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The Effect of the National Rural Employment  
Guarantee Scheme

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## Abstract

The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) of India requires one-third of the beneficiaries to be women, and equal wages to be paid to female and male participants. We study its impact on children's educational attainment via women's increased access to labour-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 the mother's share of parental NREGS workdays increases the school attendance and grade attainment of her children, particularly girls. This impact is over and above any income effect induced by the scheme.

Keywords: labour, education, gender, bargaining

JEL classification: I21, I38, J1

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### About Young Lives

Young Lives is an international study of childhood poverty, following the lives of 12,000 children in 4 countries (Ethiopia, India, Peru and Vietnam) over 15 years. [www.younglives.org.uk](http://www.younglives.org.uk)

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The views expressed are those of the author(s). They are not necessarily those of, or endorsed by, Young Lives, the University of Oxford, DFID or other funders.

# 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-related disparities in health and educational outcomes, economic opportunities continue to be limited for women. The *Report* underlines the policy priorities of reducing 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 Mahatma Gandhi National Rural Employment Guarantee Scheme (NREGS), initiated in 2006. While the programme's main objective is to alleviate rural poverty, it also has the potential to empower rural women through greater access to labour-market opportunities.

From a gender perspective, there are two interesting features of this programme. First, equal wage rates apply to women and men; and second, it gives priority to female employment and requires one-third of the beneficiaries to be women. Thus, not only does NREGS have the potential to raise female labour-force participation by bringing employment opportunities almost to their doorsteps, but the equal wage rates that it provides can potentially reduce any gender disparity prevalent in the rural labour markets. We therefore hypothesise that the introduction of this programme should lead to an increase in labour-market opportunities for women, on both the extensive and intensive margins.

An increase in women's labour-force participation can potentially affect individual and household behaviour on several fronts, including marriage, fertility, and intra-household distribution of resources. This paper analyses the effect of the policy shock of the implementation of the NREGS on children's well-being. Specifically, we explore whether an increase in mothers' participation in NREGS projects affects the educational outcomes of their children differently from the rate of fathers' participation in the programme. If the hypothesis can be proved, we attempt to understand the mechanism through which this differential effect can be explained.

While an increase in either fathers' or mothers' labour supply could improve their children's outcomes purely due to an income effect, greater labour-force participation by mothers could affect 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 have to spend more time doing household chores because the mother has less time for such tasks, then an increase in a mother's NREGS participation may lead to a *decline* in educational attainment of her children.<sup>1</sup>

Second, a mother's ability to influence household resource allocation decisions may be enhanced as a result of 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 given to her preferences in household resource-

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1 On the other hand, if children do not compensate for the time spent on household chores by the mother, and child-care services in the market are either unavailable or unaffordable, then it is more likely that children will be in school while mothers are at work. If children attend school more regularly due to their mothers working, then this could improve children's participation in school. However, this mechanism is unlikely to operate for older children and girls.

allocation decisions, and if mothers prefer to invest more in their children's health and education than fathers would do (Blumberg 1988; Thomas 1990; Hoddinott and Haddad 1995; Quisumbing and Maluccio 2003), then we should see an improvement in child outcomes. Therefore, an increase in a 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 summarise: the net impact on her children's schooling of a change in a mother's participation in the labour force depends on which of these effects dominates: the negative substitution effect, or the positive effect of greater bargaining power for mothers.<sup>2</sup>

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

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 labour 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 show that the effect of earned income on female autonomy is far greater than the effect 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 labour, 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 labour income also increased the educational attainment of all children. However, when the policy increased male labour income, the educational attainment of girls decreased, while no effect on boys was observed.

Using data from Young Lives 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 programme, relative to fathers, is indeed associated with more time spent in school by their children. 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 by children. These findings are not compromised by concerns about unobservable child-level heterogeneity, endogeneity of adult labour-force participation, or 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' voice in

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2 We are abstracting from any long-term effects of changes in fertility due to women's increased labour-force participation, since we are looking at these changes over two to three years only.



decision-making and control of income from various sources. The analysis of the household-level education expenditure data shows that an increase in women's share in total household workdays on NREGS significantly increases the share of total education expenditures, including variable costs of schooling such as stationery, in discretionary annual household expenditures in poorer households. Moreover, cross-sectional data suggest that the probability that mothers have a say in or control over the utilisation of earnings from different sources increases when they participate in the labour force. These results, together with the significant effects of greater share of mother's participation in NREGS on girls, suggest that a woman's preferences could be the primary driver of the improvements in educational attainment of her children when her programme 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 labour supply on intra-household outcomes: they also address a broader policy issue of the impact of the design of public programmes on improving household outcomes in developing countries. Specifically, our paper extends the current debate on the impact of workfare programmes on poverty (Ravi and Engler 2009; Uppal 2009) and finds evidence which suggests that mandating women's participation in public programmes has consequences beyond those immediately intended by policy makers.

