

# **Female Labor Force Participation and Child Education in India: The Effect of the National Rural Employment Guarantee Scheme**

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## **Abstract**

The National Rural Employment Guarantee Scheme (NREGS) of India mandates 1/3<sup>rd</sup> of beneficiaries to be women and equal wages across gender. We study its impact on children's educational attainment via women's increased access to labor market opportunities. Using child level panel data, and taking advantage of the temporal, sub-district level variation in the intensity of implementation of the NREGS, we find that a rise in mother's share in parental NREGS workdays increases school attendance and grade attainment of her children, particularly girls. This impact is over and above any income effect induced by the Scheme.

Keywords: labor, education, gender, bargaining

JEL classification: I21, I38, J16

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## **1. Introduction**

The World Development Report (World Bank, 2012), focusing on gender equality, finds that women in the poorer regions of the world continue to suffer from disadvantages in the economic sphere. Although, significant progress has been made in reducing gender disparities in health and educational outcomes, economic opportunities continue to be limited for women. The Report underlines the policy priorities of closing gender differences in access to economic opportunities and earnings as well as increasing women's voice within households as a means to reducing poverty in developing countries. In this paper we study the impact of one such policy initiative in India – the National Rural Employment Guarantee Scheme (NREGS) initiated in 2006. While the program's main objective is to alleviate rural poverty, it also has the potential to empower rural women through greater access to labor market opportunities.

From a gender perspective, there are two interesting features of this program. First, the wage rate provided in this program is uniform across gender, and second, it gives priority to female employment and mandates one-third of the beneficiaries to be women. Thus, NREGS not only has the potential to raise female labor force participation by bringing employment opportunities almost to their doorsteps, the equal wage rates provided in NREGS program can potentially reduce any gender disparity prevalent in the rural labor markets. We, therefore, hypothesize that the introduction of this program should lead to an increase in labor market opportunities for women, on both the extensive and intensive margins.

An increase in women's labor force participation can potentially impact individual and household behavior on several fronts including marriage, fertility, and

intra-household distribution of resources. This paper analyzes the effect of the policy shock of the implementation of the NREGS on children's well being. Specifically, we explore whether an increase in participation of mothers in NREGS projects affects the educational outcomes of their children differently from that of fathers' participation in the program. If yes, we attempt to understand the mechanism through which this differential effect can be explained.

While an increase in either fathers' or mothers' labor supply could improve their children's outcomes purely due to an income effect, greater labor force participation of mothers could impact children's education through two additional channels. First, women (particularly mothers) are likely to have more alternative uses of their time than men – market work, household chores and leisure. If children's time in doing household chores substitutes for mother's time then an increase in NREGS participation of mothers may lead to a *decline* in educational attainment of her children.<sup>1</sup>

Second, mother's say in household resource allocation decisions may rise due to her higher earned income. Research suggests that this is likely to have a *positive* effect on her children's schooling. If an increase in mother's earned income is likely to translate into greater weight being attached to her preferences in resource allocation decisions of the household and mothers prefer to invest more in their children's health and education

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<sup>1</sup> On the other hand, if mother's and children's time on household chores are not substitutes and child care services in the market are either unavailable or unaffordable, then it is more likely that children are in school when mothers are at work. If children attend school more regularly due to mothers working, then this could improve children's participation in school. However, this mechanism is unlikely for older children and girls.

(Blumberg, 1988; Thomas, 1990; Hoddinott and Haddad, 1995; Quisumbing and Maluccio, 2003) relative to fathers, then we should see an improvement in child outcomes. Therefore, an increase in mother's decision-making ability within the family can have a positive impact on her children's welfare (Thomas, 1990; Thomas et al., 2002). To sum, the net impact of a change in mother's participation in the labor force on her children's schooling depends on which of these effects dominates – the negative substitution effect or the positive effect of greater bargaining power of mothers.<sup>2</sup>

There exists relatively little empirical research on the impact of parental labor supply on children's time allocation, particularly in a developing country context. Skoufias (1993) shows that an increase in female wages (and thereby female labor supply) in rural India reduces the time in school significantly for girls only. Similar results were found by Grootaert and Patrinos (1999) in a cross-country study. However, Ilahi (1999) does not find any impact of female wages on children's time use in Peru.

In contrast to the sparse literature on time allocation effects, there is considerable empirical evidence suggesting that households' resource allocation decisions are made in a 'collective' (Chiappori, 1988) or bargaining framework (McElroy and Horney, 1981) where the final allocation usually depends on the bargaining power or weights attached to the preferences of the members of the household. The importance of labor income as a determinant of women's bargaining power within the household has been highlighted recently by Anderson and Eswaran (2009). Using data from Bangladesh, the authors

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<sup>2</sup> We are abstracting from any long term effects of changes in fertility due to increased labor force participation of women since we are looking at these changes over 2 to 3 years only.

show that the effect of earned income on female autonomy is far greater than that of unearned income. Also, women who work on the household farm have no more autonomy than those who are housewives, while those who earn independent income have considerably greater autonomy. Luke and Munshi (2011) exploit data from tea plantations in South India where women are employed in permanent wage labor, to find that a relative increase in female income has a positive effect on their children's education. Qian (2008) shows that a change in agricultural pricing policy in post Mao China which increased female labor income increased educational attainment of all children. However, when the policy increased male labor income, educational attainment of girls decreased but had no effect on boys.

Using data from the Young Lives Study (YLS) in the state of Andhra Pradesh in India and taking advantage of the temporal variation in the intensity of implementation of the NREGS within districts, we find that greater participation of mothers in the program, relative to fathers, is indeed associated with more time spent in school of children within households. Results suggest that this effect on the educational outcome of children is over and above any income effect induced by the NREGS. Moreover, the impact is largely present for the poorer households and limited to the time spent in school by girls. Further, we find that the increase in time spent in schooling translates into better educational attainment of children as well. Greater participation of mothers in NREGS leads to higher grade attainment of children. These findings are robust to concerns about unobservable child level heterogeneity, endogeneity of adult labor force participation and differences in economic trends between districts.

In order to understand the mechanisms through which these effects occur, we exploit household level data on education expenditures and on household members' say in decision-making and control of income from various sources. The analysis of the household level education expenditure data show that an increase in women's share in total household work days on NREGS significantly increases the share of total education expenditures, including variable costs of schooling such as stationary, in discretionary annual household expenditures in poorer households. Moreover, cross-sectional data suggest that the probability that mothers have a say or control over utilization of earnings from different sources increases when they participate in the labor force. These results, together with the significant effects of greater share of mother's participation in NREGS on girls, suggests that women's preferences could be the primary drivers of the improvements in educational attainment of her children when her program participation is higher. Hence our results can be explained within the framework of a bargaining model of household resource allocation.

The findings of our study not only inform us about the impact of female labor supply on intra-household outcomes but it also addresses a broader policy issue of the impact of the design of public programs on improving household outcomes in developing countries. Specifically, our paper extends the current debate on the impact of workfare programs on poverty (Ravi and Engler, 2009; Uppal, 2009) and finds evidence which suggests that mandating women's participation in public programs has consequences beyond those immediately intended by policy makers.

The paper is organized as follows. Section 2 gives the background on the National Rural Employment Guarantee Scheme and motivates the study. Section 3 describes the

data and methodology used in this paper. Section 4 discusses the results and Section 5 concludes.

## **2. Background**

The National Rural Employment Guarantee Act (2005)<sup>3</sup> of India provides a legal guarantee for up to 100 days of annual employment at a predetermined wage rate to rural households willing to supply manual labor on local public works. The act was operationalised through the National Rural Employment Guarantee Scheme (NREGS) which began in 2006. Initially restricted to 200 “poorest” districts of India (February 2006), it was extended to 130 more districts in May 2007 and to all districts across the country by 1st April, 2008. We analyze data on individuals’ labor force participation from Young Lives Study (YLS) – a panel study from six districts of Andhra Pradesh, India’s fifth largest state in terms of population and among the leading states in the generation of employment under the NREGS.

To date, there have been three rounds of YLS surveys. We use data from rounds 2 (2007) and 3 (2009-10) of the YLS for reasons of comparability and exclude round 1 data (2002). The survey years coincide with the initial implementation of NREGS (four YLS districts in Phase 1), followed by nation-wide coverage by 2008 (one YLS district each in Phase 2 and 3).<sup>4</sup>

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<sup>3</sup> <http://nrega.nic.in/rajaswa.pdf>

<sup>4</sup> Anantapur, Cuddapah, Karimnagar and Mahbubnagar implemented the NREGS in 2006. Srikakulam and West Godavari were the two districts that came under NREGS in 2007 and 2008, respectively.

Using data on NREGS participation of individual household members from the YLS, we find that the overall female labor force participation rate in the age group of 16 to 60 years has increased substantially by 13 percentage points while for males it has fallen marginally between 2007 and 2009-10. This rise in female labor force participation is largely driven by casual labor as shown in Figure 1. However, unlike females, participation of males in the casual labor market has not increased in this period; rather, it has remained almost the same.<sup>5</sup> But it is not clear from YLS data whether these trends are attributable to NREGS implementation alone (under which only casual public labor is supplied) since the YLS does not have information on casual private labor force participation trends.

Using household level data from repeated cross-sections in the National Sample Survey (NSS) for the years 1999-2000, 2004-05, and 2009-10 we report the trends in labor force participation rates in casual labor for public and private works in Andhra Pradesh, pre and post NREGS implementation. From Figure 2 we see that there has been a drastic rise in labor force participation in public works, both for men and women in the

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<sup>5</sup> Disaggregating the labor force participation rates across asset quartiles of the households, we find that the rise in female participation in casual labor market is more prominent for poorer households relative to the upper most asset quartile. Moreover, participation of women in the NREGS, on the extensive and intensive margin, has increased more substantially as compared to men and this is also more noticeable in the poorer households (see summary statistics in Table 1).



