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Mother or Motherland: Can a Government Have an Impact on Educational Attainment of the Population? Preliminary Evidence from India

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ABSTRACT

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In this paper, using data from the 61st round of the (Indian) National Sample Survey, we examine the relative impacts of personal-household and state-level characteristics (including government policy) on the likelihood of transition from one educational level to the next. Our analysis suggests that the most important factors driving these transition likelihoods are personal and household characteristics like gender and education of household heads. However, state-level characteristics and government policies have a significant impact on these transition likelihoods as well, especially for transitions from the lowest levels of education to somewhat higher levels. The odds of making the transition to higher education, especially tertiary education, are systematically lower for women than for men, for individuals in rural areas than those in urban areas, and for Muslims than for Hindus. An important conclusion of our analysis is that there is significant scope for government policy to address educational gaps between various demographic and other groups in the country.

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1. Introduction

Education, which is an investment in human capital, plays a critical role in shaping a country's economic future. To begin with, there is a broad consensus about the positive impact of the stock of human capital on a country's growth rate (Barro, 1991; Mankiw, Romer and Weil, 1992). It is also generally accepted that there are positive and significant returns to education, and that differences in education can explain a significant proportion of earnings differences between various socio-economic groups (Bhaumik and Chakrabarty, 2009a, 2009b) and indeed between labourers in different countries (Gregorio and Lee, 2002; Bargain et al., 2009). There is also some evidence to suggest that (unsurprisingly) the returns to investment in education are higher for people from the more disadvantaged socio-economic classes (Krueger and Lindahl, 2001). Provision of education, therefore, remains a key pillar of policymaking.

However, policies that emphasise removal of supply side constraints for spread of education do not necessarily succeed in ensuring in meeting their stated objectives. Drop-out rates are high in most developing countries. Even in many developed countries, a relatively small proportion of the population receive university education. Formulating policies that aim to deliver more than literacy – skills that require completion of high school or even university education – to a significant proportion of the population, therefore, requires an understanding of factors that influence individual choice of education levels. The aim of this paper is to make a contribution towards that policy discussion by examining the impact of individual and household characteristics as well as government policy on educational attainment in India.

It is well understood that educational attainment of individuals depends significantly on personal characteristics and family backgrounds (Lave, Cole and Sharp, 1981; Teachman, 1987; Lauer, 2003). In particular, it depends on the educational background of the individual's parents and the on the permanent income of the household (Tansel, 1997, 2002). Other studies have emphasised the importance of mother's education, and factors like nutrition that are related to a household's economic status (Zhao and Glewwe, In press). There is some evidence to suggest that the importance of family background on educational attainment of individuals in developing countries is fairly stable over time (Smith and Cheung, 1986). Religion and ethnicity can also play an important role in

determining an individual's educational attainment, with some people from some religious and ethnic backgrounds having a greater statistical likelihood of higher educational attainment than others (Sander, 2009, In press). In part, this could be on account of inter-group differences in the impact of parental education on educational attainment (Gang and Zimmerman, 2000). Educational attainment is also affected by factors that affect an individual's demand for education, as students respond to economic incentives in making education choices (Wilson, 2001).

The evidence about the impact of government policy on educational attainment is much more ambiguous, especially in the context of developing countries. There is evidence to suggest that government policies, in part in the form of greater educational spending, can have a positive impact on educational attainment of a population (King and Lillard, 1987; Gupta, Verhoeven and Tiongson, 2002). But the impact of government spending varies across countries (Gupta and Verhoeven, 2001). Further, analyses using individual level data demonstrate that once factors like ability (which, in turn, may be influenced by family background) are controlled, school characteristics like teacher-student ratio that can be influenced by government policy no longer has any impact on educational attainment (Dearden, Ferri and Meghir, 2002).

We examine the relative importance of family background (encompassing both individual and household characteristics) and government policy on educational attainment in India. Specifically, we use the 61st round of the National Sample Survey (NSS) data for 2005 to examine the impact of these individual, household and regional characteristics influenced by government policies on the likelihood of transition across educational levels (primary, middle, higher secondary and tertiary). In light of the evidence about significant differences in the educational attainments of Hindus and Muslims in India (Bhaumik and Chakrabarty, 2009a, 2009b), we separately estimate the impact of these variables on the educational attainments of these two religious groups. Our results suggest that state-level characteristics like per capita GDP and structure of a state's economy do influence the likelihood of transition from any level of education to the next (or higher) level. Government policies (captured by the share of a government's expenditure spent on education) matter as well. However, while public spending on education has a positive impact on transition probabilities for lower levels of education,

they have a (counterintuitive) negative impact on the likelihood of transition from high school to tertiary education.

The rest of the paper is structured as follows: In Section 2, we discuss the data and highlight some interesting patterns. The econometric methodology is discussed in Section 3. In Section 4, we report and discuss the implications of our regression results. Finally, Section 5 concludes.