The paper is organised as follows. Section 2 presents 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 offers a conclusion.

## 2. Background

The National Rural Employment Guarantee Act (2005)<sup>3</sup> of India provides a legal guarantee of up to 100 days of annual employment at a predetermined wage rate to rural households willing to supply manual labour on local public-works projects. The act (NREGA) was operationalised through the National Rural Employment Guarantee Scheme (NREGS), which was launched 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 1 April 2008. We analyse data on individuals' labour-force participation from Young Lives – a panel study from six districts of Andhra Pradesh, India's fifth-largest state (in terms of population), which is among the leading states in the generation of employment under the NREGS.

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

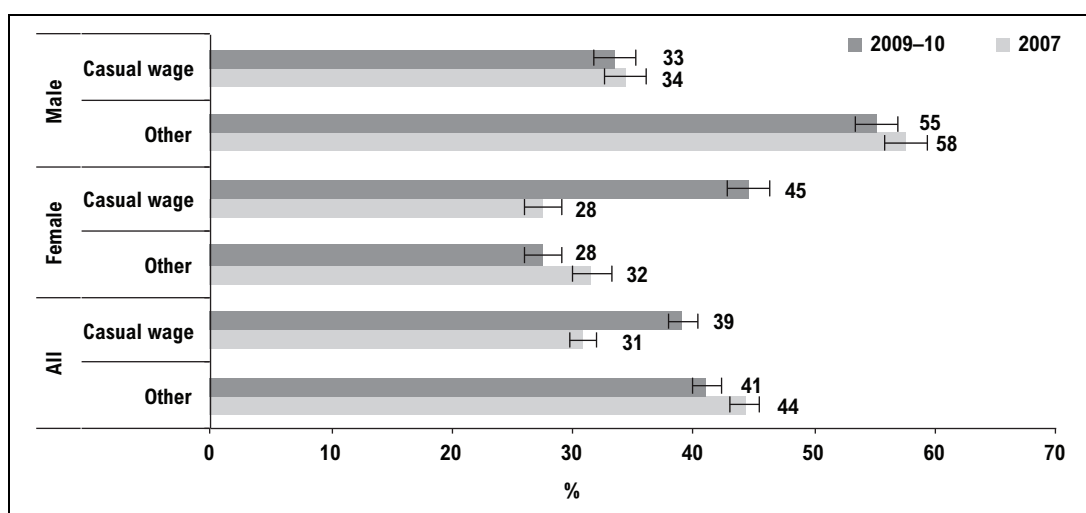
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3 <http://nrega.nic.in/rajaswa.pdf>

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

**Figure 1.** *Labour-force participation by work type and gender*



Notes: Individuals belonging to the working age of 16–60 years are included. Sample size is 5,832 in 2007 and 6,021 in 2009–10. Confidence intervals of 95 per cent are superimposed.

