

**FEMALE INCOME AND EXPENDITURE ON CHILDREN: IMPACT OF
THE NATIONAL RURAL EMPLOYMENT GUARANTEE SCHEME IN
INDIA****BHUPAL, Ganita***
SAM, Abdoul G.**Abstract**

Touted as the largest public works program in the world, the National Rural Employment Guarantee Scheme (NREGS) was enacted in 2005 with the goal of curtailing rural poverty in India. To ensure gender diversity in program participation, the Indian Government set a target to allocate a third of NREGS employment to women. We study the relationship between female NREGS income and expenditure on children's goods in rural households of Andhra Pradesh. We use propensity score matching and fixed effects estimation to account for voluntary self-selection into the program and unobserved heterogeneity. Our results indicate that female income from the program prompts a significant increase in the expenditure share of children's clothing and footwear consumption, and that this positive spur happens on account of a significant increase in the expenditure share for boys. Male NREGS income, on the other hand, has no impact on children expenditure for the considered categories.

Keywords: NREGS, rural India, female income, matching, panel data

JEL Codes: O12, H43, C23

1. Introduction

In 2005, the Government of India enacted the National Rural Employment Guarantee Act (NREGA) aimed at improving rural livelihoods through the provision of stable employment in rural areas.¹ The program set to achieve its objective by providing at least one hundred days of guaranteed unskilled wage employment in a financial year to households in rural areas of the country (Afridi 2012). One of the important features of the program is its target to allocate 33% of the opportunities to the females of working age (Schedule II(6), NREG Act). This provision and certain others proved helpful in generating employment opportunities for women and have helped increase the labor force participation of females.² The participation rate for women went up from 40% in 2006-07 to 47% in 2011 at the national level (Government of India, 2012). Across states, participation of women has widely varied; the participation rate has exceeded the national average in states like Kerala, Tamil Nadu, Rajasthan, Karnataka, Gujarat, Tripura and Andhra Pradesh in 2006, 2007 and 2008 but was lower than national

* Ganita Bhupal, Assistant Professor, e-mail: Bhupal.1@osu.edu, University of Delhi, India and Abdoul G. Sam, Associate Professor (corresponding author), e-mail: Sam.7@osu.edu, The Ohio State University, USA.

¹ The program's name was later changed to NREGS, the National Rural Employment Guarantee Scheme. It was later converted to MGNREGS (Mahatma Gandhi National Rural Employment Guarantee Scheme). We use NREGS henceforth.

² Pankaj and Tankha (2010) note that "provisions like priority for women in the ratio of one-third of total workers (Schedule II (6)); equal wages for men and women (Schedule II (34)); and crèches for the children of women workers (Schedule II (28)) were made in the Act, with the view of ensuring that rural women benefit from the scheme in a certain manner."

average in states like West Bengal, Bihar, Uttar Pradesh, Uttarakhand and Himachal Pradesh (Pankaj and Tankha, 2010).

The studies which have looked at the socio-economic impacts of female participation in NREGS have emphasized that paid work gives females more authority and resources to spend on themselves and their children and increases access to food and healthcare (e.g., Khera and Nayak 2009). These studies also state that NREGS work is looked upon by women as a stable and safe source of income, is considered more prestigious than other wage work (like working in neighbor's fields or house), and ensures regular payment.³ Even though this evidence is based on select samples from a few states, it suggests the importance of NREGS in empowering women through their participation in paid work.

The extant literature suggests that female labor force participation can have numerous positive effects including greater decision making ability and empowerment of women, particularly in developing country settings (Anderson and Eswaran, 2009; Blumberg and Coleman, 1989; Rahman and Rao, 2004; Basu, 2006; Agarwal, 1997). For example, Anderson and Eswaran (2009) note that participation in paid work contributes positively to female autonomy by increasing female bargaining power in the household, which has positive consequences for developmental expenditure (Basu 2006; Hoddinott and Haddad 1995; Phipps and Burton 1998).

Drawing from this literature, we study the effect of female participation in NREGS to analyze the expenditure pattern of rural households in India on children's consumption goods. We look at children's goods because they are considered as "public goods" for the households (see, e.g., Phipps and Burton, 1998), expenditure for which is a joint decision of both male and female adult members. We also draw inspiration for this study from a number of field survey reports and descriptive studies conducted in India (e.g., Khera and Nayak 2009; Kareemulla et al. 2010), which suggest that female income from NREGS is spent on children and food. These observations from the field have not been put to empirical tests and thus, we contribute to the literature on NREGS evaluation, female autonomy, expenditure patterns in rural households and children's well-being by analyzing the following questions in a rigorous empirical framework: Does female participation and income from NREGS affect the expenditure on children's consumption goods? Does gender of the children matter in determining such patterns? To answer these questions, we use panel data from the Young Lives study and examine the effect of female NREGS income and participation on the expenditures on children. We use propensity score matching to account for the voluntary self-selection in NREGS by households. We then perform a fixed effects regression to account for unobserved heterogeneity in the households and obtain estimates for expenditure share equations using the matched sample. We also disaggregate the child expenditure by gender to look at the gender specific effects.

