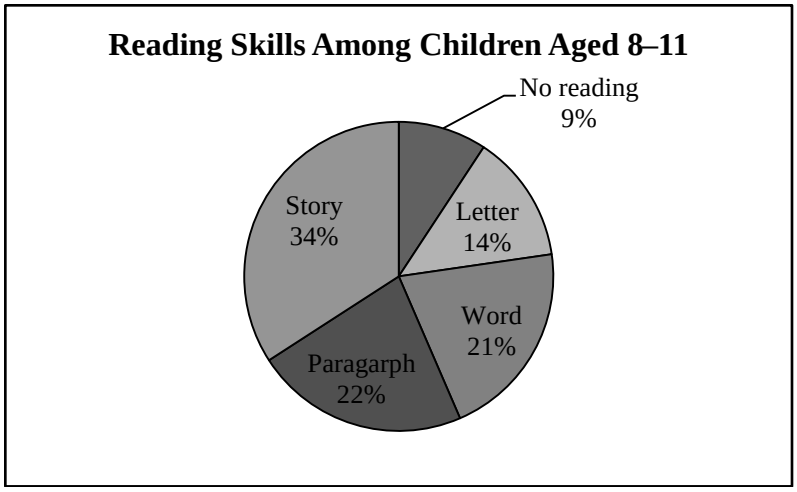
In the last model with all the controls, none of the employment variables are significant factors associated with writing ability. As seen earlier, the parental involvement and SES variables continue to be significant factors in the final model. Of the child level variables, age has a positive and significant association with writing skills and a higher number of children are negatively associated with writing scores. Of the background controls, being Muslim is negatively associated with the dependent variable as compared to Hindus. Some state dummies are significant in the final model.

Conclusion

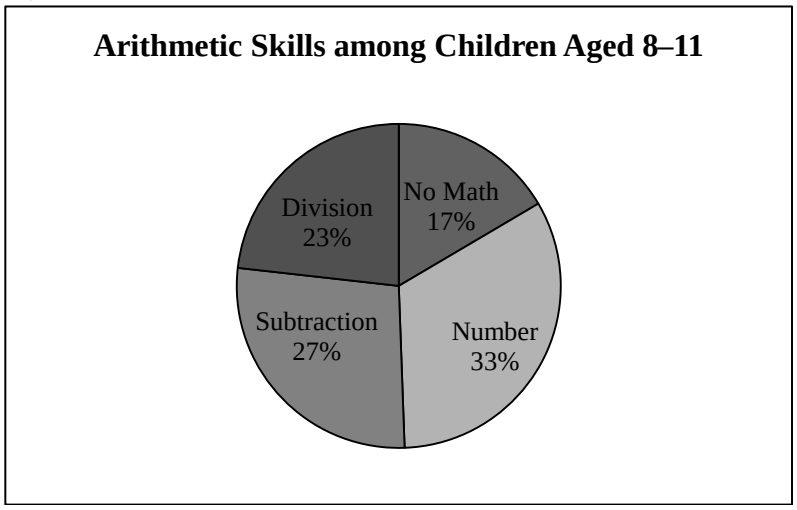
The analytical results clearly demonstrate the usefulness of our work pattern typology. While working mothers are less likely to be involved with school related activities and their children are disadvantaged in cognitive development tests, such a simple dichotomy would have failed to capture the diversity of maternal employment experiences. As expected, mothers who are salaried workers in the formal sector, are essentially no different from non-working mothers, when it comes to their involvement in school related work or their children's cognitive skills. However, for mothers working in the informal sector, tremendous difference exists as regard to their school involvement and their children's cognitive outcomes. Our typology of work highlights *within and across* sector differences in employment, while at the same time recognizes the importance to identify combination of work activities. For example, although working mothers in the agricultural sector tend to have less time with school related activities, those who are engaged in farm wage job or those combining it with other activities are most likely to experience role overload. The intensity of agricultural fieldwork and the time demand placed on them as a result of juggling multiple jobs means that they have the least available time or energy to engage in school related activities. In contrast, those who are doing their own farm work or engaged in sideline activities are a little more advantaged, possibly due to the flexible nature of their work.