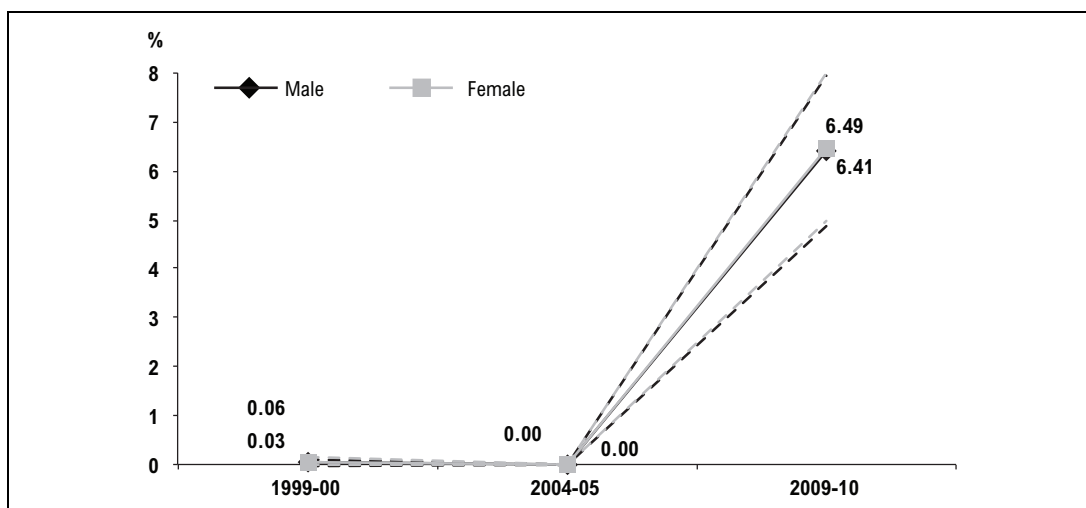
Source: Young Lives data.

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 rates of labour-force participation in casual labour 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 labour-force participation in public works, both for men and women, in the 16–60 age group since NREGS implementation.<sup>6</sup> While participation somewhat declined between 1999–00 and 2004–05, it rose sharply in 2009–10 from almost no participation at all in 2004–05. Private casual labour-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 fell from 1.5 in 1999–2000 to 1.1 in 2009–10 (Figures A1 and A2 in Appendix).

5 Disaggregating the labour-force participation rates across asset quartiles of the households, we find that the rise in female participation in the casual labour market is more prominent for poorer households relative to the uppermost asset quartile. Moreover, participation of women in the NREGS, on the extensive and intensive margins, has increased more substantially compared with that of men, and this is also more noticeable in the poorer households (see summary statistics in Table 1).

6 We take into account casual labour constituting both the principal occupation and a subsidiary occupation in the 365 days prior to the survey date.

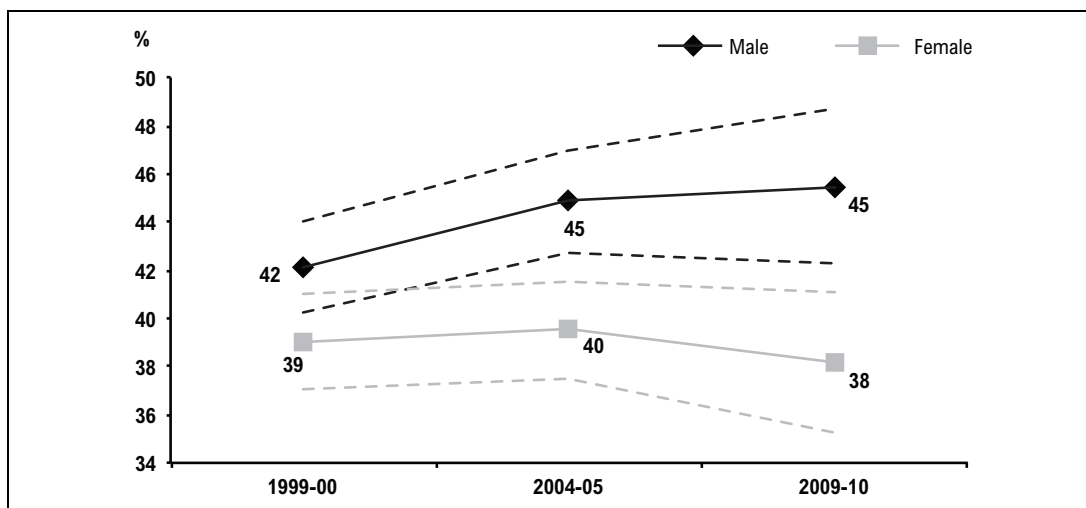
**Figure 2.** *Participation in public casual labour in Andhra Pradesh*



Notes: The labour-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. Confidence intervals of 95 per cent are shown by dotted lines.

Sources: National Sample Survey data from 55<sup>th</sup> round (1999–2000), 61<sup>st</sup> round (2004–05), and 66<sup>th</sup> round (2009).

**Figure 3.** *Participation in private casual labour in Andhra Pradesh*



Notes: The labour-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. Confidence intervals of 95 per cent are shown by dotted lines.