Doing so, we find that households with female participants earning Rs. 3,000 annually (average NREGS income for female participants) have child expenditure shares (clothing and footwear) that are about 19.7% higher than households without

³ Per Khera and Nayak (2009), "work with private contractors and landlords is often replete with an underlying threat or possibility of sexual abuse and exploitation."

female NREGS participants. When the effects are disaggregated for girls and boys, we find a statistically significant 25.5% increase in the baseline expenditure share attributable to the NREGS for boys but no significant effect for girls. The results from this study point towards an important role of NREGS in the decision-making process of the household. The spillover benefits of this program could be eventually helpful in addressing the issue of underinvestment in human capital in India and this study provides a good starting point to explore some of the externalities related to the NREGS.

The rest of the paper is organized as follows: Section 2 discusses the NREG scheme and its implementation; Section 3 presents a background and review of related work; section 4 discusses the data; Section 5 discusses econometric methods; section 6 presents the results and Section 7 concludes.

2. NREGS and its Implementation

The National Rural Employment Guarantee Scheme (NREGS) was enacted in India in 2005 and is touted as the largest public works program in the world. The scheme aims at enhancing livelihood security of households in rural areas of the country by providing at least one hundred days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work. The major thrust of the program is to generate employment, combat rural poverty and out-migration, and improve living standards of the rural population. The NREGS, thus, can be viewed as a social protection scheme, one that provides a floor to rural household income, part of an employment strategy providing work for wages and a stimulant for local economic development through the creation of productive assets (Sudarshan et. al, 2010).

Implementation of the scheme was staggered over four years from 2006 to 2009. The 200 most impoverished districts of India were the first beneficiaries of the program in 2006. In 2007, 130 more districts were added; and starting in April 2008, 296 districts were included in the third and final phase.

To be employed under the scheme, a household is required to obtain a job card at the Gram Panchayat (GP) where the household is issued a unique identification number. Once a household submits the job card with a written application, the GP is mandated to provide an employment opportunity within 15 days of the application.⁴ In case employment can't be provided to the applicant, an unemployment allowance is to be paid (which varies between one-third to one-half of the minimum wage). The payment of the wages is the responsibility of the central government while the unemployment allowance is borne by the state government. The wages paid out for employment are minimum wages but vary from state to state. NREGS, though, has set a floor minimum wage, which was 60 rupees per day when the scheme was introduced. It has been raised over time and was 120 rupees per day by 2009 (Zimmerman 2012).

⁴ Gram Panchayat is the executive body at the village level in India.

3. Literature Review

3.1 Female Income and Resource Allocation

A number of studies that have explored intra-household resource allocation find differences in expenditure patterns between men and women. The literature on this subject diverts away from the unitary model of household behavior and delves into the household bargaining literature (Hoddinott and Haddad 1994). The primary thrust of the diversion is the violation of assumption of a dictator in the household who makes all the decisions (which could very well be altruistic in nature). Indeed several empirical studies have rejected the unitary model (e.g., Alderman 2005). The bargaining literature assumes that there are many (more than one) individuals who make such decisions simultaneously.

The empirical literature has contributed to the debate on household behavior in various ways too. For example, using data from a large Brazilian household survey Thomas (1990) showed that income in the hands of a mother has more influence on health outcomes of the family than if solely controlled by the father. In a similar vein, Thomas (1993) concludes that income in the hands of women is spent on human capital (education, health and household services) and away from food and meals outside of the home. Hoddinott and Haddad (1995) explore the effect of female share of income on various items of household expenditure in Cote d'Ivoire and find that increasing the wife's share of income increases the proportion of expenditure on food and reduces the budget share of alcohol and cigarettes. In a similar study, Haddad and Hoddinot (1994) find that female share of income is positively related to anthropometric status of male children and does not affect height-for-age scores of the female children. Phipps and Burton (1998) report that an extra dollar of female income is more likely to be spent on child care than an extra dollar of male income. The study also shows that income pooling is applicable to certain categories of consumption like housing but is rejected for other categories like clothing, food, transport etc.