2. Data

For our analysis, we use individual level data from the 61st round of the NSS. We concentrate on individuals in the 25-30 age group. The lower limit for age is chosen on the basis of the reasonable assumption that, with very few exceptions, an individual takes all her decisions about education (e.g., whether or not to enrol in a college or university) by the age of 25. The upper age limit is influenced by the availability of data. As we shall see later, we argue that an individual's decision to move from the kth education level to the $(k+1)^{th}$ education level is influenced by the economic conditions prevailing at the time at which the decision is taken. For example, the decision to enrol in a middle school after the completion of primary education is made at the age of 14, such that for an individual who was 30 year old in 2005, the year in which that decision was made was in 1989. We were able to obtain appropriate data on economic conditions prevailing in different states in India going back to the late eighties, particularly data on detailed break-up of state government's budget, and this, in turn, determined the upper limit of the age cohort for our analysis. We do not, however, consider this data limitation to be a disadvantage. On account of these limits, all the individuals in our sample made their educational decisions in the era of economic liberalisation in India which started in the mid eighties (Rodrik and Subramanian, 2004), thereby making our analysis relevant in the current context of a liberalised economy.

We concentrate on individuals from 12 states that account for 87% percent of the country's population and over 85 percent of its GDP. We leave the North Eastern states and Jammu and Kashmir out of our sample because political uncertainties and insurgencies in these states may have impacted decisions about educational attainment in ways that would be difficult to model empirically. Further, we combine states like Jharkhand and Bihar that were a combined political entity in the early

nineties. This aggregation was necessitated by the fact that individual and household level data from 2005 had to be matched with state level data from the late eighties and the nineties, when these states were unified political entities, which implies total number of states as 15.

Figure 1
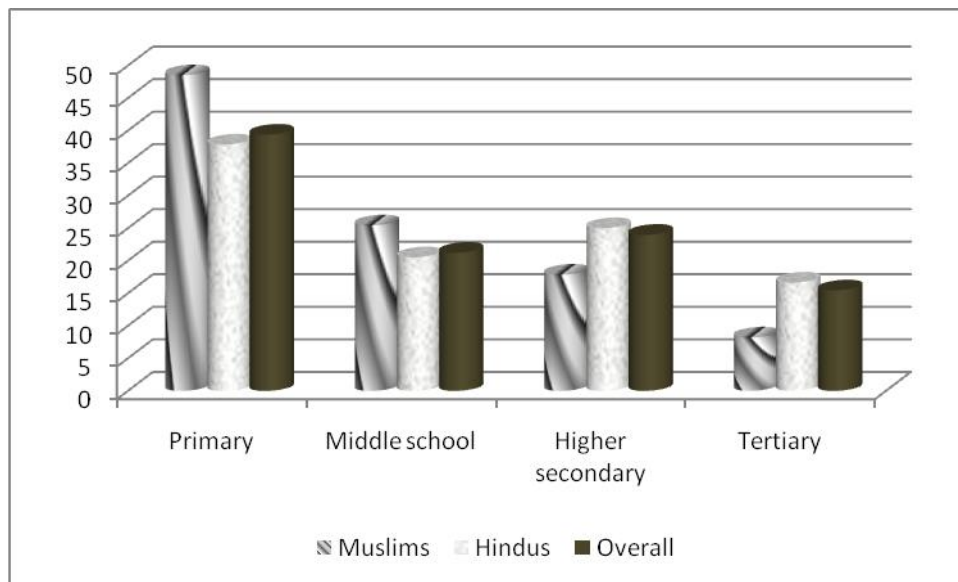
Our final sample has 14,332 observations, of which 12,283 are Hindus and 2,049 are Muslims. In keeping with earlier literature on India that also used NSS data (Bhaumik and Chakrabarty, 2009a, 2009b), we distinguish between four levels of educational attainment: primary, middle school, higher secondary (i.e., high school graduation), and tertiary which includes graduate and above. The distribution of the Hindus and Muslims (and the overall sample) across the four educational levels are reported in Figure 1. As highlighted in previous studies, while the overall distribution is skewed in favour of lower levels of education, with primary and middle school education accounting for 60.59 percent of the sample, the distribution is more skewed for the Muslims (73.94 percent) than for the Hindus (58.37 percent). The advantage of the Hindus is particularly high for tertiary education; 16.63 percent of the Hindu individuals in our sample have tertiary education, double the proportion of the Muslims (8.2 percent).