Sources: National Sample Survey data from 55<sup>th</sup> round (1999–2000), 61<sup>st</sup> round (2004–05), and 66<sup>th</sup> round (2009).

To summarise, the data suggest that the casual labour-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>

7 The fact that men's participation in overall casual labour has stayed more or less the same during this period suggests that men have taken on NREGS work as a subsidiary activity.

## 3. Data and methodology

### 3.1 Data

In order to identify the effect of the NREGS on children's education via their mothers' participation in the programme, we conduct our empirical analysis at the level of the child, using the two comparable phases of the Young Lives surveys: 2007 and 2009–10. We restrict our sample to children in the age group of 5–14 years in 2007, the school-going age group. 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 (fewer 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 discount 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 3,006 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 previous week) went 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. On a typical day, children in the survey who reported attending school regularly spent almost two hours more in school than those who reported going to school irregularly. 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. Enrolment 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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8 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 before March report a lower grade than those interviewed after March. We take this into account in our analysis.

**Table 1.** *Summary statistics*

Variable	2007			2009–10		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
<b>Child characteristics</b>						
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
Enrolment	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
<b>Mother's characteristics</b>						
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
<b>Father's characteristics</b>						
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
<b>Household characteristics</b>						
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
<b>Community (Mandal) characteristics</b>						
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

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. 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 increase for 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 workdays 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 mothers' NREGS participation and number of days of work have gone up, it would be incorrect to draw a causal link between that increase and changes in time spent by children in school, since decisions regarding labour supply of household members are endogenous. However, the introduction of the NREGS leads to an exogenous shift in the demand for labour. Larger programme-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 was not uniform across sub-districts or *mandals*. Hence the change in demand for labour for NREGS projects varied both over time and across *mandals* in Andhra Pradesh.

### 3.2 Methodology

In this section, we specify our empirical model and discuss the estimation strategy that 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 their mothers' greater labour-force participation, 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 labour force on her children's schooling is an empirical question. We posit that, controlling for income, a positive effect on children's educational outcomes of the mother's share of the total number of days that parents have worked on NREGS would suggest that the latter effect dominates the negative substitution effect.

More formally, we estimate the following specification:

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

9 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 in 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.

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

where the subscript  $c$  refers to a child in household  $h$  in village  $v$  in *mandal*  $m$  in district  $a$ .  $t$  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 wealth represented by asset quartiles and land ownership.<sup>12</sup> Since households' optimisation 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's 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 mothers' NREGS participation on TSS ( $\phi_2$ ).

While the variables included in  $\mathbf{Z}$  and  $\mathbf{X}$  are observable, there may be unobservables at the geographic level (district, *mandal*, and village) and the 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 ( $\alpha_{hvmd}$ ), *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. There may be differences between districts that implemented NREGS earlier and those that implemented it later. Moreover, these districts may have different economic-growth trajectories, as well as different 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 ( $\alpha_t$ ), which 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>14</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 could be driven by this

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11 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. Young Lives contains information on the type of school in which the child is enrolled for only a subset of our sample. Community-level data on the types of school are 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.

12 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 set, radio, car, motorbike, bicycle, telephone, mobile phone, refrigerator, fan, electric oven, table and chair, sofa and bedstead.

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

14 A novel feature of the NREGS is the introduction of compulsory 'social' audits of projects carried out under the programme. The Act envisages the conduct of audits by beneficiary households (and therefore referred to as 'social audits') at regular intervals.

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  $\alpha_{chvmd}$ ,  $\alpha_{hvmd}$ ,  $\alpha_{vmd}$  and  $\alpha_{va}$  as well as  $\alpha_d$ . If we assume that the deviation of the observed variables from their mean values is 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 labour-supply decisions are likely to be determined simultaneously with decisions about investments in children's education. To address this simultaneity issue, we adopt a 2SLS estimation procedure, using as instruments *mandal*-level rainfall shocks in the month of May and June and temporal variation in the demand for NREGS labour. 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>15</sup> The demand for NREGS labour is captured by the total sum sanctioned for NREGS projects in the *mandal* in a financial year.<sup>16</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.