Certain studies help us explore the role of female attitudes in household welfare by examining the effect of an exogenous increase in the female income. Duflo (2000) finds that exogenous income change in the form of old age pension in South African households leads to improvement in the height-for-age and weight-for-height of grand-daughters when the pension is received by grandmothers. The effects are insignificant for boys, and neither grand-daughters nor grandsons benefit when the pension receiver is the grandfather. Qian (2008) notes that increasing the income of females, holding men's income constant, improves the survival rates for girls whereas increasing male income, with constant female income, worsens the chances of survival for girls. A study from rural India suggests that females borrow to spend on female children while males borrow to spend on male children only (Agier et al., 2012). There is significant evidence that asset ownership by women leads to greater contributions towards the welfare of next generation through investments in health, education and children's clothing (see, e.g., Quisumbing and Maluccio 2000 and Doss 2006).

3.2 Evaluation of the NREGS

Several studies, both descriptive and empirical, have looked at the impact of NREGS on a number of outcomes and have recognized the contribution of NREGS in preventing out-migration from the rural areas (Sudarshan et al. 2010; Bhatia and Dreze 2006; Nayak and Khera 2009; Kareemulla et al. 2010). Increase in private sector wages

have also been reported as an offshoot of the NREGS (Sudarashan et al. 2010). Kareemulla et al. (2010) also report that many of the wage earners from NREGS spent their income on food. In addition, they observe that expenditure on health and education of family members constituted another important use of NREGS income.

Using a regression discontinuity design, Zimmermann (2012) finds that increase in private sector wages has been substantial for women after the beginning of NREGS, whereas there has been no meaningful change in the private sector wages for men. Using the Intent-to-Treat framework, Azam (2012) finds that there has been a substantial improvement in the labor force participation rates of women and NREGS has also contributed to raising the wage rate for female casual work. Based on survey conducted in Rajasthan, Gujarat and Madhya Pradesh, Papp (2012) finds that NREGS has decreased out-migration. Some recent work in the literature has focused on the role of NREGS as a safety net. For example, Uppal (2009) uses Young Lives data to evaluate the impact of NREGS on health and labor outcomes of children. He concludes that participation of households in the program decreases the probability of children entering the workforce and that the health outcomes of the children are positively impacted. Afridi et al. (2012) use the temporal and regional variation in the roll-out of the program to assess the impact of female participation on child schooling and educational outcomes. They conclude that female participation (measured by number of days that the mother worked in NREGS) increases the time that female children spend in school, whereas an opposite effect is found for father's participation. Dasgupta (2012) finds a modest but significant impact of NREGS as a mitigating factor in drought shocks to households.

The aforementioned literature has explored a number of direct and indirect effects of the program and has found many positive impacts of the scheme. This paper adds to this literature by exploring yet another effect of the program--impact of female-earned NREGS income on child expenditure in the household. Specifically, we analyze expenditure on children's consumption goods and disaggregate the effect by gender of children. This study, therefore, fills some gaps in our understanding of the impact of NREGS on household behavior and expenditure patterns.

4. Data

We use data from the Young Lives Study Project which is being carried out simultaneously in four developing countries and aims to track about 12,000 children for 20 years of their lives. Two cohorts of children are being followed in the study: the older cohort children were 8 years old when the first round was undertaken in 2001-02. The younger cohort children were 6 months to 1.5 years old during the first round. So far a total of three rounds of data collection have been undertaken in the years 2001, 2006 and 2009. In India, the survey was carried out in Andhra Pradesh, a state in the Southern region of India. The data that has been used in this essay is exclusively from rural households from the second and third round of the survey.⁵ The second round of the survey was conducted when NREGS first phase was already underway. By the

⁵ The first round of survey could not be used because of the unavailability of details about household expenditure, consumption and income.

third round of data collection, NREGS implementation was accomplished in all the districts of India and hence, all the rural households in the data had access to the program. The participation rates for rural households in the NREGS vary in the two rounds (2006 and 2009) due to difference in timing and implementation.

Out of a total of 23 districts in the state, six were chosen for the survey: Karimanagar, Ananatpoor, Srikakulam, West Godavari, Cuddapah and Mehboobnagar. Apart from these districts, the survey was also conducted in Hyderabad, the capital city of Andhra Pradesh. A total of 20 sentinel sites were selected from these six districts.⁶ The survey was designed to reflect a pro-poor bias in the sampling process and hence lower socio-economic classes are over represented in the sample. From the Young Lives data, the following districts represent the ones where NREGS was implemented in the first phase: Karimanagar, Anantpoor, Cuddapah and Mehboobanagar. Srikakulam was covered under the second phase and implementation in West Godavari took place in the third phase.

This data is a rich source of information on a number of socio-economic characteristics and expenditure patterns of the households. The data provides details of some categories of consumption by the gender of the household members. This helps to analyze the effects of program participation on children's expenditure by gender. We use three dependent variables in our empirical analysis: proportion of expenditure on all children, proportion of expenditure on boys and proportion of expenditure on girls.⁷ Expenditure shares are constructed by adding annual expenditure on clothing and footwear and then divide it by the total annual expenditure of the household.⁸ Total household annual expenditure was calculated by adding up expenditure on various good and services: food, fuel, phone, transport, personal care, non-food expenditure, expenditure on schooling, expenditure on clothing for adults and children and finally, expenditure on footwear for adults and children.