Our paper also identifies maternal involvement in school related work as an important mechanism that links maternal employment and child developmental outcomes. While the work measures are no longer significant predictors of child outcome once socioeconomic resources and developmental context are controlled, they remain to be important predictors of mothers' school involvement, which could have long term consequences for children's academic achievement even no immediate effect is observed. For PAA, we plan to revise the typology to create a smaller number of employment categories that are able to do justice to the varied employment patterns without being as cumbersome. We also plan to modify the models by introducing maternal education in the first step of analysis along with maternal employment categories. Lastly, we intend to explore other pathways through which maternal employment affects children's cognitive outcomes.

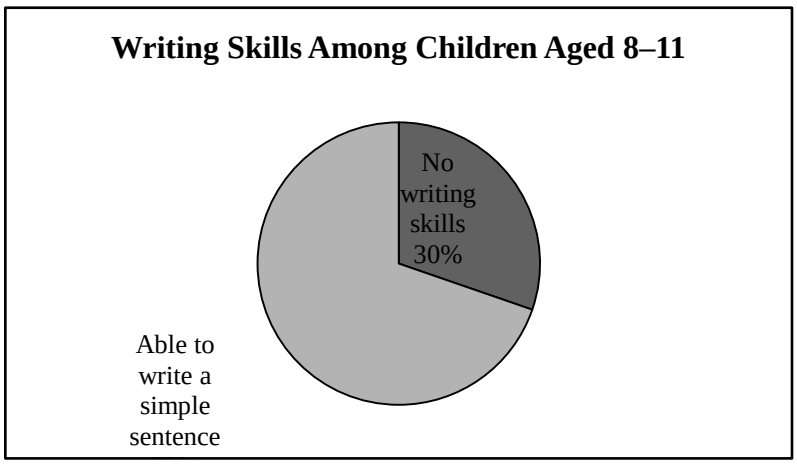
Fig. 1a) Distribution of Cognitive Scores.



1b)

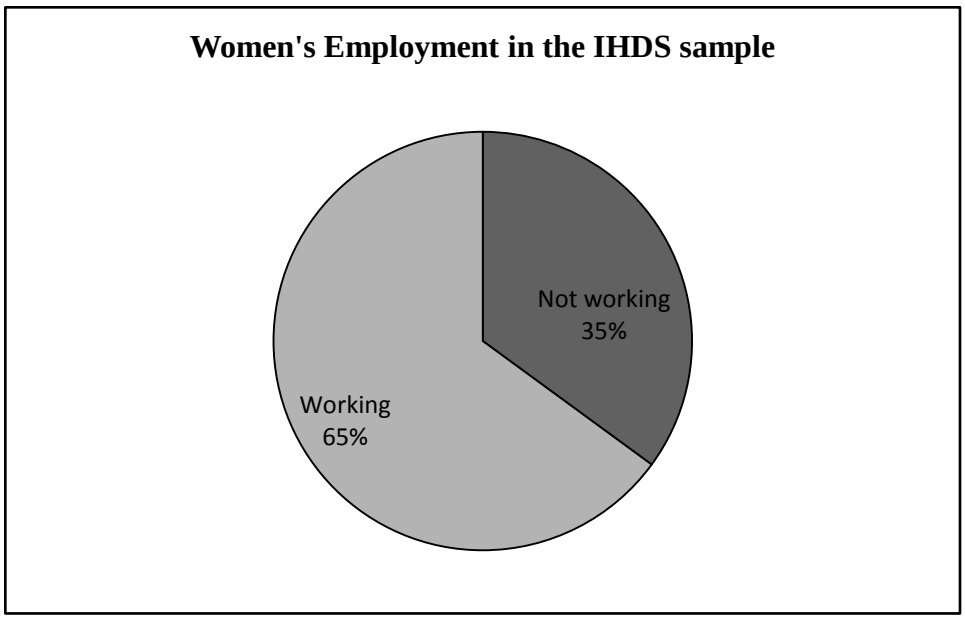


1c)