### 3.3 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 Young Lives data, we find that among rural households the crop that is cultivated by the largest proportion of households (almost 36 per cent across Rounds 2 and 3) is rice.<sup>17</sup> The cultivation of rice is highly water-intensive. The crop is cultivated in flooded fields of standing water. 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 the monsoon season. This in turn would create greater demand for labour for transplanting. Most of the transplanting work is done by women, because it is delicate work and is a highly labour-intensive activity (Mies 1986; Foster and Rosenzweig 1996). Our assumption, therefore, is that, other things being equal, demand for female labour for agricultural work will be higher if pre-monsoon rainfall is high.

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15 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 these 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 is estimated. 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.

16 Data on the sanctioned funds at the *mandal* level are obtained from the Andhra Pradesh government's website on NREGS (<http://nrega.ap.gov.in/>).

17 Groundnut is a distant second, with about 16 per cent of rural households engaged in its cultivation.



The monsoon typically arrives in Andhra Pradesh in mid-June. Hence the pre-monsoon rainfall falls mostly in May and early June. Furthermore, schools in Andhra Pradesh are closed for summer vacations from the last week of April to mid-June every year.<sup>18</sup> Thus it is unlikely that rainfall in this period will have a direct effect on time spent in school or on grade attainment due either to households' labour-substitution decisions or to 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>19</sup> Since the NREGA is envisaged as a demand-driven programme, households are expected to apply to the village council for work, and once a critical mass of demand is generated in a *gram panchayat* (a collection of one–three villages) in a *mandal*, a project has to be selected from the approved list of works and sanctioned by the district administration.<sup>20</sup> Thus the main concern with the IV's validity is that household demand may determine the total 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 Young Lives sample) – and the sanctioning of projects takes place at the district and *mandal* level. More importantly, although the NREGA envisages a demand-driven programme, 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 indicates that the programme is supply-driven rather than demand-driven.<sup>21</sup> Hence, given the fact that the programme 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 programme intensity at the *mandal* level.

The concern that remains then is whether temporal changes in awareness of NREGA entitlements (including demanding work: Khera 2011) are correlated with intensity of the NREGS and are accompanied by 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 and 2009 along with the quantum of sanctioned funds, and this learning spills over to the provision of the public good that is 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.

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18 See [http://aputl.org/go\\_s/Rc.No.31,Dt.22.07.2011.pdf](http://aputl.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.

19 Ideally, we would have liked to use lagged values of this variable. Unfortunately, since the reference period for Round 2 of Young Lives is 2006 and the NREGA was initiated in February 2006, lagged data do not exist for both rounds of the Young Lives survey.

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

21 In a survey of 1,500 households across eight districts in AP, Afridi et al. (2012) find that fewer than 30 per cent of households applied for NREGA employment in 2010–11, four years after the inception of the programme.

We address the latter concern first. In Andhra Pradesh, school participation is near-universal.<sup>22</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 and 5 in all the Young Lives districts except West Godavari, where it was between 5 and 10 per cent in 2006. Learning levels were higher than the average for the country and 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 available 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 NREGA implementation at the grassroots level and which helps to expand capacity for the programme is different and delinked from that required for public schooling. Third, elections to 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 programmes during 2007–10.

To address the former concern, we use data from Young Lives 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>23</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 Round 2 and Round 3 of the Young Lives survey 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

### 4.1 Overall impact on children’s time in school

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 noted above, this specification does not account for the possible endogeneity of labour-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 programme.

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22 Enrolment of children in the 6–10 age group was almost 93 per cent in both Round 2 and Round 3, while enrolment in the 11–14 age group was almost 81 per cent in Round 2 and 86 per cent in Round 3 in our sample.

23 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.** *Effect of mother's share in parental workdays in NREGS on child's time spent in school*

Variable	OLS-FE (1)	2SLS-FE (2)
Annual household income in thousands of rupees	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%.

Instrumenting for the endogenous variables in column 2 to correct for selectivity in programme participation, we find that the coefficient on MOTHER\_NREGS is positive and significant.<sup>24</sup> An increase of one percentage point in MOTHER\_NREGS leads to an increase of 0.058 hours a day in time spent in school. Over the school year of 200 days, this implies 11.6 more days of school. The result is even more pronounced if we take into account the

<sup>24</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 sum 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.

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>25</sup> The estimated coefficient of 5.83, therefore, implies an increase of 1.34 hours per day ( $5.83 \times 0.23$ ) in the child's time spent in school over this period. For a typical school day lasting six hours, this effect is equivalent to attending school almost a quarter of a day more. If we extrapolate this impact over the academic year, we can view this effect as an increase of almost 22.3 per cent in school- attendance rate.<sup>26</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.