A limitation of this study is that we are not able to differentiate the expenditure categories by children of specific parents because of the survey design. The question on expenditure was posed for all the children in the household and the majority of households in the data are joint households which are extended family households that typically have multiple nuclear families in their composition. Hence, unlike other studies which analyze the effect of earned income by mother and father on children's expenditure (e.g., Phipps and Burton 1994), we look at the effect of female and male income from the NREGS earned at the household level.

Since the NREGS was designed only for rural areas of India, we remove the urban households from our data. Another set of observations which was not used in the

⁶ The sample excludes data collected from the urban district of Hyderabad. This is done because the NREGS was designed only for rural areas of India.

⁷ We classify children as all individuals in the household who are below 18 years of age.

⁸ Disaggregated expenditure data on children was only available on three categories: clothing and footwear and education. However, most of the expenditure on education corresponds to the enrolment of children in private or public schools and it is difficult to presume that NREGS participation can induce households to change the school enrolment of children from public to private given that total NREGS income constitutes a small fraction of total household income. This variable also has a large number of missing values.

estimation exercise is the ones for which information on districts is not available.⁹ The resulting dataset has about 1,150 rural households in total (before matching)¹⁰. The annual average non-NREGS income of the households is Rs. 31,815.30 and total NREGS income forms about 8.5% of total household income on average. Table 1 provides a detailed description and summary statistics of the key variables. The data on participation and income from the program is available for each member of the household. This facilitates the disaggregation of NREGS income by gender. However, the same disaggregation was not possible for the non-NREGS income of the households.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.
Proportion of expenditure on children's footwear and clothing (annual)	0.062	0.039
Proportion of expenditure on boys' footwear and clothing (annual)	0.029	0.022
Proportion of expenditure on girls' footwear and clothing (annual)	0.032	0.024
Scheduled Caste (1 =Yes, 0=No)	0.345	0.479
Scheduled Tribe (1 =Yes, 0=No)	0.077	0.268
Hindu (1 =Yes, 0=No)	0.982	0.132
Wealth Index (between 0 &1, 1 represents a higher value)	0.301	0.150
Female NREGS income (Annual, in Rupees)	1503.589	2260.03
Male NREGS income (Annual, in Rupees)	1193.372	2041.123
Female participation in NREGS from the household (1 =Yes, 0=No)	0.657	0.474
Male participation in NREGS from the household (1 =Yes, 0=No)	0.550	0.497
Household size	6.606	2.967
Total annual expenditure of the household (in Rupees)	34690.37	21948.73
Non NREGS income of the household (Annual, in Rupees)	31685.35	37509.53
Any household member belongs to any organization or group(1=Yes, 0=No)	0.772	0.419
Household has BPL card (1 =Yes, 0=No)	0.963	0.188
Transfer and unearned income of the households (Annual, in Rupees)	2827.638	7944.536
Economic shocks (1=Yes, 0=No)	0.813	0.389
Food shortages (1=Yes, 0=No)	0.117	0.322
Farming is the main occupation of the household (1=Yes, 0=No)	0.675	0.468
Household has serious debt (1=Yes, 0=No)	0.547	0.497
Average education of children (in number of years)	2.734	2.232
Average education of boys (in number of years)	3.014	2.752
Average education of girls (in number of years)	3.133	2.716
Proportion of females between 0 and 4 years of age in the household (Pf0to4)	0.024	0.056
Proportion of females between 5 and 9 years of age in the household (Pf5to9)	0.092	0.105

⁹ Some of households moved away/relocated from the chosen Young Lives sentinel sites in the second and third round of data collection and there is no information on their relocation site. It is, therefore, not possible to gather relevant information about the phase of NREG implementation and hence those observations were removed. These observations, however, constitute less than 3% of the entire data.

¹⁰ The number of observations referred to here represents the pre-matching sample. The final set of results in this chapter is based on the post-matching sample which has 930 observations.