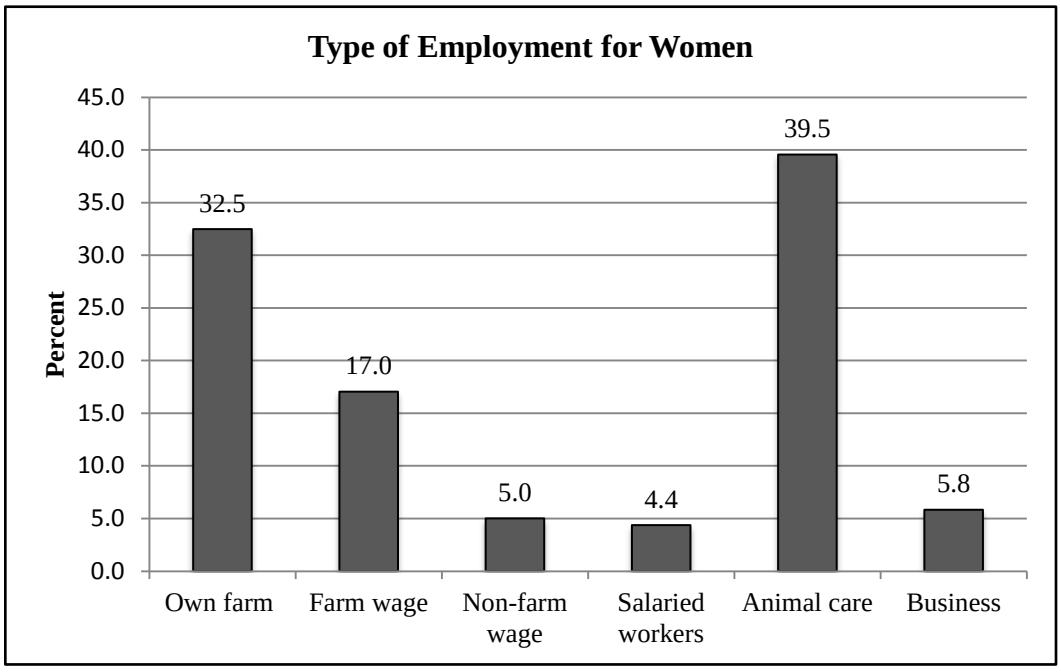
Source: IHDS 2004–5 data. N = 8360.

Figure 2a)



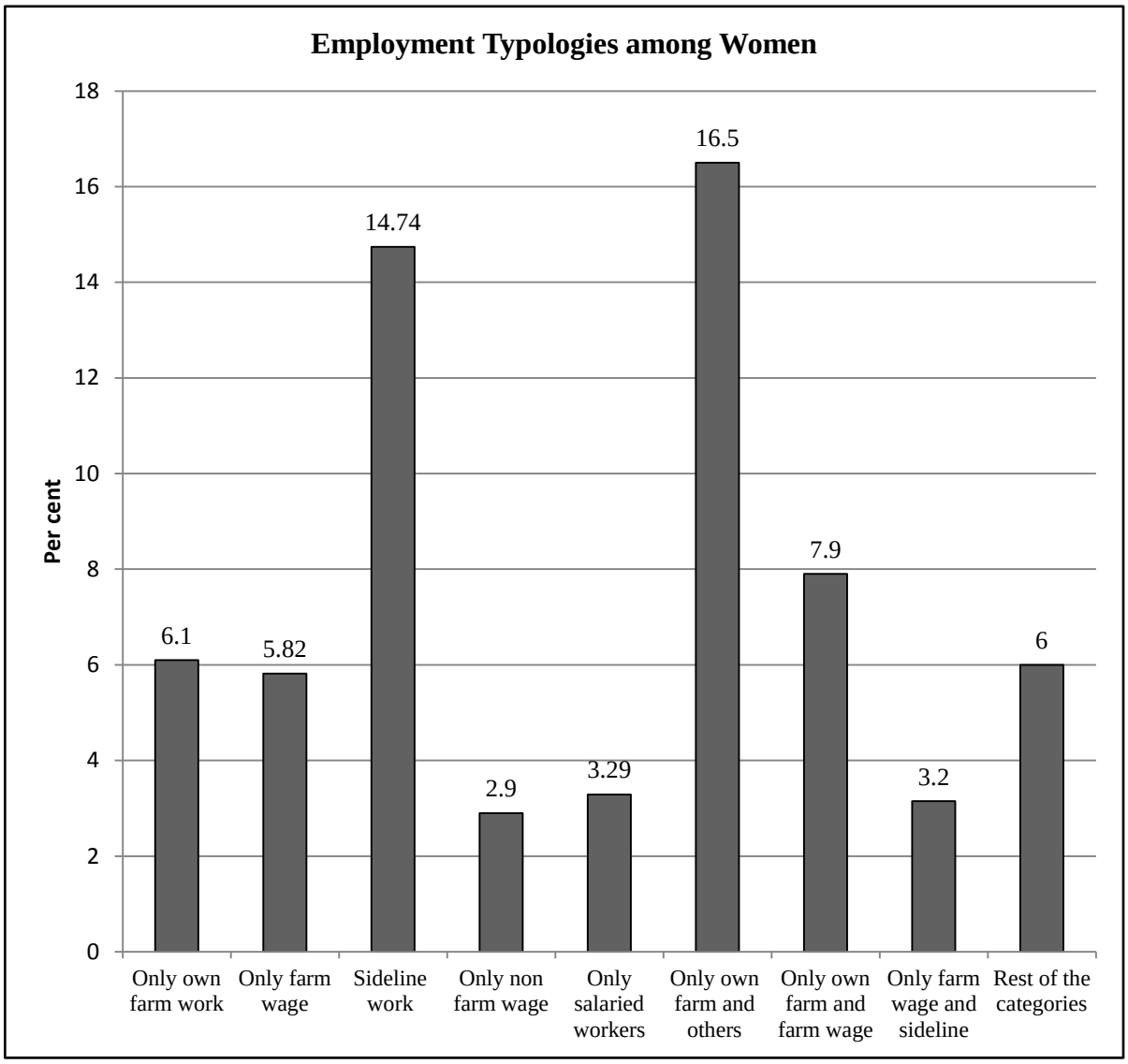
Source: IHDS 2004–5 data. N = 8360.