16-60 year age group since NREGS implementation.<sup>6</sup> While participation somewhat declined between 1999-00 and 2004-05 it has risen sharply in 2009-10 from almost no participation in 2004-05. Private casual labor force participation, on the other hand, is more or less flat for both men and women as shown in Figure 3. Furthermore, although wage rates for casual private works have increased substantially post NREGS (Imbert and Papp, 2011), the male-female wage ratio for private works in Andhra Pradesh remains unchanged. On the other hand, the gender wage ratio for public works has fallen from 1.5 in 1999-2000 to 1.1 in 2009-10 (Figures A1 and A2 in Appendix).

To summarize, the data suggest that casual labor force participation rate of women has increased substantially in Andhra Pradesh since 2007 and this may have been driven by increased participation in public works, specifically, the NREGS.<sup>7</sup>

### **3. Data and Methodology**

#### **A. Data**

In order to identify the effect of the NREGS on children's education via their mothers' participation in the program, we conduct our empirical analysis at the level of the child using the two comparable waves of the YLS surveys - 2007 and 2009-10. We restrict our sample to children in the age group of 5 to 14 years in 2007, the school going age group.

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<sup>6</sup> We take into account casual labor both as the principal occupation as well as a subsidiary occupation in the 365 days prior to the survey date.

<sup>7</sup> Given that men's participation in overall casual labor has stayed more or less the same during this period, it suggests that men have taken on NREGS work as a subsidiary activity.

In order to construct our data set we use the following exclusion rules: first, we include only children living in rural areas in both periods. This rules out children who may have migrated to urban areas (less than 1 per cent of our sample). Second, we exclude children for whom we cannot identify mothers in the sample (5 per cent of the original sample). Third, for econometric reasons explained below, we restrict our attention to children present in both rounds of the survey; we thus drop 2.9 per cent of the children present in 2007. Finally, we exclude children for whom there is some missing information on relevant covariates in either of the years. Our data set, after these exclusions, contains information on 3006 children for both years.

Table 1 describes the relevant summary statistics for 2007 and 2009-10. The time spent in school by children in the reference period (a typical day in the last week) has gone up from 5.8 hours in 2007 to almost 7 hours in 2009-10. This increase in time spent in school is largely reflective of more regular school attendance. Children in the survey, who reported attending school regularly, spent almost two hours more in school than those who reported going to school irregularly, on a typical day. We can, therefore, interpret greater time spent in school by a child as an indicator of greater number of days of school attendance. The rise in time spent in school was accompanied by a rise in the highest grade completed during this period. Enrollment rates also rose by 8 percentage points, largely a result of most 5 year olds joining school by 2009-10.<sup>8</sup>

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<sup>8</sup> There may be a variation in grade attainment depending on when the survey was conducted. In March of each year students get promoted to the next grade. While all children in the 2009-10 were interviewed by March 2010, children in 2007 were interviewed before and after March. This introduces the possibility that those interviewed

During the same period, the proportion of children with either parent working in NREGS almost doubled. This increase in participation was accompanied by a rise in the number of parental days of work on NREGS projects as well. The proportion of children whose mothers were working in NREGS rose from 28 per cent to 61 per cent, a change larger than the corresponding change in proportion of children whose fathers were working in NREGS. Further, we find that the average number of days that the mothers worked on NREGS increased by almost five times, while the average number of days worked by fathers rose, but not as much. Thus the share of the mother in the total parental work days in NREGS rose by about 8 percentage points among children who had at least one parent working in NREGS. The mean annual household income (in 2009 rupees) also increased during this period, primarily due to a rise in non-agricultural income. It is also important to note that the household size has remained more or less unchanged during this period.

While preliminary evidence presented above suggests that mother's NREGS participation and number of days of work have gone up, it would be incorrect to draw a causal link between that and changes in children's time spent in school since decisions regarding labor supply of household members are endogenous. However, the introduction of the NREGS led to an exogenous shift in the demand for labor. Larger program fund allocation to a community indicates that there may be relatively more work opportunities for households residing in that area. The last row in Table 1 suggests that the total fund allocation to NREGS did increase during the period of our study. Moreover, this increase

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before March report a lower grade than those interviewed after March. We take this into account in our analysis.

was not uniform across sub-districts or mandals. Hence the change in demand for labor for NREGS projects varied both over time and across mandals in Andhra Pradesh.

## **B. Methodology**

In this section, we specify our empirical model and discuss the estimation strategy we adopt to test our hypothesis.

To begin with, note that NREGS participation by household members can have two distinct effects on children's time spent in school (TSS).<sup>9</sup> First, as household members work on NREGS, the total income of the household may rise. In so far as households consider the education of children to be a normal good, this income effect may result in a rise in children's time spent in school.<sup>10</sup> Second, NREGS could have an additional direct impact on children's education due to greater labor force participation of mothers, but in two opposing directions: a negative substitution effect and a positive bargaining power effect. Thus, the net impact of a change in mother's participation in the

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<sup>9</sup> The time spent in school is recorded as hours spent in school on a typical day in the previous week. The total time spent on education on a typical day consists of time spent in school and time spent on studying outside school (private tuition and at home). The average time spent on education outside the school in the sample is less than 20 per cent of the total time spent on education on a typical day.

<sup>10</sup> Whether the income effect is significant or not is a function of the cost of schooling as well. If physical access to schooling is relatively easy and costs of schooling are subsidized (as in primary schooling), any effect of an increase in household income may be muted for the age group under study here.

labor force on her children's schooling is an empirical question. We posit that, controlling for income, a positive effect of the mother's share of the total number of days parents have worked on NREGS on children's educational outcomes would suggest that the latter effect dominates the negative substitution effect.

More formally, we estimate the following specification:

$$\begin{aligned}
 TSS_{chvmdt} = & \alpha_0 + \alpha_t + \alpha_{chvmd} + \alpha_{hvmd} + \alpha_{vmd} + \alpha_{md} + \alpha_d + \alpha_{dt} + \beta \mathbf{X}_{chvmdt} \\
 & + \delta \mathbf{Z}_{hvmdt} + \varphi_1 INC_{hvmdt} + \varphi_2 MOTHER\_NREGS_{chvmdt} \\
 & + \rho Soc\_audits_{md} * t + \varepsilon_{chvmdt} \quad (1)
 \end{aligned}$$

where the subscript  $c$  refers to a child in household  $h$  in village  $v$  in mandal  $m$  in district  $d$ .  $t$  refers to time, which takes the value 0 for the year 2007 and 1 for the period 2009-10.  $\mathbf{X}$  denotes the vector of child specific time variant variables that could affect TSS.<sup>11</sup> Older children are more likely to spend time working outside or looking after their siblings. We allow for this effect to be non-linear in age by including age and square of age in  $\mathbf{X}$ .  $\mathbf{Z}$  is a vector of household variables that may change over time, viz. household

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<sup>11</sup> One of the factors that could affect temporal changes in participation in schooling is changes in the quality of schools, specifically a shift from public to private schools. The YLS contains information on the type of school the child is enrolled in for only a subset of our sample. Community level data on the type of schools is not comparable between the two survey rounds. Our results are, however, robust to the inclusion of a dummy variable for whether a private school at any level existed in the locality in 2007 and 2009-10.

wealth represented by asset quartiles and land ownership.<sup>12</sup> Since households' optimization process is also a function of the size of the household we include the number of household members in  $\mathbf{Z}$  as well. Our analysis also controls for whether the household' reference week was a school holiday.<sup>13</sup> INC is total annual household income and includes income from participation in NREGS projects.

*MOTHER\_NREGS* is defined as the ratio of mother's days of NREGS work to the sum of mother's and father's days on NREGS. Thus, using the temporal variation in the number of days of NREGS work done by the mothers and fathers between 2007 and 2009-10 our empirical model aims to identify the effect of NREGS participation of mothers on TSS ( $\varphi_2$ ).<sup>14</sup>

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<sup>12</sup> Asset quartiles were generated from an asset index which was constructed by principal component analysis of binary variables indicating ownership of durable consumer goods by the household viz., television, radio, car, motorbike, bicycle, telephone, mobile phone, refrigerator, fan, electric oven, table and chair, sofa and bedstead.

<sup>13</sup> Our results also hold up when we restrict our sample to only those children for whom the previous week was not a school holiday.

<sup>14</sup> We would have preferred 'women's share in total household income' as the main variable of interest. Unfortunately, data on individual income are not available in both survey rounds. However, when we impute women's NREGS income using wage data and specify the estimating equation in terms of the share of mother's NREGS income in total household income, our results are unchanged. In the paper we report results for specification 1 due to the likely measurement error in imputing individuals' NREGS income.

While the variables included in  $\mathbf{Z}$  and  $\mathbf{X}$  are observable, there may be unobservables at the geographic level (district, mandal and village), household level and there may also exist child specific unobserved heterogeneity. If these unobservables are correlated with the regressors on the right hand-side and they also affect time spent in school, it would lead to the issue of endogeneity and thereby inconsistency of our estimates. Our specification, therefore, includes time invariant child characteristics viz. ability ( $\alpha_{chvmd}$ ), household characteristics viz. parental preferences for schooling ( $\alpha_{hvm d}$ ), mandal level characteristics ( $\alpha_{md}$ ), and village characteristics viz. culture ( $\alpha_{vmd}$ ).