Since the aim of this analysis is to examine the relative importance of family background and government policies in determining educational attainment, it would be important to have a

significant variation in the characteristics of the states included in the sample. We distinguish between two sets of government policies, the "flow" and the "stock". We take into consideration the contemporaneous education policy of the government as captured by the share of education in government expenditure. We also take into consideration the economic status of each state – as reflected by its development status (per capita state real GDP), the literacy rate of 1981, and dependence on agriculture (contribution of agriculture to state GDP) – that is an outcome of policies pursued over a number of years. While these factors affected the decisions taken by the individuals in our sample in the late eighties and nineties, in order to provide a snap shot of inter-state variations in these factors, in Figure 2 we report the average values of the underlying variables for the 1985-1998 period, whose relevance would be evident shortly. The diversity of the states is apparent from Figure 2.
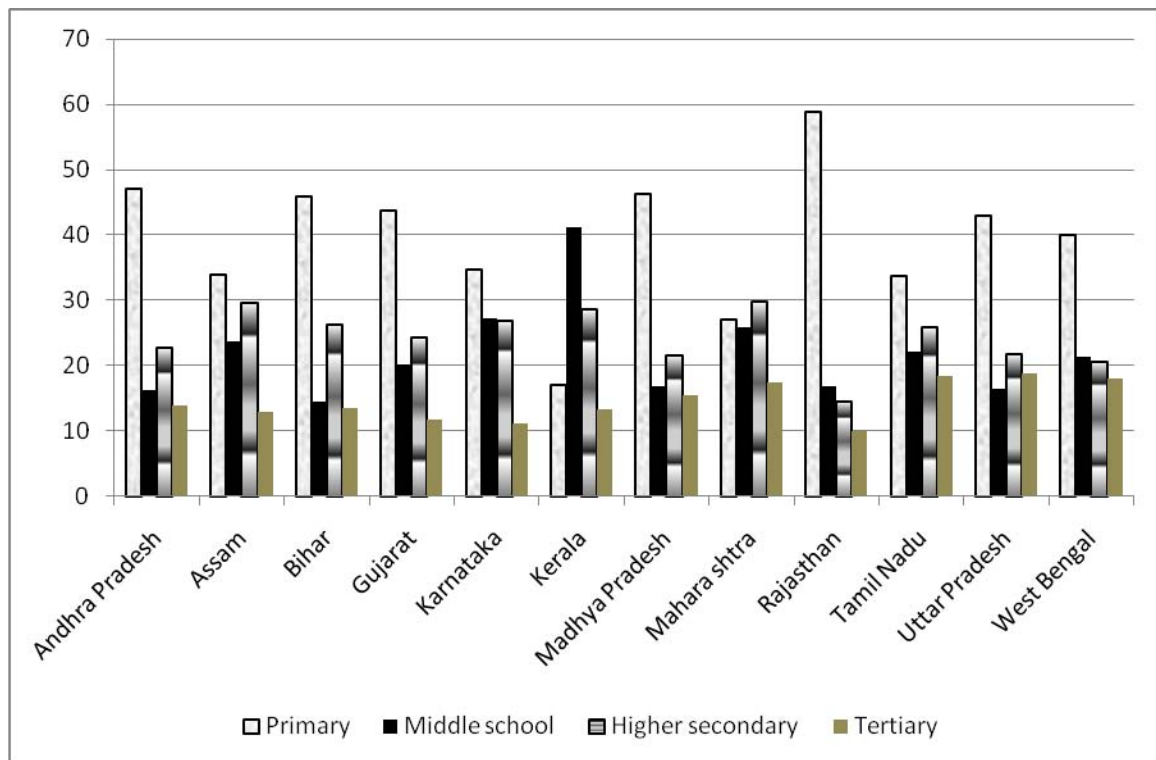
Figure 2
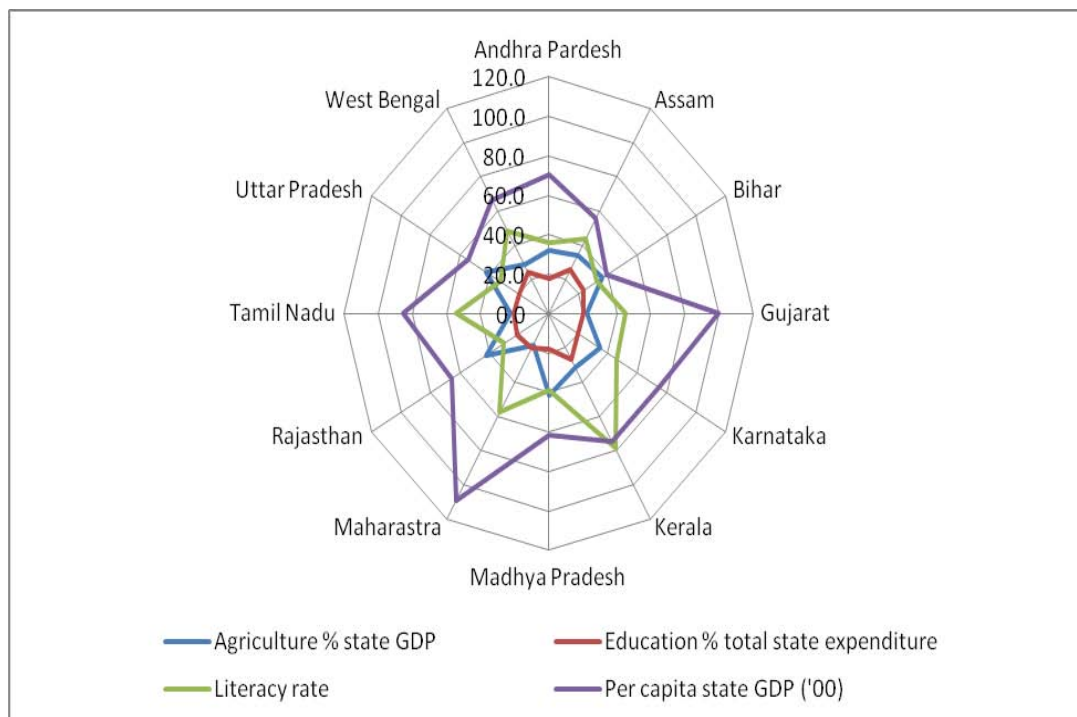
If government policies, whether directly related to education or affecting behaviour of economic agents by way of environmental factors like the level of development, do have a significant