Figure 2b)



Source: IHDS 2004–5 data. N = 8360.
These categories are not mutually exclusive.

Figure 2c) Work Pattern Typology for Working Women in India



Source: IHDS 2004–5 data. N = 8360.
These categories are mutually exclusive.
"Sideline work" refers work with animals and work on household non-farm businesses, which are typically non-wage activities.
"Rest of the categories" refers to the remaining overlapping job categories with two and three jobs that are not included in other categories above.

Table 1. Table of Means and SDs

	Observations	Mean	Std. Dev	Minimum	Maximum
Attending parent-teacher meetings	8360	0.471	0.499	0	1
Supervision of homework	8360	0.380	0.485	0	1
Housing	8360	3.167	2.092	0	7
Maternal Education	8360	3.378	4.312	0	15
Sex of the child (Male =1, Female=2)	8360	1.471	0.499	1	2
Age of the child	8360	9.469	1.067	8	11
Number of children in the household	8360	3.286	1.579	1	17
Presence of grandparent(s)	8360	0.192	0.394	0	1
Number of persons in the household	8360	6.864	2.940	2	31
Caste Groups: Brahmin	8360	0.057	0.232	0	1
Forward Castes (reference groups)	8360	0.222	0.416	0	1
Other Backward Classes	8360	0.417	0.493	0	1
Dalit (Lowest Caste)	8360	0.240	0.427	0	1
Adivasis (Tribal)	8360	0.064	0.245	0	1
Religions: Hindu	8360	0.813	0.390	0	
Muslim	8360	0.131	0.337	0	1
Christian	8360	0.017	0.130	0	1
Jammu & Kashmir	8360	0.012	0.107	0	1
Himachal Pradesh	8360	0.005	0.073	0	1
Uttarakhand	8360	0.019	0.136	0	1
Punjab	8360	0.029	0.168	0	1
Haryana	8360	0.019	0.137	0	1
Delhi	8360	0.009	0.092	0	1
Uttar Pradesh	8360	0.207	0.405	0	1
Bihar	8360	0.080	0.272	0	1
Jharkhand	8360	0.029	0.168	0	1
Rajasthan	8360	0.055	0.229	0	1
Chhattisgarh	8360	0.028	0.165	0	1
Madhya Pradesh	8360	0.051	0.221	0	1
Northeast	8360	0.009	0.095	0	1
Assam	8360	0.016	0.127	0	1
West Bengal	8360	0.068	0.252	0	1
Orissa	8360	0.037	0.188	0	1
Gujarat	8360	0.053	0.225	0	1
Maharashtra, Goa	8360	0.108	0.311	0	1
Andhra Pradesh	8360	0.064	0.245	0	1
Karnataka	8360	0.041	0.199	0	1
Kerala	8360	0.019	0.136	0	1
Tamil Nadu	8360	0.040	0.196	0	1