A potential problem for our empirical exercise is the phased implementation of NREGS. Districts that implemented NREGS earlier may be different from those that implemented it later. Moreover, these districts may have different economic growth trajectories as well as trends in educational attainment. To take into account these concerns, we allow for district specific intercepts  $\alpha_d$  and introduce district specific time trends ( $\alpha_{dt}$ ) We also control for a secular time trend ( $\alpha_t$ ), that allows for increases in demand for and supply of schooling.

In addition to district specific trends, there could be trends that are driven by rising awareness of rights due to mandated ‘social’ audits of NREGS projects.<sup>15</sup> For example, social audits that make households aware of their rights may also lead to a demand for public schools. Hence NREGS participation and children’s time in school

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<sup>15</sup> A novel feature of the NREGS is the introduction of compulsory ‘social’ audits of projects carried out under the program. The Act envisages conduct of audits by beneficiary households (and therefore referred to as ‘social’) at regular intervals.

could be driven by this rising awareness. To control for this, we allow the trend to depend on the number of social audits that have taken place in the mandal prior to the date of the survey ( $Soc\_audits_{md} * t$ ).

Given this specification, and using data on a balanced panel of children over the two time periods, we estimate a child fixed effects model. In doing so, we eliminate  $\alpha_{chvmd}$ ,  $\alpha_{hvmmd}$ ,  $\alpha_{vmd}$  and  $\alpha_{vd}$  as well as  $\alpha_d$ . If we assume that the deviation of the observed variables from their mean values are not correlated with the deviation of the error term from its mean values, this estimation procedure would yield consistent estimators of  $\varphi_1$  and  $\varphi_2$ .

The main concern with our estimation strategy is that household income and parental labor supply decisions are likely to be determined simultaneously with investments in children's education. To address this simultaneity issue, we adopt a 2SLS estimation procedure using mandal level rainfall shocks in the month of May and June and temporal variation in the demand for NREGS labor as instruments. We define a rainfall shock as the deviation of rainfall recorded in May and June for the mandal in the year prior to the survey from the long term (20 year) average rainfall, for the same months, in that mandal.<sup>16</sup> The demand for NREGS labor is captured by the total amount

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<sup>16</sup> The variable capturing rainfall shocks (RAIN) is constructed from the precipitation data available from the Center for Climatic Research at the University of Delaware. The data include monthly precipitation values at 0.5 degree intervals in latitude and longitude. To match this data at the mandal level, the nearest latitude-longitude to each mandal headquarter is taken. To construct the rainfall shock at the mandal level, the long term (1990-2008) average mandal level rainfall in the months of May and June are estimated.



sanctioned for NREGS projects in the mandal in a financial year.<sup>17</sup> In our preferred specification, therefore, we have two endogenous variables (INC, MOTHER\_NREGS) and three instruments (rainfall shocks, NREGS sanctioned amount and the interaction of the two). We discuss the validity of our instruments next.

### **C. Validity of instruments**

Agricultural production in India continues to be dependent upon rainfall. The choice of rainfall in May-June of the reference period as an instrument is, thus, driven by the nature of agricultural activity in the region of our study. Rice is the main crop cultivated in Andhra Pradesh. Using the YLS data we find that among rural households, the crop which the largest proportion of households cultivate (almost 36 per cent across rounds 2 and 3) is rice.<sup>18</sup> The cultivation of rice is highly water-intensive. The crop is cultivated in flooded, standing water fields. But prior to cultivation in the paddy fields, the rice seedlings are grown in nurseries. They are then manually transplanted into the flooded fields. It is therefore expected that rainfall in the pre-monsoon season will promote the development of rice seedlings enabling farmers to increase their cultivation of rice during

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Standard deviation of rainfall for the same period is also calculated at the mandal level. Then rainfall shock is defined as the deviation of actual rainfall in the months of May and June in the last year from the long term average, divided by the standard deviation.

<sup>17</sup> Data on the sanctioned funds at the mandal level is obtained from the Andhra Pradesh Government's website on NREGS (<http://nrega.ap.gov.in/>).

<sup>18</sup> Groundnut is a distant second, with about 16% of rural households engaged in its cultivation.

the monsoon season. This in turn would create greater demand for labor for transplanting. Majority of the transplanting work is done by women because it is delicate work and is a highly labor-intensive activity (Mies, 1986; Foster and Rosenzweig, 1996). Our assumption, therefore, is that, *ceteris paribus*, demand for female labor for agricultural work will be higher if pre-monsoon rainfall is high.

The monsoon typically arrives in Andhra Pradesh in mid June. Hence the pre-monsoon rainfall falls mostly in the month of May and early June. Furthermore, schools are closed for summer vacations from the last week of April to mid June every year in Andhra Pradesh.<sup>19</sup> Thus it is unlikely that rainfall in this period will have a direct effect on time spent in school or grade attainment either due to households' labor substitution decisions or supply-side factors such as teacher attendance.

Our second instrument is the amount sanctioned for NREGS projects in the reference period in a mandal. The financial sanction for the NREGS projects is made at the beginning of the financial year, which starts in April and ends in March of the following year.<sup>20</sup> Since the NREGA is envisaged as a demand-driven program, households are expected to apply for work to the village council and once a critical mass of demand is generated in a gram panchayat (a collection of 1 to 3 villages) in a mandal, a project has to be selected from the approved list of works and sanctioned by the district

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<sup>19</sup> See [http://aputf.org/go\\_s/Rc.No.31,Dt.22.07.2011.pdf](http://aputf.org/go_s/Rc.No.31,Dt.22.07.2011.pdf) for an official circular of the Department of Education on the schedule of public schools in AP.

<sup>20</sup> Ideally, we would have liked to use lagged values of this variable. Unfortunately, since the reference period for the 2<sup>nd</sup> round of the YLS is 2006 and the NREGA was initiated in February, 2006, lagged data do not exist for both rounds of the YLS survey.

administration.<sup>21</sup> Thus the main concern with the IV's validity is that household demand may determine the amount of sanctioned funds, partly or fully, at the mandal level.

Note that the NREGS funds are sanctioned at the beginning of the financial year (April 2006 and April 2008 for our reference periods) and are unlikely to be affected by demand for work contemporaneously. Also, our instrument is defined at the level of the mandal - a collection of 11 to 39 gram panchayats (in the YLS sample) - and the sanctioning of projects is at the district and mandal level. More importantly, although the NREGA envisages a demand driven program, the reality is quite different according to several recent studies. Imbert and Papp (2011) report that "many people are unaware of their full set of rights under the program"; "in practice, very few job card holders formally apply for work while the majority tend to wait passively for work to be provided." Other research on Andhra Pradesh (Ravi and Engler, 2009; Afridi et al., 2012) also indicate that the program is supply rather than demand driven.<sup>22</sup> Hence, given the fact that the program is driven by the supply of projects at the district and mandal level and that our instrument is defined at the level of the mandal, it is unlikely that there are significant effects of household demand for work on program intensity at the mandal level.

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<sup>21</sup> The Mandal Parishad Development Office (MPDO) is the main agency for administering each NREGA project and sanctioning all financial payments for projects undertaken in that mandal.

<sup>22</sup> In survey of 1500 households across 8 districts in AP, Afridi et al. (2012) find that less than 30 per cent of households applied for NREGA employment in 2010-11, 4 years after the inception of the program.

The concern that remains then is whether temporal changes in awareness of NREGA entitlements (including demanding work; Khera, 2011) is correlated with intensity of the NREGS and are accompanied with changes in the demand for public schooling (quality or quantity). On the other hand, say there is no increase in awareness but the administration is learning how to implement NREGS, which improves between 2006-09 along with the quantum of sanctioned funds and this learning spills over to the provision of the public good of interest to us – education. In either case, our IV will not meet the exclusion restriction as it would have a direct effect on educational outcomes.

We address the latter concern first. In Andhra Pradesh, school participation is near universal.<sup>23</sup> According to the Annual Survey of Education Report (ASER, 2006), the percentage of out of school rural children in the 6-14 age group was between 0 to 5 per cent in all the YLS districts except West Godavari where it was between 5 to 10 per cent in 2006. Learning levels were higher than the average for the country and have remained more or less steady during this period (ASER, 2006 and 2009). Thus any administrative “learning” with respect to public schooling would be minimal, if at all. Second, while it is quite likely that administrative capacity and NREGA implementation improved over time, it is unlikely that this was accompanied by administrative improvements in public schooling. The administrative machinery that has been created for the NREGA implementation at the grass roots level and which helps expand capacity for the program is different and delinked from that required for public schooling. Third, elections to

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<sup>23</sup> Enrollment of children in 6-10 years age group was almost 93 per cent in both round 2 and round 3 while enrollment in the 11-14 age group was almost 81 per cent in round 2 and 86 per cent in round 3 in our sample.

village councils for a five year term were held in 2006. Hence, there were no changes in local governments during the period of our study. State legislative elections returned the same political party back to power (Congress) in May, 2009, after our survey reference period. Thus, there are unlikely to have been significant changes in political will for implementation of public programs during 2007-10.

To address the former concern, we use data from the YLS to check whether political participation or participation in community led demand for certain public goods was correlated with the intensity of ‘social’ audits of NREGS projects.<sup>24</sup> Since the timing, frequency and conduct of these audits in a mandal is determined centrally by an independent body – the Society for Social Audit, Accountability and Transparency (SSAAT) – in Andhra Pradesh, the number of audits conducted in a mandal should be exogenous to the village and household. We find an insignificant effect of the occurrence of social audits on households’ awareness levels between the second and third round of the YLS surveys in a household fixed effects model (see Table A2 in the appendix). Nevertheless, as discussed in the empirical model above, we include a variable “number of social audits that took place in the mandal between the two survey rounds” in all our baseline regression analyses to control for any direct effect of ‘awareness’ improvements on children’s schooling..