Variable: Proportion of Females (PF) or Males (PM)	Mean	Std. Dev.
PF between 10 and 14 years of age in the household(Pf10to14)	0.088	0.108
PF between 15 and 18 years of age in the household(Pf15to18)	0.041	0.077
PF between 19 and 30 years of age in the household(Pf19to30)	0.112	0.099
PF between 31 and 60 years of age in the household(Pf31to60)	0.117	0.090
PF above 60 years of age in the household(Pf61above)	0.034	0.064
PM between 0 and 4 years of age in the household(Pm0to4)	0.024	0.062
PM between 5 and 9 years of age in the household(Pm5to9)	0.092	0.092
PM between 10 and 14 years of age in the household (Pm10to14)	0.063	0.094
PM between 15 and 18 years of age in the household (Pm15to18)	0.037	0.075
PM between 19 and 30 years of age in the household (Pm19to30)	0.065	0.064
PM between 31 and 60 years of age in the household (Pm31to60)	0.159	0.073
PM above 60 years of age in the household (Pm61above)	0.034	0.064

Tables 2 and 3 present some statistics for male and female participation and earnings. The results show that female participation and income exceed male participation and income in NREGS in both rounds.¹¹ Female participation more than doubled from 2006 to 2009 (333 participants in 2006 vs. 701 in 2009) whereas the corresponding increase for male participation was about 85.5% (from 296 in 2006 to 549 in 2009). A simple t-test for comparison of male and female income from the program suggests that average female income from the program is significantly greater than average male income.

Table 2: NREGS Participation by Males and Females

Year	2006		2009	
	Number	Percent of total	Number	Percent of
Households which participated in NREGS	395	34.04%	756	66.14%
Households with male participation	296	25.49%	549	48.03%
Households with female participation	333	28.68%	701	61.32%

Table 3: NREGS Income by Male and Female Participation

Year	2006	2009
Full Sample		
Average NREG income of the household (total)	868.45	3340.66
Average male NREG income of the household	448.08	1413.28
Average female NREG income of the household	423.95	1927.38
Participating Households		
Average NREGS income of the household (total)	2567.70	5050.77
Average male NREGS income of the household	1249.26	2136.75
Average female NREGS income of the household	1320.37	2914.01

All figures represent annual income in Rupees.

¹¹ We define male (female) participation in NREGS as participation by any male (female) participation in the household. Hence even if the same member is not employed in NREGS in both the rounds, male (female) participation is acknowledged as long as any male (female) member in the household participated in the program.

5. Econometrics

Since NREGS is based on self-selection and universality, there is an issue of non-random selection of households into the program. Self-selection of households can lead to a biased estimate of the scheme's impact on child welfare; for example, if participating households are more informed and are more concerned about the well-being of children, the impact of participation will be upward biased. To obtain an unbiased estimate, we need to ensure that participants and non-participants have comparable individual characteristics. We therefore use propensity score matching (PSM) and fixed effects estimation to account for potential sample selection bias.

5.1 Propensity Score Matching

PSM is a widely used technique to address the issue of non-random selection into treatment for a policy. The main assumption behind the use of PSM is that self-selection is made solely on the basis of observable characteristics. The set of variables which explain selection into the program has to be an extensive set of covariates independent of the treatment assignment and that simultaneously explain treatment and outcomes of the program (Sianesi 2004; Smith and Todd 2005). The Young Lives data has detailed information on a number of variables related to household characteristics.

Procedurally, PSM is carried out by estimating the probability (or propensity score) of self-selection into NREGS based on an extensive set of observable covariates. In our case, we use the probit model to estimate the propensity score. The score is then used to match participating and non-participating households on the basis of these characteristics. The non-matched observations are discarded in favor of the ones that match the characteristics of the treatment households closely. In doing so, a subset of the original sample is obtained, which has been corrected for any systematic bias based on observed covariates. We estimate the following probit participation equation:

$$NREGS = I(\alpha_0 + \alpha_1 X + \alpha_2 HH + \varepsilon > 0) \quad \text{with } \varepsilon \sim N(0, 1) \quad (1)$$

where NREGS is the dummy for household participation, $I(.)$ is an indicator function, X is a vector of economic indicators of the household and includes the following: non-NREG income of the household, wealth index of the household transfers from all public and private sources and unearned income, categorical variables for the debt situation of the household, food insecurity in the household, whether farming is the main occupation of the household and whether or not the household faced an economic shock in the three years prior to the survey. The vector HH represents a range of household characteristics including the age of the household head, education of the household head, number of members in the household, categorical variables for ethnicity and religion of the household.¹² We also include two more variables which may explain participation into the program: whether the household has a Below Poverty Line (BPL) card and whether a member in the household is a member of any informal group or organization.