Table 2. Bivariate Relationships between Work Typologies and Pathways and Work Typologies and Socioeconomic Controls (Mean Scores)

	Reading	Math	Writing
	0-4	0-3	0-1
Only own farm work	2.538	1.532	0.710
Only farm wage	2.231	1.277	0.589
Sideline work	2.497	1.560	0.699
Only non farm wage	2.365	1.338	0.635
Only salaried workers	2.843	1.778	0.779
Only own farm and others (excluding farm wage)	2.351	1.376	0.613
Only own farm and farm wage	2.409	1.229	0.603
Only farm wage and others	2.140	1.281	0.538
Rest of the categories	2.345	1.256	0.606
Unemployed women	2.789	1.779	0.745
For the entire working sample	2.420	1.416	0.644

Source: IHDS 2004–5 data. N = 8360.

Table 3. Relationships between Work Typologies and Pathways and Work Typologies and Socioeconomic Controls (Mean Scores)

Pathways and controls	Participation in school committees 0-1	Help with homework 0-1	Housing as an indicator of SES 0-7	Maternal education 0-15
Only own farm work	0.483	0.358	2.616	2.743
Only farm wage	0.312	0.336	2.137	1.100
Sideline work	0.413	0.339	3.117	3.234
Only non farm wage	0.462	0.320	2.612	1.828
Only salaried workers	0.625	0.532	4.283	6.069
Only own farm and others (excluding farm wage)	0.417	0.229	2.450	1.952
Only own farm and farm wage	0.340	0.340	1.878	1.325
Only farm wage and others	0.342	0.313	1.986	0.887
Rest of the categories	0.312	0.310	1.986	1.690
Unemployed women	0.585	0.508	4.201	5.073
For the entire working sample	0.407	0.318	2.587	2.351

Source: IHDS 2004–5 data. N = 8360.

Table 4a. Multivariate logit regression of Participation on School Committees on Maternal Employment.

VARIABLES	Only employment	Employment typologies	Adding Socioeconomic controls	All controls
Any work	-0.758***			
(ref: Unemployed women)	(0.0638)			
Maternal Employment Categories				
Only own farm work		-0.393**	0.0306	-0.327*
(ref: Unemployed women)		(0.143)	(0.161)	(0.151)
Only farm wage		-1.096***	-0.486**	-0.624***
		(0.136)	(0.149)	(0.157)
Sideline work		-0.639***	-0.376***	-0.222
		(0.0954)	(0.111)	(0.123)
Only non farm wage		-0.412*	0.0772	-0.0686
		(0.164)	(0.170)	(0.181)
Only salaried workers		0.179	0.151	0.116
		(0.161)	(0.178)	(0.186)
Only own farm and others (excluding farm wage)		-0.656***	-0.161	-0.306**
		(0.0950)	(0.105)	(0.114)
Only own farm and farm wage		-0.576***	-0.0963	-0.279
		(0.146)	(0.163)	(0.177)
Only farm wage and others		-0.914***	-0.232	-0.238
		(0.178)	(0.189)	(0.203)
Rest of the categories		-0.825***	-0.526***	-0.450**
		(0.139)	(0.152)	(0.163)
Socioeconomic controls				
Housing			0.205***	0.216***
			(0.0179)	(0.0204)
Mother's education			0.0676***	0.0688***
			(0.00911)	(0.0102)
Other controls				
Sex of the child				0.153*
				(0.0699)
Age of the child				0.00108
				(0.0332)
Number of children				-0.0540
				(0.0354)
Presence of grandparents				0.0317
				(0.118)
Number of persons				0.0161

				(0.0197)
Brahmin				-0.124
(ref: Forward caste)				(0.160)
Other backward classes				-0.157
				(0.0922)
Scheduled castes				-0.300**
				(0.110)
Scheduled tribes				-0.382*
				(0.152)
Muslim				-0.196
(ref: Hindu)				(0.106)
Christian				0.127
				(0.261)
Constant	0.373***	0.312***	-0.842***	-0.257
	(0.0504)	(0.0491)	(0.101)	(0.423)
Observations	8360	8360	8360	8360
Log pseudolikelihood	-5646	-5601	-5310	-4916
Degrees of freedom	1	9	11	43
BIC (smaller is better)	-64191.435	-64208.447	-64771.823	-65263.499

Robust standard errors in parentheses *** p<0.001, ** p<0.01, * p<0.05
State controls included but not shown

Table 4b. Multivariate logit regression of Supervision of Homework on Maternal Employment.