impact on educational attainment, we should expect a significant variation in the aggregate levels of educational attainment across the states. In Figure 3, we report the differences in the educational attainment of individuals in our sample across the 12 states. It can be seen that while in each state the share of primary and middle school education exceeds the share of higher/tertiary education by a substantial margin, there are nevertheless significant variations across the states.

Figure 3

Education attainment not only varies across states, but location within states – broadly divided into urban and rural locations – also matter significantly. In Figures 4a and 4b, we report the distribution in individuals with middle school education and tertiary education across states, divided into rural and urban locations. It can be seen that for lower levels of educational attainment, urban locations do not have a significant advantage over rural locations in any of the states. However, for higher/tertiary education, the advantage of urban locations is significant.

The above discussion suggests that there is considerable variation in educational attainment across the Indian states, and there are also considerable variations in educational policies of

governments and other local conditions (that are affected by the "stock" of government policies) that can affect an individual's demand for education. Taken together, there is perhaps prima facie evidence that government policies, whether about education itself or about the economics of the states in general, might have an impact on educational attainment. However, there is also evidence to suggest that factors like religion might influence an individual's educational attainment, and we have not yet looked at factors like parental education. Hence, at this stage, it is not possible to make a conjecture about the relative importance of family background and government policies-local economic conditions in determining educational attainment. We examine this more rigorously in the rest of this paper.

Figure 4a
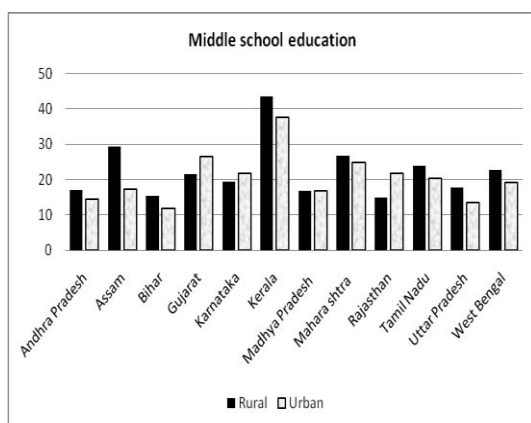
Figure 4b
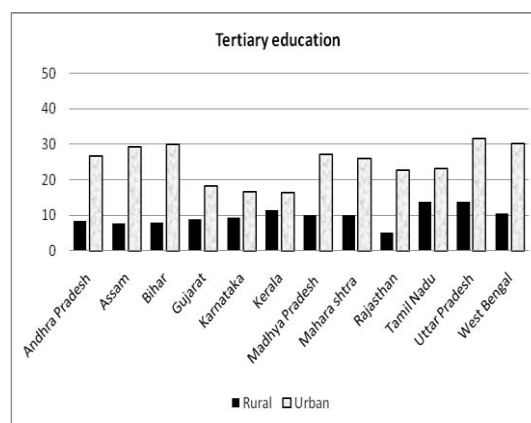
3. Methodology and specification

In contrast to the section of the literature that uses ordered probit to model the educational attainment of individuals, we view progression through educational levels as a sequential process in which attaining each level of education is conditional on not exiting the process after completing the previous level of education. This view is consistent with the observation that children can (and indeed do) drop out of schools after completing some years of education, and that not all high school graduates continue into tertiary education. While there is a well-defined order in education – tertiary education is higher than high school education, for example – the sequence and the risk of not making the transition from one level of education to the next cannot be ignored.