## **4. Results**

### **A. Overall impact on children’s time in school**

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<sup>24</sup> The intensity of audits could increase households’ awareness of their entitlements and also be correlated with the volume of NREGS funds allocated to a mandal.

Table 2 shows the results for child's time spent in school. Column 1 reports the results of an OLS-FE regression, accounting for unobservable heterogeneity in child characteristics and differences in trends across districts. We find that the coefficient of MOTHER\_NREGS is insignificant. However, as pointed out above, this specification does not account for the possible endogeneity of labor force participation of parents and household income. The negative coefficient on MOTHER\_NREGS probably reflects the fact that poorer women, with children who have lower educational attainment, are more likely to increase their participation in the program.

Instrumenting for the endogenous variables in column 2 to correct for selectivity in program participation, we find that the coefficient on MOTHER\_NREGS is positive and significant.<sup>25</sup> A one percentage point increase in MOTHER\_NREGS leads to a 0.058 hours a day increase in time spent in school. Over the school year of 200 days, this

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<sup>25</sup> The first stage results (Table A1 in the appendix) suggest that our instruments are good predictors of the endogenous variables (F statistics ranging from 52 to 86). The results suggest that an increase in the amount sanctioned for NREGS projects in a mandal increases the household income. The coefficient on rainfall shock is negative but insignificant for annual household income possibly because agricultural income forms a very small proportion of total annual household income for our sample. Also, a good rain shock for the summer crop may well be followed by a bad rain shock during the winter crop, resulting in an insignificant effect of May-June rainfall on total annual agricultural income. The coefficient on rainfall shock is negative, as expected, while the interaction of the two instruments is positive and significant for share of mother's NREGS participation.

implies 11.6 more days of school. The result is even more pronounced if we take into account the change in mother's share of parental work in NREGS between the two survey rounds. To elaborate, between 2007 and 2009-10, mother's share of parental work in NREGS went up by 23 percentage points.<sup>26</sup> The estimated coefficient of 5.83, therefore, implies 1.34 hours per day ( $5.83 \times 0.23$ ) increase in the time spent in school of the child over this period. For a typical school day lasting 6 hours, this effect is equivalent to attending school almost quarter a day more. If we extrapolate this impact over the academic year, we can view this effect as an almost 22.3 per cent increase in school attendance rate.<sup>27</sup>

In so far as NREGS income is a part of total income, any NREGS work by parents may lead to a rise in the time spent in schooling. In column 1 we find that the coefficient on total household income is insignificant. Once we account for the endogeneity of household income in column 2, we get a positive and significant income effect.

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<sup>26</sup> This reflects 16 more days worked by the mother on NREGS and a tripling of her contribution to household income in 2009-10, if (as we explained in section 2) there is no crowding out from private labor.

<sup>27</sup> We recognize that any additional time spent in school could be substituted by less time spent studying outside school leading to an insignificant effect of mother's NREGS work days on total time spent on education on a typical day. In an alternate specification, therefore, we consider the total time spent on education (including time spent studying outside the school) as the dependent variable. Our results are unchanged.

As pointed out, children's time spent in school and parental NREGS participation may co-vary because of increasing awareness, through social audits. While the OLS-FE results estimate this effect to be negative, the 2SLS-FE results find this effect to be insignificant. Recall that the variable, "number of NREGS social audits in the mandal between the two survey rounds x time" allows for different trends in time spent in school depending on the number of audits that have taken place in the mandal before the survey. Our results point out, that if anything, the change in time spent in schooling is lesser in mandals with more social audits.

The coefficient on time is positive and significant in columns 1 and 2. In both cases, the point estimates are large representing the effect of increasing age of the child over time. While the child's age drops out as it is collinear with time, we find that there is a non-linear effect of age. The square of age turns out to be negative in columns 1 and 2. The greater the age, the lower the increase in time spent in school. This reflects the higher opportunity cost of time in school for older children.

#### **B. Heterogeneity of impact on children's time in school**

The reported average effect of NREGS participation by mothers may hide large heterogeneity of impact across households belonging to different socio-economic groups. To address this issue we run our regressions by two indicators of household wealth - asset ownership and land ownership. We construct sub-samples of children who belong to households with asset ownership, in 2007, less than the median and more than the median asset ownership index (note that the median, which is the sum of the first two asset quartiles, is based on the pooled sample of 2007 and 2009-10). In addition, we classify



households into those whose land ownership in 2007 was less than the median land ownership and more than the median land ownership (1.04 acres based on the distribution of land in the pooled sample).

The results in Table 3 suggest that the effect of MOTHER\_NREGS is significant for the households which had lower than median asset ownership in 2007. The marginal coefficient on MOTHER\_NREGS is significant only in column 1. There is no significant impact of MOTHER\_NREGS in households with higher than median asset ownership. This indicates that the overall result, that we observed in the last section, is driven by the sub-sample of children who belonged to poorer households in 2007. For these children, mother's work in NREGS contributed even more to the total income of the household than in the entire sample.

The results are, however, different in columns 3 and 4 where households are classified on the basis of land owned in 2007. The coefficient on share of mother's days in parental NREGS work days is significant for households above and below median land ownership in 2007. Note, however, the significant income effect for poorer households in column 3.

Next, we look at whether the effect of mother's days of NREGS work differs by the characteristics of the child in Table 4. In columns 1 and 2 we disaggregate the overall analysis by the gender of the child. The coefficient on share of mothers' days of NREGS work suggests a positive impact only on female children.<sup>28</sup> Furthermore, the sub-sample

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<sup>28</sup> Our results are in keeping with the findings of existing research on the impact of parental resources on children's outcomes. Previous literature suggests that the impact of mother's influence on household decision-making may differ by the gender of the child

for which data are available on the type of school they are enrolled in suggests that there was a 7 to 9 percentage point increase in enrollment in private schools between 2007-2009 but this change was greater for boys than girls (YLS report, 2011). Thus given the positive effects we find for girls' schooling but not for boys', any changes in the quality of schools could not be driving our results here.

Columns 3 and 4 further disaggregate the effect of NREGS work by the age of the child. We divide the sample of children into two groups: those who were in the age group 5-10 years in 2007 and those who were 11-14 years old. The share of parental days worked by the mother in NREGS is positive and significant for the younger and older age cohorts.

### **C. Impact on children's grade progression**

In the previous sections, we have shown that an increase in mothers' share of workdays on NREGS projects positively affects children's time spent in school. In this section, we delve into whether an increase in attendance rate in school has translated into higher grade attainment of a child. To find the determinants of GRADE, we consider a slight

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(Thomas, 1994; Murthi et al., 1995) but the literature is not conclusive on whether it exacerbates or reduces gender differences. For instance, Thomas (1994) finds that in Brazil women's education has a significantly stronger effect on girls' health while educated fathers prefer to invest more in boys. In Java (Thomas et al., 2002) and Cote d'Ivoire (Haddad and Hoddinott, 1994), on the other hand, women with greater earned income allocate more resources to sons' health.

modification of the empirical model presented above. We estimate the following specification:

$$\begin{aligned}
 GRADE_{chvmdt} = & \alpha'_0 + \alpha'_t + \alpha'_{chvmd} + \alpha'_{hvmd} + \alpha'_{md} + \alpha'_{vmd} + \alpha'_d + \alpha'_{dt} \\
 & + \beta' X_{chvmdt} + \delta' Z_{hvmdt} + \varphi'_1 INC_{hvmdt} \\
 & + \varphi'_2 MOTHER\_NREGS_{chvmdt} + \rho' SOCIAL\_AUDITS_{md} * t \\
 & + \varepsilon'_{chvmdt} \qquad (2)
 \end{aligned}$$

The dependent variable is grade attainment of a child divided by ideal grade completed for age (subscripts follow the same convention as in equation 1). We define ideal grade completed for age by assuming that at the age of 6, a child should have completed class one. Thereafter, the ideal grade completed increases by one for every incremental year.

We report results of OLS-FE and 2SLS-FE in Table 5.<sup>29</sup> For the overall sample, we find that while MOTHER\_NREGS is positive and insignificant in OLS-FE specification in column 1 and for 2SLS-FE in column 2. When we stratify the sample by households' asset ownership in 2007, we find that MOTHER\_NREGS is positive and significant for households with less than median asset ownership (columns 3 and 4). We find no significant effects by land ownership. However, we find significant positive effects for female children. The coefficient of 0.297 reflects a 13.5 percent increase in GRADE (as compared to Round 2) when take into account the change in MOTHER\_NREGS (0.19 in 2007 and 0.41 in 2009-10). These results substantiate what we have also observed for time spent in school - that the effect of days of NREGS work by mother is more visible in the lower economic strata and for girls.

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<sup>29</sup> We use the same instruments as in our main specification for TSS.

To sum, our results for grade attainment suggest that the days of work by the mother on NREGS, *ceteris paribus*, has led to better educational attainment for her children.<sup>30</sup>

#### **D. Discussion of results**

Our results establish that an increase in mother's share in NREGS workdays has a significant positive impact on her children's educational attainment. There are three likely explanations for the results we observe. The first possible explanation is that children's time does not substitute for mother's time on household chores and mothers who increase their workforce participation leave their children at school in the absence of day care or other family support. This would be an unintended, positive consequence of

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<sup>30</sup> There are certain caveats to interpreting the effect of NREGS work days on children's grade progression. First, the highest grade completed is right censored for the sub-sample of children who are still enrolled in school. This is not the case, however, for children who have completed schooling (17 year olds in 2009-10) or have dropped out by the time of the survey interview. Second, the effect of parental labor market activities may not be reflected completely in grade attainment for those households which are interviewed before April (March is the last month of an academic year) since the highest grade attained by children in these households would be right censored. Finally, the highest grade completed is a stock variable that may be determined not just by current NREGS participation of parents but also program participation between 2007 and 2009-10. Our assumption of a monotonically increasing relationship between program participation in 2007 and 2009-10 may not be valid.