VARIABLES	Only employment	Employment typologies	Adding Socioeconomic controls	All controls
Any work	-0.774***			
(ref: Unemployed women)	(0.0663)			
Maternal Employment Categories				
Only own farm work		-0.675***	-0.199	-0.323
(ref: Unemployed women)		(0.163)	(0.191)	(0.209)
Only farm wage		-0.574***	0.491**	0.224
		(0.141)	(0.160)	(0.174)
Sideline work		-0.666***	-0.359**	-0.275*
		(0.105)	(0.109)	(0.114)
Only non farm wage		-0.699***	0.105	0.0305
		(0.161)	(0.166)	(0.183)
Only salaried workers		0.170	0.0638	-0.00996
		(0.158)	(0.200)	(0.227)
Only own farm and others (excluding farm wage)		-1.171***	-0.560***	-0.0604
		(0.107)	(0.127)	(0.134)
Only own farm and farm wage		-0.175	0.625**	0.151
		(0.147)	(0.195)	(0.196)
Only farm wage and others		-0.756***	0.361	0.241
		(0.182)	(0.206)	(0.198)
Rest of the categories		-0.678***	-0.328	-0.200
		(0.141)	(0.182)	(0.181)
Socioeconomic controls				
Housing			0.0705***	0.0960***
			(0.0209)	(0.0235)
Mother's education			0.255***	0.245***
			(0.00997)	(0.0111)
Other controls				
Sex of the child				0.00469
				(0.0773)
Age of the child				0.00698
				(0.0364)
Number of children				-0.000133
				(0.0431)
Presence of grandparents				0.231*
				(0.117)
Number of persons				-0.0412

				(0.0243)
Brahmin				0.112
(ref: Forward caste)				(0.177)
Other backward classes				-0.0111
				(0.109)
Scheduled castes				-0.152
				(0.120)
Scheduled tribes				-0.140
				(0.169)
Muslim				0.0606
(ref: Hindu)				(0.121)
Christian				0.0560
				(0.239)
Constant	-0.0014	-0.0413	-1.564***	-0.31
	(0.0512)	(0.0494)	(0.116)	(0.437)
Observations	8360	8360	8360	8360
Log pseudolikelihood	-5416	-5364	-4425	-3875
Degrees of freedom	1	9	11	43
BIC (smaller is better)	-64650.438	-64683.196	-66543.432	-67344.798

Robust standard errors in parentheses *** p<0.001, ** p<0.01, * p<0.05
State controls included but not shown

Table 5a. Multivariate ordinal regression of Reading Ability on Maternal Employment

VARIABLES	Only Employment	Employment typologies	Adding pathways	Adding Socioeconomic controls	All controls
Any work (ref: Unemployed women)	-0.553*** (0.0605)				
Maternal Employment Categories					
Only own farm work (ref: Unemployed women)		-0.424** (0.133)	-0.261 (0.133)	0.0683 (0.147)	0.103 (0.152)
Only farm wage		-0.789*** (0.132)	-0.597*** (0.131)	-0.0734 (0.135)	-0.184 (0.137)
Sideline work		-0.432*** (0.09)	-0.261** (0.0912)	-0.0844 (0.0926)	-0.0331 (0.0916)
Only non farm wage		-0.644*** (0.119)	-0.472*** (0.12)	-0.0755 (0.129)	-0.0519 (0.146)
Only salaried workers		-0.0462 (0.113)	-0.0585 (0.114)	-0.0768 (0.119)	-0.121 (0.121)
Only own farm and others (excluding farm wage)		-0.546*** (0.0875)	-0.298*** (0.0899)	0.0662 (0.0929)	0.0303 (0.0976)
Only own farm and farm wage		-0.329* (0.129)	-0.242 (0.142)	0.181 (0.137)	-0.0825 (0.15)
Only farm wage and sideline		-1.036*** (0.154)	-0.852*** (0.154)	-0.276 (0.164)	-0.315 (0.162)
Rest of the categories		-0.379** (0.127)	-0.184 (0.13)	0.00585 (0.129)	0.0175 (0.136)
Pathways					
Participation in PTA			0.406*** (0.0587)	0.176** (0.0614)	0.200** (0.0637)
Supervision of homework			0.752*** (0.0612)	0.317*** (0.0671)	0.262*** (0.072)
Socioeconomic controls					
Housing				0.177*** (0.0158)	0.175*** (0.0179)
Mother's education				0.0885*** (0.00845)	0.0865*** (0.00905)
Other Controls					
Sex of the child					-0.103 (0.057)
Age of the child					0.503***