Following Buis (2009), therefore, we model educational attainment in India using a sequential logit model. As mentioned above, in light of the data availability and also the past literature on the impact of education on earnings in India, we construct four levels of educational attainment, namely, primary, middle school, higher secondary (or high school graduation) and tertiary. Given these levels of education, we construct a sequence structure that is depicted in Figure 5.

Figure 5
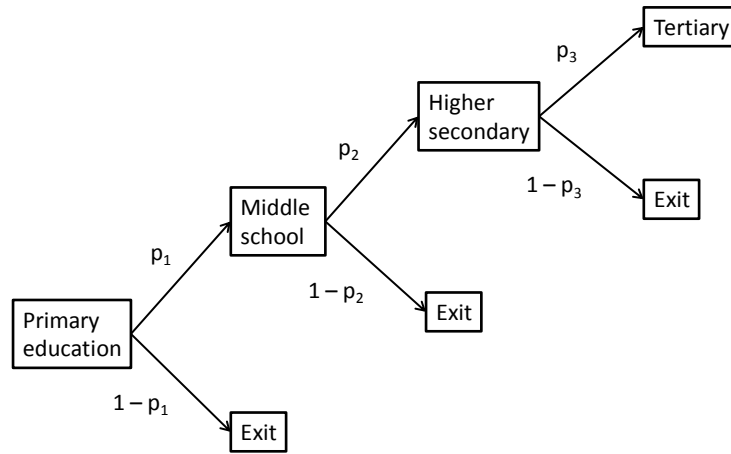
After completing any level of education k, an individual i has the option to continue to the next level of education with probability p_{ki} or exit with probability $(1 - p_{ki})$. The use of the sequential logit model yields estimates of these transitional probabilities p_{ki} that are given by

$$\hat{p}_{ki} = \frac{\exp\left(\alpha_k + \sum_m \beta_{km} x_m + \sum_n \lambda_{kn} z_n\right)}{1 + \exp\left(\alpha_k + \sum_m \beta_{km} x_m + \sum_n \lambda_{kn} z_n\right)}, \text{ if } p_{k-1,i} = 1$$

We model the transition probability as a function of m individual and household characteristics (x) and n other variables that capture the government's educational policy of the individual's state of

residence and the economic environment in the state in general. Starting from an educational level l,

an individual's probability of reaching a higher education level L is, therefore, given by $\prod_{k=l}^{L} p_k$.

Table 1

Variable	Measurement
Dependent variable	Education = 1: primary or below-primary (up to class 5); Education = 2: middle (up to class 8); Education = 3: (higher) secondary (up to class 12); Education = 4: undergraduate and above
Personal and household characteristics	
Gender	Dummy variable = 1 for female (7588 males and 6744 females)
Household per capita consumption	Mean = INR 687.67
Education of household head	Categorical variable with 1 indicating illiteracy and 13 indicating postgraduate education
Location	Dummy variable = 1 for rural
Government policy and economic environment	
Per capita state GDP	Data obtained from the Reserve Bank of India, and measured in INR in 1993-1994 prices
Agriculture % of state GDP	Data was provided by the National Council of Applied Economic Research
Literacy rate in the state	State-level literacy rate in 1981
Education % of state govt. expenditure	Data obtained from state government budget documents

The choice and measurement of household characteristics and the policy-environmental variables are highlighted in Table 1. Our measures of personal and household characteristics are easily understood. These measures are contemporaneous, i.e., of 2005. Some of these characteristics (e.g., gender) are invariant over time. Others like a household's socio-economic status, measured by per capita household consumption can, in principle, change over time. But it is possible to make the reasonable assumption that in a developing country like India current socio-economic status is strongly correlated with past socio-economic status such that, at the very least, the relative positions of households in the distribution do not change substantially over time.

The variables capturing state-level characteristics and government policies, however, do not have contemporaneous measure. Consider, for example, an individual who is 25 in 2005. If he took the decision to make (or not make) the transition from middle school to (higher) secondary education at the age of 14, then her decision would have been influenced by state-level characteristics and government policy *at that point in time*, i.e., in 1994. For the same transition, the relevant year for an individual who is 30 years old in 2005 is 1989. It is easy to see how (with one exception) the values for the state-level variables were chosen for the analysis. Given the age range of 25-30 for our sample of individuals, and given that the transitions range from "primary to middle school" to "higher secondary to tertiary", the values of the state-level characteristics and proxies for government policies were chosen from the 1985-1998 period. The only exception to this is the literacy rate at the state level. For this variable, we use an initial value for all states and all individuals, namely, the state-level literacy rate in 1981. The rationale for the choice of 1981 as the initial year is that in that year all the individuals in our sample were below the age of 5, which is roughly the age at which children in India are introduced to formal education.