As noted, 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 it 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 indicate that, if anything, the change in time spent in schooling is less 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 the child's increasing age 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.

## 4.2 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 those whose ownership was 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

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25 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 explained in section 2) there is no crowding out from private labour.

26 We recognise 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 workdays on total time spent on education on a typical day. In an alternative 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.

MOTHER\_NREGS in households with higher than median asset ownership. This indicates that the overall result, observed in the previous 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.

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

Variable	Asset Ownership		Land Ownership	
	Asset ≤ median (1)	Asset > median (2)	Land ≤ median (3)	Land > median (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%

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 workdays 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, in Table 4 we look at whether the effect of mother's days of NREGS work differs by the characteristics of the child. In columns 1 and 2 we disaggregate the overall analysis by the sex of the child. The coefficient on share of mother's days of NREGS work suggests a

positive impact only on female children.<sup>27</sup> Furthermore, the sub-sample for which data are available on the type of school in which they are enrolled suggests that there was a 7–9 percentage point increase in enrolment in private schools between 2007 and 2009, but this change was greater for boys than for girls (Galab et al. 2011). Thus, given the positive effects that we find for girls' schooling but not for boys', any changes in the quality of schools could not be driving our results here.

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

Variable	Gender		Age group	
	Male (1)	Female (2)	5–10 years (3)	11–14 years (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%.

27 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 sex of the child (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 Hodinott 1994), on the other hand, women with greater earned income allocate more resources to sons' health.

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.

### 4.3 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 by a child. To find the determinants of GRADE, we consider a slight modification of the empirical model presented above. We estimate the following specification:

$$\begin{aligned} \text{GRADE}_{chvmdt} = & \alpha'_0 + \alpha'_t + \alpha'_{chvmd} + \alpha'_{hvmd} + \alpha'_{md} + \alpha'_{vmd} + \alpha'_d + \alpha'_{dt} \\ & + \beta' X_{chvmdt} + \delta' Z_{hvmdt} + \phi'_1 \text{INC}_{hvmdt} + \phi'_2 \text{MOTHER}_{NREGS_{chvmdt}} \\ & + \rho' \text{SOCIAL}_{AUDITS_{md}} * t + \varepsilon'_{chvmdt} \end{aligned} \quad (2)$$

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>28</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 per cent increase in GRADE (as compared with Round 2) when we 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 the mother is more visible in the lower economic strata, and for girls.

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<sup>28</sup> We use the same instruments as in our main specification for TSS.

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

Variable	Overall		Heterogeneity (2SLS-FE)			
	OLS-FE (1)	2SLS-FE (2)	Asset ≤ median (3)	Asset > median (4)	Male (5)	Female (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%.

To summarise: our results for grade attainment suggest that the mother's days of work have led, all things being equal, to better educational attainment for her children.<sup>29</sup>

29 There are certain caveats concerning attempts to interpret the effect of NREGS workdays 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 who have dropped out by the time of the survey interview. Second, the effect of parental labour-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 by programme participation between 2007 and 2009–10. Our assumption of a monotonically increasing relationship between programme participation in 2007 and 2009–10 may not be valid.



## 5. 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 that we observe. The first possible explanation is that children's time does not substitute for mother's time spent on household chores, and that 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 NREGS participation for 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 observed on both boys and girls, probably more so 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 labour-force participation on children's educational outcomes, particularly those of girls. While we find that there is an insignificant effect of mother's programme 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 mother's employment 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: that 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 labour-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 care, etc. While we do find an increase in share of schooling expenses related to more regular attendance (i.e. books and stationery, 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).

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

Variable	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 of 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 of 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 of 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%.

Further, we analyse whether increased participation in the labour market led to improvements in women's decision-making abilities within households, using data from Round 2 of the Young Lives survey.<sup>30</sup> Our dependent variable is the binary response to the following questions:

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

The sample is restricted to care givers who are mothers in the age group 16–60 years.<sup>31</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 labour market does increase the say and control that these women have concerning 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 sources of income for households.<sup>32</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 indicate that our findings cannot be explained within a unitary framework of the household.

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30 These data were not collected for households in Round 3 of Young Lives. Our analysis, therefore, is cross-sectional. We also have very little variation in women's NREGS participation in Round 2.