NREGS participation on children's educational attainment. There are several reasons why we think this is unlikely. First, if the above explanation were correct, then the impact should have been on both boys and girls, probably larger for the former and for children in the younger age-group. The empirical literature on the effects of parent's time allocation indicates that there should be a negative or zero effect of mother's labor force participation on children's educational outcomes, particularly girls. While we find that there is an insignificant effect of mother's program participation on boys, both young and older children and girls tend to benefit. The gender effect suggests that women's preference could be coming into play. Second, to test for the possibility that schools substitute for day care for working mothers, we control for the demographic composition of the household. Under this hypothesis, the effect of mothers working on children's time in school should be insignificant if there are older siblings or grandparents in the household to take care of the younger ones. But the interpretation of our results is unchanged when we control for demographic composition of the household, including the presence of household members in the 60+ age group. (See Table A3 in the appendix for details).

A second possible explanation of our result is the mandatory provision of child care facilities on NREGS work sites. Mothers who have higher participation in NREGS may also have better access to child care facilities. This would free up the time of older siblings, particularly girls, who could then attend school more regularly. However, in our sample only 1 per cent of households report using on-site child care facilities in 2007 while more than 80 per cent of households report absence of child care facilities at the last work-site in 2009-10. Furthermore, we find that our results are driven by mothers in

the 26-32 age group (in 2007, as opposed to 25 or below, 33-39 and 40+ age groups), who are less likely to have very young children. We, therefore, do not consider this explanation as being likely.

This leads us to our preferred explanation - the effects we are seeing are due to the increased bargaining power of mothers in household decision-making. If this is the case, we should see a positive effect of mother's labor force participation on other schooling indicators besides those related to time allocation. We, therefore, use household level data on education expenditures to test our hypothesis. Results are reported in Table 6. Our specification is now run at the household level (since these data are not available at the child level) with additional controls for the number of children in the 5-17 age group and the gender composition of this group in the household. Our main coefficient of interest is the share of NREGS days of women in the household. The dependent variable is the share of education expenditure in the annual household expenditure on non-food consumption – clothing, education, health and others. While we do find an increase in share of schooling expenses related to more regular attendance (i.e. books and stationary, columns 3 and 4) for the overall sample and poorer households, there is a significant effect of share of women's participation in NREGS on the overall education expenditure share in asset quartile 1 (column 2). We do not find any significant impact for other components of education expenditure (columns 5 to 8).

Further, we analyse whether increased participation in the labor market led to improvements in women's decision-making abilities within households using data from

the second round of the Young Lives survey.<sup>31</sup> Our dependent variable is the binary response to the following questions:

- a. “Is the caregiver responsible for making the key decisions about any of the plots?”  
(Land)
- b. “Does the caregiver control the use of the earnings from the sale of goods or rent from any of these plots?” (Earnings from land)
- c. “Is the caregiver responsible for making the key decisions about any of these work for wages activities?” (Wage activities)
- d. “Is the caregiver responsible for controlling the earnings from any of these from work for wages activities?” (Earnings from wage activities)

The sample is restricted to caregivers who are mothers in age group 16-60 years.<sup>32</sup> Our main variable of interest is whether the woman works. Results for a 2SLS specification with district fixed effects are reported in Table 7. The positive and significant coefficient on ‘working’ across all outcomes, except column 3, suggests that greater participation of mothers in the labor market does increase the say and control these women have on important decisions being made within the household. In a rural setting earnings from land and from wages are likely to be the two most important

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<sup>31</sup> These data were not collected for households in round 3 of the YLS. Our analysis, therefore, is cross-sectional. We also have very little variation in women’s NREGS participation in round 2.

<sup>32</sup> The labor force participation rate among fathers in our sample is 98.4 per cent, almost universal.

sources of income for households.<sup>33</sup> This result, therefore, bolsters our claim that an increase in work opportunities for women is likely to have a positive effect on their decision-making abilities within the household. The positive impact of mother's NREGS work on girls' time in school and our analysis here indicates that our findings cannot be explained within a unitary framework of the household.

## **5. Conclusion**

The role of increasing women's bargaining power within households as a means of reducing poverty has been emphasized in discussions on development policy. In this paper, we look at one such policy initiative in India - the National Rural Employment Guarantee Scheme. While the scheme has been conceived primarily to provide households a guaranteed income through employment on public projects, it is sensitive to issues of gender discrimination in the labor market. Given that private casual wages for women are often less than those of men, the scheme stipulates equal wage rates across gender. It also gives priority to female employment and targets at least one third of the beneficiaries to be women. Thus the scheme aims to increase and improve rural women's labor market opportunities.

In this paper we contend that, *ceteris paribus*, an increase in participation of a mother on NREGS projects, relative to the father, could affect her household's outcomes such that they reflect her preferences better. Using panel data collected by the Young Lives Study in a large southern state of India (Andhra Pradesh) and taking advantage of

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<sup>33</sup> We find no impact of work status of mothers on their participation in decisions related to earnings from livestock and self-employment activities of the household.



intra district variation in rainfall shock and the funds sanctioned for NREGS, we find that greater participation of mothers in NREGS works, relative to fathers, has a positive effect on her children's time in school. Moreover we find that this effect is largely on children in the poorest wealth group and for girls in the household. Our findings of the positive effect of mothers' program participation on children's time spent in school carries implications for their educational attainment as well. Our results suggest that grade attainment of children, particularly of those from poorer households and girls, improves due to mothers' NREGS participation, implying that more time in school translates into better educational attainment.

We find evidence that suggests that the positive impact of mothers' increased program participation could be due to her improved position in household decision-making. Our assertion is supported by recent qualitative evidence on the empowering effects of NREGS on rural women (Pankaj and Tankha, 2010; Khera and Nayak, 2009). Thus, our study not only informs us about the impact of female labor supply on intra-household outcomes but also extends the current debate in India on the effects of one of its most ambitious poverty alleviation program. It suggests that the design of public programs matter and have consequences beyond the immediate aims of these programs.

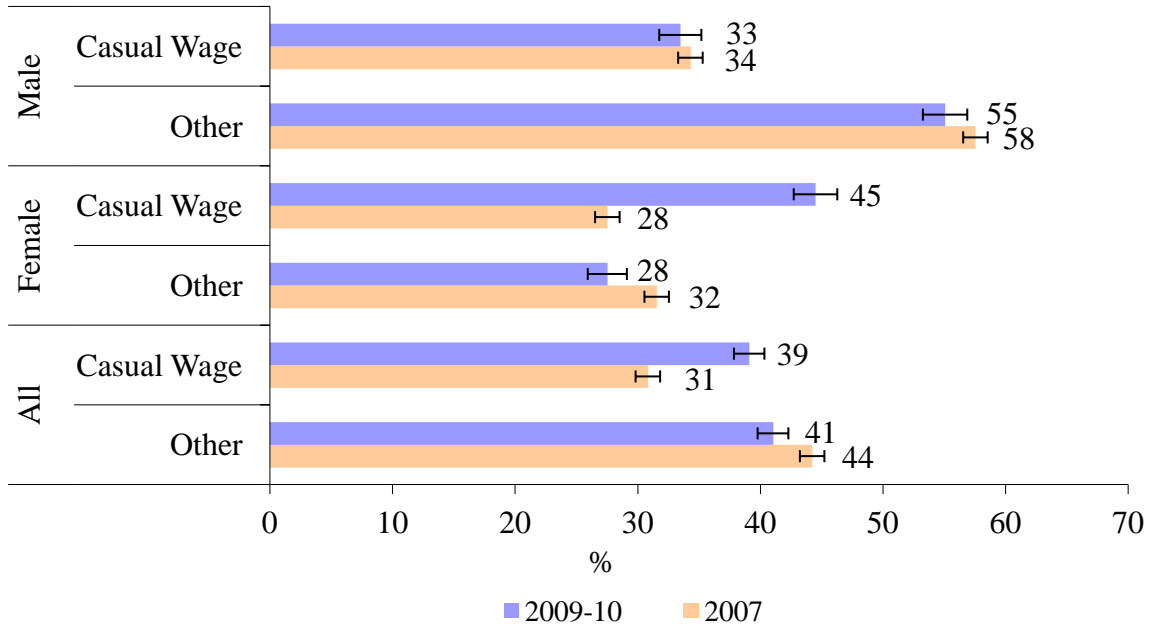
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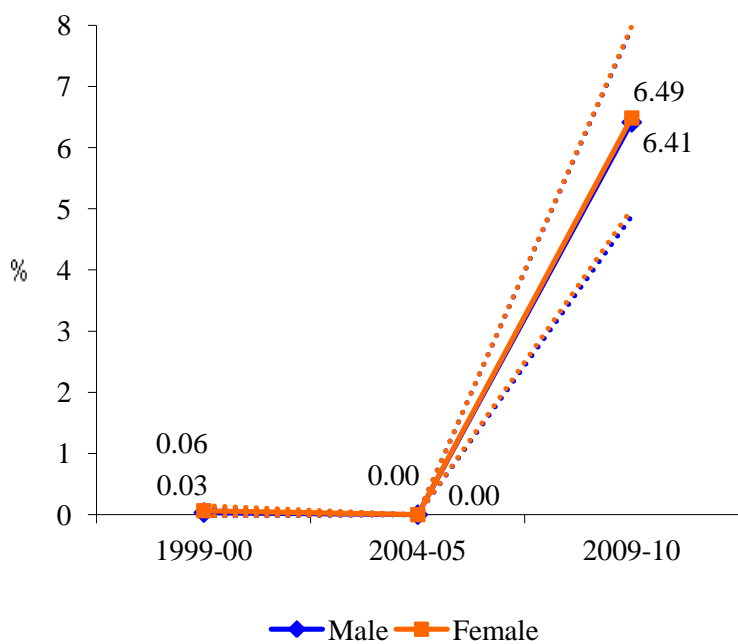
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**Figure 1: Labor Force Participation by Work Type and Gender**