					(0.0276)
Number of children					-0.0863**
					(0.0324)
Presence of grandparents					0.106
					(0.0893)
Number of persons					0.00658
					(0.0175)
Brahmin					0.331*
(ref: Forward caste)					(0.151)
Other backward classes					0.0912
					(0.0822)
Scheduled castes					-0.121
					(0.0878)
Scheduled tribes					-0.119
					(0.118)
Muslim					-0.328***
(ref: Hindu)					(0.0946)
Christian					-0.122
					(0.203)
Cut 1	-2.667***	-2.654***	-1.975***	-1.321***	1.858***
	(0.0706)	(0.0708)	(0.0765)	(0.0863)	(0.293)
Cut 2	-1.602***	-1.585***	-0.910***	-0.230**	3.013***
	(0.0598)	(0.059)	(0.0649)	(0.0775)	(0.292)
Cut 3	-0.533***	-0.602***	0.134*	0.866***	4.205***
	(0.0464)	(0.0512)	(0.0608)	(0.0765)	(0.293)
Cut 4	0.626***	0.337***	1.088***	1.880***	5.313***
	(0.0598)	(0.0482)	(0.0605)	(0.0784)	(0.299)
Observations	8360	8360	8360	8360	8360
Log pseudolikelihood	-12606	-12577	-12345	-12027	-11489
Degrees of freedom	1	9	11	13	46
BIC (smaller is better)	-50243.087	-50228.75	-50675.071	-51292.812	-52070.992

Robust standard errors in parentheses *** p<0.001, ** p<0.01, * p<0.05
State controls included but not shown

Table 5b. Multivariate ordinal regression of Arithmetic Ability on Maternal Employment.

VARIABLES	Only Employment	Employment typologies	Adding pathways	Adding Socioeconomic controls	All controls
Any work	-0.678***				
(ref: Unemployed women)	(0.0577)				
Maternal Employment Categories					
Only own farm work		-0.433***	-0.290*	0.0296	0.0203
(ref: Unemployed women)		(0.128)	(0.129)	(0.131)	(0.137)
Only farm wage		-0.863***	-0.685***	-0.173	-0.134
		(0.126)	(0.126)	(0.129)	(0.138)
Sideline work		-0.396***	-0.237*	-0.0564	-0.0133
		(0.0936)	(0.0947)	(0.102)	(0.100)
Only non farm wage		-0.640***	-0.494***	-0.108	-0.0100
		(0.117)	(0.119)	(0.131)	(0.135)
Only salaried workers		-0.0545	-0.0554	-0.0601	-0.166
		(0.115)	(0.122)	(0.126)	(0.127)
Only own farm and others (excluding farm wage)		-0.603***	-0.363***	-0.00819	0.00552
		(0.0898)	(0.0908)	(0.0958)	(0.103)
Only own farm and farm wage		-0.677***	-0.605***	-0.203	-0.163
		(0.113)	(0.122)	(0.122)	(0.133)
Only farm wage and others		-1.013***	-0.827***	-0.281	-0.221
		(0.157)	(0.159)	(0.167)	(0.168)
Rest of the categories		-0.456***	-0.277*	-0.0936	-0.127
		(0.117)	(0.119)	(0.120)	(0.122)
Pathways					
Participation in PTA			0.449***	0.231***	0.305***
			(0.0572)	(0.0606)	(0.0641)
Supervision of homework			0.689***	0.267***	0.206**
			(0.0593)	(0.0641)	(0.0704)
Socioeconomic controls					
Housing				0.166***	0.180***
				(0.0161)	(0.0182)
Mother's education				0.0830***	0.0901***
				(0.00826)	(0.00874)
Other controls					
Sex of the child					-0.252***
					(0.0578)
Age of the child					0.530***
					(0.0278)
Number of children					-0.0646