The variables included in equation (1) are important drivers of NREGS participation since they capture the economic condition of the household (wealth index, non-NREGS income of the household, transfer income, food shortages, BPL card and debt situation) and the skill level (education of household head and farming as main

¹² Ethnicity and religion variables include categorical variables for affiliation to Scheduled Caste, Scheduled Tribe, and Hinduism.

occupation) of the household. Membership of an organization or informal group essentially represents the social capital and network structure of the household which has been found to be correlated with awareness and knowledge transfer. Since NREGS provides unskilled work and minimum wages and is a universal program, households with sound economic background and skilled manpower will not be tempted to participate. We find evidence of this in the results obtained (Table 4) from the participation model and therefore, argue that the variables included in the estimation of the propensity score form a reasonable set of covariates for matching. The matching technique that is employed in the study is nearest neighbor matching with replacement.¹³ The matching procedure is applied separately for each of the two rounds.¹⁴ The Probit results (Table 4) show that variables pertaining to skill level and income of the household are crucial for self-selection into the program, i.e. both non-NREGS income of the household and the education level of the household head are negatively related to the probability of participation in the program.¹⁵

Table 4: Probit Estimates of Participation in NREGS (Round 2009)

Variables	NREGS
Scheduled Caste (1 =Yes, 0=No)	0.403*** (0.126)
Scheduled Tribe (1 =Yes, 0=No)	0.102 (0.176)
Hindu (1=yes, 0=No)	0.578** (0.268)
Education of household head	-0.033*** (0.0113)
Age of household head	-0.000827 (0.00465)
Household Size	0.0120 (0.0145)
Wealth Index	-2.334*** (0.381)
Non-NREGS income of the household	-0.0012** (0.000612)
Economic shocks (1=Yes, 0=No)	0.260** (0.112)
Main occupation –farming (1=Yes, 0=No)	0.447*** (0.111)
Household has debt (1=yes, 0=No)	0.0408 (0.0920)
Food shortage (1=Yes, 0=No)	-0.0196 (0.154)
Transfer income	-1.94e-06 (3.65e-06)
Household member belongs to any group or organization (1=Yes, 0=No)	0.364*** (0.108)
Household has a BPL card (1=Yes, 0=No)	0.950*** (0.305)
Constant	-1.292** (0.530)
Observations	1107

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Non-NREGS income scaled by 1000.

¹³ Matching with replacement is important for this study because the control group is relatively small compared to the treatment group. In such empirical settings, “matching with replacement is the natural choice” (Dehejia and Wahba 2002). Following Guo and Fraser (2010), we used a caliper size of 0.25 σ ps, where σ ps represents the standard deviation of the estimated propensity score.

¹⁴ There is no consensus in the PSM literature on how to use this technique on panel data models, but matching within the year to avoid any time dependent effects on the matching is a standard procedure and has been used in previous studies (e.g. Young, 2008).

¹⁵ The education level of the household head can be taken as an indicator of the skill level; educated people will be employed in better paying activities and hence, take up of NREGS will be lower. Non-NREGS income and wealth index of the household are indicators of the economic condition of the household, hence the results imply that wealthier people are less likely to join the program.

Being a farming household increases the likelihood of participation in the program. Facing an economic shock also increases the likelihood of participation. For the other household characteristics, belonging to a Scheduled Caste (SC) and being a Hindu increase the likelihood of participation. These results are not surprising as the NREGS has a provision of 33% job reservation for SCs and the majority of the households in the survey are Hindu households. Possessing a BPL card is positively related to participation and group membership also has a high positive correlation with the likelihood of participation.

The systematic differences between participants and non-participants should be significantly attenuated post matching. Table 5 presents the mean differences for unmatched and matched sample for selected covariates. As can be seen, matching reduces the systematic differences to a very large extent on all but three variables, indicating that the matching was overall successful. After the matching was performed, the unmatched observations were discarded in favor of the matched sample.

Table 5: Covariate Balance for Propensity Score Matching

Variable	Unmatched			Matched		
	Participants (Mean)	Non-Participants (Mean)	T-stats (for difference in means)	Participants (Mean)	Non-participants (Mean)	T-stats (for difference in means)
Scheduled Caste	0.251	0.129	4.75***	0.245	0.230	-0.68
Scheduled Tribe	0.175	0.105	3.08***	0.177	0.151	1.35
Hindu	0.982	0.957	-2.42***	0.981	0.933	0.48
Education, household head	2.731	4.563	-6.75***	2.749	2.479	1.35
Age, household head	40.045	40.693	-1.06	40.004	40.949	-1.78*
Wealth Index	0.421	0.519	-10.61***	0.422	0.402	2.67***
Household Size	7.325	7.648	-1.52	7.729	7.6	0.43
Non NREG income of the household (in thousands of rupees)	41.798	77.066	-7.50***	41.811	41.768	0.02
Transfer income of the household	6392.2	7123.2	-0.99	6374.8	7566.5	-2.06**
Economic shocks	0.820	0.711	4.19***	0.821	0.818	-0.10
Main Occupation-farming	0.727	0.624	3.53***	0.725	0.694	1.28
BPL card	0.994	0.915	7.20***	0.994	0.993	0.33
Land size	2.317	2.650	-1.50	2.323	2.253	0.42
Household has serious debt	0.559	0.518	1.30	0.557	0.606	-1.87
Household faces food shortages	0.117	0.082	1.85*	0.117	0.134	-0.95
Membership of organization	0.814	0.724	3.46***	0.812	0.794	0.86