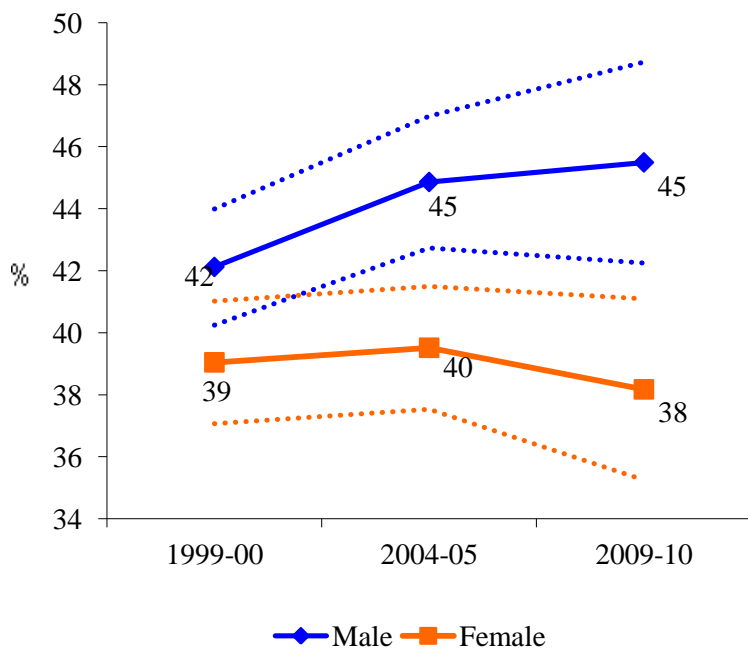


Notes: Individuals belonging to the working age of 16-60 years are included. Sample size is 5832 in 2007 and 6021 in 2009-10. 95% confidence intervals are superimposed.  
 Source: Young Lives data.

**Figure 2: Participation in Public Casual Labor in Andhra Pradesh**



**Figure 3: Participation in Private Casual Labor in Andhra Pradesh**



Notes: The labor force participation figures are calculated considering both the usual principal and subsidiary activity status of the individuals. Working population belonging to the age group of 16-60 years is considered. 95% confidence intervals are shown by dotted lines.

Source: National Sample Survey data from 55<sup>th</sup> round (1999-00), 61<sup>st</sup> round (2004-05) and 66<sup>th</sup> round (2009)

**Table 1: Summary statistics**

Variable	2007			2009-10		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
<i>Child characteristics</i>						
Sex (Male=1, Female=2)	3006	1.52	0.50	3006	1.52	0.50
Age (yrs.)	3006	8.27	3.00	3006	11.27	3.00
Enrollment	3006	0.79	0.41	3006	0.87	0.33
Time spent in school (hours)	3006	5.79	2.18	3006	6.95	2.59
Highest grade completed	1963	3.89	2.32	1963	6.28	2.57
Parents participated in NREGS	3006	0.33	0.47	3006	0.66	0.47
Total number of days parents worked in NREGS	3006	9.27	21.53	3006	36.06	48.05
<i>Mother's characteristics</i>						
Mother's age (yrs.)	3006	30.33	5.46	3006	33.29	5.43
Mother's education (highest grade completed)	2998	1.92	3.32	2998	1.92	3.32
Whether mother is working	3002	0.62	0.49	2999	0.84	0.37
Whether mother has worked in NREGS	3006	0.28	0.45	3006	0.61	0.49
Number of days mother worked in NREGS	3006	4.63	11.23	3006	20.78	28.47
Mother's share in total parental NREGS days	3006	0.18	0.32	3006	0.41	0.37
Mother's share in total parental NREGS days conditional on parents participated in NREGS	1000	0.54	0.33	1981	0.61	0.28
<i>Father's characteristics</i>						
Father's age (yrs.)	3006	36.25	6.33	3006	39.19	6.23
Father's education (highest grade completed)	3004	3.98	4.54	3004	3.98	4.54
Whether father is working	2999	0.99	0.11	2999	0.98	0.15
Whether father has worked in NREGS	3006	0.25	0.43	3006	0.49	0.50
Number of days father worked in NREGS	3006	4.64	11.87	3006	15.28	24.97
Father's share in total parental NREGS days	3006	0.15	0.29	3006	0.25	0.29
Father's share in total parental NREGS days conditional on parents participated in NREGS	1000	0.46	0.33	1981	0.39	0.28
<i>Household characteristics</i>						
Annual non-agricultural income (Rs.)	3006	28643	30122	3006	42041	46963
Annual agricultural income (Rs.)	3006	4272	22215	3006	8428	39870
Household size	3006	5.77	2.12	3006	5.76	2.19
Land owned (acre)	3006	2.14	3.27	3006	3.50	40.27
Total number of days household worked in NREGS	3006	11.18	26.72	3006	42.98	56.51
Whether date of interview was after March	3006	0.36	0.48	3006	0.00	0.00
Whether date of interview was during school summer vacation	3006	0.08	0.28	3006	0.00	0.00
<i>Community (Mandal) characteristics</i>						
Rainfall shock in May-June	3006	0.50	0.48	3006	-0.61	0.51
Total NREGS amount sanctioned (Rs. in lakhs)	3006	72.46	83.02	3006	201.91	191.73

Source: Young Lives Study

**Table 2: Effect of mother's share in parental workdays in NREGS on child's time spent in school**

Variable	OLS-FE	2SLS-FE
	(1)	(2)
Annual household income in thousands	0.001 (0.001)	0.033*** (0.013)
Mother's share in parental work on NREGS	-0.048 (0.111)	5.823*** (1.921)
Square of age	-0.040*** (0.003)	-0.039*** (0.004)
Household size	-0.046 (0.032)	-0.147* (0.084)
Asset Quartile 2	0.025 (0.111)	-0.168 (0.180)
Asset Quartile 3	-0.187 (0.124)	-0.069 (0.194)
Asset Quartile 4	-0.170 (0.163)	-0.050 (0.260)
Land owned	0.002*** (0.001)	0.000 (0.001)
Number of social audits * Time	-0.278** (0.135)	0.063 (0.230)
Date of interview during summer vacation	-0.416** (0.199)	-0.421 (0.287)
Time	3.133*** (0.214)	1.528** (0.605)
Constant	9.243*** (0.308)	
District Level Trends	Yes	Yes
Child Fixed Effects	Yes	Yes
Observations	6,012	6,012
Number of Children	3,006	3,006
R-squared	0.271	

Notes: Robust standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

**Table 3: Decomposition of effect on time spent in school by asset quartiles and land ownership (2SLS-FE)**

Variable	Asset Ownership		Land Ownership	
	Asset $\leq$ Median	Asset $>$ Median	Land $\leq$ Median	Land $>$ Median
	(1)	(2)	(3)	(4)
Annual household income in thousands	0.012 (0.015)	0.017 (0.011)	0.022* (0.012)	0.003 (0.015)
Mother's share in parental work on NREGS	2.975*** (1.098)	-0.701 (2.231)	2.939* (1.540)	4.915*** (1.850)
Square of age	-0.051*** (0.004)	-0.025*** (0.005)	-0.035*** (0.005)	-0.049*** (0.005)
Household size	-0.070 (0.083)	-0.087 (0.072)	-0.159* (0.089)	0.030 (0.083)
Asset Quartile 2	0.028 (0.140)	-1.224 (0.975)	-0.080 (0.193)	-0.051 (0.228)
Asset Quartile 3	0.130 (0.217)	-1.741** (0.855)	-0.128 (0.214)	-0.095 (0.228)
Asset Quartile 4	0.247 (0.303)	-1.877** (0.867)	-0.099 (0.298)	0.003 (0.315)
Land owned	-0.061 (0.056)	0.001 (0.001)	0.050 (0.078)	0.003** (0.001)
Number of social audits * Time	-0.333 (0.226)	0.038 (0.299)	0.148 (0.245)	-0.457 (0.279)
Date of interview during summer vacation	-0.210 (0.258)	-0.756* (0.431)	-0.526 (0.353)	-0.097 (0.346)
Time	3.246*** (0.465)	1.611* (0.830)	1.775*** (0.596)	3.217*** (0.607)
District Level Trends	Yes	Yes	Yes	Yes
Child Fixed Effects	Yes	Yes	Yes	Yes
Observations	3,864	2,148	3,172	2,840
Number of Children	1,932	1,074	1,586	1,420

Notes: Robust standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.