					(0.0333)
Presence of grandparents					0.118
					(0.0945)
Number of persons					0.0143
					(0.0184)
Brahmin					0.329*
(ref: Forward caste)					(0.154)
Other backward classes					-0.0233
					(0.0820)
Scheduled castes					-0.239**
					(0.0896)
Scheduled tribes					-0.222
					(0.128)
Muslim					-0.473***
(ref: Hindu)					(0.104)
Christian					0.231
					(0.194)
Cut 1	-2.092***	-2.038***	-1.505***	-0.822***	2.991***
	(0.0576)	(0.0568)	(0.0688)	(0.0869)	(0.328)
Cut 2	-0.461***	-0.398***	0.194***	.943***	4.938***
	(0.0478)	(0.0465)	(0.0618)	(0.0853)	(0.322)
Cut 3	0.787***	0.854***	1.493***	2.313***	6.465***
	(0.0474)	(0.0464)	(0.0649)	(0.0908)	(0.337)
Observations	8360	8360	8360	8360	8360
Log pseudolikelihood	-11210	-11183	-10965	-10682	-10059
Degrees of freedom	1	9	11	13	46
BIC (smaller is better)	-53044.813	-53025.663	-53443.650	-53992.234	-54940.429

Robust standard errors in parentheses *** p<0.001, ** p<0.01, * p<0.05
State controls included but not shown

Table 5c. Multivariate ordinal regression of Writing Ability on Maternal employment

VARIABLES	Only Employment	Employment typologies	Adding pathways	Adding Socioeconomic controls	All controls
Any work	-0.477***				
(ref: Unemployed women)	(0.0734)				
Maternal Employment Categories					
Only own farm work		-0.114	0.0370	0.292	0.279
(ref: Unemployed women)		(0.176)	(0.185)	(0.199)	(0.212)
Only farm wage		-0.586***	-0.395**	0.0289	0.0773
		(0.148)	(0.149)	(0.156)	(0.176)
Sideline work		-0.175	0.00247	0.154	0.175
		(0.112)	(0.116)	(0.118)	(0.123)
Only non farm wage		-0.424*	-0.274	0.0521	0.203
		(0.179)	(0.179)	(0.188)	(0.201)
Only salaried workers		0.197	0.154	0.141	0.0792
		(0.178)	(0.193)	(0.212)	(0.209)
Only own farm and others (excluding farm wage)		-0.440***	-0.202	0.0769	0.0735
		(0.110)	(0.111)	(0.118)	(0.129)
Only own farm and farm wage		-0.473**	-0.402*	-0.0721	0.0320
		(0.166)	(0.180)	(0.170)	(0.186)
Only farm wage and others		-0.972***	-0.786***	-0.326	-0.277
		(0.178)	(0.184)	(0.188)	(0.197)
Rest of the categories		-0.169	0.0225	0.190	0.203
		(0.161)	(0.164)	(0.159)	(0.165)
Pathways					
Participation in PTA			0.465***	0.275***	0.268**
			(0.0777)	(0.0813)	(0.0878)
Supervision of homework			0.729***	0.324***	0.268**
			(0.0841)	(0.0886)	(0.0924)
Housing				0.124***	0.159***
				(0.0198)	(0.0237)
Mother's education				0.0971***	0.0920***
				(0.0119)	(0.0131)
Sex of the child					-0.111
					(0.0766)
Age of the child					0.352***
					(0.0370)
Number of children					-0.0874*
					(0.0402)

Presence of grandparents					-0.0282
					(0.134)
Number of persons					0.0106
					(0.0231)
Caste: Brahmin					0.0655
(ref: Forward caste)					(0.192)
Other backward classes					0.00948
					(0.116)
Scheduled castes					-0.0829
					(0.126)
Scheduled tribes					-0.174
					(0.162)
Religion: Muslim					-0.425***
(ref: Hindu)					(0.123)
Christian					0.264
					(0.292)
Constant	1.071***	1.018***	0.415***	-0.161	-2.116***
	(0.0621)	(0.0582)	(0.0703)	(0.0929)	(0.423)
Observations	10250	10250	10250	10250	10250
Log pseudolikelihood	-5090	-5063	-4911	-4757	-4467
Degrees of freedom	1	9	11	13	45
BIC (smaller is better)	-65303.558	-65284.761	-65571.255	-65860.027	-66141.548

Robust standard errors in parentheses *** p<0.001, ** p<0.01, * p<0.05
State controls included but not shown

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