5.2 Fixed Effects Regression

The next step in the estimation exercise is to obtain regression estimates from the matched sample. To do so, the following equation is estimated:

$$E_{it} = \beta_0 + \beta_1 \log(ANN_EXP)_{it} + \beta_2 M_NREG_{it} + \beta_3 F_NREG_{it} + \varphi HH_{it} + \sum_k \theta_k \left(\frac{N_k}{HHSIZE} \right)_{it} + \mu_{it} + \alpha_i \quad (2)$$

where for each household i , at time t , E represents the expenditure share (calculated as a proportion of household expenditure) on children's goods.¹⁶ ANN_EXP is the total annual expenditure of the household, M_NREG represents the male NREGS income, F_NREG denotes the female NREGS income and HH includes household level variables--age of the household head and log of household size.¹⁷ Also included in HH is the average education level of children in years of schooling and its square.¹⁸ To account for the demographic composition of the household, variables representing proportion of members in various age and gender categories were also included following Bhalotra and Attfield (1998) and Zimmermann 2012(b). These are denoted by the expression $(N_k/HHSIZE)$, where N_k represents the number of people in the k^{th} age-gender category.¹⁹ β , φ , θ are the parameters to be estimated, μ_{it} denotes the random error term and the α_i s represent household fixed effects. Note that the inclusion of household fixed effects in the regression function serves to control for any unobserved household characteristics driving self-selection in NREGS.

6. Results

Another econometric issue in our empirical analysis is the potential endogeneity of total expenditure (ANN_EXP) which includes expenditure on children. To address this concern, we follow Banks (1997) et al. and use non-NREGS income of the household to instrument for annual expenditure. The validity of this instrument stems from the fact that non-NREGS income should affect the expenditure share going to children only via the allocation of total household consumption expenditure. On the other hand, we include male and female NREGS income in the main equation (2) to investigate if and how differential access to income by gender affects expenditure on children differently. The results from the first stage (available upon request) show that

¹⁶As mentioned previously, we specify the expenditure share by the gender of the child to estimate any gender specific effects. So we run this particular specification with three dependent variables – Proportion of expenditure on children's goods, proportion of expenditure on girls and proportion of expenditure on boys.

¹⁷(i) We do not log the value of NREGS income because of a number of zero values on account of non-participation which was 66% in 2006 and 34% in 2009. (ii) Female and male NREGS incomes were divided by a factor of 1000 rupees.

¹⁸We include the average education of children, boys and girls in the respective regressions.

¹⁹We include a number of age categories with male and female gender divisions. The age categories are 0-4, 5-9, 10-14, 15-18, 19-29, 30-59 and 60 and above. The inclusion of age and gender categories is standard in such models. See, for example, Bhalotra and Attfield (1998) and Zimmermann 2012(b). Since all the demographic composition categories cannot be included in the estimation because of singularity concerns, the "females 60 and above" category has been omitted.

the non-NREGS income is highly significant and positively predicts total expenditure as expected.

Table 6 presents the results of the estimation of the panel data equation (2). The estimates indicate that the main variables of interest, male and female NREGS income, have opposite signs in all three regression equations; however, male NREGS income does not significantly affect child expenditure shares in any of the three models. The coefficient on female NREGS income, on the other hand, is positive and significant in two of the three equations, implying that an increase in female NREGS income increases the expenditure share on children's footwear and clothing and that this effect happens primarily through the increase in spending on boys.

The sign on female NREGS income coefficient in girls' expenditure share is in the expected direction but the effect is not statistically significant. Hence, we can conclude that earned income by females from the program does not lead to a significant increase in footwear and clothing expenditure share on girls. This result, though it contradicts some studies which discuss generous female attitudes towards female children in the household (e.g. Duflo 2003 and Qian 2008) is in line with some other studies which suggests that greater autonomy to females can have no or negative effect on female children (e.g., Hoddinott and Haddad 1994). Also, given that son preference is commonly held in India, this result does not emerge as completely unexpected.²⁰

When translated into a marginal effect, the coefficient estimate of female NREGS income in Model 1 suggests that an increase of Rs. 3,000 (about average earnings of a female participant in 2009 (bottom panel of Table 3)) in NREGS income leads to an increase of .984% in the expenditure share of children clothing and footwear. Given the average expenditure share is about 5%, this marginal effect translates to a 19.7% increase in the baseline expenditure share of children clothing and footwear. The same effect for boys' expenditure translates into a 25.5% increase in the total annual spending on their goods.²¹ These large effects draw attention to the significance of female paid income in child expenditure in rural India, especially for boys.