4. Regression results and discussion

The regression estimates are reported in Tables 2 (for Hindus) and 3 (for Muslims). Each of these tables has three panels. Panel A reports the coefficient estimates for logit regressions for moving from the primary education to any of the higher levels of education. Panel B reports the coefficients for moving from middle school to higher secondary or tertiary education. Finally, Panel C reports the

estimated coefficients for moving from higher secondary to tertiary education. In both tables, for each

of these panels, most of the estimated coefficients are significant at the 5 percent or 1 percent level.

The likelihood ratio chi-square statistics for the regression models are also significant at the 1 percent

level. Hence, we are fairly confident that our specification explains variations in the educational

attainment in the data reasonably well, for both the Hindu and Muslim sub-samples.

Table 2

	Transition 1 Panel A	Transition 2 Panel B	Transition 3 Panel C
Personal and household characteristics			
Gender (female = 1)	- 1.034 *** (0.051)	- 0.237 *** (0 .057)	- 0.118 * (0.064)
Household per capita consumption	0.001 *** (0.0001)	0.001*** (0.0001)	0.001 *** (0.00001)
Education of household head	0.300 *** (0.009)	0.177 *** (0.009)	0.139 *** (0.010)
Government policy and economic environment			
Per capita state GDP	0.001 *** (0.00003)	0.001 *** (0.00003)	- 0.000004 (0.00003)
Agriculture % of state GDP	0.060 *** (0.005)	0.070 *** (0.006)	0.018 ** (0.007)
Literacy rate in the state	- 0.049 *** (0.003)	- 0.050 *** (0.003)	0.001 (0.0036)
Education % of state govt. expenditure	0.167 *** (0.010)	0.078 *** (0.012)	- 0.032 *** (0.012)
Location			
Rural household	- 0.377 *** (0.059)	- 0.201 *** (0.060)	- 0.444 *** (0.064)
Regression statistics Log likelihood =-11913.753 LR chi-square = 9032.81 Sample size = 12283			

Note: (1) Transition 1 is from primary to middle school or higher; Transition 2 is from middle school to higher secondary or tertiary; Transition 3 is from higher secondary to tertiary. (2) Values within parentheses are standard errors. (3) ***, ** and * indicate significance at the 1, 5 and 10 percent levels, respectively.

The coefficient estimates for the Hindu individuals (Table 2) suggest that the transition to a

higher level of education is affected both by household characteristics (or family background) and by

government policy and the economic environment prevailing in the state at the time of the relevant

decision. Both the educational attainment of the household head and the socio-economic status of the

household (as reflected in the per capita consumption of the household) have a significant and positive impact on the likelihood of transition at each level of an individual's educational attainment. Though the effect household per capita consumption expenditure remains the same across three stages of transitions, the impact of head education is more profound in the first stage of hurdle. In most cases, being a woman reduces the likelihood of transition to the next level of educational attainment. However, once an individual already attains higher secondary level of education, being a woman though decreases the likelihood of transition to tertiary education, but the impact is only marginally significant. This suggests that Hindu women in India generally tend to drop out of education early in life.

Government policy and the economic environment have significant impact on the likelihood of transition as well. Both government expenditure on education (as a percentage of total expenditure) and the level of development in the state (as captured by per capita state GDP) have positive impact on the likelihood of transition to middle school and higher secondary levels of education. However, the level of development does not influence transition to tertiary education, while government expenditure has a *negative* impact on the likelihood of this transition. In an equally counterintuitive manner, state level literacy rate has a *negative* impact on the likelihood of transition to middle school and higher secondary levels of transition. It is, however, not surprising that state-level literacy rate has no impact on the likelihood of transition to tertiary education; the regional educational environment is more likely to affect decisions to enrol in school, but perhaps not so much progression to tertiary education. Interestingly, the likelihood of transition increases with the contribution of agriculture to the state's GDP, suggesting that education might be an instrument to signal capability and thereby increase employability, and is particularly important in states where the spread of industries and the services sector is low. Finally, unsurprisingly, residence in rural areas has a significant negative impact on the likelihood of transition at all levels of educational attainment.

The regression results for Muslims (Table 3) are similar in most respects, but there are also some differences. Once again, education level of the household head and the socio-economic status of the household (captured by per capita consumption) have positive and significant impact on an individual's transition likelihood at each level of educational attainment. For Muslim individuals the

impact of household head education plays less dominant role, particularly at lower level of transitions, reflected by the magnitude of the coefficient estimates. Being a woman reduces the likelihood of transition from primary to middle school or higher levels of education, but has no or marginally significant impact on the transition likelihood for higher levels of education.