31 The labour-force participation rate among fathers in our sample is 98.4 per cent: almost universal.

32 We find no impact of mothers' work status on their participation in decisions related to earnings from livestock and self-employment activities of the household.

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

Variable	Land (1)	Earnings from land (2)	Wage activities (3)	Earnings from wage activities (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)
Scheduled Caste	-0.083 (0.065)	-0.112 (0.071)	0.260 (0.202)	0.212 (0.150)
Scheduled Tribe	-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. INC = total annual household income, including income from participation in NREGS projects.

## 6. Conclusion

The role of increasing women's bargaining power within households as a means of reducing poverty has been emphasised 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 was conceived primarily to provide households with a guaranteed income through employment on public projects, it is sensitive to issues of gender discrimination in the labour market. Given that private casual wages for women are often less than those of men, the scheme stipulates equal wage rates for males and females. It also gives priority to female employment and requires at least one-third of the beneficiaries to be women. Thus the scheme aims to increase and improve rural women's labour-market opportunities.

In this paper we contend that, other things being equal, 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 Young Lives in a large southern state of India (Andhra Pradesh), and taking advantage of intra-district variation in rainfall shock and the funds sanctioned for NREGS, we find that greater participation of mothers in NREGS projects, 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' programme participation on children's time spent in school carry 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 which suggests that the positive impact of mothers' increased programme participation could be due to their 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 labour supply on intra-household outcomes but also extends the current debate in India on the effects of one of its most ambitious poverty-alleviation programmes. It suggests that the design of public programmes matters and has consequences beyond the immediate aims of these programmes.

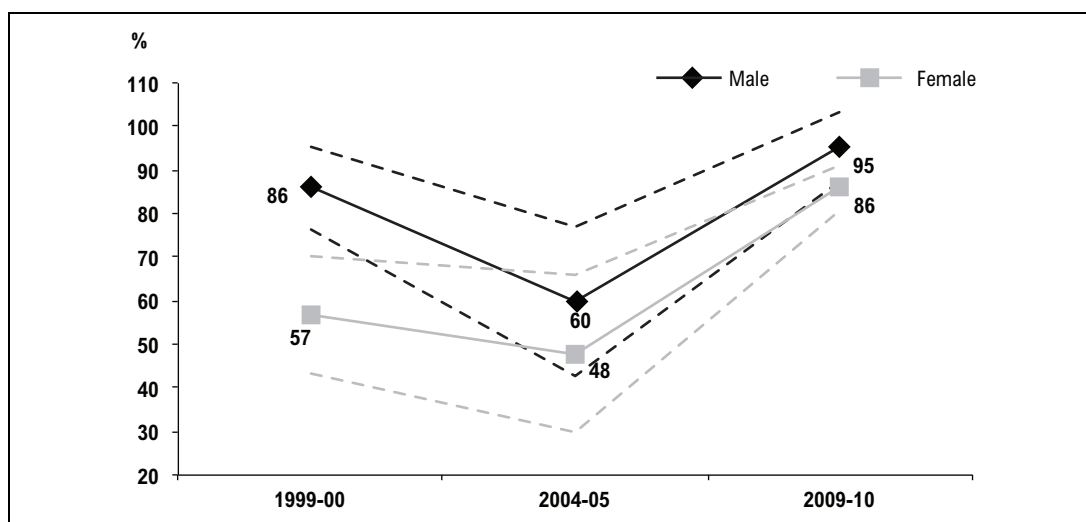
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## Appendix