**Table 4: Decomposition of effects on time spent in school by gender and age group (2SLS-FE)**

Variable	Gender		Age-group	
	Male	Female	5-10 years	11-14 years
	(1)	(2)	(3)	(4)
Annual household income in thousands	0.021 (0.013)	0.044* (0.023)	0.036*** (0.014)	0.036 (0.033)
Mother's share in parental work on NREGS	2.880 (2.196)	8.823** (3.534)	4.730** (2.099)	9.268* (4.776)
Square of age	-0.035*** (0.004)	-0.042*** (0.007)	-0.043*** (0.008)	-0.046 (0.029)
Household size	-0.032 (0.111)	-0.328* (0.169)	-0.099 (0.095)	-0.281 (0.239)
Asset Quartile 2	-0.140 (0.175)	-0.368 (0.357)	-0.054 (0.189)	-0.444 (0.467)
Asset Quartile 3	-0.217 (0.202)	0.140 (0.388)	0.150 (0.216)	-0.711 (0.498)
Asset Quartile 4	0.018 (0.302)	-0.231 (0.440)	-0.118 (0.284)	0.170 (0.643)
Land owned	-0.089** (0.039)	0.000 (0.002)	-0.082* (0.043)	0.001 (0.002)
Number of social audits * Time	0.144 (0.278)	-0.109 (0.384)	0.005 (0.262)	0.296 (0.494)
Date of interview during summer vacation	-0.463 (0.284)	-0.267 (0.549)	-0.905*** (0.317)	1.248 (0.935)
Time	2.042*** (0.631)	0.922 (1.134)	1.797*** (0.630)	1.464 (2.626)
District Level Trends	Yes	Yes	Yes	Yes
Child Fixed Effects	Yes	Yes	Yes	Yes
Observations	2,910	3,102	4,166	1,846
Number of Children	1,455	1,551	2,083	923

Notes: Robust standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

**Table 5: Effect of mother's share in parental workdays in NREGS on child's grade progression**

Variable	Overall		Heterogeneity (2SLS-FE)			
	OLS-FE	2SLS-FE	Asset ≤ Median	Asset > Median	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Annual household income in thousands	0.000 (0.000)	-0.001 (0.001)	-0.003 (0.002)	0.001 (0.001)	-0.002 (0.003)	0.0002 (0.001)
Mother's share in parental work on NREGS	0.023 (0.015)	0.074 (0.165)	0.257* (0.132)	0.134 (0.203)	-0.340 (0.372)	0.469* (0.278)
Household size	-0.006 (0.006)	0.002 (0.009)	0.011 (0.017)	-0.002 (0.014)	-0.010 (0.024)	-0.008 (0.015)
Asset Quartile 2	-0.027* (0.015)	-0.029* (0.016)	-0.008 (0.019)	-0.000 (0.058)	-0.023 (0.026)	-0.053* (0.028)
Asset Quartile 3)	-0.038** (0.016)	-0.043** (0.017)	0.030 (0.030)	0.035 (0.052)	-0.007 (0.031)	-0.057** (0.029)
Asset Quartile 4	-0.034 (0.022)	-0.027 (0.023)	0.058 (0.044)	0.013 (0.056)	-0.029 (0.046)	-0.031 (0.033)
Land owned	-0.000*** (0.000)	0.000 (0.000)	-0.003 (0.006)	-0.000 (0.000)	0.006 (0.006)	0.000 (0.000)
Number of social audits * Time	-0.001 (0.019)	-0.011 (0.021)	-0.030 (0.031)	0.042 (0.040)	-0.015 (0.032)	-0.013 (0.037)
Date of interview after March	-0.007 (0.014)	-0.022 (0.020)	-0.027 (0.023)	0.006 (0.033)	-0.014 (0.038)	-0.038 (0.030)
Time	0.053** (0.023)	0.066 (0.045)	0.052 (0.048)	0.008 (0.067)	0.116* (0.067)	-0.008 (0.082)
Constant	0.808*** (0.034)					
District Level Trends	Yes	Yes	Yes	Yes	Yes	Yes
Child Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,926	3,926	2,494	1,432	1,820	2,106
Number of Children	1,963	1,963	1,247	716	910	1,053
R-squared	0.027					

Notes: Robust standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

**Table 6: Effect of women's share in household workdays in NREGS on educational expenditure (2SLS-FE)**

	Total Expenditure		Books and Stationery		Fees		Others (uniform, tuition and transport)	
	Overall	Asset Quartile 1	Overall	Asset Quartile 1	Overall	Asset Quartile 1	Overall	Asset Quartile 1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Annual household income in thousands	-0.001 (0.001)	-0.001 (0.001)	0.001** (0.000)	0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	-0.000 (0.000)	-0.002* (0.001)
Share of female members in total days household worked in NREGS	0.017 (0.129)	0.233* (0.123)	0.129* (0.067)	0.079* (0.046)	-0.185 (0.118)	0.096 (0.062)	0.073 (0.072)	0.057 (0.081)
Average age of children in school going age	0.003 (0.003)	0.004 (0.004)	0.000 (0.002)	0.001 (0.002)	0.002 (0.002)	-0.000 (0.002)	0.002 (0.002)	0.004 (0.003)
Number of boys in school going age	0.050*** (0.009)	0.036*** (0.014)	0.008* (0.005)	0.015*** (0.006)	0.022*** (0.007)	0.012 (0.008)	0.020*** (0.005)	0.010 (0.008)
Number of girls in school going age	0.026*** (0.007)	0.016 (0.011)	0.005 (0.004)	0.003 (0.005)	0.015** (0.006)	0.009* (0.005)	0.006 (0.004)	0.003 (0.006)
Household size	-0.006 (0.004)	-0.006 (0.007)	-0.005* (0.003)	-0.004 (0.003)	0.001 (0.004)	-0.006 (0.004)	-0.002 (0.002)	0.005 (0.005)
Asset quartile 2	-0.005 (0.009)	0.014 (0.015)	-0.008 (0.005)	-0.006 (0.007)	-0.001 (0.008)	-0.001 (0.007)	0.004 (0.005)	0.019** (0.010)
Asset quartile 3	0.001 (0.010)	0.014 (0.017)	-0.010* (0.006)	-0.016** (0.007)	0.016* (0.009)	0.015* (0.008)	-0.003 (0.006)	0.015 (0.011)
Asset quartile 4	0.010 (0.014)	0.045 (0.036)	-0.010 (0.008)	-0.014 (0.015)	0.009 (0.012)	0.011 (0.020)	0.013 (0.008)	0.048** (0.024)
Land owned	-0.000*** (0.000)	-0.001 (0.001)	-0.000* (0.000)	0.000 (0.000)	-0.000*** (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.001 (0.001)
Number of social audits * Time	-0.022 (0.017)	-0.028 (0.021)	0.020** (0.008)	-0.004 (0.008)	-0.047*** (0.014)	-0.015 (0.011)	0.004 (0.010)	-0.009 (0.013)
Time	0.074** (0.037)	0.032 (0.037)	-0.019 (0.017)	0.021 (0.015)	0.091*** (0.031)	-0.004 (0.018)	0.001 (0.021)	0.017 (0.024)
District Level Trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,852	1,530	3,878	1,546	3,862	1,534	3,856	1,532
Number of households	1,926	765	1,939	773	1,931	767	1,928	766

Notes: Robust standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

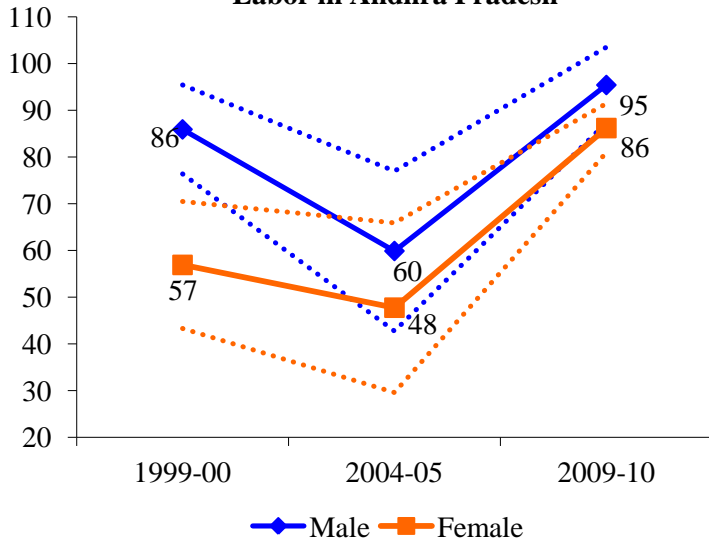
**Table 7: Effect of work status of mothers on their decision-making within household (2SLS-FE)**

Variable	Land	Earnings from Land	Wage Activities	Earnings from Wage Activities
	(1)	(2)	(3)	(4)
Annual household income (INC)	0.011 (0.007)	0.009 (0.008)	0.037* (0.019)	0.024 (0.015)
Mother is working	1.162*** (0.435)	1.562*** (0.496)	0.915 (0.824)	1.096* (0.653)
Mother's age	-0.008 (0.023)	-0.034 (0.026)	0.026 (0.040)	0.019 (0.034)
Mother's age squared	0.000 (0.000)	0.000 (0.000)	-0.000 (0.001)	-0.000 (0.000)
Mother's highest grade passed	-0.002 (0.007)	0.001 (0.008)	-0.025 (0.019)	-0.011 (0.015)
Household size	-0.052** (0.026)	-0.041 (0.031)	-0.102** (0.052)	-0.081** (0.041)
Asset quartile 2	0.043 (0.055)	0.087 (0.060)	-0.110 (0.101)	-0.034 (0.081)
Asset quartile 3	0.030 (0.075)	0.128 (0.087)	-0.252 (0.168)	-0.103 (0.132)
Asset quartile 4	-0.217 (0.240)	-0.088 (0.282)	-1.633* (0.884)	-1.008 (0.715)
Household's land ownership	-0.013 (0.010)	-0.009 (0.011)	-0.049 (0.034)	-0.041 (0.025)
Muslim	0.333** (0.140)	0.300* (0.174)	0.475 (0.436)	0.529 (0.325)
Christian	0.174 (0.158)	0.027 (0.161)	0.155 (0.220)	-0.088 (0.157)
SC	-0.083 (0.065)	-0.112 (0.071)	0.260 (0.202)	0.212 (0.150)
ST	-0.078 (0.106)	-0.181 (0.121)	0.369 (0.233)	0.233 (0.180)
Backward caste	0.014 (0.061)	0.047 (0.066)	0.399 (0.255)	0.335* (0.188)
Mixed caste	-0.255 (0.250)	-0.276 (0.349)	0.619 (0.429)	0.357 (0.313)
Constant	-0.248 (0.309)	-0.075 (0.354)	-0.607 (0.573)	-0.478 (0.490)
District fixed effects	Yes	Yes	Yes	Yes
Observations	1,881	1,908	1,498	1,472