Table 3

	Transition 1 Panel A	Transition 2 Panel B	Transition 3 Panel C
Personal and household characteristics			
Gender (female = 1)	- 0.780 *** (0.125)	0.080 (0.144)	- 0.398 * (0.213)
Household per capita consumption	0.002 *** (0.0003)	0.001 *** (0.0002)	0.001 *** (0.0002)
Education of household head	0.236 *** (0.021)	0.150 *** (0.023)	0.139 *** (0.034)
Government policy and economic environment			
Per capita state GDP	0.001 *** (0.00001)	0.001 *** (0.0001)	- 0.0003 *** (0.0001)
Agriculture % of state GDP	0.118 *** (0.014)	0.071 *** 0.018	- 0.029 (0.026)
Literacy rate in the state	- 0.018 *** (0.006)	- 0.041 *** (0.007)	0.003 (0.010)
Education % of state govt. expenditure	0.221 *** (0.027)	0.079 *** (0.031)	- 0.099 *** (0.038)
Location			
Rural household	0.247 * (0.135)	0.082 (0.161)	- 0.196 (0.243)
Regression statistics Log likelihood = -1744.577 LR chi-square = 1477.01 Sample size = 2049			

Note: (1) Transition 1 is from primary to middle school or higher; Transition 2 is from middle school to higher secondary or tertiary; Transition 3 is from higher secondary to tertiary. (2) Values within parentheses are standard errors. (3) ***, ** and * indicate significance at the 1, 5 and 10 percent levels, respectively.

Government policies and state level economic environment influence transition likelihoods as well. Transition likelihoods for moving up from primary and middle school levels increase with the per capita state GDP and with the share of education in the overall expenditure of the state government. The impact of education expenditure is more prominent for the transition from primary to higher secondary education for Muslim individuals than their Hindu counterpart. However, these

are *negatively* correlated with the likelihood of transition from higher secondary to tertiary education. As with her Hindu counterpart, a Muslim individual's transition likelihoods are inversely related to the literacy rate of her state of residence. The share of agriculture does not affect the transition likelihood from higher secondary to tertiary education. Unlike Hindu individual, the sector of residence does not affect the transition likelihood for all levels of education.

Table 4

	Hindu				Muslim			
	Male		Female		Male		Female	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Primary to middle school or higher	0.93	0.79	0.82	0.57	0.70	0.68	0.50	0.48
Middle school to higher secondary or tertiary	0.73	0.55	0.67	0.48	0.40	0.37	0.41	0.38
Higher secondary to tertiary	0.45	0.25	0.39	0.21	0.31	0.24	0.19	0.14

Next, we compute the overall transition probabilities by religion, gender and (rural/urban) location. They are reported in Table 4 and, in effect, are a reality check for our regression results. The probabilities are consistent with our expectations. First, probability for transition is higher at lower levels of education attainment than at higher levels. Even in the best of cases – for a Hindu male resident in an urban area – the probability of transition from higher secondary to tertiary education is 0.45, less than half the transition probability from primary to a higher level of education. The odds worsen even more rapidly for Muslims, women and residents of rural areas. Second, transition probabilities are uniformly lower for females and members of rural households. This is evident from a cursory comparison of the "urban" and "rural" columns for any given religious group and gender, and the "male" and "female" columns of any given religious group and location. Finally, transition probabilities are also uniformly lower for Muslims relative to their Hindu counterparts. Importantly, while this is true for both men and women, the difference is starker for women than for men. For example, for Hindu women in urban areas, the transition probability from primary to a higher level of education (0.82) is more than 60 percent higher than the corresponding probability for an urban

Muslim woman (0.50). The extent of this gap is even greater (100 percent) for the transition probability from higher secondary to tertiary education; 0.39 for the urban Hindu woman and 0.19 for her Muslim counterpart.
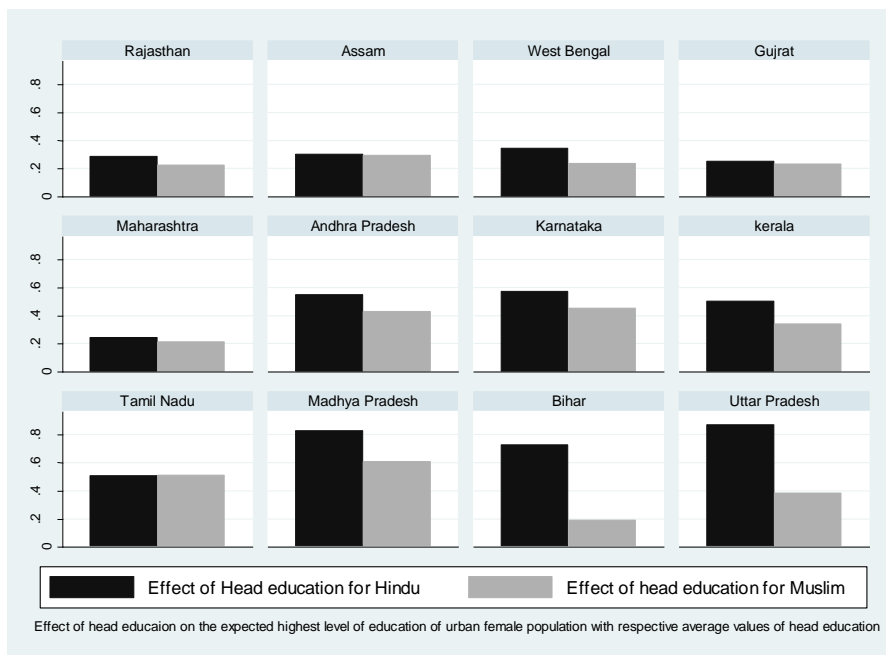
Figure 6a