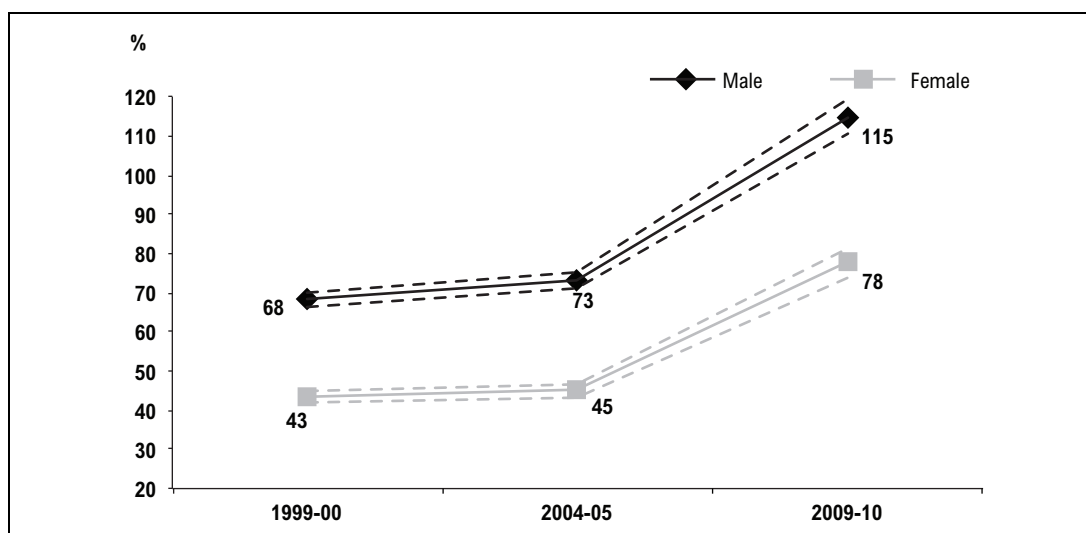
**Figure A1.** *Daily wage rate for public casual labour in Andhra Pradesh*



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. Confidence intervals of 95 per cent are shown by dotted lines.

Sources: National Sample Survey data from 55th round (1999–2000), 61st round (2004–05) and 66th round (2009–10).

**Figure A2.** *Daily wage rate for private casual labour 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. Confidence intervals of 95 per cent are shown by dotted lines.

Sources: National Sample Survey data from 55th round (1999–2000), 61st round (2004–05) and 66th round (2009–10).



**Table A1.** *First-stage regressions (for overall results)*

Variable	Time spent in school	
	Annual household income in thousands of rupees (1)	Mother's share in total days parents worked in NREGS (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
Over-identification 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*

	Taken action on a community problem (1)	Participated in awareness campaign (2)	Participated in protest march / demonstration (3)	Voted in local elections (4)	Index 1# (5)	Index 2## (6)
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 columns 1, 2, 3 and 4.  
## Index 2 is obtained similarly by PCA of the dependent variables in columns 1, 2, and 3 (excluding 4).

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

Variable	(1)	(2)	(3)
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 females aged 0–4 years in household</i>	-0.158 (0.232)		-0.190 (0.240)
<i>Number of males 0–4 years in household</i>	0.249 (0.232)		0.279 (0.235)
<i>Number of females aged 5–9 years in household</i>	0.046 (0.163)		0.014 (0.168)
<i>Number of males aged 5–9 years in household</i>	-0.087 (0.211)		-0.045 (0.215)
<i>Number of females 10–15 years in household</i>	-0.221 (0.177)		-0.261 (0.187)
<i>Number of males aged 10–15 years 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.

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

The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) of India requires one-third of the beneficiaries to be women, and equal wages to be paid to female and male participants. We study its impact on children's educational attainment via women's increased access to labour-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 the mother's share of parental NREGS workdays increases the school attendance and grade attainment of her children, particularly girls. This impact is over and above any income effect induced by the scheme.



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## About Young Lives

Young Lives is an international study of childhood poverty, involving 12,000 children in 4 countries over 15 years. It is led by a team in the Department of International Development at the University of Oxford in association with research and policy partners in the 4 study countries: Ethiopia, India, Peru and Vietnam.

Through researching different aspects of children's lives, we seek to improve policies and programmes for children.

## Young Lives Partners

Young Lives is coordinated by a small team based at the University of Oxford, led by Professor Jo Boyden.

- *Ethiopian Development Research Institute, Ethiopia*
- *Centre for Economic and Social Sciences, Andhra Pradesh, India*
- *Sri Padmavathi Mahila Visvavidyalayam (Women's University), Andhra Pradesh, India*
- *Grupo de Análisis para el Desarrollo (Group for the Analysis of Development), Peru*
- *Instituto de Investigación Nutricional (Institute for Nutrition Research), Peru*
- *Center for Analysis and Forecasting, Vietnamese Academy of Social Sciences, Vietnam*
- *General Statistics Office, Vietnam*
- *Child and Youth Studies Group (CREET), The Open University, UK*
- *Oxford Department of International Development (ODID), University of Oxford, UK*
- *Save the Children*

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