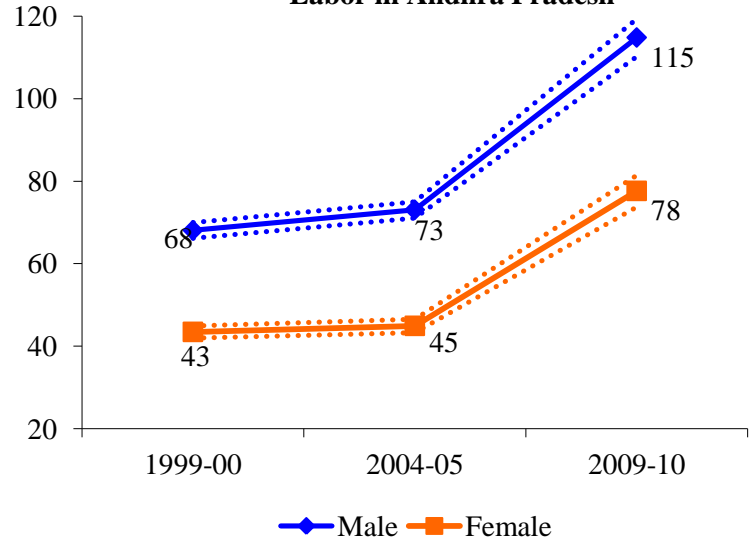
Notes: Robust standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The same set of instruments (Rainfall shock in May-June, Total fund sanctioned in NREGS, and their interaction) is used for annual household income and working status.

## Appendix

**Figure A1: Daily Wage Rate for Public Casual Labor in Andhra Pradesh**



**Figure A2: Daily Wage Rate for Private Casual Labor in Andhra Pradesh**



Notes: The wage rates are calculated for the working population in the age group of 16-60 years. Reference period is the seven days prior to the survey date. The wage rates are expressed in 2009-10 prices. 95% confidence intervals are shown by dotted lines.

Source: National Sample Survey data from 55<sup>th</sup> round (1999-00), 61<sup>st</sup> round (2004-05) and 66<sup>th</sup> round (2009-10).

**Table A1: First stage regressions (for overall results)**

Variable	Time Spent in School	
	Annual household income in thousands	Mother's share in total days parents worked in NREGS
	(1)	(2)
Rainfall shock in May-June	-10.734 (6.649)	-0.210*** (0.053)
Total amount sanctioned	0.024** (0.010)	-0.0001 (0.000)
RAIN * Total amount sanctioned	-0.025* (0.014)	0.0002*** (0.000)
Square of age	-0.045 (0.055)	-0.0001 (0.000)
Household size	4.856*** (1.504)	-0.009 (0.006)
Asset Quartile 2	-1.973 (1.504)	0.040** (0.019)
Asset Quartile 3	-3.863 (2.603)	0.004 (0.021)
Asset Quartile 4	6.799** (3.122)	-0.051* (0.027)
Land owned	0.072*** (0.005)	-0.0001*** (0.000)
Number of social audits * time	6.764* (3.878)	-0.101*** (0.034)
Date of interview during summer vacation	2.206 (3.758)	-0.004 (0.026)
Time	-12.464 (9.363)	-0.027 (0.086)
Constant	13.879 (10.446)	0.327*** (0.055)
District Level Trends	Yes	Yes
Child Fixed Effects	Yes	Yes
Observations	6,012	6,012
Number of Children	3,006	3,006
R-squared	0.137	0.291
F-Stat	51.84	86.37
Overidentification Test (Hansen J Statistic)		0.455
Weak Identification Test (Cragg-Donald Wald F Statistic)		5.247

Notes: Robust standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. F-stat for joint significance of the three instruments is 14.40 (p-value 0.0001) for column 1, and 11.05 (p-value 0.0001) for column 2.

**Table A2: Effect of social audits on households' awareness**

	<b>Taken action on a community problem</b>	<b>Participated in awareness campaign</b>	<b>Participated in protest march / demonstration</b>	<b>Voted in local elections</b>	<b>Index 1<sup>#</sup></b>	<b>Index 2<sup>##</sup></b>
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>	<b>(5)</b>	<b>(6)</b>
Number of social audits * Time	0.039 (0.032)	-0.046 (0.028)	-0.070*** (0.022)	0.002 (0.008)	-0.191 (0.127)	-0.191 (0.127)
Average age of the household	0.002 (0.002)	-0.002 (0.002)	0.001 (0.001)	0.001 (0.001)	0.002 (0.009)	0.002 (0.009)
Household size	0.001 (0.007)	0.009 (0.006)	0.000 (0.004)	0.001 (0.002)	0.019 (0.024)	0.019 (0.024)
Land owned	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Asset Quartile 2	0.034 (0.022)	0.010 (0.022)	-0.009 (0.015)	-0.003 (0.009)	0.056 (0.090)	0.057 (0.090)
Asset Quartile	0.031 (0.024)	0.038 (0.024)	-0.002 (0.016)	-0.002 (0.009)	0.114 (0.097)	0.114 (0.097)
Asset Quartile 4	0.050 (0.032)	0.047 (0.032)	-0.006 (0.022)	-0.005 (0.012)	0.153 (0.132)	0.154 (0.132)
Time	-0.086** (0.037)	-0.077** (0.037)	0.074*** (0.025)	0.005 (0.011)	-0.103 (0.151)	-0.105 (0.151)
Constant	0.033 (0.056)	0.076 (0.049)	0.015 (0.033)	0.974*** (0.021)	-0.351* (0.211)	-0.349* (0.211)
District Level Trends	Yes	Yes	Yes	Yes	Yes	Yes
Household Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,229	4,230	4,231	4,234	4,226	4,226
Number of Households	2,123	2,123	2,123	2,123	2,123	2,123
R-squared	0.046	0.056	0.038	0.022	0.057	0.058

Notes: Robust standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

# Index 1 is obtained by principal component analysis (PCA) of the dependent variables in column 1, 2, 3 and 4.

## Index 2 is obtained similarly by PCA of the dependent variables in column 1, 2, and 3 (excluding 4).

**Table A3: Effect of mother's share in total days parents worked in NREGS on child's time spent in school (2SLS-FE)**

<b>Variable</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>
Annual household income in thousands	0.033*** (0.012)	0.033*** (0.013)	0.033*** (0.012)
Mother's share in total parental days in NREGS	5.693*** (1.845)	5.913*** (1.953)	5.766*** (1.874)
Square of age	-0.040*** (0.004)	-0.039*** (0.004)	-0.040*** (0.004)
Household size		-0.150 (0.094)	
<i>Number of 0-4 years old females in household</i>	-0.158 (0.232)		-0.190 (0.240)
<i>Number of 0-4 years old males in household</i>	0.249 (0.232)		0.279 (0.235)
<i>Number of 5-9 years old females in household</i>	0.046 (0.163)		0.014 (0.168)
<i>Number of 5-9 years old males in household</i>	-0.087 (0.211)		-0.045 (0.215)
<i>Number of 10-15 years old females in household</i>	-0.221 (0.177)		-0.261 (0.187)
<i>Number of 10-15 years old males in household</i>	-0.159 (0.201)		-0.116 (0.208)
<i>Number of females above 15 years of age in household</i>	-0.212 (0.172)		-0.290 (0.197)
<i>Number of males above 15 years of age in household</i>	-0.198 (0.165)		-0.143 (0.183)
<i>Number of females above 60 years of age in household</i>		0.228 (0.266)	0.033 (0.256)
<i>Number of males above 60 years of age in household</i>		-0.179 (0.280)	-0.268 (0.268)
Asset Quartile 2	-0.168 (0.179)	-0.172 (0.182)	-0.178 (0.181)
Asset Quartile 3	-0.076 (0.189)	-0.067 (0.196)	-0.080 (0.190)
Asset Quartile 4	-0.058 (0.254)	-0.045 (0.263)	-0.063 (0.257)
Land owned	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)
Number of social audits * Time	0.035 (0.218)	0.056 (0.231)	0.027 (0.219)
Date of interview during summer vacation	-0.433 (0.284)	-0.417 (0.288)	-0.431 (0.285)
Time	1.716*** (0.571)	1.515** (0.612)	1.702*** (0.578)
District Level Trends	Yes	Yes	Yes
Child Fixed Effects	Yes	Yes	Yes
Observations	6,012	6,012	6,012
Number of Children	3,006	3,006	3,006

Notes: Robust standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Controls for households' demographic composition in italics.

In column 3 age group above 15 years is defined as above 15 but below 60 years of age.