Effect of head educaion on the expected highest level of education of urban female population with respective average values of head education

Figure 6b

Effect of household head education on the expected highest level of education for urban female population with average HIndu head's education
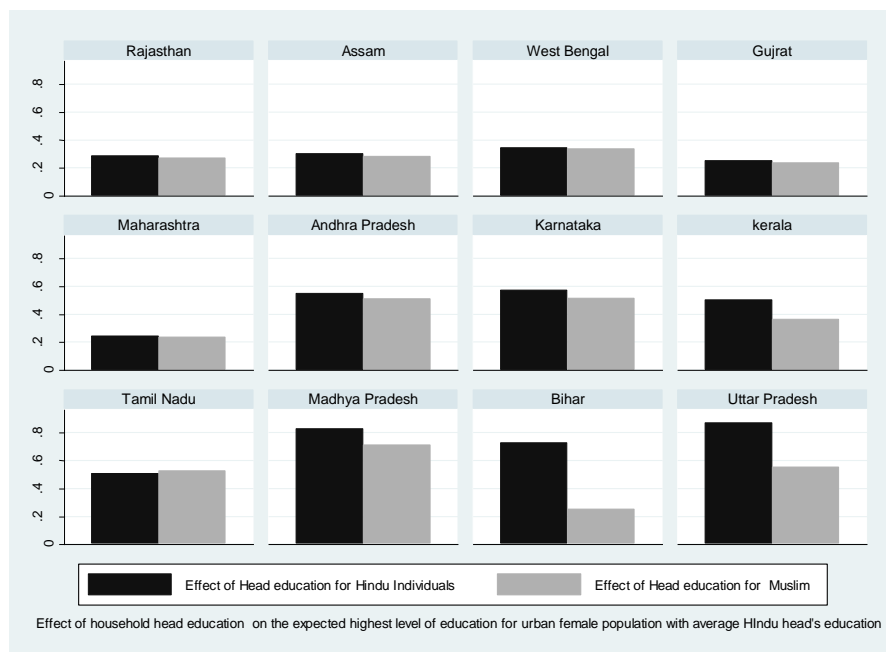
Finally, we revisit the question as to whether government policy has a role to play in enhancing educational attainment, or whether much of it is determined by family background or household characteristics. We have already seen from the regression estimates that government policies – whether contemporaneous education policy or cumulative impact of economic policy reflected in the level of development of the state – have at least as much impact on educational attainment as household characteristics like education of household head and per capita consumption. In light of our discussion about the differences in the transition probabilities of Muslim women relative to their Hindu counterparts, we now focus on the importance of a key household characteristic – education of the household head – which is believed to have a very significant influence on the educational attainment of the household members. In Figure 6a, for each state, we report the impact of the household head's education on educational attainment of women, at the average education levels of heads of Hindu and Muslim households. In Figure 6b, we recomputed this impact, after endowing heads of Muslim households with the average education level of their Hindu counterparts. We can see that while this bridges the gap between the educational attainment of Hindu and Muslim women, a large part of the gap remains open. In other words, household characteristics in general and the family's educational background in particular do not explain the lion's share of the inter-personal variation in educational attainment (nor the difference in educational attainment of Hindus and Muslims), leaving scope for appropriate government policy (whether targeted directly at education or at the economic environment in general) to make an impact.

5. Conclusion

Education policies of governments should ideally take into account not just supply side failures but also individual, household and state-level characteristics that might influence an individual's decision to continue with formal education, Mindful of this proposition, in this paper, we examine the relative impacts of personal-household and state-level characteristics (including government policy) on the likelihood of transition from one educational level to the next. We undertake the analysis separately for Hindus and Muslims. Our analysis suggests that the most important factors driving these transition

likelihoods are personal and household characteristics like gender and education of household heads. However, state-level characteristics and government policies have a significant impact on these transition likelihoods as well, especially for transitions from the lowest levels of education to somewhat higher levels. The odds of making the transition to higher education, especially tertiary education, are systematically lower for women than for men, for individuals in rural areas than those in urban areas, and for Muslims than for Hindus. These results are consistent with the existing literature on gender gaps and gaps between Hindus and Muslims with respect to educational attainment. An important conclusion of our analysis is that there is significant scope for government policy to address educational gaps between various demographic and other groups in the country.

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