Among the remaining variables, many affect expenditure on children in the expected direction; however, very few have statistically significant coefficients. This is not surprising given that the matching process has made "treatment" and control households comparable, on average, based on their observable characteristics. The proportion of boys in the categories 10 to 14 and 15 to 18 years of age are found to influence the expenditure proportion on boys significantly. This result is expected since spending on children increases as they grow older. We also note the average education positively and significantly impacts spending on girls.

²⁰ See Lancaster et al. 2008 and Zimmermann 2012 (b) for a discussion on gender bias in India. Lancaster et al. 2008 discuss a number of expenditure categories including clothing and find a significant gender bias.

²¹ The proportional marginal effect for boys is found by dividing the marginal effect evaluated at the income of the average female NREGS participant (.00213*3) by the baseline expenditure on footwear and clothing for boys (.025).

Overall, our results lend support to the hypothesis of ‘maternal altruism’ according to which children benefit more if income is earned or received by a woman than if it is controlled by a man (Behrman and Skoufias 2006).

7. Conclusion

We have examined the impact of NREGS on children footwear and clothing expenditure in rural India. We have used propensity score matching and household fixed effects to circumvent statistical biases arising from voluntary self-selection into the program. Our empirical analysis reveals spending on children is determined not just by NREGS income but also by who earns the income. Specifically, we find that NREGS income has a large and significant salutary impact on children expenditure only when earned by a female in the household; male-earned NREGS income does not spur a significant change in spending on children for the considered spending categories. We disaggregate children expenditure by gender and find that the material benefits stemming from female-earned NREGS income are mostly driven by increased spending on boys. These results are congruent with both the maternal altruism hypothesis and preference for boys in India.

This study leads to some interesting insights into the spillover benefits of NREGS in India. That females tend to spend more money on children as they earn more from NREGS suggests that female participation in the program can work to improve the welfare of children in a meaningful way.

Table 6: Fixed Effects Panel Data Estimates

VARIABLES	Proportion of exp., children (Model 1)	Proportion of exp., boys only (Model 2)	Proportion of exp., girls only (Model 3)
Log annual expenditure	-0.0242 (0.0374)	-0.0329 (0.0218)	0.00191 (0.0227)
Female NREGS income	0.00328*** (0.00105)	0.00213*** (0.000567)	0.00120* (0.000616)
Male NREGS income	-0.00124 (0.00140)	-0.000256 (0.000779)	-0.000886 (0.000808)
Log household size	0.0143 (0.0174)	0.0153 (0.0100)	0.00175 (0.0117)
Age of household head	0.000183 (0.000234)	8.74e-05 (0.000126)	0.000137 (0.000139)
Average education of children	0.00647 (0.00549)		
Average education of children, squared	-0.000268 (0.000499)		
Average education of boys		0.00203 (0.00237)	
Average education of boys, squared		-4.88e-06 (0.000206)	
Average education of girls			0.00463*** (0.00165)
Average education of girls, squared			-0.000249 (0.000166)

Pm0to4	0.0541 (0.0904)	-0.00321 (0.0508)	0.0414 (0.0570)
Pf0to4	-0.224*** (0.0714)	-0.137*** (0.0394)	-0.101** (0.0432)
Pm5to9	0.0228 (0.0899)	0.0263 (0.0455)	-0.00661 (0.0551)
Pf5to9	-0.0836 (0.0580)	-0.0543* (0.0312)	-0.0146 (0.0360)
Pm10to14	0.133 (0.0925)	0.108** (0.0458)	0.0278 (0.0527)
Pf10to14	-0.0205 (0.0576)	-0.00981 (0.0312)	0.00493 (0.0371)
Pm15to18	0.0659 (0.0937)	0.0868* (0.0466)	-0.0207 (0.0553)
Pf15to18	0.0480 (0.0765)	0.0303 (0.0426)	0.0433 (0.0488)
Pm19to30	0.0570 (0.0868)	0.0665 (0.0478)	-0.0134 (0.0522)
Pf19to30	-0.00224 (0.0575)	0.0274 (0.0310)	-0.0215 (0.0349)
Pm31to60	0.0546 (0.0911)	0.0780 (0.0517)	-0.0270 (0.0553)
Pf31to60	-0.00339 (0.0691)	0.0499 (0.0377)	-0.0434 (0.0422)
Pm61above	0.124 (0.0921)	0.124** (0.0502)	-0.00350 (0.0557)
Constant	0.243 (0.353)	0.294 (0.202)	0.00611 (0.212)
Observations	923	923	923
R-squared	0.218	0.235	0.173

Standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1; Female and Male NREG income scaled by 1000.

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